GSA Data Repository item 2011164

Gray, R.E., Hamel, J.V., and Adams, W.R., Jr., 2011, Landslides in the vicinity of Pittsburgh, Pennsylvania, *in* Ruffolo, R.M., and Ciampaglio, C.N., eds., From the Shield to the Sea: Geological Field Trips from the 2011 Joint Meeting of the GSA Northeastern and North-Central Sections: Geological Society of America Field Guide 20, p. 61–85, doi: 10.1130/2011.0020(04).

GUIDEBOOK SERIES
THE GEOLOGICAL SOCIETY OF AMERICA

GUIDEBOOK FOR FIELD TRIPS
PITTSBURGH MEETING, 1959

FIELD TRIP COMMITTEE

Tracy V. Buckwalter, ***Univ. of Pgh.***
Addison S. Cate, ***Pa. Geol. Survey***
Carlyle Gray, ***Pa. Geol. Survey***
Randall B. Carter, Chairman,
Gulf Res. & Dev. Corp.

Prepared for the Annual Meeting of
THE GEOLOGICAL SOCIETY OF AMERICA
and ASSOCIATED SOCIETIES

FIELD TRIP LEADERS

FIELD TRIP 1

R. R. Conlin, Pennsylvania Geological Survey
J. T. Miller, Pennsylvania Geological Survey
F. W. Swain, University of Minnesota
J. L. Dyson, Lafayette College
H. Arndt, United States Geological Survey
G. H. Wood, Jr., United States Geological Survey

FIELD TRIP 2

R. R. Dutcher, Pennsylvania State University
J. C. Ferm, Louisiana State University
E. G. Williams, Pennsylvania State University
N. K. Flint, University of Pittsburgh

FIELD TRIP 3

Thomas Arkle, Jr., West Virginia Geological Survey

FIELD TRIP 4

Carlyle Gray, Pennsylvania Geological Survey
A. A. Socolow, Pennsylvania Geological Survey

FIELD TRIP 5

V. C. Shepps, Pennsylvania Geological Survey
G. W. White, University of Illinois
J. B. Droste, University of Indiana
R. F. Sitler, Kent State University

FIELD TRIP 6

S. S. Philbrick, Corps of Engineers, U. S. Army
H. F. Ferguson, Corps of Engineers, U. S. Army

CONTENTS

GUIDEBOOK FOR FIELD TRIPS
PITTSBURGH MEETING, 1959

Published by

THE GEOLOGICAL SOCIETY OF AMERICA

1959

Address all communications to

The Geological Society of America

419 West 117 Street, New York 27, N. Y.

INTRODUCTION

The Pennsylvanian rocks of the Allegheny Plateau area of western Pennsylvania, eastern Ohio, and northern West Virginia are cyclic sediments. The foundation and slope problems of engineering construction in this area arise as a result of the lithologic character of the rocks composing the cycles and the repetition of these partial and complete cycles.

It is the purpose of this trip to define these cyclic rocks, demonstrate their relationship to the four major problems in engineering geology in the Pittsburgh area, and to relate the effect of the area's geomorphic history and economic development with these problems. The problems are:

1. Design of rock cuts
2. Landslides
3. Foundations in bedrock
4. Subsidence over coal mines

ROAD LOG

Assembly for departure on this field trip will be at the Penn-Sheraton Hotel. Departure time is to be 8:30 a.m. on Sunday, November 1, 1959.

Buses will proceed to the north portal of the Fort Pitt Tunnel. (See Fig. 1.)

Mileage

0 STOP 1. North Portal of the Fort Pitt Tunnel. Note slopes above and to either side of the portal, type and strike of joints, differential weathering of rocks, angles of slopes, and location of benches. Section begins in the Ames limestone and extends up through the Pittsburgh coal.

Proceed east along East Carson Street, paralleling Mt. Washington past the plugged Wabash Tunnel, to Arlington Avenue.

Turn right to the Liberty Tunnel. Turn left and proceed through the tunnel in the right-hand lane of traffic.

As you exit the tunnel turn right on Saw Mill Run Blvd., then left at West Warrington Avenue (Route 19) and continue on Saw Mill Run Blvd. (Rts 88 and 51) to the underpass of the Pittsburgh and West Virginia Railroad.

3.2 STOP 2. Pittsburgh and West Virginia Railroad Underpass. Note the outcrop of the Morgantown sandstone on either side of the road cut, underlain by the Wellersburg clay and limestone and the Birmingham shale. To the left of the road a commercial company is quarrying and crushing the Morgantown sandstone. The rate of weathering of the clays is approximately 0.6 feet per year as measured at the light pole, and about 0.2 feet per year as indicated by the retreat of the clay at the east wing-walls.

4.6 Proceed west along Saw Mill Run Blvd. to South Portal of the Fort Pitt Tunnel. Slopes on clays and shales of the upper Conemaugh sequence on right were cut on 1:1 in 1950.

Proceed along Saw Mill Run Blvd., noting outcrop of the Wellersburg coal, and clay and limestone beneath the Morgantown sandstone.

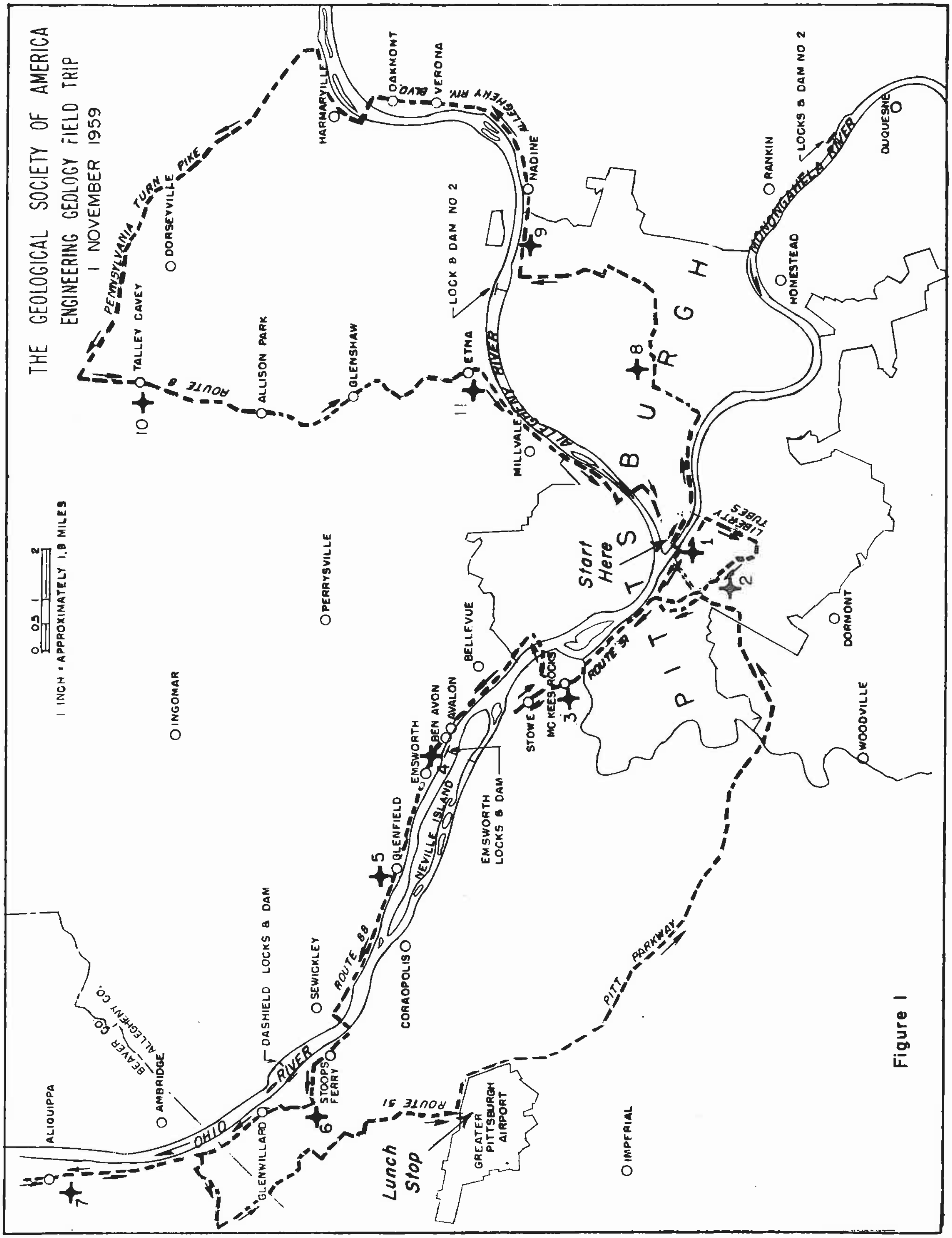

THE GEOLOGICAL SOCIETY OF AMERICA
ENGINEERING GEOLOGY FIELD TRIP
1 NOVEMBER 1959
0 .05 1 2
1 INCH = APPROXIMATELY 1.9 MILES
PENNSYLVANIA TURN PIKE
ROUTE 8
ALLEGHENY RIV. BLVD.
ALLEGHENY RIVER
MONONGAHELA RIVER
OHIO RIVER
ROUTE 88
ROUTE 51
ROUTE 51
PITT PARKWAY
LIBERTY TUBES
PITTSBURGH
Start Here
Lunch Stop
TALLEY CAVEY
ALLISON PARK
GLENSHAW
ETNA
MILLVALE
DORSEYVILLE
HARMARVILLE
OAKMONT
VERONA
NADINE
LOCK 8 DAN NO 2
LOCKS & DAM NO 2
RANKIN
DUQUESNE
HOMESTEAD
DORMONT
WOODVILLE
BELLEVUE
PERRYSVILLE
INGOMAR
BEN AVON
AVALON
EMSWORTH
EMSWORTH LOCKS & DAM
NEVILLE ISLAND
GLENFIELD
STOWE
MC KEES ROCKS
SEWICKLEY
CORAOPOLIS
DASHIELD LOCKS & DAM
STOOPS FERRY
GLENWILLARD
AMBRIDGE
ALIQUIPPA
BEAVER CO.
ALLEGHENY CO.
GREATER PITTSBURGH AIRPORT
IMPERIAL
1
2
3
4
5
6
7
8
9
10
11

Figure I

Mileage

Proceed to West Carson Street in the left-hand lane of traffic, then turn left on West Carson Street (Route 51); continue on Route 51 to Stop 3.

8.4 STOP 3. Island Avenue Slide at McCoubray Street.

For the next 0.4 mile note condition of street, sidewalks, and houses as a result of slide in 1951. This slide was caused by the removal of the toe of hillside overburden (colluvial material) by the Hako Corporation for the construction of an office building and parking lot.

Turn around and return to the McKees Rocks Bridge and cross Ohio River. Note cliffs of Buffalo sandstone above Pennsylvania Railroad.

Turn left to Ohio River Blvd. (Route 88) at traffic light. Note collector-type water well at upstream end of Davis Island and Pittsburgh Coke & Chemical Company plant on Neville Island.

Turn on Brighton Road in Ben Avon; left on Forest Avenue, through underpass beneath Ohio River Blvd. (Route 88) to Emsworth Station of Pennsylvania R. R.

STOP 4. Emsworth Locks and Dam.

Proceed on foot through underpass beneath Pennsylvania R. R. tracks to river-side station platform to observe Emsworth Locks and Dam, the upstream locks on the Ohio River. Lift is 18 feet from elevation 692 to 710. Lock dimensions: 110 x 600 feet and 56 x 360 feet. Locks and first two piers of dam founded on bedrock; remainder of dam founded on steel H-piles driven to rock.

Return to Ohio River Blvd. (Route 88).

Continue on Route 88 through Emsworth. Once through Emsworth, note cut on right exposing Saltsburg sandstone and shale underlain by fire clay and uniform slope across soil-filled ravines. Slides occurred in soil during construction, but rock falls are rare and small.

Proceed on Route 88 through Glenfield to Stop 5.

17.3 STOP 5. Glenfield.

Road cut for newest section of Ohio River Blvd. exposes the Pittsburgh red beds at the top, Saltsburg shale, the Bakerstown coal, and the Saltsburg sandstone at the bottom. Note conditions of slope at road level, with the jointing in the shale paralleling the river and road. Also note the undercutting of the shale by the Bakerstown coal and underlying clay.

Proceed west along Route 88 to the Sewickley Bridge; turn left across the Bridge over the Ohio River, then right on Narrows Run Road to Stop 6.

20.1 STOP 6. Stoops Ferry

Note slope conditions looking west toward Stoops Ferry. Conditions similar to these existed near Aliquippa where 20 people were killed in 1942 when rock fall struck a commercial bus. Damages were about $500,000. Note exposure of Brush Creek limestone.

Proceed along Narrows Run Road to its intersection with the Stoops Ferry and Shousetown Road, then bear to right on the Stoops Ferry and Shoustown Road.

Mileage

Continue on this road to intersection, then turn right toward Glenwillard, Wireton, and South Heights. Upon leaving South Heights note slides in colluvial soils on left side of road.

24.9 STOP 7. Aliquippa.

Cuts expose section of upper Conemaugh strata. Proceed 2.3 miles to west end of cut, note location of the benches, undercutting of the sandstones by the fire clays. The design of the cuts is not in harmony with the geological conditions.

Turn around and return along Stoops Ferry and Shousetown Road to its intersection with Route 151 (about 1 mile); turn right on Route 151. The section exposed at the preceding stop is shown again in cuts on right side of road approaching the top of Conemaugh series.

Turn left on Route 51 and proceed toward Carnot. Note strip mines in the Pittsburgh coal along this route.

At Carnot turn right onto Carnot Beers School Road and continue to the Greater Pittsburgh Airport for lunch.

38.6 LUNCH STOP.

Leave Airport and turn right on Parkway and return to North Portal of Fort Pitt
54.9 Tunnel at Point Bridge.

Cross Point Bridge then right onto the Parkway East.

Passing under the 10th Street Bridge, note slope conditions, sandstone and underlying clays with supporting structures under Boulevard of the Allies.

Proceed up Oakland ramp to Forbes Street; continue along Forbes Street to Halket Street; then left on Halket Street to Fifth Avenue; then right onto Fifth Avenue.

STOP 8. Oakland Area.

Foundation problems in the Oakland area (see Fig. 2.) will be discussed.

Continue along Fifth Avenue; then left from Fifth Avenue onto Washington Blvd.;

then right onto Allegheny River Blvd.

60.5 STOP 9. Brilliant Cut (on right).

A slump slide of about 100,000 cu. yds. occurred on this cut in March, 1941, changing the slope from an average of 1:1 to nearly vertical. The slide scarp followed a vertical joint in the Morgantown sandstone through the underlying strata to flatten and then rise at the toe to heave the landward track of the railroad about 2 feet. The estimated cost of this slide was $100,000.

The section exposed at Brilliant Cut is in the lower Conemaugh series (Pennsylvanian), extending from the upper Saltsburg sandstone to the Morgantown sandstone. A few of the units of the typical phases of the Conemaugh cycles are visible here. A complete cycle (though such has not been observed in any one outcrop) for this part of the Conemaugh series is given in Table 1. (See also Fig. 3.).

GEOLOGIC SECTION - OAKLAND DISTRICT, PITTSBURGH, PA.

SCHEMATIC

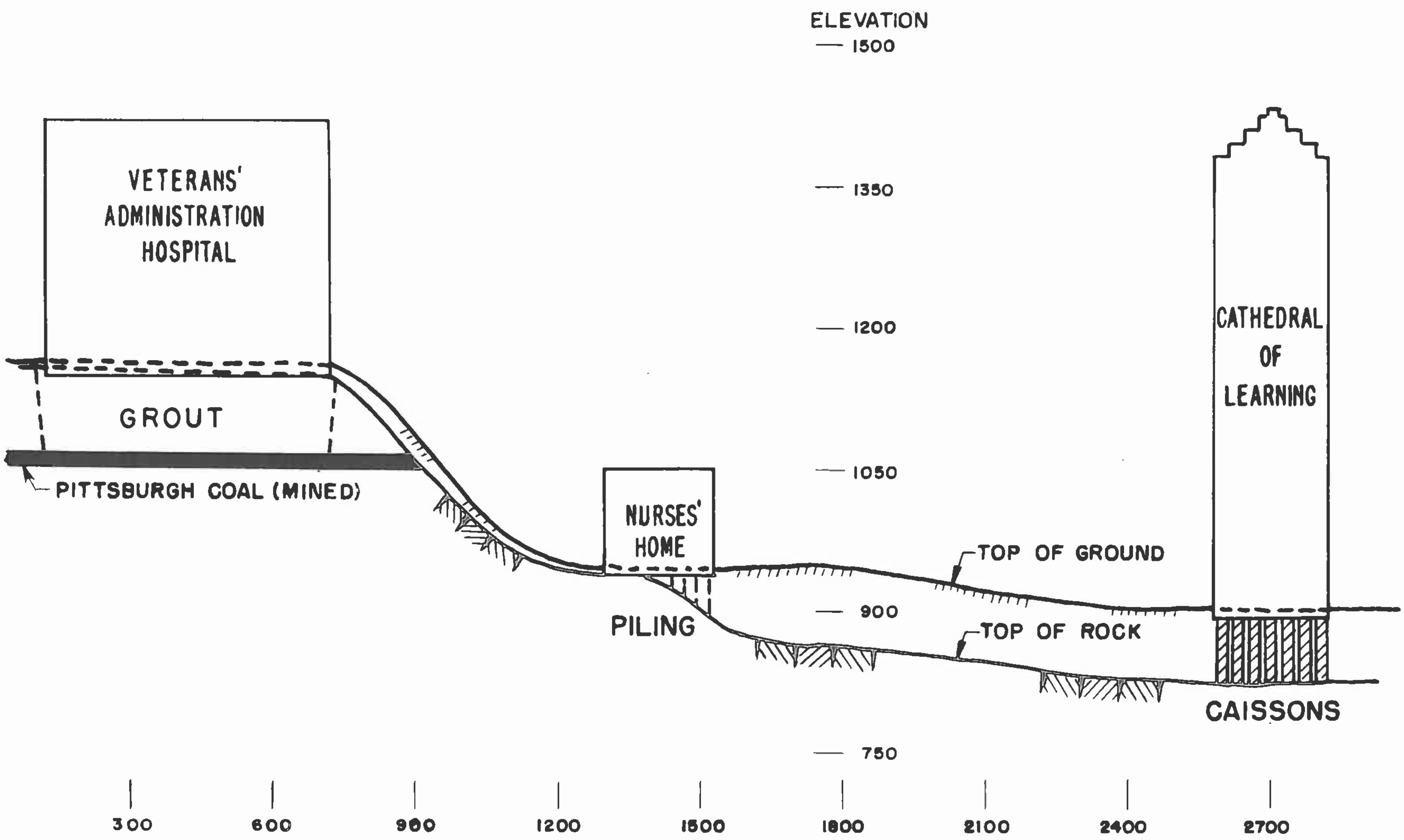


TABLE 1.

SEDIMENTARY CYCLES IN CONEMAUGH SERIES*

Lower Conemaugh	Middle Conemaugh	Upper Conemaugh
Unit 11. Shale, brown red with iron-claystone concretions	10. Shale, red with iron-clay-stone concretions	9. Shale, gray with claystone or limestone concretions
10. Shale, dark gray to black with iron concretions	9. Shale, gray green, with iron-claystone concretions	8. Shale, black; locally coaly
9. Limestone, fossiliferous	8. Limestone, fossiliferous	7. Limestone, often brecciated
8. Shale, gray to black	7. Shale or claystone	6. Shale, black
7. Shale or claystone, gray	6. Coal, or black shale	5. Underclay
6. Coal, or black shale	5. Underclay	4. Shale, gray with few limestone concretions
5. Underclay	4. Limestone, fresh-water	3. Limestone, fresh-water
4. Shale or claystone, gray or brownish-red	3. Shale or claystone	2. Shale, gray with lime-stone concretions
3. Limestone, fresh water	2. Shale or claystone	1. Sandstone, locally shaly
2. Shale or claystone, gray or brownish red	1. Sandstone, micaceous	
1. Sandstone, micaceous		

* From Sixteenth Annual Field Conference of Pennsylvania Geologists, 1950.

GENERALIZED COLUMNAR SECTION – ALLEGHENY COUNTY

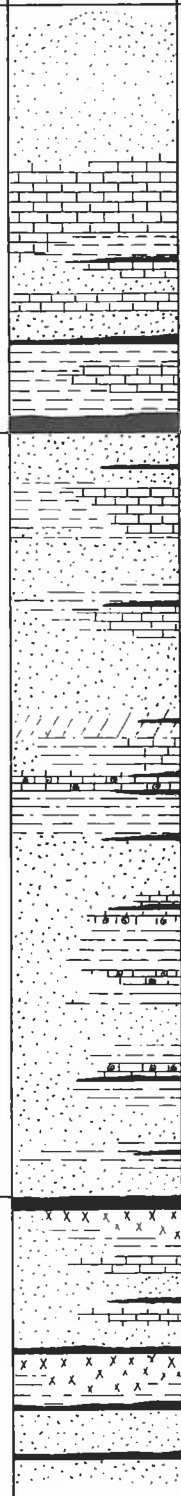
PERIOD	SERIES	COLUMNAR SECTION	THICKNESS	FORMATION OR MEMBER	GENERAL CHARACTER
PENNSYLVANIAN	MONONGAHELA		350±	Uniontown sandstone Benwood limestone Sewickley coal Lower Sewickley sandstone Fishpot limestone Redstone sandstone Redstone coal Redstone limestone Pittsburgh coal	*Chiefly massive, fresh water limestone, interbedded with gray shales. Occasional sandstone near top and bottom. Has thin coals with thick Pittsburgh at bottom. Clays are thin.*
	CONEMAUGH		630±	Lower Pittsburgh sandstone Little Pittsburgh coal Lower Pittsburgh limestones and shales Connellsville sandstone Little Clarksburg coal Clarksburg limestone and clay Morgantown sandstone Wellersburg coal Birmingham shale and sandstone Duquesne coal Ames limestone (marine) Harlem coal Pittsburgh red beds Upper Bakerstown coal Saltsburg sandstone Bakerstown coal Woods run limestone (marine) Pine Creek limestone (marine) Buffalo sandstone Brush Creek limestone (marine) Brush Creek coal Upper Mahoning sandstone Mahoning coal, shale and clay Lower Mahoning sandstone	*Consists mainly of shales and lenticular sandstones, with impure coals and both marine and fresh water limestones. Most shales are silty, but several clay shales and indurated clays are present.*
	ALLEGHENY		275±	Upper Freeport coal Bolivar clay Upper Freeport limestone Upper Freeport sandstone Lower Freeport coal Lower Freeport limestone Lower Freeport sandstone Upper Kittanning coal Upper Kittanning clay Middle Kittanning coal Lower Kittanning coal	*Contains shale, sandstone, clays and coal, with shales predominating. Sandstone thinbedded and shaly. Contains valuable coals and fire clays*

Figure 3

The detailed section* exposed at Brilliant, including unit equivalents of the standard section for the middle Conemaugh series, is as follows:

	Thickness	
Sandstone, Morgantown (Unit 1)	-	-
Claystone, gray; Wellersburg (Unit 3)	1'	7"
Claystone, red; with limestone nodules; Wellersburg clay (Unit 2)	14'	11"
Shale, gray-green, rather sandy (Unit 1)	3'	9"
Shale, red with limestone nodules; Schenley "red beds" (Unit 10)	6'	2"
Shale, gray-green with iron-claystone concretions; Birmingham shale (Unit 9)	45'	0"
Shale, fissile, black with plant fragments (Unit 7)	5'	6"
Clay, gray-yellow (Unit 5)		1/2"
Claystone, gray; Duquesne (Unit 3)	2'	3"
Claystone, red with limestone nodules (Unit 2)	10'	10"
Shale, gray-green, sandy; Grafton (Unit 1)	4'	2"
Shale, red and gray-green with iron-claystone and limestone concretions (Units 9 and 10)	17'	3"
Limestone, slightly shaly with marine fossils; Ames limestone (Unit 8)	3'	4"
(Conspicuous light-colored bed directly above talus on west side of cut.)		
Coal smut (Unit 6)		1/2"
Clay, blue-gray (Unit 5)		1/2"
Claystone, gray (Unit 3)	3'	4"
Claystone, red and olive with nodules of limestone; Pittsburgh "red beds" (Unit 2)	23'	2"
Sandstone, gray; micaceous Upper Saltsburg (Unit 1)	17'	3"
Shale, red, with fossiliferous limestone (<u>Aviculopecten</u> (?)) and iron-claystone concretions (Unit 10)		4"
Shale, gray-green, <u>Aviculopecten</u> (Unit 9)	2'	0"
Shale, black (Unit 7)	1'	10"
Coal smut; Bakerstown (Unit 6)		1/4"
Clay, gray (Unit 5)		1/4"

*From Sixteenth Annual Field Conference of Pennsylvania Geologists, 1950.

Mileage

63.5 Continue along Allegheny River Blvd. to Nadine Pumping Station, noting pre-Saltsburg slumping on right. The shales lie at a considerable angle beneath the nearly horizontal sandstones, due to ancient landslides. Recent slides on right have damaged houses. Buffalo sandstone forms cliff at south end of Verona.

Continue on Allegheny River Blvd. (Green Belt) through Verona and Oakmont.

Turn left on Hulton Road; cross Hulton Bridge; then right on Route 28.

Note Harmarville Coal Company on left mining the Upper Freeport Coal. (see Figs. 4, 5, and 6.)

Continue on Route 28 to the Allegheny Valley Interchange of the Pennsylvania Turnpike. Gulf Research Center is on high terrace on left at interchange.

69.5 Pass through tollgate and proceed west.

69.9 Note Brush Creek coal on left at underpass. It is of no commercial value, but is a good marker bed in this area.

Continue west along the Turnpike, noting Brush Creek coal on right with underlying Upper Mahoning Sandstone.

Continue west along Turnpike noting Upper Mahoning sandstone and shale on right. Also note slope conditions and position of benches.

Turn right at Butler Interchange then left toward Pittsburgh on Route 8; proceed on Route 8 to Talley Cavey and abandoned Wildwood shopping center.

79.9 STOP 10. Wildwood Shopping Center.

Note cracking due to subsidence caused by mining Upper Freeport coal. Depth from top of ground to top of coal is about 270'.

Continue south toward Etna. There has been settling on Wildwood Road about 100 yards east of the intersection (just south of Stop 10) and a tilted garage may be seen west of the intersection.

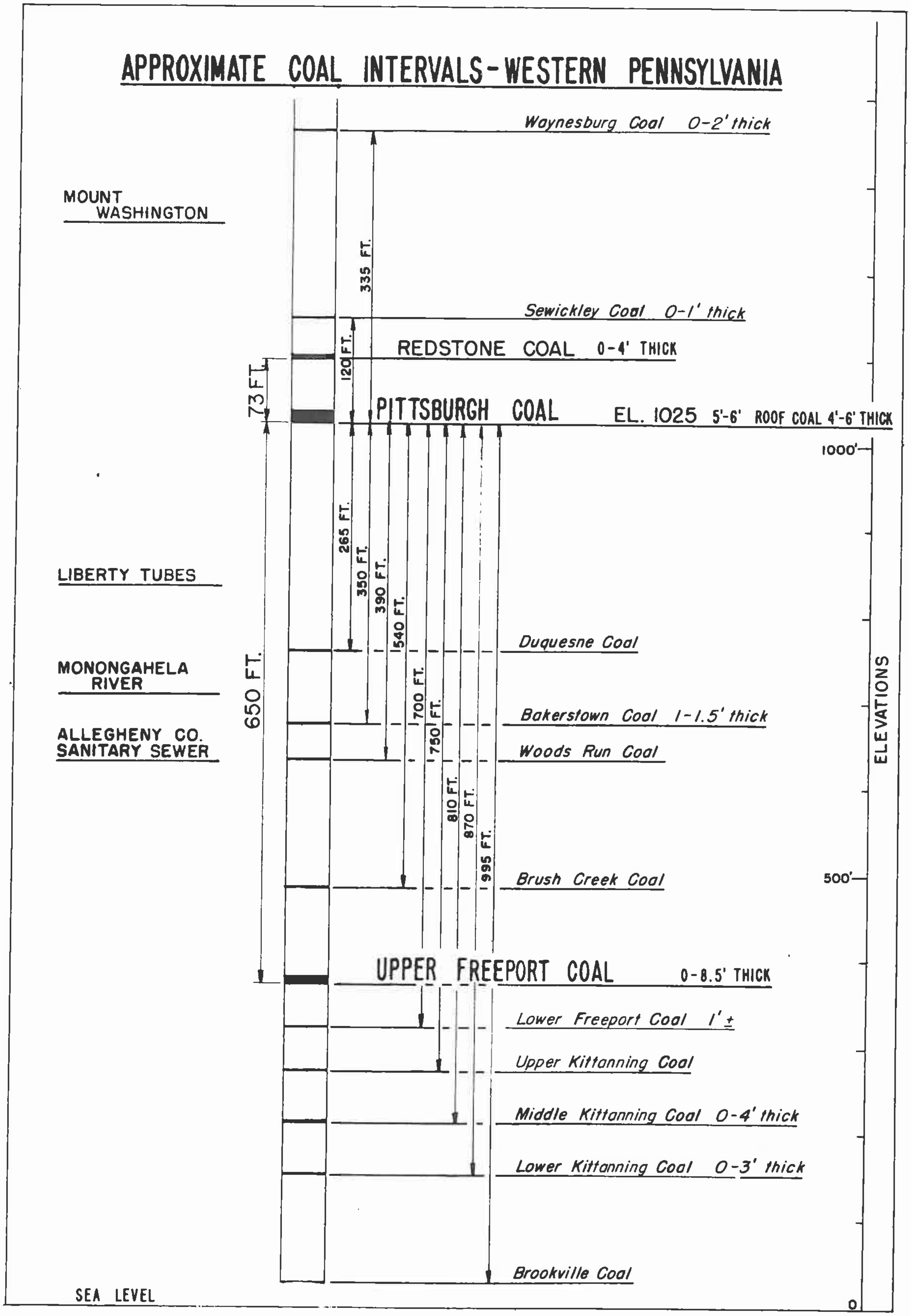
84.3 Note outcrop of Upper Freeport coal in cuts on left. Proceed south toward Etna noting the massive Buffalo sandstone overlain by the Pine Creek limestone (marine) on the left. Continue to the Etna bypass.

89.2 STOP 11. Etna Bypass

North end of cut begins in the Buffalo sandstone and continues up through the Ames limestone. Note condition of slopes and position of benches.

Continue on Route 8 to Pittsburgh noting outcrop of massive cross-bedded Buffalo sandstone and overlying Pine Creek limestone in cuts on right.

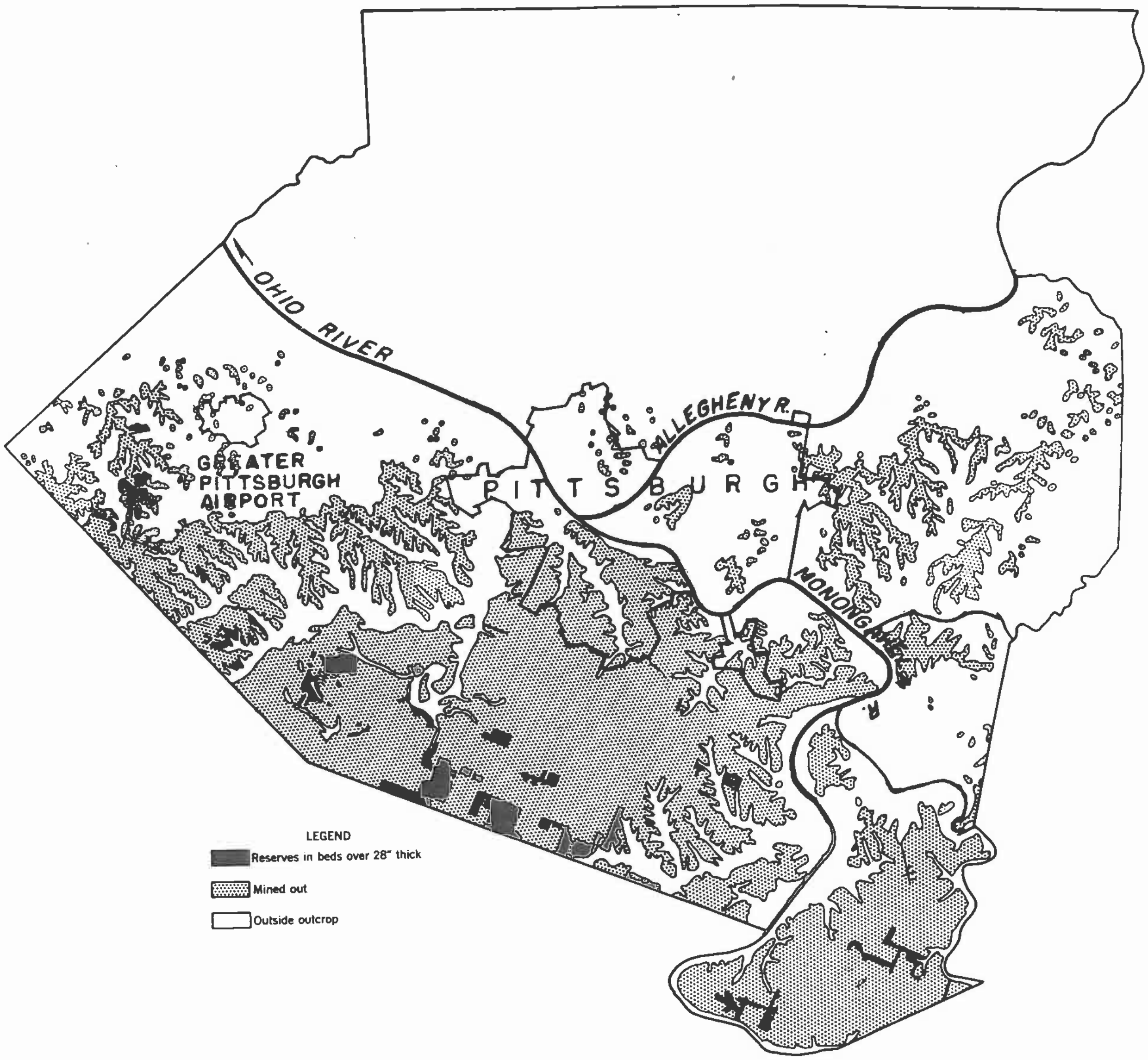
96.2 Pittsburgh - End of Road log.



APPROXIMATE COAL INTERVALS-WESTERN PENNSYLVANIA
Waynesburg Coal 0-2' thick
MOUNT WASHINGTON
335 FT.
Sewickley Coal 0-1' thick
REDSTONE COAL 0-4' THICK
120 FT.
73 FT.
PITTSBURGH COAL EL. 1025 5'-6' ROOF COAL 4'-6' THICK
1000'
265 FT.
350 FT.
390 FT.
540 FT.
LIBERTY TUBES
Duquesne Coal
MONONGAHELA RIVER
650 FT.
700 FT.
750 FT.
Bakerstown Coal 1-1.5' thick
ALLEGHENY CO. SANITARY SEWER
Woods Run Coal
810 FT.
870 FT.
995 FT.
Brush Creek Coal
500'
UPPER FREEPORT COAL 0-8.5' THICK
Lower Freeport Coal 1' ±
Upper Kittanning Coal
Middle Kittanning Coal 0-4' thick
Lower Kittanning Coal 0-3' thick
Brookville Coal
SEA LEVEL
0
ELEVATIONS

Figure 4

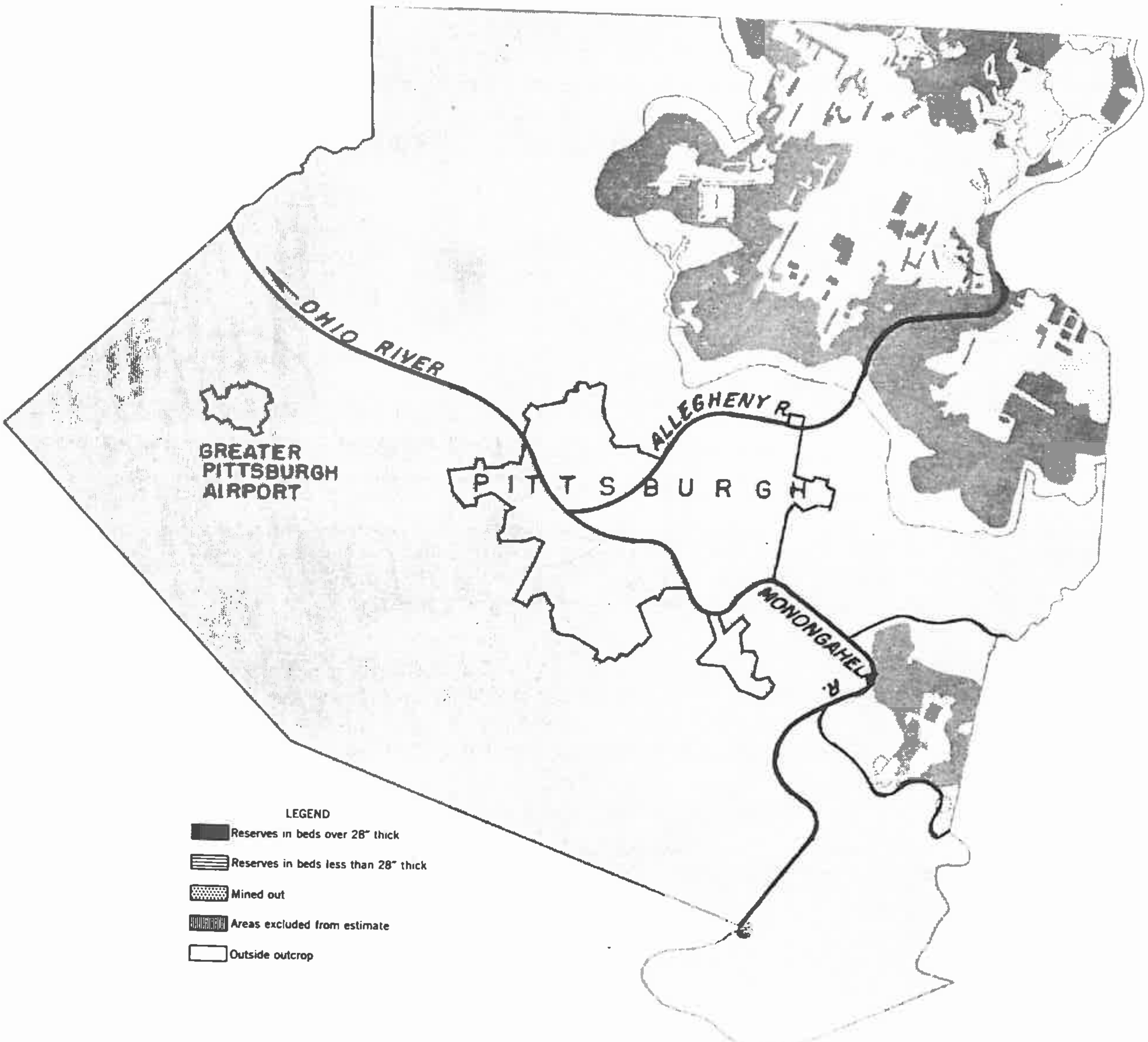
COAL RESERVES-ALLEGHENY COUNTY



Pittsburgh bed, Allegheny County, Pa., January 1, 1953.
(FROM BUREAU OF MINES, REPORT OF INVESTIGATIONS 5003)

Figure 5

COAL RESERVES-ALLEGHENY COUNTY



Upper Freeport bed, Allegheny County, Pa., January 1, 1953.
(FROM BUREAU OF MINES, REPORT OF INVESTIGATIONS 5003)

Figure 6

REFERENCES

Field Conference of Pennsylvania Geologists, 1950, Guidebook.

Johnson, Meredith, 1929, Pittsburgh Quadrangle, Pa.: Pa. Geol. Surv. Bull. A-27.

Leighton, Henry, 1926, The geology of Pittsburgh and its environs: Ann. Carnegie Mus., vol. XVII.

Munn, M. J., 1911, Sewickley: U. S. Geol. Surv. Folio 176.

Richardson, G. B., 1932, Geology and coal, oil, and gas resources of the New Kensington Quadrangle, Pa.: U. S. Geol. Surv. Bull. 829.

Shaw, E. W. and Munn, M. J., 1911, Burgettstown and Carnegie: U. S. Geol. Surv. Folio 177.