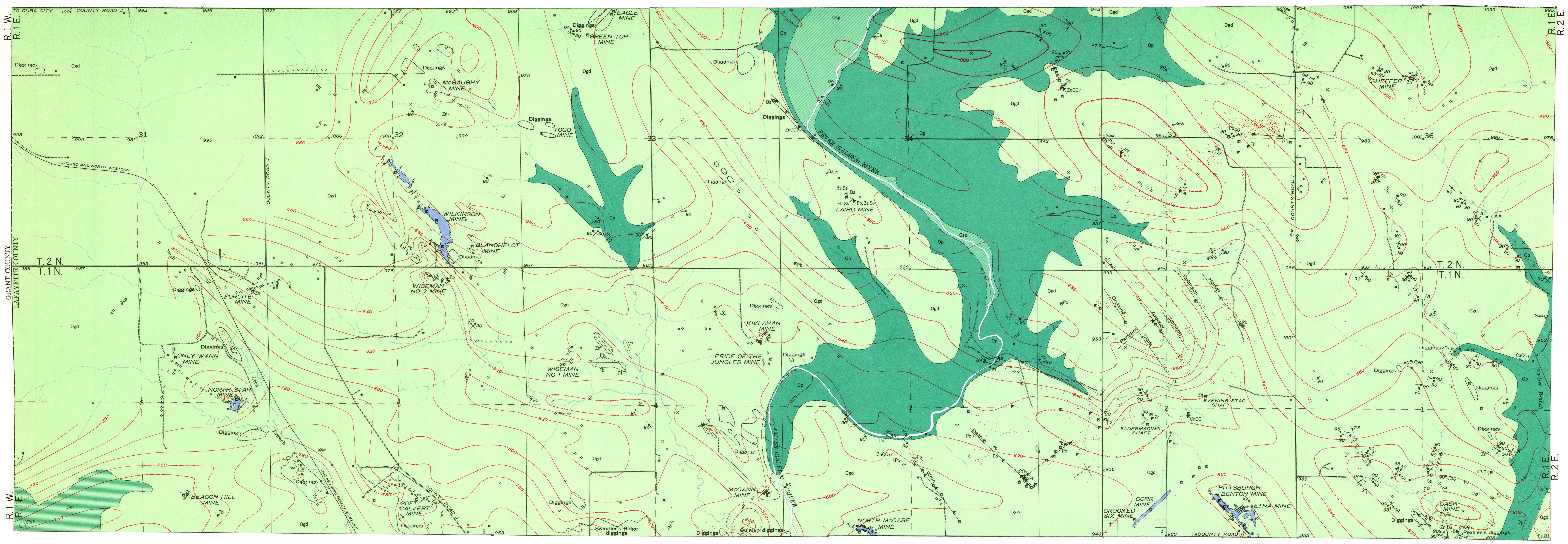
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
W. E. WRATHER, DIRECTOR

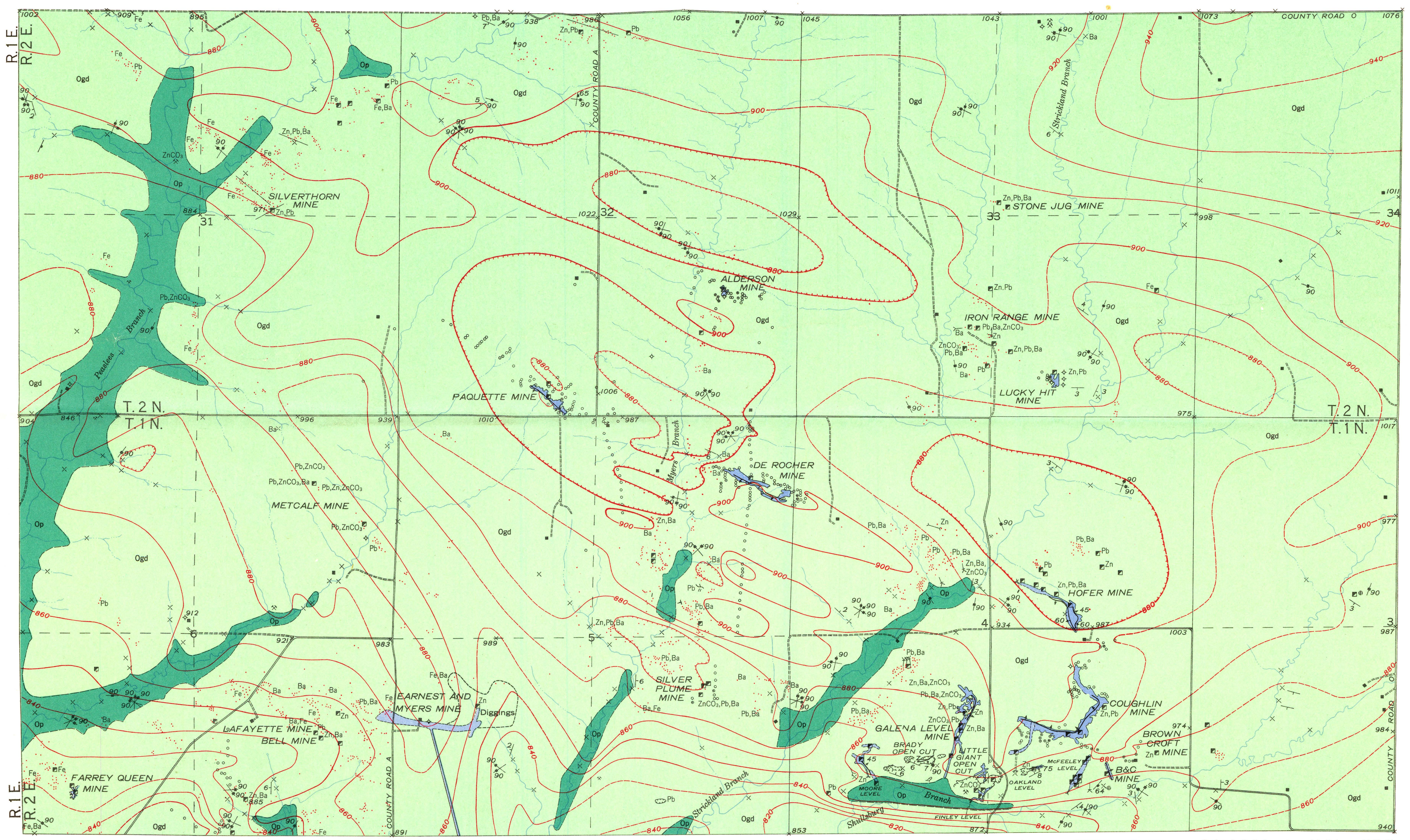
PREPARED IN COOPERATION WITH
THE STATE OF WISCONSIN
GEOLOGICAL AND NATURAL HISTORY SURVEY

MINERAL INVESTIGATIONS
FIELD STUDIES MAP MF 15



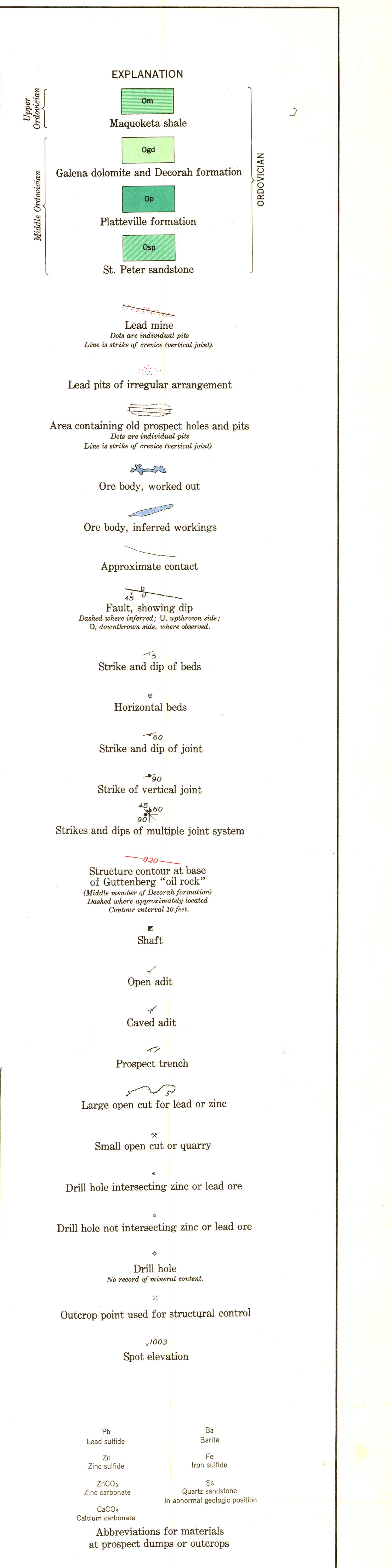
WESTERN PART OF THE AREA EAST OF CUBA CITY, WISCONSIN

Geology by A. F. Agnew and A. E. Flint, 1949–51



EASTERN PART OF THE AREA EAST OF CUBA CITY, WISCONSIN

Geology by R. P. Crumpton and A. F. Agnew, 1949–51



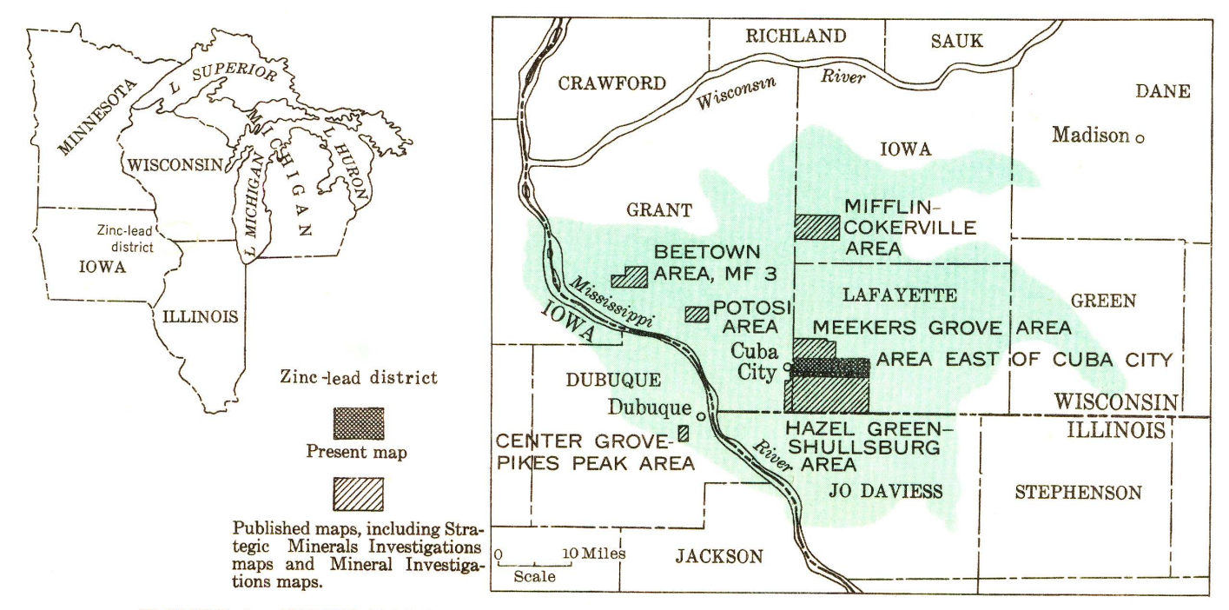
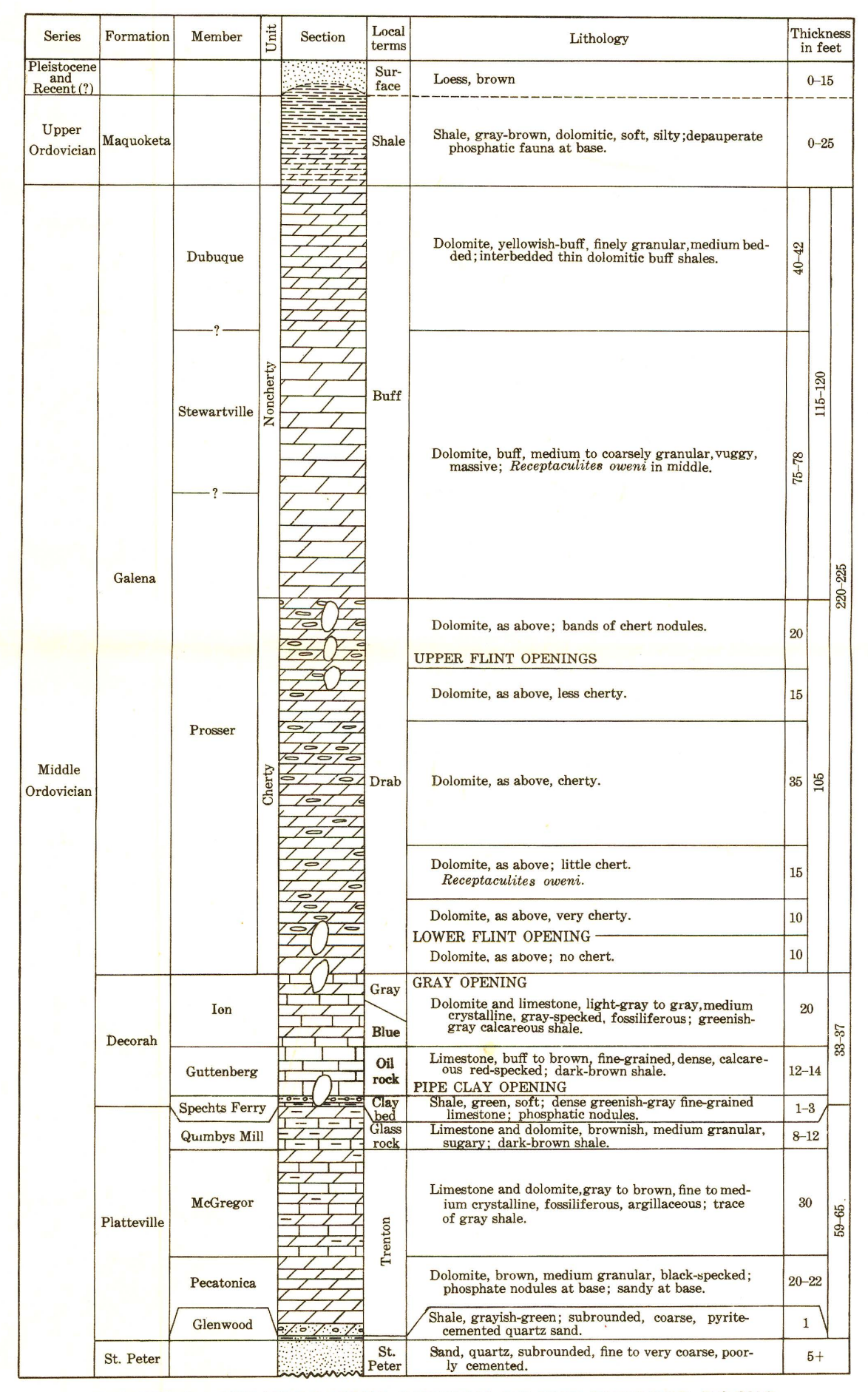


FIGURE 1. INDEX MAPS OF WISCONSIN-ILLINOIS-IOWA ZINC-LEAD DISTRICT



Series	Formation	Member	Unit	Section	Local terms	Lithology	Thickness in feet			
Pleistocene and Recent (?)					Surface	Loess, brown	0–15			
Upper Ordovician	Maquoketa				Shale	Shale, gray-brown, dolomitic, soft, silty; depauperate phosphatic fauna at base.	0–25			
Middle Ordovician	Galena	Dubuque	Noncherty		Buff	Dolomite, yellowish-buff, finely granular, medium bedded; interbedded thin dolomitic buff shales.	40–42	115–120	220–225	
		Stewartville				Dolomite, buff, medium to coarsely granular, vuggy, massive; *Receptaculites oweni* in middle.	75–78			
		Prosser	Cherty		Drab	Dolomite, as above; bands of chert nodules.	20	105		
						UPPER FLINT OPENINGS				
						Dolomite, as above, less cherty.	15			
						Dolomite, as above, cherty.	35			
						Dolomite, as above; little chert. *Receptaculites oweni.*	15			
						Dolomite, as above, very cherty.	10			
						LOWER FLINT OPENING				
						Dolomite, as above; no chert.	10			
	Decorah	Ion			Gray Blue	GRAY OPENING Dolomite and limestone, light-gray to gray, medium crystalline, gray-specked, fossiliferous; greenish-gray calcareous shale.	20			33–37
		Guttenberg			Oil rock	Limestone, buff to brown, fine-grained, dense, calcareous red-specked; dark-brown shale. PIPE CLAY OPENING	12–14			
		Spechts Ferry			Clay bed	Shale, green, soft; dense greenish-gray fine-grained limestone; phosphatic nodules.	1–3			
	Platteville	Quimbys Mill	Trenton		Glass rock	Limestone and dolomite, brownish, medium granular, sugary; dark-brown shale.	8–12			59–65
		McGregor				Limestone and dolomite, gray to brown, fine to medium crystalline, fossiliferous, argillaceous; trace of gray shale.	30			
		Pecatonica				Dolomite, brown, medium granular, black-specked; phosphate nodules at base; sandy at base.	20–22			
		Glenwood				Shale, grayish-green; subrounded, coarse, pyrite-cemented quartz sand.	1			
	St. Peter				St. Peter	Sand, quartz, subrounded, fine to very coarse, poorly cemented.	5+			

FIGURE 2. STRATIGRAPHIC SECTION OF THE EXPOSED ROCKS IN THE MAPPED AREA EAST OF CUBA CITY

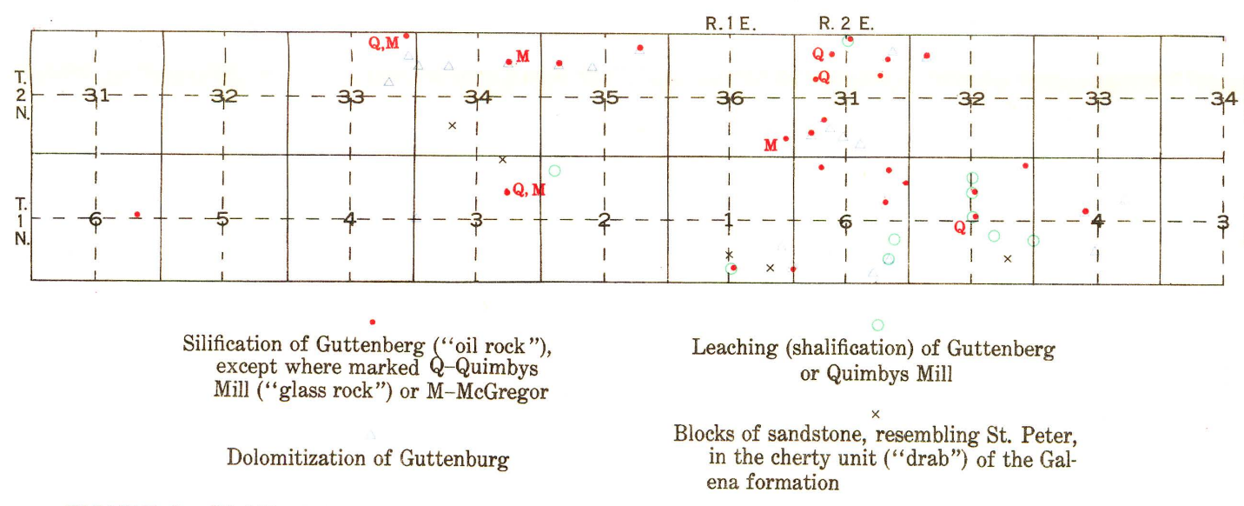


FIGURE 3. PLAT SHOWING AREAS OF SILICIFICATION, DOLOMITIZATION, AND LEACHING RELATED TO MINERALIZATION, AND AREAS OF ANOMALOUS BLOCKS OF SANDSTONE

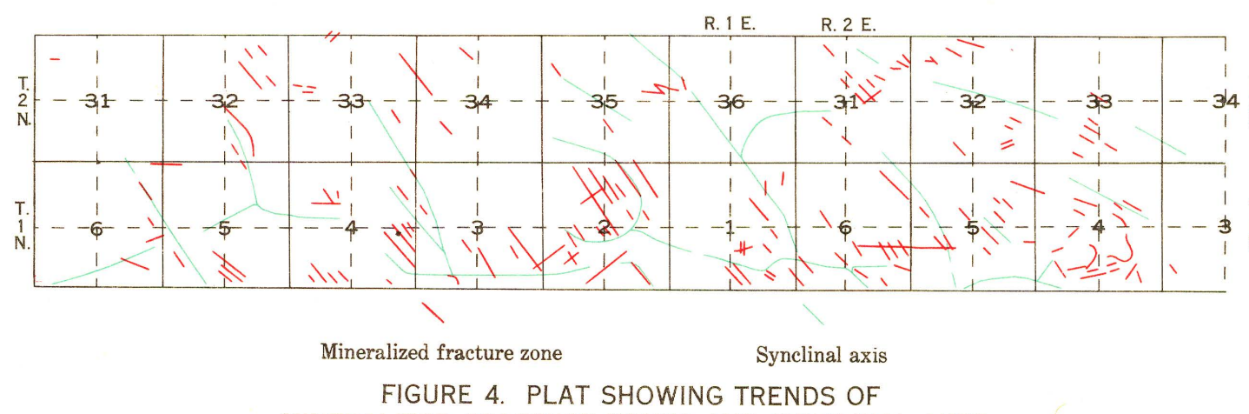


FIGURE 4. PLAT SHOWING TRENDS OF MINERALIZED FRACTURE ZONES AND SYNCLINAL AXES

GEOLOGY AND ZINC-LEAD-BARITE DEPOSITS IN THE AREA EAST OF CUBA CITY, WISCONSIN

By Allen F. Agnew, Arthur E. Flint
and R. P. Crumpton

INTRODUCTION

The current study of the Wisconsin-Illinois-Iowa zinc-lead district (fig. 1) was begun in 1942, with the major emphasis placed on detailed mapping of geologic structure and ore deposits. Preliminary reports for several areas in the mining district have been prepared, and the present study of the area east of Cuba City, Wis., is a continuation of that program.

The investigation of the area east of Cuba City, by the U. S. Geological Survey in cooperation with the Wisconsin Geological and Natural History Survey, indicates that further prospecting for zinc and lead ores is justified; moreover, the quantity of barite present should be noted because local concentrations of this mineral may be of potential commercial value.

The compilation of geologic data in the mapped area by the U. S. Geological Survey in 1949, 1950, and 1951 covers 19 square miles extending from Cuba City eastward to a line just north of Shullsburg. The Cuba City area lies between the previously mapped Meekers Grove (Jenkinsville) area (Heyl, Agnew, Behre, 1945) at the north and the Hazel Green-Shullsburg area (Agnew, Heyl, Behre, Lyons, 1948) at the south. The southern half of secs. 1 to 6, T. 1 N., R. 1 E., and of secs. 3 to 6, T. 1 N., R. 2 E., had been mapped as part of the Hazel Green-Shullsburg area, but additional information was obtained as part of the work related to this report. Interpretations shown on maps are based on all available data; some of the data acquired earlier have been re-evaluated because of additional exposures and because of physical modification of previously mapped exposures. So far as possible, the geologic interpretation for the borders of the area east of Cuba City was adjusted to interpretations for the adjacent mapped areas. In some places, however, adjustment could not be made even after considerable review, and consequently the present interpretation differs from the earlier ones.

Horizontal control for the base map was compiled from aerial photographs made in 1940 by the U. S. Department of Agriculture. Vertical control was obtained from published maps (Grant, 1906, pls. 11, 13, and 15; Hotchkiss and Steidtmann, 1909, pls. 1 and 4) and was extended by level and plane-table surveys. The authors were assisted in plane-table surveying by Julius H. Moor, John W. Allingham, and Marvin A. Hustad. Lines of vertical control were surveyed by Dale W. Ressmeyer and Hugh F. Seeley.

The landowners, mine operators, prospectors, and drillers were very courteous and helpful in supplying information, and their assistance is gratefully acknowledged.

HISTORY

Early mining in this district was a process of digging numerous small, shallow pits and shallow shafts with short drifts. These former mine workings, which are commonly called "diggings" in this district, may be seen in many areas, but plowing has obscured or obliterated some excavations for which the general location is known only from records. Mine areas were being plowed over as early as 1840 (Whitney, 1862, p. 288), and consequently not all early diggings in the following tabulations are shown on the map.

Galena was mined in the area east of Cuba City before 1840 (Owen, 1840, p. 59; Percival, 1855, p. 49, 52, 75-76, 78, 88, 92; Whitney, 1862, p. 288-291, 297-301; Strong, 1877, p. 716-719). Principal lead deposits worked prior to 1854 and the dates of their discovery are as follows:

Name of diggings	*Location of lead deposits*	*Discovery date*
Pitner	NW¼ sec. 6, T. 1 N., R. 1 E.	1838
Old French	SE¼ sec. 6, T. 1 N., R. 2 E.	1842
Swindler's Ridge	SW¼ sec. 4, T. 1 N., R. 1 E.	1844
Dean	N½SE¼ sec. 3, T. 1 N., R. 1 E.	1850
Earnest and Spenceley.	SW¼ sec. 5, T. 1 N., R. 2 E.	Before 1854

Smithsonite was first produced in the Wisconsin-Illinois-Iowa district in 1859, and sphalerite was recovered by 1867. In the mapped area, diggings that produced zinc before 1877 are as follows:

Name of diggings	*Location of zinc deposits*	*Discovery date*
Earnest and Spenceley.	SW¼ sec. 5, T. 1 N., R. 2 E.	Before 1854
Drybone	S½ sec. 4, T. 1 N., R. 2 E.	Before 1860
Drybone Range	S½S½ sec. 4, T. 1 N., R. 2 E.	Before 1860
Bainbridge	E½NE¼ sec. 4, T. 1 N., R. 1 E.	1874
M. J. Williams & Co.	SW cor. sec. 3, T. 1 N., R. 1 E.	1876

In 1873, annual zinc production from mines in the district first surpassed that of lead. Approximately equivalent amounts of zinc and lead were mined until 1893. Since 1893 the greater increase in production of zinc has resulted in a ratio of 5 to 1 up to 15 to 1. In 1952 the ratio of zinc to lead recovered from mines in this district was 9.5 to 1.

In addition to lead and zinc ores, barite and iron sulfide minerals have been mined from the mapped area. Barite was mined in the NE¼ sec. 33 and the NW¼ sec. 34, T. 2 N., R. 1 E., in the period between 1918 and 1930; and iron sulfides were obtained at the Wilkinson mine (SE¼ sec. 32, T. 2 N., R. 1 E.) from 1911 to 1915.

ROCK UNITS

Bedrock geology of the area is shown on the map. Cambrian sandstone, overlain by dolomite of the Prairie du Chien group, was penetrated for 8 feet in the USGS-Vinegar Hill Roaster drill hole near the northeast corner of sec. 6, T. 1 N., R. 1 E. (Heyl, Lyons, Agnew, 1951, p. 35), but is not exposed in the area.

The Prairie du Chien group is not exposed in the mapped area, but the aforementioned drill hole penetrated 267 feet of dolomite, dolomitic sandstone, and chert, which is part of the Prairie du Chien, below 50 feet of St. Peter sandstone. The dolomite of the Prairie du Chien group contains zinc and lead minerals in other parts of the Wisconsin-Illinois-Iowa district (Heyl, Lyons, Agnew, 1951, p. 5; Agnew, Flint, and Allingham, 1953) and consequently is regarded as a potential mining zone. However, it should be noted that in or near the mapped area only one other hole is known to have shown rock of ore-bearing potentialities at the stratigraphic position of the Prairie du Chien group, and that is the Cuba City waterworks well no. 2 (SW¼SE¼ sec. 25, T. 2 N., R. 1 W., northwest of mapped area), which penetrated 245 feet of dolomite and chert of the Prairie du Chien group beneath 70 feet of St. Peter sandstone. Other holes drilled near the mapped area showed the following variations in lithology and different thickness relations with the overlying St. Peter sandstone: Cuba City Canning Corp. well no. 2 (SE¼SW¼ sec. 30, T. 2 N., R. 1 E., north of mapped area) cut 210 feet of sandstone typical of the St. Peter, 30 feet of dolomite, and 95 feet of red and green shale (Thwaites); USGS-Raisbeck holes nos. 1, 2, and 3 (W½SE¼ sec. 21, T. 2 N., R. 1 E., north of mapped area) penetrated respectively, 232, 325, and 131 feet of sandstone typical of the St. Peter, and 92, 15, and 158 feet of dolomite, chert, and red and green shale; the USGS-James mine drill hole (NW¼SW¼ sec. 9, T. 1 N., R. 2 E., south of the mapped area) was an exploration by diamond drilling, which is not the common practice in this district, and the materials penetrated were 163 feet of sandstone typical of the St. Peter, 113 feet of red and green shale, sandstone, limestone, and dolomite, and 21 feet of dolomite typical of the Prairie du Chien. Similar irregularities can be expected in any part of the area east of Cuba City.

Less than 10 feet of the St. Peter sandstone is exposed in the area east of Cuba City (sec. 34, T. 2 N., R. 1 E.), but the formation is 50 feet thick at the USGS-Vinegar Hill Roaster drill hole near the northeast corner of sec. 6, T. 1 N., R. 1 E., and 60 feet thick in a well near the center of the north line of sec. 33, T. 2 N., R. 1 E. Springs mark the outcrop of the upper contact of the St. Peter sandstone.

The Platteville formation is exposed along the Fever River and parts of some of its tributaries, along Peaslees Branch and its tributaries, and along Shullsburg Branch and parts of Myers Branch and Strickland Branch. The Platteville formation is 59 feet thick in the western part of the area but 65 feet thick in the eastern part; the increase is due principally to the increased thickness of the Quimbys Mill member locally called "glass rock." The upper beds of the Platteville formation, especially the Quimbys Mill member, and in the eastern part of the area the McGregor limestone member or so-called Trenton beds (Lucky Hit mine, SE¼ sec. 33, T. 2 N., R. 2 E.) have been mined locally for zinc and lead ores.

The Decorah formation is not differentiated from the overlying Galena dolomite on the geologic maps. If mapped separately, it would be shown as a narrow band between areas of the Platteville formation and the Galena dolomite and would obscure on the maps many of the evidences of mineralization. Decorah rocks are found along the southeastward-flowing streams in the NE¼ sec. 5, the NW¼ sec. 4, and the NW¼SE¼ sec. 4, T. 1 N., R. 1 E.; along the southeastward-flowing stream in the NE¼ sec. 32, T. 2 N., R. 1 E.; and along the westward-flowing stream in the SW¼ sec. 3, T. 1 N., R. 2 E. The Decorah formation is normally 37 feet thick in the western part of the area but is 33 feet thick at the east edge; the decrease is due to the slight thinning of the lower units, known locally as "clay bed" and "oil rock." The Decorah rocks, particularly the "gray" and "blue" units of the Ion dolomite member, are ore-bearing locally. Springs are common at several horizons where beds of this formation crop out.

Galena dolomite, the next younger formation, is exposed in many parts of the mapped area, but the upper, noncherty beds are found principally in the extreme southwestern part. The thickness of the Galena dolomite in the area is about 215 to 230 feet as recorded in holes drilled within 2 miles of the southwest corner and about 3 miles from the southeast corner of the mapped area. Several mineralized zones (fig. 2) characterize the lower, cherty part of the Galena dolomite. Springs are present at several horizons where the Galena dolomite crops out.

Beds in the lower part of the Maquoketa shale were the youngest rocks exposed at the time of mapping. These were seen in the walls of a sinkhole outside the mapped area, in the northeast corner of sec. 12, T. 1 N., R. 1 W., about 200 feet southwest of the area shown in the lower left-hand corner of the map of the western part. Here about 5 feet of light-brown to gray unctuous clay (weathered Maquoketa shale) is separated from the underlying upper beds of the Galena dolomite by a 4-foot covered interval that probably represents the lowest strata of the Maquoketa. The Maquoketa shale is shown on the map in only the SW¼ sec. 6, T. 1 N., R. 1 E., and probably does not exceed 25 feet in thickness in the area east of Cuba City.

The uplands in the area east of Cuba City are capped by a veneer of soil, loess (fine sand and silt), and residual clay and rock fragments. The lowlands are covered by loose, stream-deposited material of variable thickness.

ROCK ALTERATION

Dolomitized limestone strata were noted in many mineralized areas, particularly in the "oil rock" or Guttenberg limestone member and "glass rock" or Quimbys Mill member (figs. 3 and 4, respectively); and leaching and shalification near mineralized zones (figs. 3 and 4) have locally reduced the thickness of some limestone-shale units, especially the Guttenberg, which, in the mapped area, has been reduced to 7 feet.

Evidence of silicification directly associated with mineralized rock was noted in the Guttenberg and Quimbys Mill limestone members in the DeRocher mine (NE¼NE¼ sec. 5, T. 1 N., R. 2 E.), which was the only operating mine in the area in 1949-1951. This evidence consists of an intimate replacement of the limestone and shale by silica, which preserved the original textural and structural characteristics and in many places formed chert nodules. Similar silicified material was seen on the dumps at some shafts that penetrated the Guttenberg member, and in several exposures of Guttenberg (fig. 3).

The chert resulting from silicification in mineralized areas should not be confused with a band or two of silicified rock that occurs within 3 feet of the top of the Guttenberg throughout the area. This latter type of material is quite irregular and ranges from chert nodules through poorly silicified limestone nodules to mottled clots of only slightly silicified limestone. This irregular layer of silicified rock apparently is not related to trend of mineralization or to structure.

STRUCTURE

The average dip for the mining district as a whole is 15 to 30 feet per mile. The mapped area, however, which lies on the south limb of the eastward-trending Meekers Grove arch, dips 25 to 60 feet per mile south-southwest.

Rocks in the mapped area have been subjected to compression that produced a pattern of folds and faults superimposed on the regional dip. Geologic mapping shows that the principal trend of the folds in the area is northwestward, with subsidiary trends east and northeastward (maps and fig. 4).

A well-developed joint pattern (maps and fig. 4) is present. The two major trends are northwest and northeast; subsidiary joints trend east, and a very few trend north.

Topographic control by structure is well displayed in this area. The parallelism of stream valleys with structure and with the trend of the mineralized areas is especially noteworthy along the Fever River and Peaslees Branch and their tributaries. The southeasterly course of the Fever River in sec. 34 and its southwesterly course in sec. 3 are remarkably similar in direction to the nearby "ten o'clocks" (joints into which the sun shines at approximately 10 o'clock, therefore southeastward-trending) and "four o'clocks" (southwestward-trending joints) in secs. 2 and 3.

An indirect indication of geologic structure may be the silicified limestone beds of the Quimbys Mill and upper part of the McGregor in the SE¼NE¼ sec. 3, T. 1 N., R. 1 E., and in the northeast corner of sec. 33, T. 2 N., R. 1 E.; the resulting product is a slightly porous, spongelike, yellowish-brown rock. Similar material was seen in the lower part of the McGregor member in the SW¼SW¼ sec. 35, T. 2 N., R. 1 E. This type of silicified material, thought to be related to the Meekers Grove arch rather than to ore trends, was seen during earlier mapping less than 2 miles to the north.

At several localities (fig. 3), anomalous blocks of quartz sandstone that are associated with mineralization in the Galena are thought to be related to structural features (joints and possibly faults). This type of sandstone was noted in material from drill holes, on mine dumps, and in an exposure. The material may have been injected along fractures from the St. Peter sandstone below, or may have been deposited in the joints as sediments, or may have been ice-rafted into its position.

ORE DEPOSITS

The ore deposits of the area east of Cuba City contain lead and zinc minerals that occur in fractures related to folds, and as replacements of the carbonate host rock in the Galena, Decorah, and Platteville formations.

Minerals.—The ore minerals and associated minerals are as follows:

	Mineral name	*Chemical composition*	*Local term*
Ore minerals	Sphalerite Galena	Zinc sulfide Lead sulfide	Jack Lead
Minerals of possible economic value.	Smithsonite Barite Pyrite-marcasite.	Zinc carbonate Barium sulfate Iron sulfide	Drybone Bar-tees Sulfur
Gangue minerals.	Calcite Limonite	Calcium carbonate Hydrous iron oxide	Tiff Ocher

Lead ore bodies.—Most of the areas of diggings were worked for lead ore; the composition of the dumps indicates that the associated zinc-bearing minerals were discarded. The lead ore occurred in the Galena dolomite as gash-veins in more or less vertical joints (crevices), to depths of 70 feet or more. The galena was present in pods several feet wide, as isolated crystals ("dice lead") or clusters ("cog lead") in a matrix of dolomite sand and as veins (sheets) less than an inch thick. Podlike masses of ore were present in "openings" at favorable stratigraphic horizons, and in many openings several podlike enlargements occurred along a crevice. "Chimneys" or pipes of galena were sometimes found at intersections of crevices. Individual crevices were mined for a distance of as much as 1,700 feet. The great number of shafts along any particular mineralized crevice or "range" was due to the aversion of the early miners to drifting long distances underground. A striking example of the regularity of pattern of the mineralized joints is seen in the N½ sec. 2, T. 1 N., R. 1 E.

Zinc ore bodies.—Most of the zinc ore, with minor amounts of lead ore, has been found in the lower part of the Galena dolomite ("drab" of local usage), the Decorah formation ("gray," "blue," and "oil rock" of local usage), and the upper part of the Platteville formation (Quimbys Mill member or "glass rock" of local usage, and the McGregor). The ore is along reverse faults (pitches) and associated bedding-plane faults (flats) on the flanks of folds. In the central part (core ground) of an ore body the minerals replaced the rock and filled vugs, constituting a "brangle" type of ore. The principal ore zones are in the lower 40 feet of the "drab" beds, in the "gray" and "blue" beds, and in the "glass rock" strata. The mapped ore bodies were as much as 30 feet or more high, 100 feet or more wide, and 2,500 feet or more long, although the average length was perhaps 1,000 feet.

Zinc- and lead-bearing pitch-and-flat deposits.—As pitch-and-flat deposits in this area are related to geologic structure, many possibilities for discovering additional deposits of this type are evident on geologic maps. Examples are the northwestward-trending synclines, in secs. 5 and 6, T. 1 N., R. 1 E., in sec. 32, T. 2 N., R. 1 E., and in secs. 32 and 33, T. 2 N., R. 2 E.

Until about 1940, prospecting and mining rarely penetrated below the top of the "oil rock" beds. Even in the last 10 years the underlying strata were prospected and mined in only a few places.

"Glass rock" beds are mineralized and ore-bearing in much of that part of the mapped area lying east of Peaslees Branch; yet the "glass rock" in most of that territory is unprospected even though several deposits in these beds **have been** worked. Between the Fever River and Peaslees Branch at least one mine (North McCabe, SE¼SW¼ sec. 3, T. 1 N., R. 1 E.) worked ore in the "glass rock." As the "glass rock" unit becomes somewhat thinner west of the Fever River, its ore-bearing potential there may be somewhat less; however, the Quinlan diggings (SE cor. sec. 4, T. 1 N., R. 1 E.) worked ore in the "glass rock." This unit should be prospected by each drill hole.

The McGregor or so-called Trenton beds of the Platteville formation have been prospected almost nowhere in the area east of Cuba City, although zinc ore from beds as much as 10 feet below the top of the "Trenton" was produced in 1944-45 from the Lucky Hit mine, SW¼SE¼ sec. 33, T. 2 N., R. 2 E. About half a mile south of the mapped area, in the Old Mulcahy mine just east of the center of sec. 9, T. 1 N., R. 2 E., similar zinc ore was mined from the same stratigraphic zone in the "Trenton." Samples from a hole deepened in June 1950 at the Ewing and Cook mine (about 500 feet south of the mapped area, in the center of the N½NW¼ sec. 12, T. 1 N., R. 1 E.) showed zinc ore at 20 to 25 feet below the top of the "Trenton." Thus, the ore-bearing potential of the "Trenton" beds should be investigated further.

Drilling by the Alderson Mining Co. in 1946 at the Alderson mine (NE¼SE¼ sec. 32, T. 2 N., R. 2 E.) revealed zinc and lead minerals in the "Trenton" beds and iron minerals in the St. Peter sandstone. Similar mineralized material, reportedly following a fracture downward into the St. Peter sandstone, was noted 30 years ago in the Pittsburg mine less than half a mile north of the mapped area (NW¼SE¼ sec. 28, T. 2 N., R. 1 E.). Because of the isolated occurrences and the type of minerals (mainly iron) in the Pecatonica, Glenwood, and St. Peter sequence, systematic prospecting of these strata is not recommended at present. However, inasmuch as information is scarce and minerals in these beds might be recovered economically from an operation that is working in the "glass rock" or in the "Trenton" beds above, at least one prospect hole in each mineralized area probably should be put down about 10 feet into the St. Peter sandstone.

Lead-bearing crevice (gash-vein) deposits.—A considerable reserve of galena and of zinc minerals is probably present below the old workings because mining in most of these deposits was done 75 or more years ago, when pumps were so inefficient that shafts had to be abandoned as soon as they reached the water table. An example is the Swindler's Ridge diggings along the south line of the SW¼ sec. 4, T. 1 N., R. 1 E. The relatively narrow lateral extent of the deposits and the tendency of the material in the crevices to cave make it mechanically difficult to prospect these areas adequately with vertical churn-drill holes and economically infeasible to prospect them with inclined core-drill holes. However, the close spacing of crevices in some localities suggests that such an area of diggings might profitably be prospected and mined for lead by sinking a centrally located shaft, then developing drifts along the crevices and crosscuts between crevices.

Lower mineralized zones.—Mineralized zones in the Prairie du Chien rocks, below the St. Peter sandstone, have been mentioned briefly. The Prairie du Chien constitutes a possible lower zone for future development, but at present it is not known to have the same potentiality as the "glass rock" and "Trenton" strata. Much study is needed, however, before its possibilities can be properly assessed.

Byproduct ore minerals.—Smithsonite is not being recovered now from ores of the Wisconsin-Illinois-Iowa zinc-lead district as it is commonly mixed with sphalerite and separation of the minerals is difficult. In much of the area east of Cuba City smithsonite occurs in crevice or pitch-and-flat deposits alone or mixed with sphalerite, and this material constitutes a considerable zinc reserve if an economical means of recovery can be devised. Research on this treatment problem is highly desirable.

Barite is a common constituent of most of the pitch-and-flat ore bodies east of County Trunk I; it also occurs in great abundance just west of the Fever River in secs. 33 and 34 and on the east side of the river in the NE¼NW¼ sec. 34, T. 2 N., R. 1 E. In the Fever River localties it is associated with galena in crevices; east of County Trunk I it occurs with both galena and sphalerite in crevices and in pitch-and-flat deposits. Thus, in both types of occurrence barite could be mined, recovered, and marketed as a byproduct; moreover, in the Fever River occurrences it could possibly be mined for itself alone, at relatively low cost, by adit, incline, or open cut. Further study of the economics of treatment of this type of deposit is needed.

Iron sulfide is present in various amounts in all zinc-lead occurrences. From 1911 to 1915 the Vinegar Hill Zinc Co. operated the Wilkinson mine (SE¼ sec. 32, T. 2 N., R. 1 E.) primarily for its iron-sulfide. The economics of recovery and marketing should be investigated because this material could be recovered as a possible source of sulfur and low-grade iron ore.

Prospecting.—Drilling of vertical churn-drill holes, which has been the common prospecting method for more than 50 years, is adequate for most explorations for pitch-and-flat deposits. The rotary core drill is recommended, nevertheless, where the ground is not soft and caving, where an accurate picture of the ore in place is desired, or where inclined holes are needed.

An initial line of drill holes will provide a cross section of a mineralized zone or structural feature and is good practice in prospecting. The zone can be traced by single holes along its trend and by additional lines of holes across it.

In areas where no structural data are known to be available (sec. 31, T. 2 N., R. 1 E.), or where the data are largely inferred (sec. 34 and N½ sec. 33, T. 2 N., R. 2 E.), structure can be determined by drilling on a grid of 500- to 1,000-foot centers (660- and 1,320-foot centers are commonly used locally); once the structural trends are established, drilling can proceed as outlined above.

In addition to structure and evidences of mineralization, occurrences of the shalified "oil rock" should be observed. Relatively unleached ("limy oil rock") beds are less favorable than very shaly ("rich oil rock") leached strata.

Not all areas of "rich oil rock" contain ore; similarly, not all structures are ore-bearing. However, if these criteria are followed, the number of drilled holes that do not intersect ore may be considerably reduced.

Sinkholes indicate open joints, and prospecting along such joints is desirable as they may be associated with underlying pitch-and-flat deposits.

Drilling in the NW¼ sec. 31, T. 2 N., R. 1 E., may encounter much soft, oxidized ground, as was found in many holes drilled in Cuba City half a mile to the west; such rock is less favorable as a host for zinc deposits, and it causes difficulties in the mining of lead-barite deposits.

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MINERAL INVESTIGATIONS
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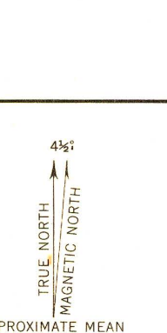
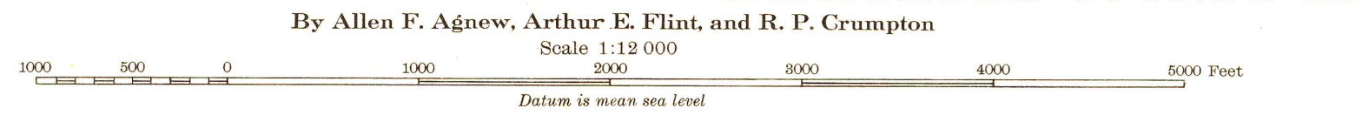


APPROXIMATE MEAN DECLINATION, 1954

GEOLOGY AND ZINC-LEAD-BARITE DEPOSITS IN AN AREA IN LAFAYETTE COUNTY EAST OF CUBA CITY, WISCONSIN

By Allen F. Agnew, Arthur E. Flint, and R. P. Crumpton

Scale 1:12 000



Datum is mean sea level

1954

Wisconsin (Cuba City east area). Geol. 1:12,000. 1954.
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