PREPARED IN COOPERATION WITH
THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY
AND UNITED STATES BUREAU OF MINES

EXPLANATION

— — 10 — —
— — 20 — —

Isopachs

Dashed where approximately located. Isopach interval 10 feet. Locally sandstone has been removed by recent erosion; these areas are not differentiated

+

Corner of 7½-minute quadrangle

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Data point
See index for sources of data

GEOLOGIC DESCRIPTION

This isopach map of the sandstone overlying the Pittsburgh coal bed was prepared as part of a broad geologic study to determine the paleogeography and sedimentation of coal-bearing rocks and to provide basic geologic data to aid environmental studies.

The sandstone described in this report is within the lower member of the Pittsburgh Formation and occurs between the Redstone and Pittsburgh coal beds. Where the Redstone coal bed is absent the sandstone is part of the lower member and Redstone Member, undifferentiated (sections A-A' and B-B'). The areal and stratigraphic position of this sandstone is variable and may occur in isolated lenses or in large, sinuous, elongate deposits of variable thickness that occupy any stratigraphic position within the lower member. In addition to sandstone, the lower member of the Pittsburgh Formation is composed of interbedded shale, silty shale, claystone, and limestone.

The sandstone is commonly very light to light gray. In weathered exposures it exhibits various shades of yellowish orange and brown depending on the iron-oxide content. Bed thickness is variable and ranges from less than 1 inch to about 3 feet in channel-filled sandstone. Crossbedding is local and consists of two general types: the most prevalent crossbeds are slightly concave upward, are tangential to the lower contact of the crossbed set, and taper downdip; less abundant are planar, even crossbeds that are not tangential to the lower contact. Inclination of laminae within a crossbed set averages about 20°. The overbank and the upper part of the channel-fill sandstones are even bedded and range from a fraction of an inch to about 1 foot in thickness. Grain size ranges from very fine (0.0625-0.125 mm) to coarse sand (0.5-1 mm); the median diameter of most grains is within the very fine sand range (0.0625-0.125 mm). The thicker bedded, channel-fill sandstone is coarser grained than the thin, even-bedded sandstone. Where thick to massive, crossbedded, channel-fill sandstone grades up into thin, even-bedded sandstone, grain size decreases upward.

The sandstone framework is composed of approximately 65 percent quartz and 7 percent feldspar. About 23 percent is interstitial clay, very finely divided quartz, and squeezed shale fragments. The remaining percentage consists of mica and minor amounts of iron oxide, iron sulfide, and other heavy minerals.

Observations on the packing characteristics of the detrital grains indicate that the porosity of the sandstone may be approximately 10 percent. No permeability tests were made for this study, but similar sandstones from the same area have values that range from 0.001-0.03 gallons per day per square foot (Berryhill and others, 1971, p. 40).

The mapped distribution pattern and the geometry of the sandstone bodies observed in outcrops indicate that sand was deposited in the channels and on the bordering flood plains of a generally north- to northwestward-flowing river system. Channels were cut into flood-plain deposits and were then filled by the sand which locally spilled onto the adjoining flood plains. Finally, the sand-filled channels and the flood-plain sand deposits were buried by finer grained sediments.

PRACTICAL APPLICATION

This map is intended primarily for coal mine roof stability research and, to a lesser extent, for locating construction materials and ground water. In order to fully understand, evaluate, and control the roof condition in coal mines, several geologic parameters such as the type and distribution of the roof strata must be known. For example, Kent (1969, p. 321), in a study of mine roof conditions of the Pittsburgh coal bed, related the occurrence of roof falls to the lateral margins of sandstone bodies in the roof. These unstable roof conditions were attributed by Kent to the differential compaction of sandstone and laterally equivalent shale and clay. He indicated that unstable roof rock occurred in a 500-foot marginal zone.

The design and performance of coal-mine pillars with respect to their reaction on loading is governed in part by geologic criteria--in particular, the distribution and character of the roof rock. For example, roof-rock type influences the loading reaction of protective pillars for oil and gas wells that penetrate coal beds. The possibility of casing failure by shearing may be enhanced by the presence of a sandstone roof rock above the protective coal mine pillar (Barry Voigt, U.S. Bur. Mines, oral commun., 1973).

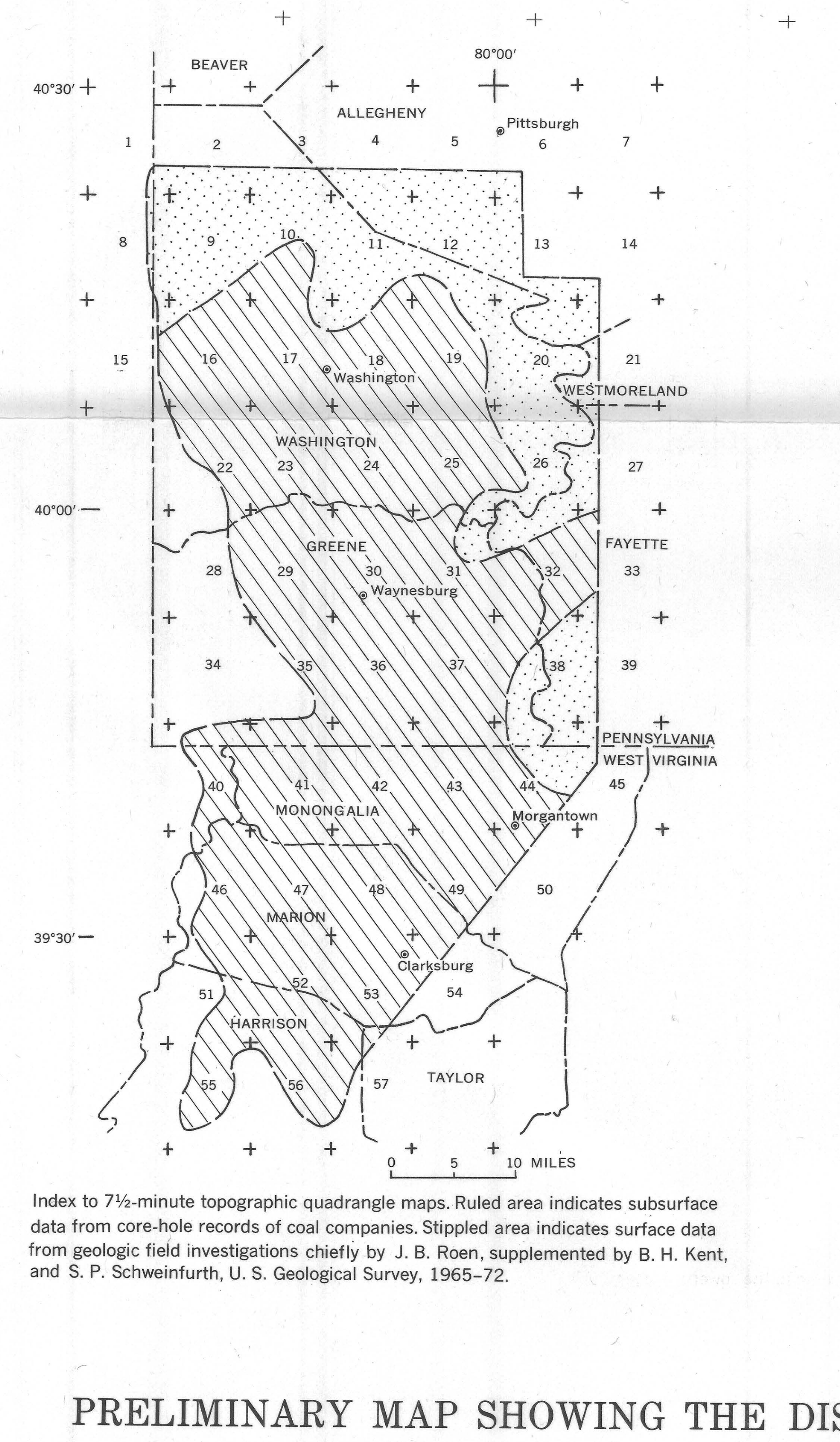
Sandstone in the lower member of the Pittsburgh Formation has been used locally for building stone; however, the high clay content precludes it from being of significant value in building construction. The occurrences of carbonate cement enhance the utility of the sandstone as a potential building material. Some deposits contain as much as 1 percent pyrite which weathers to produce sulfuric acid that adversely affects the sandstone's use. Other uses include road metal, base courses, and fill for highway construction.

The potential of the sandstone as a source bed for water is limited owing to extensive mining in the underlying Pittsburgh coal bed. Subsidence after mining causes fracturing of the sandstone and drainage of its water content. Where the coal has not been removed, however, the sandstone is generally water bearing and may have sufficient quantities for domestic uses.

REFERENCES CITED

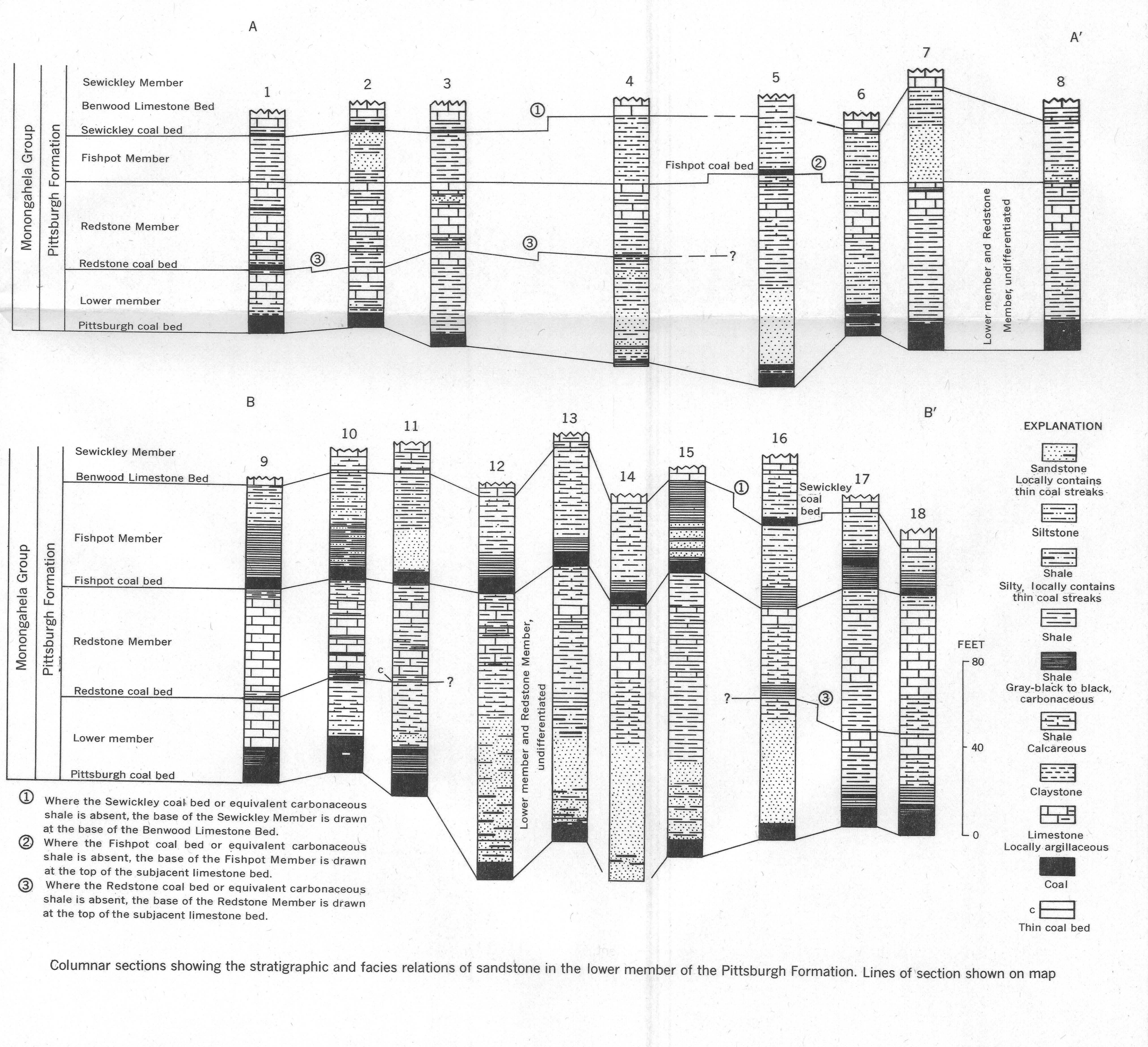
Berryhill, H. L., Jr., Schweinfurth, S.P., and Kent, B. H., 1971, Coal-bearing Upper Pennsylvanian and Lower Permian rock, Washington area, Pennsylvania: U.S. Geol. Survey Prof. Paper 621, 47 p.

Kent, B. H., 1969, The geologic setting of a Pittsburgh coal mine in southwestern Pennsylvania, as related to roof rock conditions, in Some Appalachian coals and carbonates: models of ancient shallow-water deposition--Geol. Soc. America. Coal Div., Preconvention Field Trip 1969: Morgantown, W. Va., West Virginia Geol. and Econ. Survey, p. 321.



1. Weirton
2. Burgettstown
3. Clinton
4. Oakdale
5. Pittsburgh West
6. Pittsburgh East
7. Braddock
8. Steubenville East
9. Avella
10. Midway
11. Canonsburg
12. Bridgeville
13. Glassport
14. McKeesport
15. Bethany
16. West Middletown
17. Washington West
18. Washington East
19. Hackett
20. Monongahela
21. Donora
22. Claysville
23. Prosperity
24. Amity
25. Ellsworth
26. California
27. Fayette City
28. Wind Ridge
29. Rogersville
30. Waynesburg
31. Mather
32. Carmichaels
33. New Salem
34. New Freeport
35. Holbrook
36. Oak Forest
37. Garards Fort
38. Masontown
39. Smithfield
40. Hundred
41. Wadestown
42. Blacksville
43. Osage
44. Morgantown North
45. Lake Lynn
46. Glover Gap
47. Mannington
48. Grant Town
49. Rivesville
50. Morgantown South
51. Wallace
52. Shinnston
53. Fairmont West
54. Fairmont East
55. Wolf Summit
56. Clarksburg
57. Rosemont

Index to 7½-minute topographic quadrangle maps. Ruled area indicates subsurface data from core-hole records of coal companies. Stippled area indicates surface data from geologic field investigations chiefly by J. B. Roen, supplemented by B. H. Kent, and S. P. Schweinfurth, U. S. Geological Survey, 1965-72.



Columnar sections showing the stratigraphic and facies relations of sandstone in the lower member of the Pittsburgh Formation. Lines of section shown on map

PRELIMINARY MAP SHOWING THE DISTRIBUTION AND THICKNESS OF SANDSTONE IN THE LOWER MEMBER OF THE PITTSBURGH FORMATION, SOUTHWESTERN PENNSYLVANIA AND NORTHERN WEST VIRGINIA

By
John B. Roen and Deborah F. Kreimeyer

1973

For sale by U.S. Geological Survey, price 50 cents