GEOLOGICAL SURVEY CIRCULAR 131

November 1951

EXPLORATORY DRILLING IN THE PRAIRIE DU CHIEN GROUP OF THE WISCONSIN ZINC-LEAD DISTRICT BY THE U. S. GEOLOGICAL SURVEY IN 1949-1950

By

Allen V. Heyl, Jr., Erwin J. Lyons, and Allen F. Agnew

Prepared in cooperation with the

Wisconsin Geological and Natural History Survey

UNITED STATES DEPARTMENT OF THE INTERIOR

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GEOLOGICAL SURVEY

W. E. Wrather, Director

Washington, D. C.

Free on application to the Geological Survey, Washington 25, D. C.

CONTENTS

ILLUSTRATIONS

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ABSTRACT

The U. S. Geological Survey in cooperation with the Wisconsin Geological and Natural History Survey explored the Prairie du Chien group in the main productive area of the Wisconsin zinc-lead district during 1949-50. Eight properties--Crow Branch diggings, Leix, Harris, Spitzbarth, Kennedy, James, Raisbeck and Vinegar Hill Roaster--were explored using both diamond and churn drills. Twenty holes were drilled that totaled 8,582 feet in depth. The objectives of the exploration were to determine if the Prairie du Chien and other formations below the principal ore-bearing strata (Galena, Decorah, and Platteville formations) of the district are favorable for ore deposits, and to determine the type of ore deposits, if present. Lean deposits of sphalerite, marcasite, and pyrite were found in the Prairie du Chien on five properties--Crow Branch, Leix, Harris, Spitzbarth, and Vinegar Hill Roaster--and also in the Franconia sandstone on the Leix property. In the drilled area the sulfides in the Prairie du Chien group occur in certain more brittle or soluble dolomite beds that contain cavities formed by brecciation or solution.

INTRODUCTION

Historical data

The Upper Mississippi Valley zinc-lead district (fig. 1) is one of the oldest mining areas in the United States. As early as 1658 (Thwaites, 1895, p. 272) lead ore was known in the area, and continuous active mining began in 1823 (Bain, 1900, p. 3). From about 1830 to 1871 the district was by far the most important lead-producing area in the United States. Zinc ore was first recovered from the mines about 1859, and production subsequently increased slowly. After 1902 more efficient mining and concentration methods were employed, and the production of zinc ore increased rapidly to a peak in 1917, when 64,000 tons of zinc metal was produced. The activity of this period of mining has not been surpassed, although the years 1922-29 and 1942-50 were also important periods of mining.

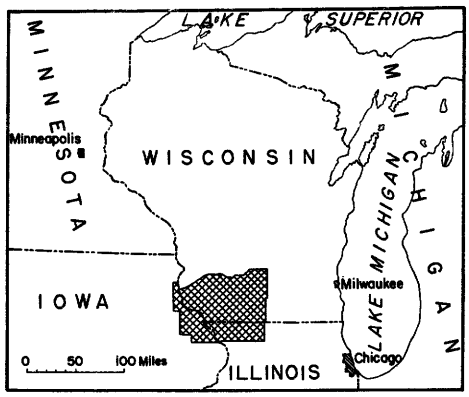
Practically all of the ore mined to date (1950) has been recovered from the Galena, Decorah, and Platteville formations (fig. 2), but numerous deposits of sulfides, most of which lie north of the main productive part of the zinc-lead district as outlined in figure 1, were found in the underlying Prairie du Chien group during the nineteenth century. Although these lead, zinc, and copper deposits in the Prairie du Chien have been little explored and developed, a few deposits have been mined on a small scale. The principal localities of former commercial mining are: Ohlerking diggings, secs. 31 and 32, T. 7 N., R. 1 E., 2 miles west of Highland, Wis.; Lansing lead mine, NW¼ sec. 10, T. 99 N., R. 4 W., 5 miles northwest of Lansing, Iowa; and Demby-Weist mine area, N½N½ sec. 29, NW¼ sec. 28, S½ sec. 21, and the NE¼ sec. 20, T. 7 N., R. 4 E., about 6 miles northeast of Dodgeville, Wis.

Galena was the principal ore mined in all of these places, but zinc ores also are present in the Demby-Weist mine area. Production statistics and information obtained locally indicate that mining was successful at these three places. Some of the geologists (Percival, 1855, p. 66; 1856, pp. 59, 63; Jenney, 1893, pp. 211-212) who examined these and the other ore deposits in the Prairie du Chien group, considered the possibilities good for ore deposits in these beds within the main productive area of the district; but others (Hall and Whitney, 1862, pp. 405-413; Chamberlin, 1882, pp. 554-560) very strongly opposed this view.

The drilling program described in this report was undertaken during 1949-50 because the results of the geologic study of the district in progress from 1942 to the present (1950) favor the view that deposits of zinc and lead exist in the Prairie du Chien group within the principal mineralized area as suggested by Percival and Jenney.

Objectives of project

The objectives of the exploratory program of diamond drilling and churn drilling, by the U. S. Geological Survey in cooperation with the Wisconsin Geological and Natural History Survey, were to



INDEX MAP SHOWING LOCATION OF MAP OF ZINC-LEAD DISTRICT OF WISCONSIN, ILLINOIS, AND IOWA

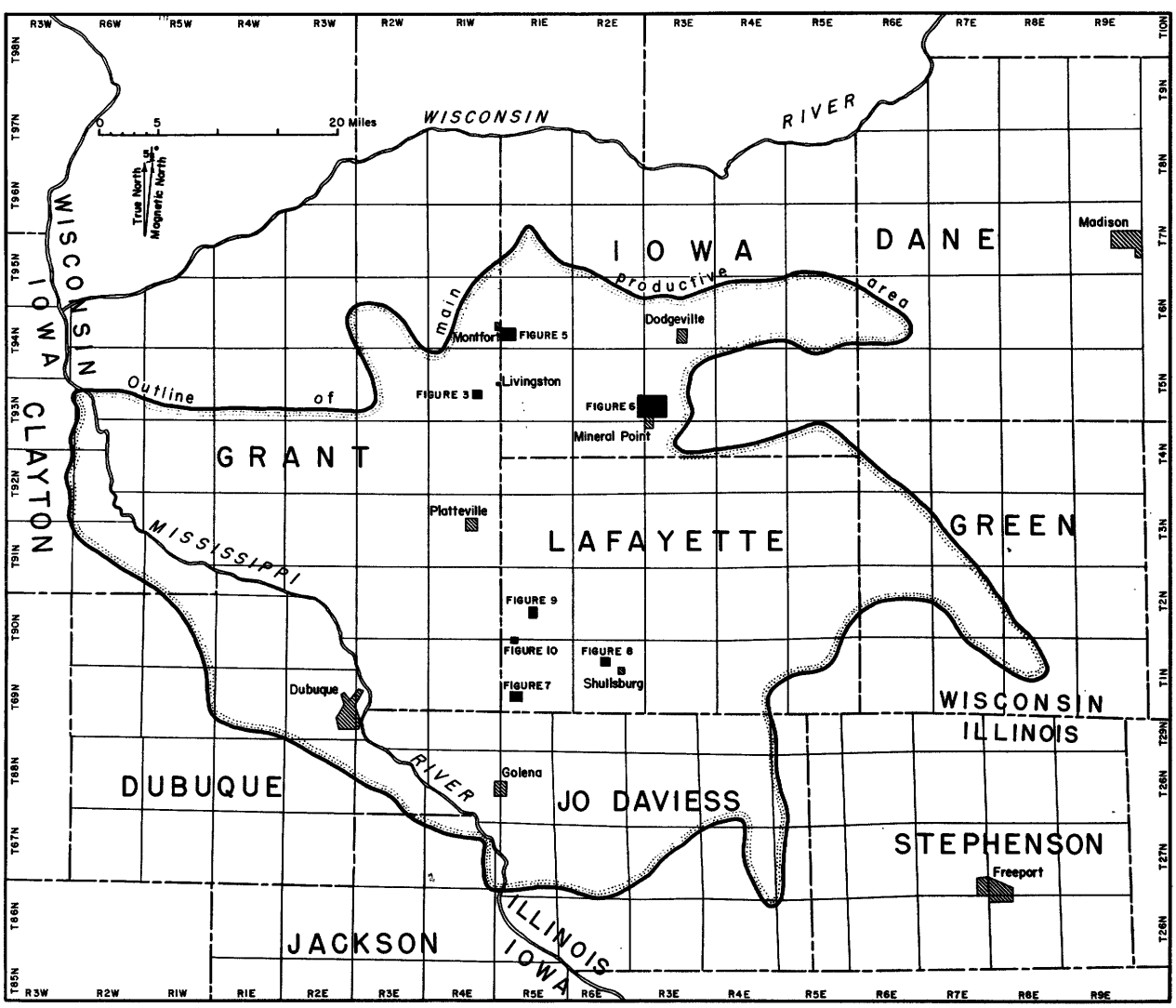


Figure 1. -Index map showing outline of main productive area of the Upper Mississippi Valley zinc-lead district and location of areas covered by detailed map of this report

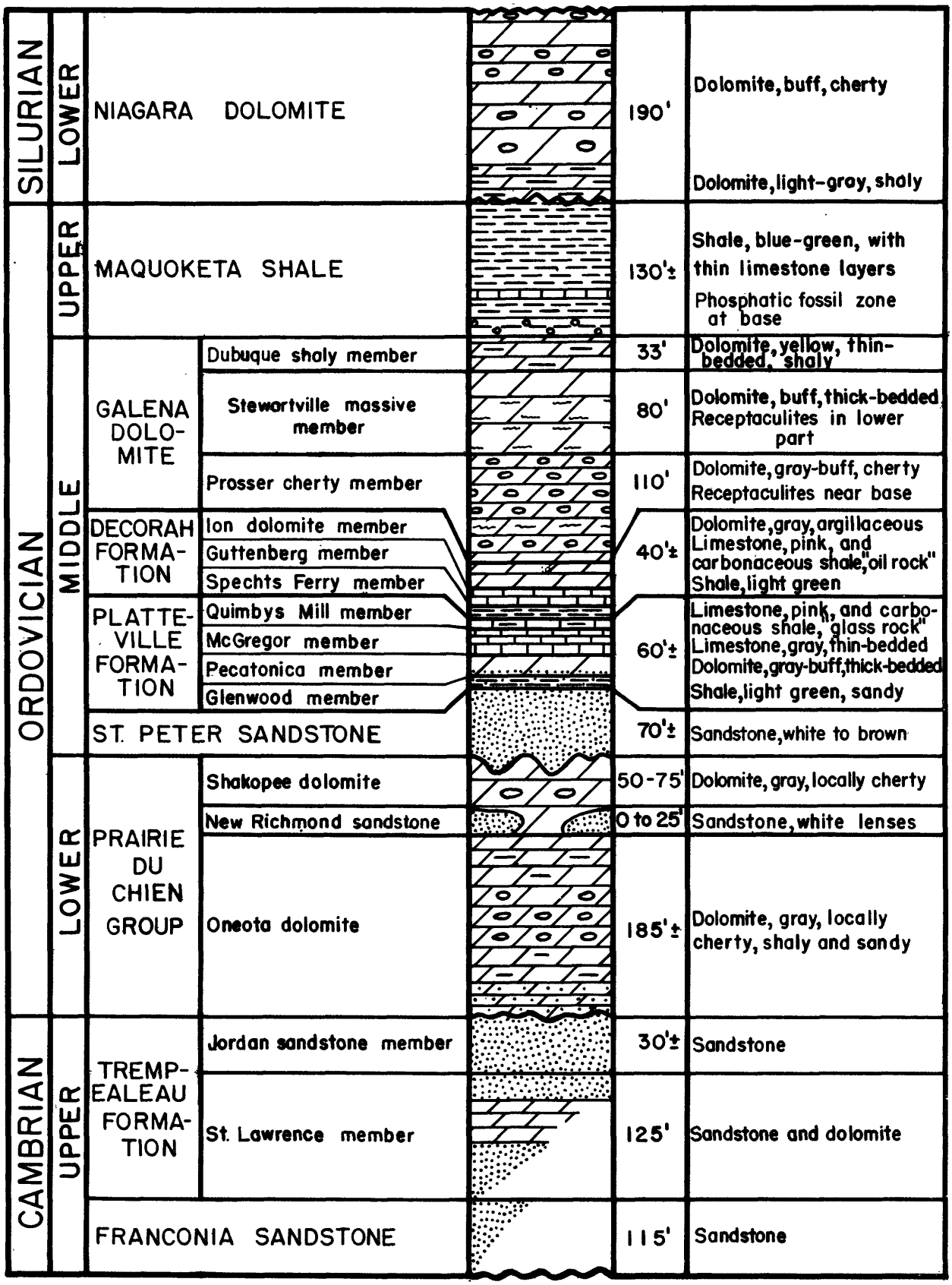


Figure 2. -Generalized stratigraphic section of the Upper Mississippi Valley zinc-lead district

learn if the Prairie du Chien group and other formations below the principal ore-bearing strata of southwestern Wisconsin also are favorable for ore deposits and to determine the type of ore deposits, if present.

Small local deposits of sulfides in the Prairie du Chien group are widespread in its belt of outcrop to the north and northwest of the main productive area, and the lithology of the dolomitic beds suggested that these beds might contain deposits of zinc and lead ores at depth beneath the actively mined part of the district. The areas for special investigation were selected on the basis of especially favorable geologic structures or because of reported sulfides in wells that penetrated these lower strata.

Eight properties were explored by 20 drill holes that totaled 8,582 feet of drilling. Lean deposits of sphalerite, marcasite, and pyrite were found in the Prairie du Chien group on five properties, and also in the Franconia sandstone on one property. The location of the properties that were drilled is shown (black areas) on the index map (fig. 1).

Acknowledgments

The geological study and drilling program was under the direct supervision of A. V. Heyl, Jr., E. J. Lyons, and A. F. Agnew. R. P. Crumpton, A. E. Flint, and J. H. Moor contributed materially to the success of the program by their assistance. W. P. Huleatt, Chief of the Physical Exploration Unit, was the Contracting Officer. D. C. Dixon was in charge of the operation of the diamond drills.

G. A. Apell of the U. S. Bureau of Mines gave valuable data and assistance on the technical details and operation of the drills.

GEOLOGY

General Features

The Upper Mississippi Valley zinc-lead district is about 100 miles south of the main area of outcrop of the pre-Cambrian shield in Wisconsin. The ore deposits are in the northern fringe of Paleozoic sedimentary rocks that overlap this shield area. The regional strike throughout most of the district is N. 85° W., but in the western part it swings to N. 45° W. The regional dip is about 17 feet per mile toward the south-southwest. The rocks of the district have been folded into broad undulations as much as 200 feet in amplitude, and are cut by numerous minor reverse, normal, bedding-plane, and shear faults that generally have displacements from 1 to 10 feet and a few faults that have large displacements.

Stratigraphy

The rocks exposed in the zinc-lead district are Silurian or older in age (fig. 2). The youngest strata, the Niagara dolomite crop out mainly along the southern and western edges of the district, but they also cap a few isolated erosion outliers within it. Most of the outcrops throughout the district are Galena dolomite, but smaller and fewer exposures of the Decorah, the Platteville, and St. Peter formations are common. The Prairie du Chien group is exposed in some of the deeper valleys and along the north and east margins of the district. The oldest rocks exposed in the area--the Franconia and Trempealeau formations of late Cambrian age--crop out only along the Wisconsin River. Rocks of the pre-Cambrian basement have been encountered only in wells, at depths from 1,500 to 2,000 feet.

The formations of Cambrian age consist mostly of sandstone, in part shaly and dolomitic; however, the St. Lawrence member of the Trempealeau formation, as penetrated at Montfort, Wis., is a dolomite that contains a little quartz sand. These Cambrian strata apparently are overlain conformably by the Prairie du Chien group of Early Ordovician age.

The base of the Prairie du Chien group is a transition zone about 15 feet thick that consists of alternating sandstone, arenaceous dolomite, and dolomite beds. A persistent oolite layer is just above the transition zone and below a bed $2\frac{1}{2}$ feet thick of algal dolomite. About 180 feet of gray to drab dolomite that weathers buff lies above the algal beds. The lower 40 feet of this dolomite is moderately thin- bedded; the upper 120 feet is thick-bedded to massive. The dolomite contains a few quartz sand grains, local sand lenses and algal structures, and areas of glauconite. Vuggy areas are common. Small patches of chert occur throughout, and persistent chert bands are found toward the top of the unit. Above the massive beds are 25-50 feet of strata of variable lithology, which consists of sandstone lenses, shale, dolomite, dolomitic sandstone, chert, and cherty oolite layers. For the most part the beds are irregular and discontinuous. The most prominent feature of these strata is the large and abundant algal structures that, at least in part, cause the contact between the Prairie du Chien and overlying St. Peter sandstone to be uneven. The algal areas in particular are vuggy, although small solution cavities are common in all the dolomitic beds. Also in these algal areas is a tan to buff, compact, calcareous dolomite in even beds from 2 to 3 inches thick. The beds in places are very shaly and consist mostly of pale-green, gray, red, and maroon shale.

A disconformity of considerable relief marks the boundary between the Prairie du Chien group and the overlying St. Peter sandstone, and consequently the group varies greatly in thickness over a wide area. In the northern part of the district the maximum thickness of the Prairie du Chien is about 220 feet; in the southern part the maximum thickness is about 260 feet. The disconformity is more marked toward the south.

The St. Peter sandstone, of Middle Ordovician age, ranges from 40 to 200 feet or more in thickness.

The lower beds of the St. Peter were deposited in the valleys within the unconformity surface. These beds consist of thin-bedded red, pink, and white, poorly-cemented sandstone with interbeds of red and green shale, dolomite, and limestone. The sand grains are well rounded and frosted but not well sorted. The upper part of the St. Peter sandstone is generally white, yellow, or brown, and consists of well-sorted, frosted, rounded quartz sand grains; it is thick bedded and may be cross-bedded on a large scale.

The stratigraphy of the beds above the St. Peter sandstone is shown in figure 2; more detailed descriptions are not given here because this report is primarily concerned with the strata and mineralization below the principal ore-bearing formations.

Sulfide deposits

General characteristics.--The ore deposits that have been mined in the district are mostly in the Galena, Decorah, and Platteville formations. The principal primary minerals are quartz (chert and other forms of silica), dolomite, sphalerite, marcasite, pyrite, galena, barite, chalcopyrite, and calcite, which were deposited throughout the district in this regular paragenetic sequence.

The ore-bearing solutions altered the host rocks within and in the immediate vicinity of the deposits by three processes: solution of the impure calcareous rocks, silicification, and dolomitization.

The ore deposits show both horizontal and vertical zoning. A northwest-trending zone passing through the east-central part of the district contains abnormally large quantities of copper, barium, and nickel. Local mines within this zone produced commercial quantities of barium and copper. On the fringes of the district, galena is the most abundant ore mineral, but in the central area, sphalerite is the most abundant ore mineral. A vertical zoning is represented by concentrations of galena near the surface, whereas sphalerite, pyrite and marcasite, quartz, dolomite, and possibly chalcopyrite are more abundant in the deeper deposits.

Sulfides in the Galena, Decorah, and Platteville formations. --The principal ore deposits in the Galena, Decorah, and Platteville formations can be classified according to their controlling fracture systems as reverse and bedding-plane fault type and joint type. Ore deposits of the first type are veins in faults and related fractures, which are along the flanks of folds. The vein minerals have been deposited as vein fillings along fractures and bedding planes, cavity fillings in solution and tectonic breccias, and disseminations by replacement and impregnation of favorable beds, particularly shaly layers. The joint-controlled deposits are limited to the Galena dolomite. In these deposits the chief mineral, galena, is deposited in gash veins that fill vertical joints, and in podlike bodies in favorable beds along the joints.

Sulfides in the St. Peter sandstone. --Pyrite and marcasite are the principal sulfides in the St. Peter sandstone and in the immediately overlying, thin, sandy Glenwood shale member of the Platteville formation. Locally, sphalerite and galena are present in small quantities. In general, the known sulfide deposits in the St. Peter sandstone are directly below large sulfide deposits in the overlying formations. The sulfides from the cement between the quartz sand grains and less commonly coat small fractures. In these areas of sulfide mineralization, secondary quartz generally has been deposited as silica cement and as crystal overgrowths on the quartz grains.

Sulfides in the Prairie du Chien group. --The Prairie du Chien group to the north of the main productive area of the district contains many small deposits of sulfides of lead, copper, iron, and zinc; and data from the Geological Survey exploration program indicate that within the main part of the district this group also contains sulfides of zinc and iron, but only traces of copper and lead. Considerable secondary silica and dolomite are present in nearly all of the mineral deposits, within the Prairie du Chien but calcite is uncommon. The known sulfide deposits in the Prairie du Chien are (1) veins or lodes along vertical joints or faults, and (2) mineralized zones of crackle and solution breccias, in places related to bedding-plane faults and shear zones. Replacements of the dolomite by pyrite and marcasite, and rarely by sphalerite, are not uncommon in the brecciated areas, and in one place sphalerite was deposited between the individual dolomite grains of a porous dolomite.

The sulfide deposits in the Prairie du Chien group at the Crow Branch, Leix, and Vinegar Hill areas lie directly beneath ore deposits in the overlying rocks. Elsewhere, though, as at the Ohlerking diggings at Highland, Wis., and the Harris and Spitzbarth properties near Mineral Point, Wis., the deposits are not known to lie beneath sulfide deposits, although ore bodies in the overlying strata are known nearby.

Perhaps in the most distinctive feature of the deposits in the Prairie du Chien group is the abundance of secondary quartz. Not only does quartz (chert) replace large areas of the wall rocks, but also drusy quartz and chalcedony line vugs and fill fractures.

Sulfides in the Trempealeau and Franconia formations. --The Trempealeau and Franconia formations in the Upper Mississippi district are exposed only in the deepest valleys along the Wisconsin and Mississippi Rivers north of main productive area of the district, and only a very few of the known lead and zinc deposits are in them. In two of these deposits the Lansing lead mine and the lead prospect near Dresbach, Minn., (Winchell, 1884, p. 258)--galena is in veins along faults. Sphalerite, pyrite, and marcasite were found in the Franconia sandstone on the Leix property at Montforth, Wis.,

by the Geological Survey drilling. The sulfides in these shaly sandstone beds occur between the quartz sand grains and are similar to the sulfides in the St. Peter sandstone deposits.

EXPLORATORY WORK BY THE GEOLOGICAL SURVEY

Problems of drilling

The exploratory program of the Geological Survey consisted of both diamond and churn drilling. The churn drilling was technically more successful and considerably less expensive than diamond drilling.

Diamond drilling.--Three types of rocks--sandstone, soft plastic shales, and porous cherts--caused the chief difficulties in drilling. The pounding of the core barrel and rods, plus the current of the return water, removed large quantities of sand from the drilling hole walls in the parts of the St. Peter sandstone that consist of well-rounded grains of very loosely cemented quartz sand. As long as the water return was strong, this sand was washed out of the drill hole. If the return flow of water stopped, either because of mechanical difficulties or because of cutting a permeable zone or fracture, the sand dropped to the bottom of the hole and quickly settled around the barrel and bit, completely binding it to the wall. In most cases sufficient water pressure could not be obtained to wash out the sand if it was wedged above the bit; if this sand was packed particularly tight, reverse drilling was impossible also. A very high-pressure flow of water and very careful checking of the water pressure by use of a gage on the drill was helpful. The pump that fed the water into the drill was always located nearby so that water pressure could be regulated quickly. The use of aquagel mud was helpful in some holes.

The soft plastic shales in the Prairie du Chien group, and in the basal part of the St. Peter sandstone, where it is thick, were drilled successfully by casing or cementing the hole immediately after drilling stopped at the end of the day before the hole could fill with shale. The use of small rather than large amounts of water helped decrease the swelling and heaving of the shale.

The cherts, where highly fractured and several feet thick, were difficult to drill. In some places several bits were worn out after penetrating only a few feet of chert, and therefore drilling was usually expensive.

An obvious advantage of diamond drilling is that cores provide considerably more information concerning lithology and mineral occurrence than do churn-drill cuttings. A disadvantage, however, is the poor recovery of core in highly fractured mineralized rocks; also, at best, the recovery of sludges was intermittent. NX bits gave the best core recovery.

The diamond drilling program has shown that successful penetration of the strata of this area requires extreme care in drilling sedimentary rocks. Moreover, a trained exploration engineer, rather than a geologist, should be assigned to a diamond-drilling project to manage technical problems. He should have full authority to make decisions as to the methods and time of casing, cementing, reaming, reduction of bit size, and abandonment of the drill hole.

Churn drilling.--Fewer mechanical difficulties were encountered in churn drilling than in diamond drilling. The loosely consolidated layers of the St. Peter sandstone were drilled without much difficulty. Cherty portions of the dolomites caused considerable wearing of the bits, but because the cherts are brittle they were more easily shattered and drilled by this method. Inclined fractures, particularly where the walls were indurated by silica, caused difficulties; the bit tended to follow the fracture and to become wedged. In one drill hole, blasting was necessary to shatter the hardened footwall of a fracture so that this wall could be penetrated by the drill bit.

The soft plastic shale that made core drilling difficult also constituted the main problem in churn drilling. Very slow drilling under light weight and a short stroke were helpful in penetrating these beds. Some holes through the shale beds had to be reamed and cased immediately after drilling, to prevent caving. Concentric casing was set in one drill hole where a second shale bed was cut below the first casing.

The large diameter of the churn-drill holes and the more consistent recovery of the cutting made the samples of mineralized rock more representative of the true rock content than the samples obtained by diamond drilling. However, the churn-drill cuttings do not retain nearly as many of the stratigraphic and ore-deposit characteristics; and self-salting in some of the drill holes made casing necessary.

The churn drilling proceeded much more rapidly and needed less supervision than the diamond drilling. This saving in manpower lowered considerably the total cost of exploration.

Results

Eight properties were drilled during the investigation. Five were selected because of known ore deposits in the Galena, Decorah, and Platteville formations and because of favorable geologic structures. The other three properties (Leix, Spitzbarth, and Harris) were drilled to check reports that wells had cut some sphalerite mineralization in the Prairie du Chien group.

In the southern part of the Wisconsin district, the unconformity separating the St. Peter sandstone from the underlying Prairie du Chien group cuts so deeply into the Prairie du Chien on the James and Raisbeck properties, that only a small thickness of the dolomite remains. On the other properties the dolomite has not been thinned by erosion, and hence it is sufficiently thick to form the host rock for large lead and zinc deposits. On five of the properties drilled--Crow Branch, Leix, Vinegar Hill, Spitzbarth, and Harris--lean

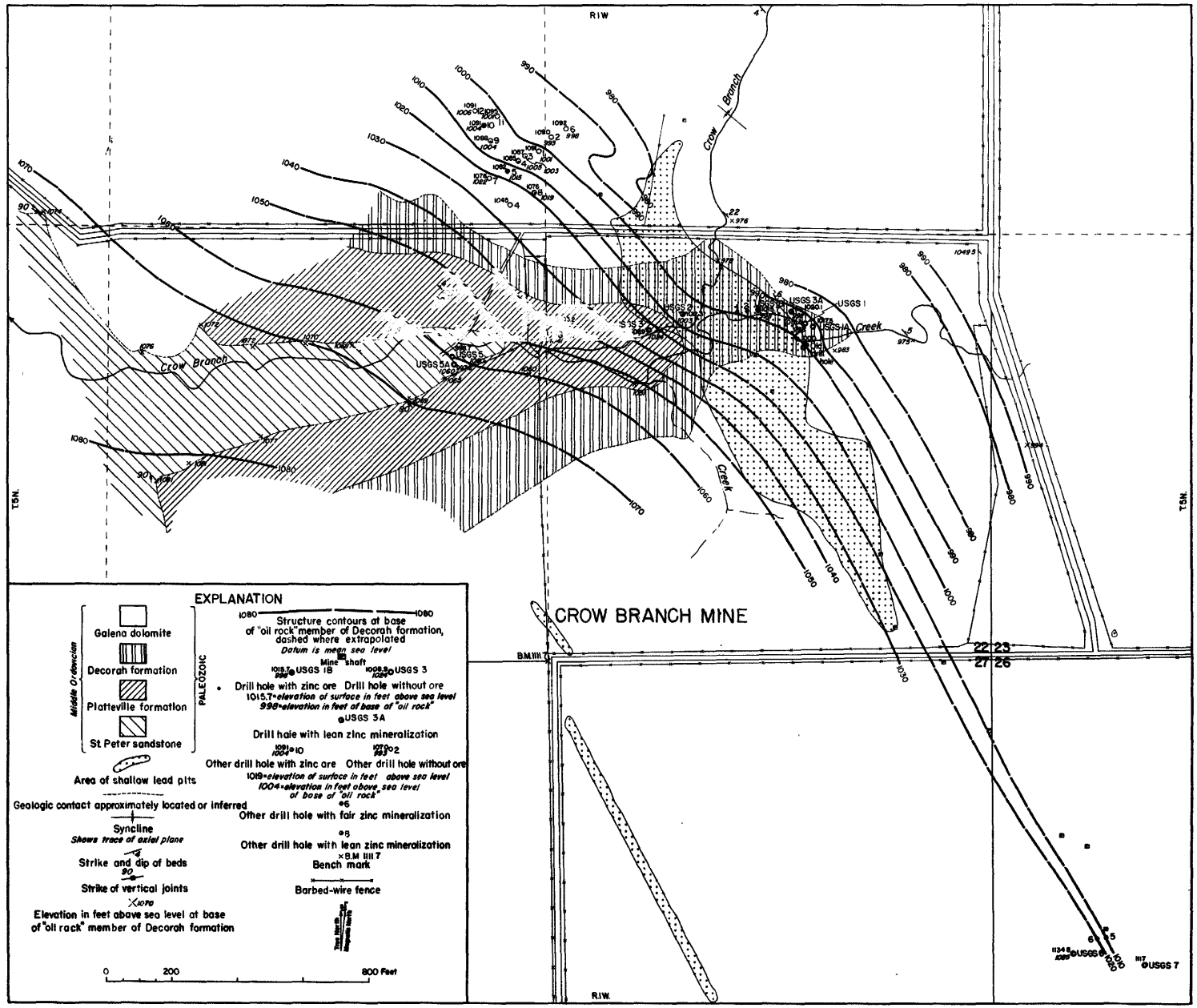


Figure 3. -Geologic map and location of drill holes in Crow Branch area near Livingston, Wis.

sphalerite, marcasite, and pyrite deposits were found in the Prairie du Chien. On the Kennedy property pyrite and marcasite were found in notable quantities in this formation. Sphalerite and pyrite were found also in the Franconia sandstone at the Leix property, where drilling penetrated a considerable thickness of the Cambrian beds. As was expected, zinc and lead sulfides in considerable quantities were found in the Galena, Decorah, and Platteville strata in the Crow Branch, Kennedy, Leix, and Vinegar Hill areas. Logs of the holes drilled on these properties are listed at the end of the report.

Crow Branch area. --The major structural feature in the Crow Branch area (fig. 3) is a northwest-trending sycline that has an amplitude of about 100 feet and is assymetric with a steeper southwest limb. The drill holes showed that the fold has the same magnitude at the top of the Cambrian beds as it does in the overlying Platteville and Decorah strata (fig. 4).

The Crow Branch ore body lies along the lower part of the southwest steeper limb of the major syncline, and is known to be at least 3,100 feet in length and as much as 300 feet in width. The largest area of shallow lead pits (fig. 3) indicates the general lateral extent of the ore body where it is partly eroded or at shallow depth in Crow Branch Creek valley. The ore occurs in all the beds from the Prosser thirty member of the Galena dolomite downward into the McGregor limestone member of the Platteville formation. The ore body was mined for lead ore during the nineteenth century, and while in operation, was described by several geologists

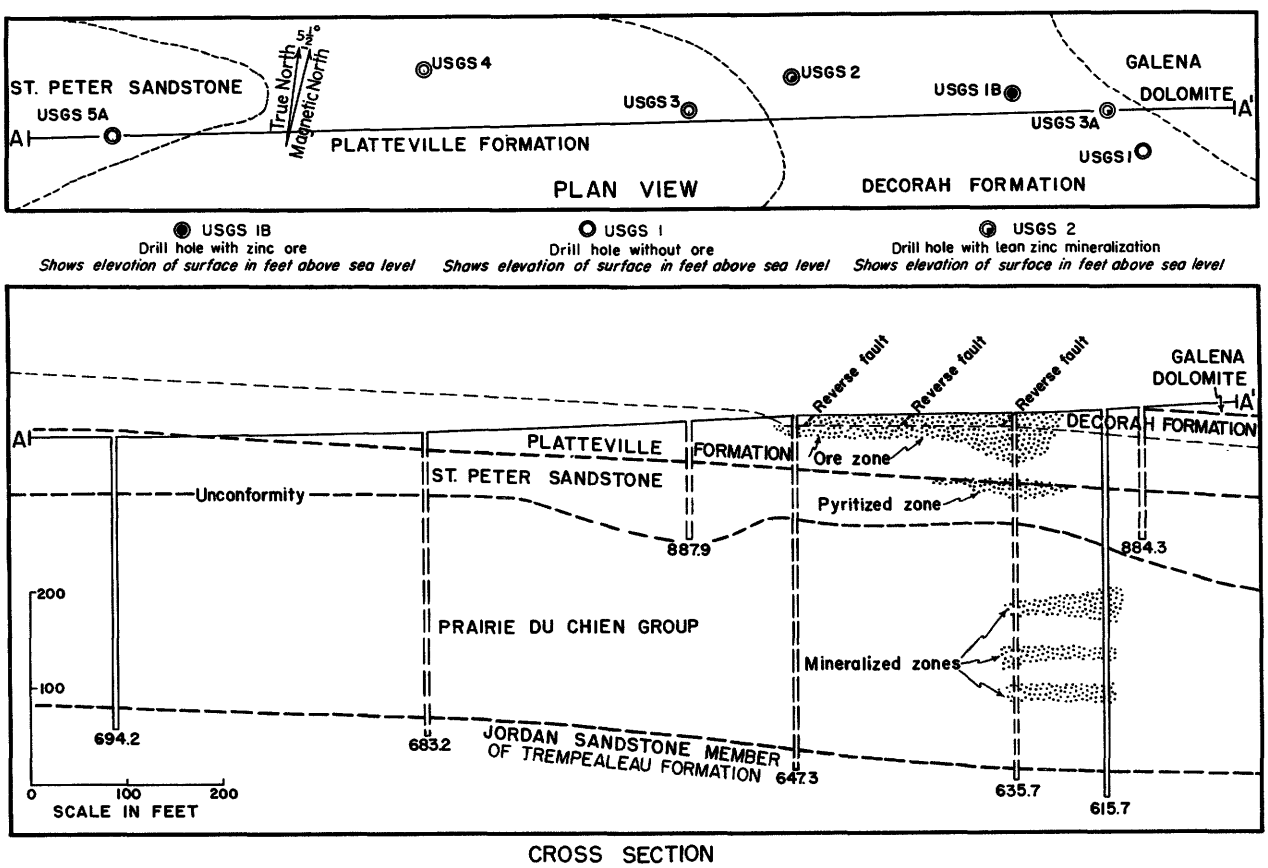


Figure 4. -Plan view and geologic map and cross section in the northwestern part of Crow Branch area (fig. 3)

(Percival 1856, pp. 34-36, 47-48, 61-62; Hall and Whitney, 1862, pp. 361-364; Chamberlin 1882, p. 481). It is controlled by several northwest-trending, southwest-dipping reverse faults (fig. 4) and associated bedding-plane faults.

The Crow Branch area was explored by 10 Geological Survey drill holes, 3 of which (USGS 1, 3, and 5) bottomed above the Prairie du Chien group, owing to mechanical difficulties encountered by the diamond drill. Seven of the Geological Survey drill holes are located along a line trending at nearly right angles to the trend of the major syncline in order to explore in the Prairie du Chien group for an extension at depth of the ore in the Galena, Decorah, and Platteville formations (fig. 4). The drilling indicated that the southwest-dipping fault system that controls the ore body above the St. Peter sandstone apparently does not extend below the Platteville formation. However, three mineralized zones were found that contain sphalerite, pyrite, and marcasite in the beds of the Prairie du Chien. These zones lie beneath and toward the northeast of the ore body in the Galena, Platteville, and Decorah formations. The zones are apparently in the more brittle dolomite beds of the Prairie du Chien which have been fractured into a crackle breccia during the tectonic deformation that produced the folds and the over-lying unconnected faults. The undulations in the beds in the upper ore zone (fig. 4) at the top of the Platteville formation are the result of solution thinning by the ore solutions and some faulting in these beds. Disregarding these local undulations, the dip of the lower beds closely corresponds to that of the upper beds. In one drill hole (USGS 1B) a pyritized zone was found that contains a little sphalerite and galena. The two drill holes (fig. 3, USGS 6 and 7) were drilled at the southeast end of the Crow Branch ore body to see if the zinc-bearing zones of the Prairie du Chien extended along the trend of the ore body. No sphalerite was found, but instead considerable quantities of pyrite and marcasite were present.

Leix property. --The single churn-drill hole on the Leix property (fig. 5) was put down to check reports of sphalerite in the Prairie du Chien group in the well drilled 60 feet to the south, in the middle of the railroad right-of-way, by the Chicago & North Western Railway in 1910.

In the U. S. Geological Survey drill holes (USGS 1), a little honey-yellow sphalerite was found in the lower part of the Prairie du Chien group at a depth of from 395 to 405 feet and the sphalerite is in the pores between the dolomite grains of the rock.

Disseminated sphalerite ore was cut in the Guttenberg limestone member of the Decorah formation, at 145-150 feet in depth. This ore is 900 feet to the east of, and probably is on the extension of, the easterly heading of the abandoned C. P. David mine; its location therefore suggests that an unmined part of the ore body extends at least this far toward the east.

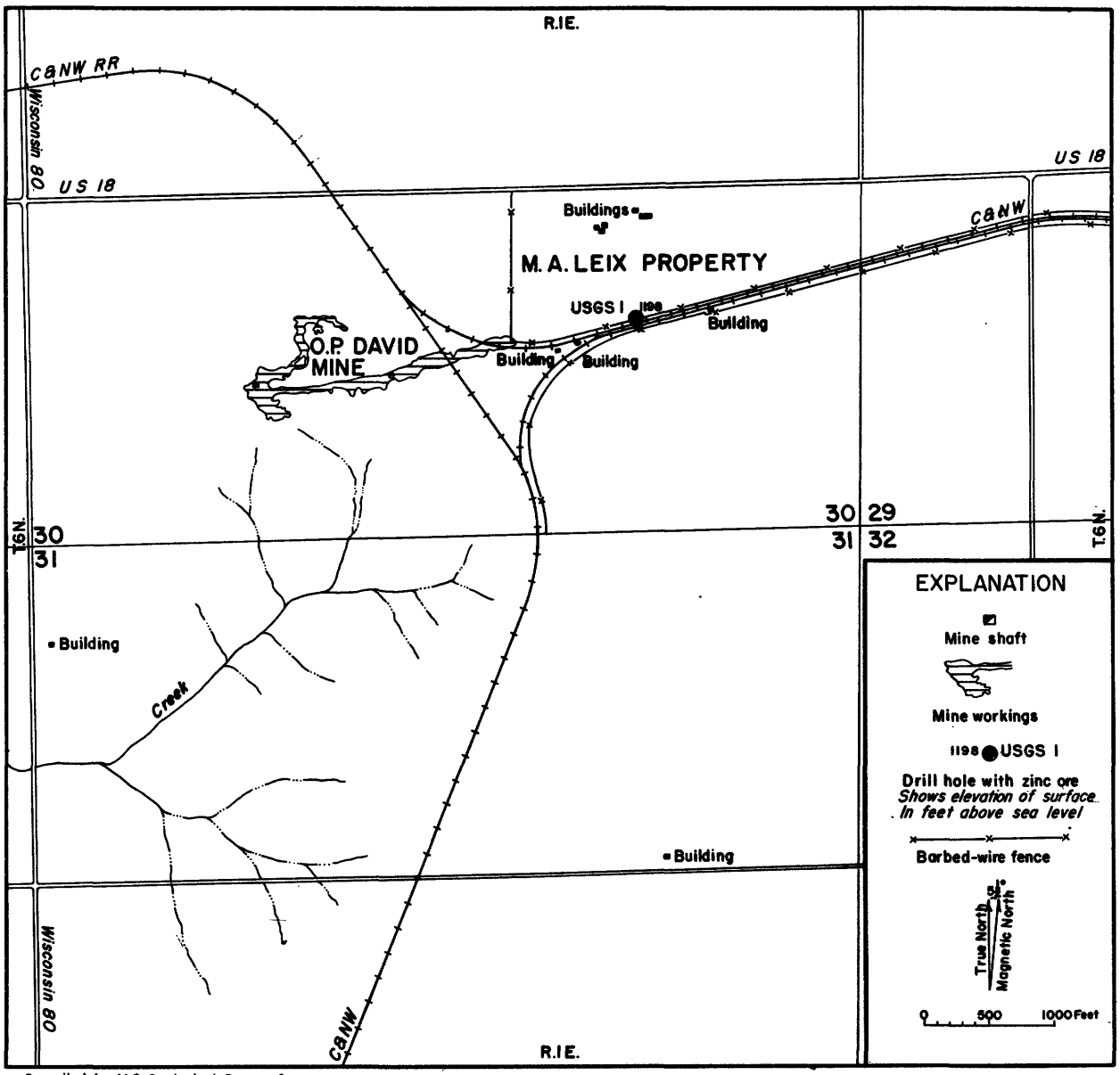
A third mineralized zone that contains considerable pyrite and a little sphalerite was found in the upper part of the Franconia sandstone, where the sulfides occur as cement between the quartz sand grains and are disseminated in the glauconitic green shales.

Parmley Harris property. --A well on the Harris property (fig. 6) that was deepened in 1949 struck considerable sphalerite and marcasite in the uppermost beds of the Prairie du Chien group. The first 2 feet of the deepened well were in greenish sandy shale at a depth of 170 to 172 feet and averaged 0.35 percent zinc and 3.55 percent iron (analyst, Frank Walther, Platteville, Wis.)--the iron in the form of pyrite and marcasite. The nearby Geological Survey hole (20 feet west of the well) drilled subsequently, found slightly smaller quantities of sphalerite, pyrite, and marcasite at about the same depth.

Spitzbarth property. --A well drilled in 1900 on the Spitzbarth property (fig. 6) was reported to have penetrated sphalerite in the upper beds of the Prairie du Chien group. A check hole was drilled by the Geological Survey within 20 feet of the old well; some sphalerite, pyrite, and marcasite were found in those beds at a depth of 100 to 105 feet. This sphalerite was in large crystals that apparently lined cavities in the rock, or replaced it.

Kennedy mine property. --The Kennedy mine property (fig. 7) contains the large abandoned Kennedy mine, which is in one of the important northwest-trending ore bodies in the south-central part of the district. The ore body lies along the axial area of one of the larger northwest-trending synclines. Six holes were drilled along a line bearing southwest, at right angles to the general structural trend. Holes 3 and 3A were not completed, owing to diamond drilling difficulties, but hole 3B was completed very near the other two, by churn drilling. Hole 1, in the central area of the ore body, is between the two reverse fault zones that bound the ore body. This drill hole cut lean zinc and iron sulfide deposits in the beds above the St. Peter sandstone, and similar quantities of pyrite and marcasite in the basal part of the St. Peter sandstone and at two horizons in the lower part of the Prairie du Chien group. In the middle of the Prairie du Chien, from 355 to 368 feet in depth, the rock was entirely replaced by silica in the form of chert, drusy quartz, and jasperoid. This silicification was to a lesser extent in drill hole 2, at the western edge of the ore body, but not in the holes still farther southwestward.

Hole 2 penetrated 15 feet of mineable ore in the lower beds of the Decorah formation, and indicates that some unmined ore remains in the mine walls. Although no zinc was found in the Prairie du Chien beds, the considerable quantities of iron sulfide and the intense silicification indicate that mineralizing solutions passed through these beds.



Compiled by U.S. Geological Survey from mine map by New Jersey Zinc Co., aerial photos and original Surveys, 1950

Figure 5. -Map showing workings of O. P. David mine and location of drill holes on Leix property near Montfort, Wis.

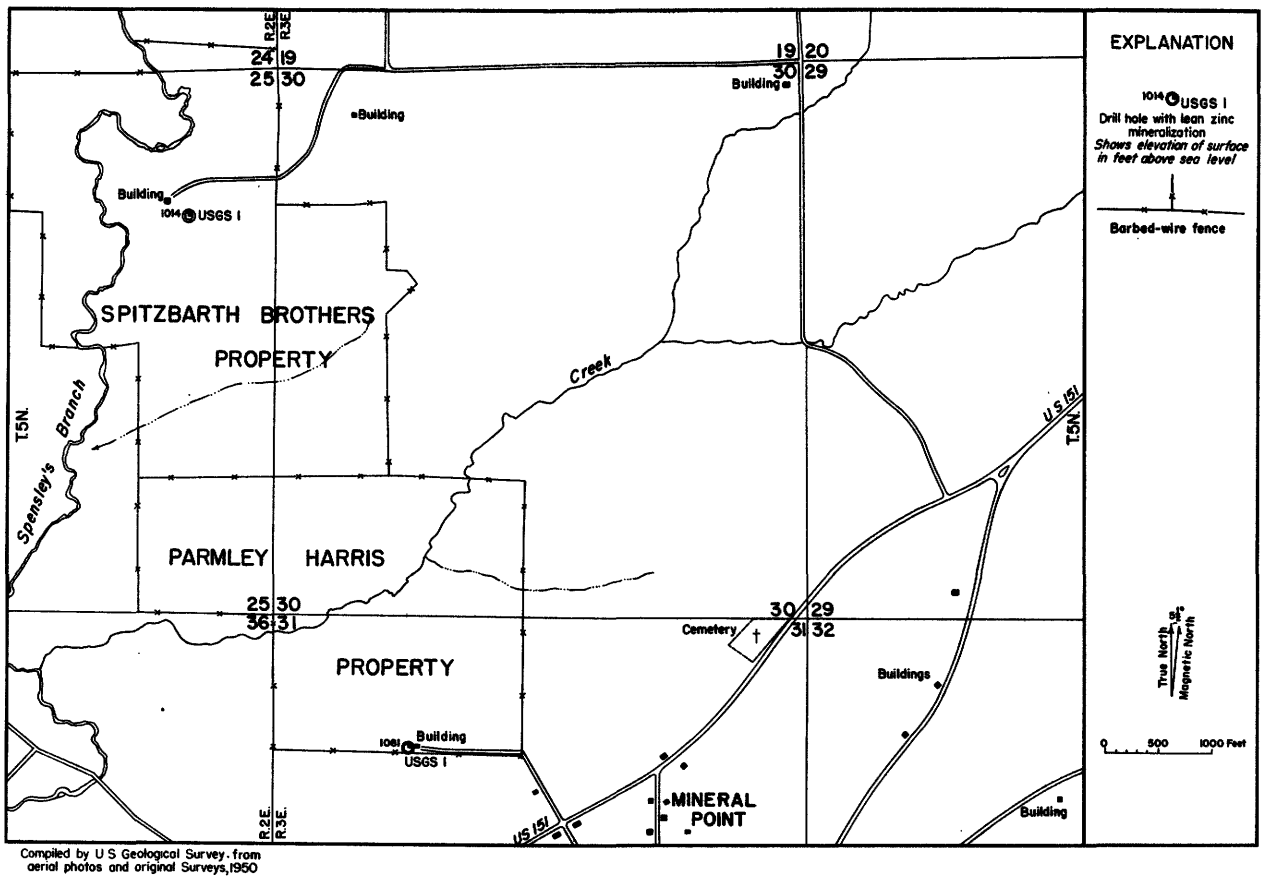


Figure 6. -Map showing location of drill holes on Spitzbarth and Harris properties near Mineral Point, Wis.

The unconformity at the base of the St. Peter sandstone is fairly well marked here, and the lithology of the Prairie du Chien strata changes rapidly laterally. In some places, as in hole 1, the rock is nearly all dolomite; in others, as in hole 4, it is largely red and green shales interbedded with dolomite.

James mine area. --One diamond drill hole was completed in the James mine area (Thomas Doyle property) near Shullsburg, Wis. (fig. 8). This drill hole penetrated an unusually great thickness (276 feet) of St. Peter sandstone and a small thickness of Prairie du Chien group so additional contemplated drill holes were not started. In addition to being thicker than normal the St. Peter sandstone in this drill hole has an unuslal lithology, particularly the lower 110 feet that consist of thin beds of red, brown, yellow, and white sandstones interbedded with red and green shales, and a little limestone and dolomite. The exact stratigraphic age and relationships of these lower beds are not known. They are strongly sheared, slickensided, and full of small drag folds.

Meekers Grove area. --Three churn-drill holes were put down on the Raisbeck property just south of Meekers Grove, Wis. (fig. 9). These holes are located on a line bearing north-northeast across the steeper north limb of a major anticline of about 200 feet amplitude that trends east. (Heyl and others, 1945). All of these holes cut very thick St. Peter sandstone including considerable thicknesses of the unusual red and green shale and sandstone beds similar to those in the James mine drill hole. The only sulfides found in these holes were

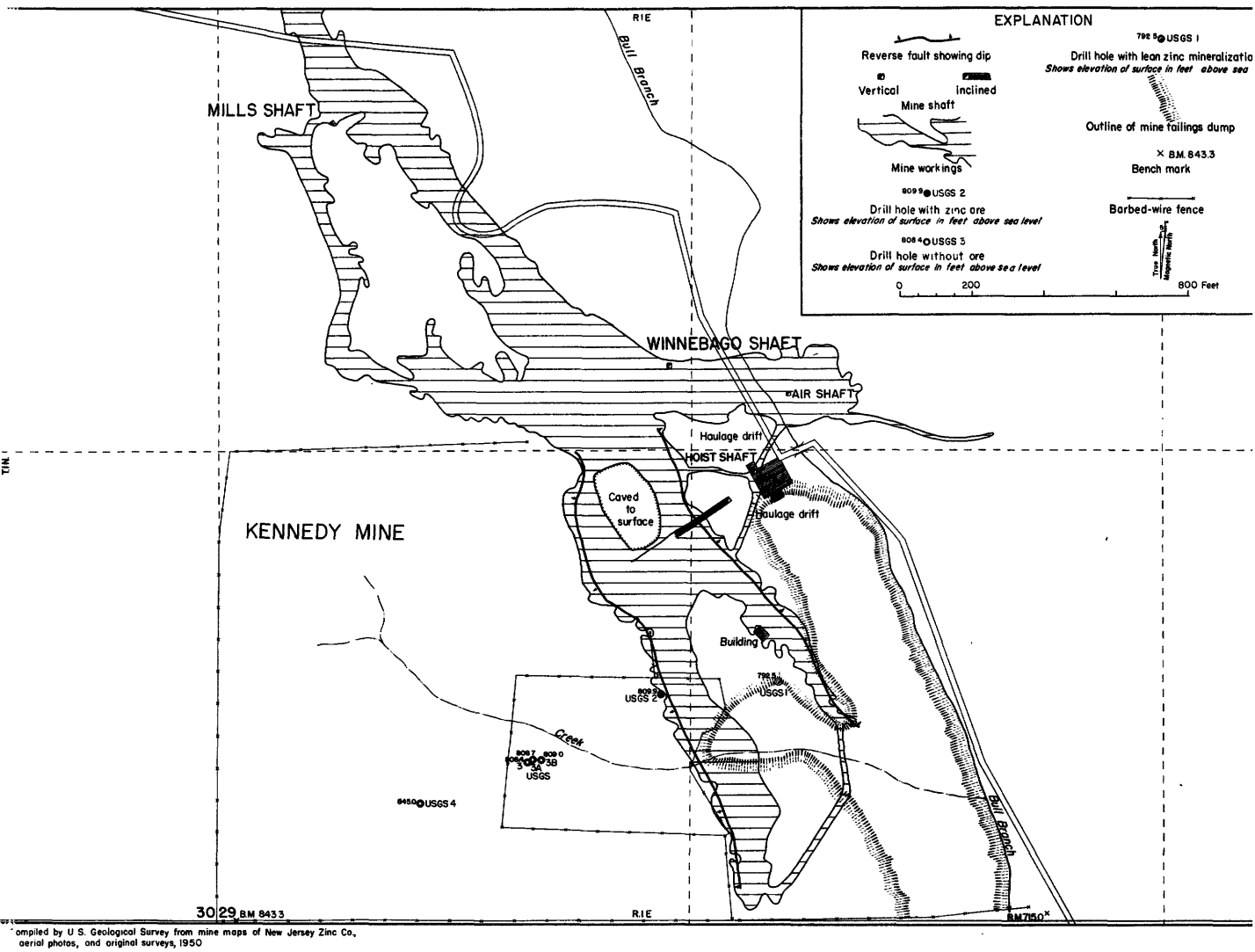


Figure 7. -Map showing location of drill holes on Kennedy mine property near Hazel Green, Wis.

considerable pyrite and a little galena in the upper part of the St. Peter sandstone in holes 1 and 2, and abundant iron sulfide in the Galena and Decorah formation in hole 3.

Vinegar Hill roaster property. --Although the U. S. Geological Survey drilling in the south-central part of the district has been unfavorable, owing to the unconformity at the top of the Prairie du Chien group that here cuts out most of this group in several known places, one hole was drilled on the property of the Vinegar Hill Zinc Co. (fig. 10) where previous drilling by that company had indicated that normal dolomitic Prairie du Chein strata were present. Also, older drilling had located an ore body in the Galena and Decorah beds along an east-trending syncline.

The Geological Survey drill hole was placed within the area of this ore body, and considerable iron and zinc sulfides were penetrated in the Galena and Decorah formations. Fractured dolomite of the Prairie du Chien group, in which a little coarsely crystalline sphalerite and marcasite coated the fracture walls, was cut from depths of 445 to 455. A little sphalerite was found along the uppermost part of the sandstone of Cambrian age.

Conclusions

Although no minable ore was found in the beds beneath the Platteville formation, the Geological Survey drilling program showed that the dolomite beds of the Prairie du Chien group, where present throughout the mining district, are favorable

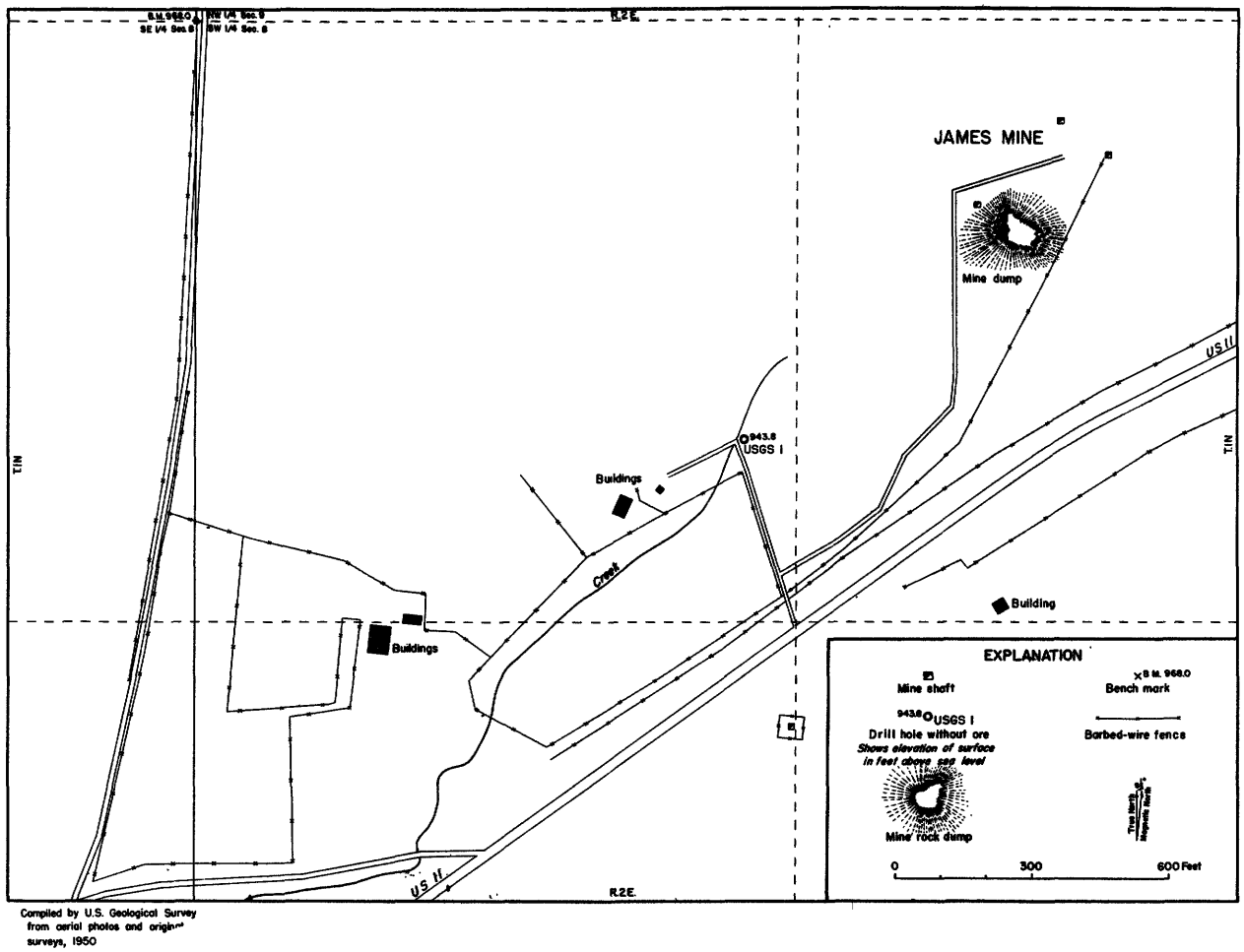


Figure 8. -Map showing location of drill holes on James mine property near Shullsburg, Wis.

at several horizons for sulfide deposits. To date the sulfide deposits in the Prairie du Chien are all very low in grade and consist mainly of sphalerite, marcasite, and pyrite; and they are unlike the galena and chalcopyrite deposits that are prevalent in these rocks to the north of the main productive area.

The northern part of the main productive area of the mining district is considered more favorable for the occurrence of ore deposits in the Prairie du Chien group than the southern part. The drilling indicates that in many places within the southern part of the district the Prairie du Chien is considerably thinned by pre-St. Peter erosion, now represented by the unconformity separating the St. Peter sandstone and the underlying Prairie du Chien. In the northern part of the mining district on the other hand, the Prairie du Chien is 200 feet or more in thickness, except locally where erosion channels formed by pre-St. Peter erosion are known. Because the Prairie du Chien group is generally much thicker in the northern part of the district, and hence is here represented by a greater thickness of dolomite, the writers believe that this area is more favorable for the occurrence of zinc-lead deposits of possible commercial importance.

In some places, as in the Crow Branch, Kennedy, Leix, and Vinegar Hill roaster areas, the deeper sulfide deposits lie almost directly beneath the deposits in the Galena, Decorah, and Platteville formations.

In the areas drilled, the sulfides in the Prairie du Chien group were deposited in certain more brittle or soluble dolomite beds in which cavities were

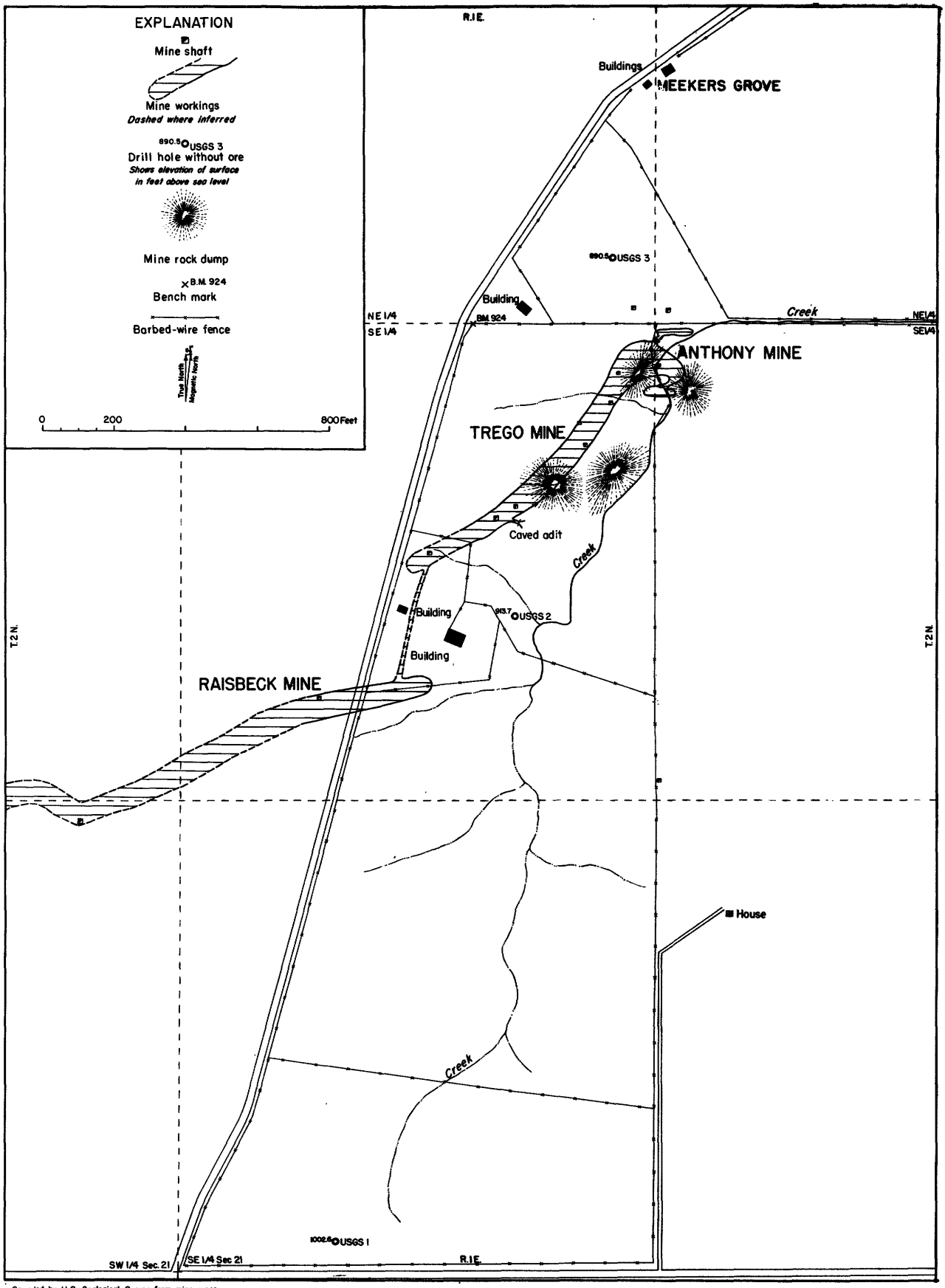
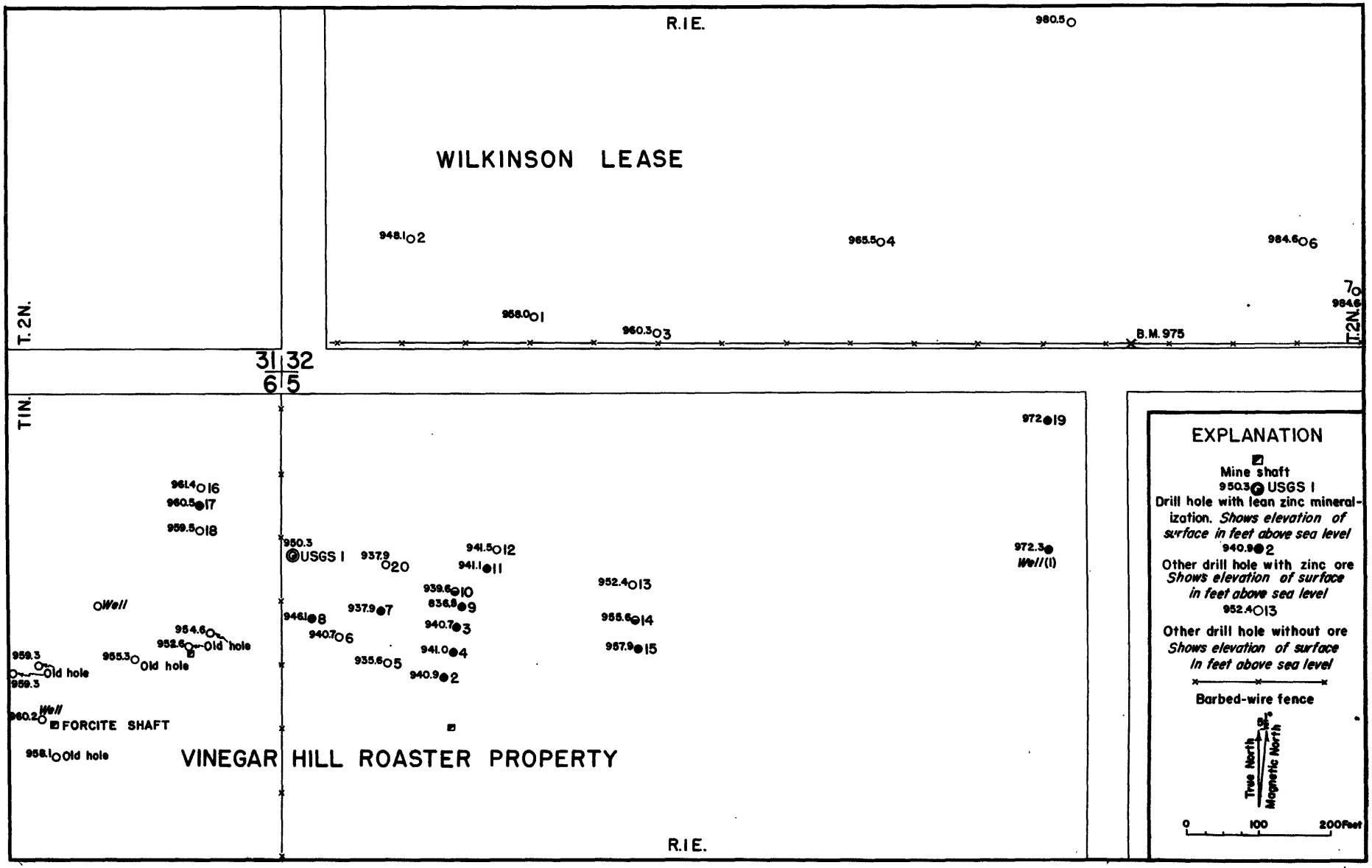


Figure 9. -Map showing location of drill holes on Raisbeck property, Meekers Grove area, Wis.



Compiled by U.S. Geological Survey from maps of the Vinegar Hill Zinc Co. and original surveys, 1950

Figure 10. -Map showing location of drill holes on Vinegar Hill roaster property near Cuba City, Wis.

formed by brecciation or solution. The sulfides are in laterally extending brecciated or vuggy zones rather than along distinct vertical fractures or replacement areas. Abundant silica and dolomite are deposited with the sulfides. In many respects this type of sulfide deposit is similar to that found in the Joplin, Mo., mining district.

At Crow Branch the drilling indicated that the large folds, at least, are not limited to the the Middle Ordovician beds but are equally well developed in the underlying formations.

The drill hole that penetrated a considerable thickness of the upper part of the Cambrian strata on the Leix property showed that some of these beds are also favorable for sulfide deposits.

A by-product result of the drilling program of the Prairie du Chien group was the discovery of additional ore in the Galena, Decorah and Platteville formations on three of these properties, the Crow Branch, Leix, and Kennedy. These ore discoveries are small contributions to the known ore reserves of the Wisconsin district.

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DESCRIPTIVE RECORDS OF DRILL HOLES

All drill holes are at 90° inclination. All percentages in long descriptions are estimates in terms of the metal content, i. e. galena percent means 1 percent lead in the sample.

CROW BRANCH AREA

Crow Branch no. 1 (Diamond Drill Log)

Location: 1281 ft N. 37°15' E. of southeast corner sec. 22, T. 5 N., R. 1 W.
Date begun: 7/2/49 — Elevation collar: 1016.3 ft
Date completed: 7/5/49 — Total depth: 132+ ft
Water table: not reached — Driller: Frank Balcar

Footage From	Footage To	Unit	Description
0	5.4		Surficial, residual.
5.4	7.2	Decorah-(Ion)	Limestone, gray; dolomite, buff.
7.2	20.2	Decorah-(Guttenberg)	Limestone, buff; shale, brown, trace pyrite.
20.2	25.4	Decorah-(Spechts Ferry)	Limestone, gray, argillaceous.
25.4	28.6	Platteville-(Quimbys Mill)	Limestone, buff; shale, brown.
28.6	60.6	Platteville-(McGregor)	Limestone, gray.
60.6	79.4	Platteville-(Pecatonica)	Limestone, buff.
79.4	81.6	Platteville-(Glenwood)	Shale, green, sandy; trace pyrite.
81.6	132+	St. Peter	Sandstone, trace pyrite.

Crow Branch no. 1B

Location: 1236 ft N. 21°30' E. of southeast corner sec. 22, T. 5 N., R. 1 W.
Date begun: 9/6/49 — Elevation collar: 1015.7 ft
Date completed: 9/13/49 — Total depth: 380 ft
Water table struck: 9 ft — Driller: Gille Bros.

Churn Drill Log

Footage From	Footage To	Formation	Description
0	9	Decorah-(Ion)	Dolomite, gray and blue, mottled; little sphalerite, pyrite, marcasite, barite, calcite and trace of galena.
9	17	Decorah-(Guttenberg)	Dolomite, pink, dense. Mineralization same.
17	20	Decorah-(Spechts Ferry)	Limestone, gray, argillaceous, fossiliferous; with phosphate nodules; mineralization same.
20	23	Platteville-(Quimbys Mill)	Dolomite, gray-brown, dense; mineralization same.
23	52	Platteville-(McGregor)	Dolomite, buff and gray; mineralization same but decreasing with depth.
52	71	Platteville-(Pecatonica)	Dolomite, bluish-gray, argillaceous; marcasite, pyrite, sphalerite; phosphate nodules 68-70.
71	73	Platteville-(Glenwood)	Shale, green, sandy, with pyrite, marcasite, and phosphate nodules; trace barite.
73	115	St. Peter	Sandstone, medium-large grained; sphalerite 75-95; pyrite and marcasite; little barite; trace galena 80-85.
115	200	Prairie du Chien	Dolomite, light-gray to buff; trace pyrite and marcasite; gray-green shale; oolite 125-130, 135-140, 145-170; glauconite 125-130, 195-200; cherty, little green shale.
200	370	Prairie du Chien	Dolomite, same; cherty; sphalerite 200-210, 220-340, pyrite and marcasite; trace chalcopyrite 250-255; several sandy zones; trace green shale, trace glauconite.
370	380	Trempealeau-(Jordan)	Sandstone, colorless, rounded grains; trace pyrite and marcasite.

Analyses 2/

Feet From	Feet To	Zn	Fe	Pb
0	15	2.10	4.10	0.45
15	20	2.20	4.60	.30
20	25	5.50	7.80	1.15
25	30	4.70	9.30	.40
30	35	4.90	10.00	.65
35	40	3.20	5.90	.15
40	45	1.75	4.50	Tr.
45	47.5	.80	4.60	.05
47.5	50	2.30	3.25	.73
50	52.5	.20	4.25	----
52.5	55	.15	1.85	----
55	57.5	.10	1.90	----
57.5	60	.05	6.25	----
60	62.5	.05	2.90	----
62.5	65	.20	2.15	----
65	67.5	----	1.70	----
67.5	70	----	2.25	----
70	72.5	.05	4.00	----
72.5	75	----	6.00	----
75	80	.25	1.80	----
80	85	.05	1.65	Tr.
175	180	----	1.75	----
200	205	.75	1.75	----
205	210	.10	1.10	----
230	235	.05	1.15	----
235	240	Tr.	.95	----
240	245	Tr.	.75	----
245	250	.35	1.05	----
250	255	Tr.	1.05	----
255	260	.25	1.10	----
260	265	.10	.90	----
285	290	.25	.75	----
290	295	.10	.55	----
295	300	.20	.90	----
300	305	Tr.	1.00	----

2/ All analysis in the descriptive logs of drill holes are by Frank Walther, analyst, Platteville, Wis.

Crow Branch no. 2

Location: 1123 ft N. 21°30' E. of SE corner sec. 22, T. 5 N., R. 1 W.
Date begun: 9/12/49 — Elevation collar: 1012.3 ft
Date completed: 9/21/49 — Total depth: 365 ft
Water table struck: 10 ft — Driller: Judd and Co.

Churn Drill Log

Footage From	Footage To	Unit	Description
0	15		Residual soil and yellow-buff dolomite, oxidized; pyrite and limonite abundant; little barite, calcite; trace galena.
15	17.5	Platteville-(Quimbys Mill)	Dolomite, yellow-buff, dense; brown shale; pyrite, limonite; calcite, considerable galena and sphalerite; trace barite.
17.5	29	Platteville-(McGregor)	Limestone, light-gray; mineralization same; gray shale 28-29'.
29	51	Platteville-(Pecatonica)	Dolomite, gray, mottled; trace sphalerite at 40-45; galena, considerable pyrite and marcasite.
51	53	Platteville-(Glenwood)	Shale, green, phosphatic, sandy. Little galena, considerable pyrite.
53	104	St. Peter	Sandstone, large, rounded, grains; trace of pyrite and marcasite; occasional green shale and calcite; all oxidized.
104	140	Prairie du Chien	Dolomite, buff and gray; cherty; oolite 115-120, 125-130, little sphalerite 105-110, 130-135, trace pyrite, marcasite and glauconite.

Churn Drill Log-Continued.

Footage From	Footage To	Unit	Description
140	165	Prairie du Chien	Sandstone and dolomite, buff-tan; trace glauconite, cherty oolite, green shale, marcasite and pyrite.
165	170	Prairie du Chien	Quartz and oolite; trace pyrite, marcasite, and glauconite.
170	347	Prairie du Chien	Dolomite, buff, light-gray and pink, with quartz; marcasite and pyrite, trace-fair; trace glauconite, green shale; occasional oolites.
347	365	Trempealeau-(Jordan)	Sandstone; trace pyrite and marcasite.

Analyses

Feet From	Feet To	Zn	Fe	Pb
15	17.5	0.30	6.90	1.40
17.5	20	.25	9.90	2.35
20	23	.15	5.90	1.20
23	28	.05	3.25	.40
28	30	----	3.70	.15
30	35	----	4.20	----
35	40	----	4.05	----
40	45	----	4.60	.90
45	50	----	4.80	.95
50	52.5	----	4.25	.45
105	110	----	1.10	----
130	135	.10	1.75	----

Crow Branch no. 3 (Diamond Drill Log)

Location: 1044 ft N. 17°30' E. of southeast corner sec. 22, T. 5 N., R. 1 W.
Date begun: 7/2/49 — Elevation collar: 1008.9 ft
Date completed: 7/26/49 — Total depth: 121.2 ft
Water table: not reached — Driller: Frank Balcar

Footage From	Footage To	Unit	Description
0	11.2		Surficial.
11.2	20.0	Platteville-(McGregor)	Limestone, gray.
20.0	39.0	Platteville-(Pecatonica)	Limestone, buff.
39.0	41.0	Platteville-(Glenwood)	Shale, green, sandy, trace pyrite.
41.0	121.2	St. Peter	Sandstone, yellow to white.

Crow Branch no. 3A

Location: 1287 ft N. 35°15' E. of southeast corner sec. 22, T. 5 N., R. 1 W.
Date begun: 9/21/49 — Elevation collar: 1020.1 ft.
Date completed: 9/29/49 — Total depth: 405 ft
Water table struck: 9 ft — Driller: Judd and Co.

Churn Drill Log

Footage From	Footage To	Unit	Description
0	10	Decorah-(Ion)	Dolomite, yellow-buff, oxidized. Trace pyrite.
10	15	Decorah-(Ion)	Dolomite, blue-gray; trace pyrite.
15	28	Decorah-(Guttenberg)	Limestone, light-tan, dense; trace pyrite, green and brown shale.
28	31	Decorah-(Spechts Ferry)	Limestone, buff, fossiliferous, phosphatic; gray shale, trace pyrite.
31	35	Platteville-(Quimbys Mill)	Limestone, dark-brown, dense; trace calcite, pyrite, gray shale.

Churn Drill Log-Continued.

Footage From	Footage To	Unit	Description
35	65	Platteville-(McGregor)	Limestone, light-gray, buff; trace pyrite.
65	82	Platteville-(Pecatonica)	Dolomite, gray; trace pyrite and calcite.
82	85	Platteville-(Glenwood)	Shale, green, phosphatic, with pyrite and sand grains; trace galena.
85	141	St. Peter	Sandstone, large rounded, colorless grains; pyrite trace-fair; trace green shale.
141	144	St. Peter	Shale, green, sandy.
144	378	Prairie du Chien	Dolomite, buff; trace glauconite and green shale; occasional quartz and cherty zones with oolite; sphalerite 190-197.5 200-220, 250-260, 275-315, 350-380; pyrite and marcasite trace-little; sandstone 255-270.
378	385	Jordan	Sandstone, small to large grains; trace green shale, pyrite and marcasite.

Analyses

Feet From	Feet To	Zn	Fe	Pb
80	85	----	3.25	Tr.
190	195	0.50	.85	---
195	197.5	.25	1.00	---
197.5	200	----	.85	---
200	202.5	.10	1.00	---
202.5	205	.10	1.00	---
205	207.5	.20	.90	---
207.5	210	.15	.55	---
210	212.5	.10	.75	---
212.5	215	.25	.95	---
215	217.5	.05	1.05	---
217.5	220	.05	1.10	---
250	255	.05	.85	---
255	257.5	.15	.90	---
257.5	260	.07	.85	---
275	280	.05	.75	---
285	290	.07	.55	---
290	295	.65	.80	---
295	300	.12	.65	---
300	305	.08	.80	---
310	315	.05	.80	---
365	370	Tr.	1.05	---
370	375	----	.95	---

Crow Branch no. 4 (Churn Drill Log)

Location: 1105 ft N. 1°30' E. southeast corner sec. 22, T. 5 N., R. 1 W.
Date begun: 9/5/49
Date completed: 9/12/49
Water table struck: 93 ft
Elevation collar: 1003.2 ft
Total depth: 320 ft
Driller: Judd and Co.

Footage From	Footage To	Unit	Description
0	13		Soil and stream gravel; placer barite, galena, pyrite and limonite.
13	18	Platteville-(Pecatonica)	Dolomite, gray and buff.
18	22	Platteville-(Glenwood)	Shale, green, with pyritized sandstone.
22	65	St. Peter	Sandstone, clear, rounded, large grains, oxidized; trace pyrite.
65	69	St. Peter	Shale, gray-green, with sand grains, glauconite and pyrite.
69	302	Prairie du Chien	Dolomite, light-tan, gray, and buff, cherty; trace glauconite shale, pyrite, marcasite; trace chalcopyrite 135-160; a few oolite and sandstone zones; considerable quartz.

Crow Branch no. 4 (Churn Drill Log)-Continued.

Footage From	Footage To	Unit	Description
302	320	Jordan	Sandstone, medium-grained, friable, oxidized. Trace oolite, limonite, pyrite, brown and green shale.

Crow Branch no. 5 (Diamond Drill Log)

Location: 1845 ft N. 60°30' W. of southeast corner sec. 22, T. 5 N., R. 1 W.
Date begun: 7/2/49 — Elevation collar: 998.7
Date completed: 7/5/49 — Total depth: 76.2
Water table: not reached — Driller: Frank Balcar

Footage From	Footage To	Unit	Description
0	12.4		Surficial.
12.4	63.7	St. Peter	Sandstone, white to brown.
63.7	74.2	St. Peter	Shale, green.
74.2	76.2	Prairie du Chien	Dolomite, buff; trace pyrite.

Crow Branch no. 5A (Diamond Drill Log)

Location: 1830 ft N. 61° W. of southeast corner sec. 22, T. 5 N., R. 1 W.
Date begun: 7/15/49 — Elevation collar: 997.8 ft
Date completed: 8/4/49 — Total depth: 303.6 ft
Water table: not reached — Driller: Frank Balcar

Footage From	Footage To	Formation	Description
0	9		Surficial.
9	60.6	St. Peter	Sandstone.
60.6	63.3	St. Peter	Shale, green.
63.3	105.5	Prairie du Chien	Dolomite, buff, cherty; trace pyrite, marcasite.
105.5	154.0	Prairie du Chien	Dolomite, gray, chert and drusy quartz; marcasite, pyrite in vugs and fractures.
154.0	218.0	Prairie du Chien	Dolomite, varicolored; marcasite, pyrite.
218.0	281.5	Prairie du Chien	Dolomite, tan; marcasite.
281.5	287.2	Trempealeau-(Jordan)	Sandstone; dolomite, green shale streaks; trace marcasite.
287.2	303.6	Trempealeau-(Jordan)	Sandstone, brown dolomite, pink; trace marcasite.

Crow Branch no. 6 (Churn Drill Log)

Location: 1882 ft S. 62° E. of southeast corner sec. 22, T. 5 N., R. 1 W.
Date begun: 9/15/49 — Elevation collar: 1134.8 ft
Date completed: 9/22/49 — Total depth: 450 ft
Water table struck: 70 ft — Driller: Gille Bros.

Footage From	Footage To	Unit	Description
0	10		Surficial deposits.
10	35	Galena	Dolomite, buff, cherty; trace limonite.
35	60	Galena	Dolomite, buff, cherty; limonite-10 percent Fe.
60	78	Galena	Dolomite, buff, cherty; trace limonite-marcasite.
78	98	Decorah-(Ion)	Dolomite, gray; pyrite, marcasite.
98	109	Decorah-(Guttenberg)	Dolomite, brown; shale, brown; pyrite common.
109	111	Decorah-(Spechts Ferry)	Shale, green.
111	113	Platteville-(Quimbys Mill)	Dolomite, brown; shale, brown; pyrite common.
113	125	Platteville-(McGregor)	Dolomite, gray; pyrite and marcasite common.
125	130	Platteville-(McGregor)	Limestone, gray; pyrite and marcasite.
130	140	Platteville-(McGregor)	Dolomite, gray; trace pyrite.
140	155	Platteville-(Pecatonica)	Dolomite, gray-brown; trace pyrite and marcasite.

Crow Branch no. 6 (Churn Drill Log)-Continued.

Footage From	Footage To	Unit	Description
155	160	Platteville-(Glenwood)	Shale, green, sandy; pyrite common.
160	197	St. Peter	Sandstone; trace pyrite.
197	215	Prairie du Chien	Dolomite, buff to gray; trace pyrite.
215	290	Prairie du Chien	Dolomite, buff to gray, shale, olive, sandy, trace pyrite.
290	395	Prairie du Chien	Dolomite, cream; cherty; little pyrite.
395	425	Prairie du Chien	Dolomite, silicified, cherty; green shale; trace pyrite.
425	430	Prairie du Chien	Dolomite brown; oolite; trace pyrite.
430	450	Trempealeau-(Jordan)	Sandstone; brown sandy dolomite; trace pyrite.

Crow Branch no. 7 (Churn Drill Log)

Location: 2030 ft S. 63°30' E. of southeast corner sec. 22, T. 5 N., R. 1 W.
Date begun: 2/9/50 Elevation collar: 1117 ft
Date completed: 2/22/50 Total depth: 470 ft
Water table struck: 60 ft Driller: Gille Bros.

Footage From	Footage To	Unit	Description
0	15		Residual Soil.
15	86	Galena	Dolomite, yellow-buff, oxidized, cherty. Little limonite.
86	100	Decorah-(Ion)	Dolomite, light-gray; pyrite and marcasite 4-15 percent.
100	105	Decorah-(Ion)	Dolomite, blue; pyrite and marcasite 20 percent.
105	112	Decorah-(Guttenberg)	Shale, and dolomite; pyrite and marcasite 2-8 percent.
112	115	Decorah-(Spechts Ferry)	Shale, with phosphate nodules; pyrite and marcasite.
115	116	Platteville-(Quimbys Mill)	Dolomite, tan, sugary.
116	130	Platteville-(McGregor)	Shale, blue; pyrite and marcasite 1 percent.
135	140	Platteville-(McGregor)	Dolomite, blue-gray.
140	157	Platteville-(Pecatonica)	Dolomite, blue-gray; pyrite and marcasite 0.2-2 percent.
157	160	Platteville-(Glenwood)	Shale, green, sandy, phosphatic; pyrite and marcasite 3 percent.
160	233	St. Peter	Sandstone, large to small, rounded, colorless-frosted quartz grains. Little pyrite and marcasite.
233	270	Prairie du Chien	Dolomitic sandstone and dolomite; trace oolite, green shale, pyrite and marcasite.
270	280	Prairie du Chien	Sandstone, fine-large, rounded, colorless-frosted quartz grains.
280	310	Prairie du Chien	Dolomite, light-buff to buff; cherty; occasional glauconitic and green shale. Dolomitic sandstone 305-310; Little pyrite and marcasite 300-310.
310	330	Prairie du Chien	Dolomite, pink and buff. Occasional oolites. Little pyrite, marcasite, and green shale.
330	380	Prairie du Chien	Dolomite, light-tan, buff, and pink; some sandstone 330-335, 340-345, 365-370. Pyrite and marcasite 0.4-4 percent, trace chalcopyrite 370-375. Occasional trace of green shale.
380	395	Prairie du Chien	Dolomite, buff. Little pyrite and marcasite. Dolomitic sandstone and shale 390-395. Little pyrite and marcasite.
395	459	Prairie du Chien	Dolomite, tan, pink, and buff, with scattered sand grains; some sandstone stringers. Trace pyrite, marcasite, and green shale. Quartz and cherty oolite 445-455.
459	470	Trempealeau-(Jordan)	Sandstone, fine to large, colorless-frosted, quartz grains. Trace pyrite and marcasite.

LEIX PROPERTY

Leix no. 1

Location: 242 ft north and 265 feet west of southeast corner sec. 30, T. 6 N., R. 1 E., Leix property, Montfort, Wisconsin.
Date begun: 1/7/50
Date completed: 2/3/50
Water table struck: 60 ft
Elevation collar: 1197. 7 ft
Total depth: 685 ft
Driller: Gille Bros.

Churn Drill Log

Footage From	Footage To	Unit	Description
0	5		Soil.
5	25	Galena	Dolomite, yellow-buff; trace pyrite; trace sphalerite 15-20.
25	70	Galena	Dolomite, yellow-buff; chert fair to common.
70	81	Galena	Dolomite, buff; trace pyrite and marcasite.
81	100	Galena	Dolomite, yellow-buff; chert fair amount to common; trace barite 90-95; trace pyrite and marcasite 81-85; trace pyrite 95-100.
100	125	Galena	Dolomite, yellow-buff; chert abundant 100-115, little 115-125.
125	135	Decorah-(Ion)	Dolomite, buff and gray; trace pyrite and marcasite.
135	140	Decorah-(Ion)	Shale, gray-green; trace calcite, phosphate nodulas; marcasite and pyrite.
140	149	Decorah-(Guttenberg)	Dolomite, tan and brown; phosphate nodules; trace chert and quartz; little brown shale; sphalerite abundant;140-150; heavy pyrite.
149	154	Decorah-(Spechts Ferry)	Limestone; light-buff; fair sphalerite 150-154; phosphate nodules; gray shale.
154	155	Platteville-(Quimbys Mill)	Shale and dolomite, chocolate brown; fair sphalerite 154-155.
155	160	Platteville-(McGregor)	Dolomite, gray; little sphalerite, marcasite and pyrite; trace calcite.
160	170	Platteville-(McGregor)	Limestone; light-gray, argillaceous; trace sphalerite and pyrite.
170	178	Platteville-(McGregor)	Limestone, light-gray to tan, argillaceous; calcite common; trace sphalerite; little pyrite.
178	195	Platteville-(Pecatonica)	Dolomite, gray-blue; little green shale; trace calcite; trace pyrite and sphalerite.
195	198	Platteville-(Glenwood)	Shale, green, sandy; abundant pyrite; phosphate nodules common.
198	249	St. Peter	Sandstone; pyrite fairly common; little green and gray shale.
249	251	St. Peter	Shale, greenish-gray; trace pyrite.
251	280	Prairie du Chien	Dolomite, tan, buff, and light-buff; trace green and yellow shale, glauconite, pyrite and marcasite.
280	300	Prairie du Chien	Dolomite, sandy, and dolomitic sandstone; trace glauconite, pyrite, marcasite. Cherty oolite 290-300.
300	310	Prairie du Chien	Dolomite, sandy; light-tan and cherty oolite; little green and yellow shale.
310	315	Prairie du Chien	Dolomite, light-buff; sandstone 20 percent; shale 20 percent; trace oolite, glauconite, pyrite and marcasite.
315	380	Prairie du Chien	Dolomite, buff, light-buff, grayish; fair green and buff shale; trace pyrite and marcasite; considerable quartz and cherty oolite 325-335, 365-380; silicified dolomite 340-345.
380	415	Prairie du Chien	Dolomite, buff, light-buff; little sphalerite 395-405, little pyrite and marcasite.
415	466	Prairie du Chien	Dolomite, buff, and tan; little chert, green shale, trace marcasite and pyrite; trace sphalerite 430-460; quartz 455-466; trace glauconite.
466	495	Trempealeau-(Jordan)	Sandstone; little glauconitic shale, quartz; trace oolite 466-470, and pyrite.
495	545	Trempealeau	Dolomite, sandy; trace pyrite and marcasite.
545	590	Trempealeau	Dolomite, tan to buff; trace pyrite and marcasite, fair at 550-565, trace green shale.
590	607	Franconia	Dolomite and dolomitic sandstone; very glauconitic; green shale; trace pyrite and marcasite.
607	625	Franconia	Sandstone and siltstone; very glauconitic; green shale, pyrite 3-4 percent, sphalerite 0. 1 percent 615-625.

Churn Drill Log-Continued.

Footage		Unit	Description
From	To		
625	645	Franconia	Sandstone and green shale; trace yellow shale; pyrite 1-3 percent, very glauconitic; trace sphalerite.
645	655	Franconia	Shale and sandstone; very glauconitic; trace pyrite.
655	685	Franconia	Sandstone; little green shale, abundant 680-685; trace pyrite 655-665; 675-685; very glauconitic.

Analyses

Feet		Zn	Fe
From	To		
145	150	7.90	3.20
150	155	2.00	1.40
395	400	.25	.90
400	405	.20	1.10
615	620	.10	2.25
620	625	.05	2.75

HARRIS PROPERTY

Harris no. 1

Location: 35 ft east, 50 feet north of southeast corner NW¼NW¼ sec. 31, T. 5 N., R. 3 E.
Date begun: 1/7/50 — Elevation collar: 1081.2 ft
Date completed: 1/21/50 — Total depth: 370 ft
Water table struck: 130 ft — Driller: Judd and Co.

Churn Drill Log

Footage From	Footage To	Unit	Description
0	10		Soil.
10	15	Decorah-(Ion)	Dolomite, yellow, oxidized.
15	23	Decorah-(Ion)	Dolomite, yellow, mottled.
23	28	Decorah-(Guttenberg)	Dolomite, buff, mottled; trace pyrite.
28	30	Decorah-(Spechts Ferry)	Dolomite, buff, mottled; trace calcite, phosphate nodules, pyrite and galena 1 percent.
30	44	Platteville-(Quimbys Mill)	Dolomite, tan; trace calcite.
44	65	Platteville-(McGregor)	Dolomite, buff to gray; trace pyrite.
65	70	Platteville-(McGregor)	Dolomite; trace pyrite, sphalerite and galena.
70	75	Platteville-(McGregor)	Dolomite; trace pyrite.
75	94	Platteville-(Pecatonica)	Dolomite; grayish-buff; trace pyrite.
94	97	Platteville-(Glenwood)	Dolomitic sandstone; considerable phosphate nodules.
97	110	St. Peter	Sandstone; limonite (2-4 percent.)
110	115	St. Peter	Sandstone, trace chalcopyrite.
115	148	St. Peter	Sandstone, little pyrite.
148	155	Prairie du Chien	Dolomite, buff, slightly sandy, with heavy quartz and cherty oolite. Fair pyrite and limonite (3 percent).
155	165	Prairie du Chien	Dolomitic sandstone and buff dolomite; little quartz and cherty oolite. Trace green shale, pyrite and limonite.
165	170	Prairie du Chien	Dolomitic sandstone and buff dolomite, trace quartz, little limonite and pyrite.
170	180	Prairie du Chien	Dolomite, buff; trace quartz and cherty oolite; little pyrite, limonite, marcasite and sphalerite.
180	190	Prairie du Chien	Dolomite, buff; trace sphalerite, fair pyrite and marcasite.
190	215	Prairie du Chien	Dolomite, buff; pyrite, marcasite, limonite (0.1-0.8 percent).
215	240	Prairie du Chien	Dolomite, buff to gray; considerable quartz and chert (2-15 percent). Fair pyrite and marcasite (0.8-2 percent).
240	265	Prairie du Chien	Dolomite, buff; little green shale 240-245; cherty oolite 250-260; little chert and quartz; little pyrite and marcasite 0.1-0.2 percent.
265	310	Prairie du Chien	Dolomite, buff; trace pyrite and marcasite; glauconite 270-280; cherty oolite 305-310; little quartz and chert.
310	355	Prairie du Chien	Dolomite, tan to buff; sandy; trace pyrite; quartz and cherty oolite 310-315; little green shale 310-315, 325-355; cherty oolite 330-335, 350-355; trace pyrite; trace glauconite 310-320, 345-350.
355	370	Trempealeau-(Jordan)	Dolomitic sandstone, fair green shale, trace pyrite.

Analyses

Feet From	Feet To	Zn	Fe
170	175	0.20	1.10
175	180	.25	1.55

SPITZBARTH PROPERTY

Spitzbarth no. 1

Location: 820 ft west, 110 feet south of southwest corner NW¼NW¼ sec. 30, T. 5 N., R. 3 E.
Date begun: 1/23/50 — Elevation collar: 1014.2
Date completed: 2/6/50 — Total depth: 275 ft
Water table struck: 43 ft — Driller: Judd and Son.

Churn Drill Log

Footage From	Footage To	Unit	Description
0	15		Soil and residual material.
15	71	St. Peter	Sandstone; trace chert and green shale, limonite; few phosphate nodules.
71	75	Prairie du Chien	Dolomite, buff, oxidized; some brown and green shale; cherty oolite and quartz; trace limonite.
75	80	Prairie du Chien	Dolomitic sandstone; dolomite, buff; oxidized; trace pyrite and limonite.
80	85	Prairie du Chien	Dolomite, buff, oxidized; trace pyrite and limonite.
85	90	Prairie du Chien	Dolomitic sandstone, oxidized.
90	95	Prairie du Chien	Dolomite, buff, oxidized, trace pyrite and limonite.
95	125	Prairie du Chien	Dolomite, buff, sphalerite, quartz, marcasite and pyrite from 100-120 feet.
125	235	Prairie du Chien	Dolomite, pinkish to grayish-buff; trace sphalerite, pyrite, marcasite, glauconite.
235	260	Prairie du Chien	Dolomite, sandy, tan, trace pyrite and marcasite.
260	265	Prairie du Chien	Dolomite, sandy, tan ; cherty oolite, trace pyrite and marcasite.
265	275	Prairie du Chien	Dolomite, sandy, and dolomitic sandstone, cherty oolite; trace pyrite and marcasite.

Analyses

Feet From	Feet To	Zn	Fe
100	105	0.2	1.55
105	110	.1	1.0
110	115	.35	1.25
115	120	.2	.65

KENNEDY MINE PROPERTY

Kennedy no. 1

Location: 665 ft north and 245 ft east of southwest corner SE¼SW¼ sec. 29, T. 1 N., R. 1 E.
Date begun: 9/24/49 — Elevation collar: 792.5 ft
Date completed: 10/12/49 — Total depth: 520 ft
Water table struck: 75 ft — Driller: Gille Bros.

Churn Drill Log

Footage From	Footage To	Unit	Description
0	90	Galena	Dolomite, yellowish-buff and buff, cherty; sphalerite 15-20, 70-95; little limonite, pyrite and marcasite.
90	105	Decorah-(Ion)	Dolomite, gray and buff; little sphalerite, pyrite, and marcasite.
105	114	Decorah-(Ion)	Dolomite, gray-blue, mottled; little sphalerite, marcasite, pyrite and calcite.
114	119	Decorah-(Guttenberg)	Dolomite, light- and dark-tan, dense; little sphalerite, fair pyrite.
119	120	Decorah-(Spechts Ferry)	Limestone, buff, argillaceous, fossiliferous; phosphate nodules; little chert and shale; trace galena and sphalerite; fair pyrite.
120	126	Platteville-(Quimbys Mill)	Limestone and shale, brown; sphalerite 1.4 percent; pyrite 2.4 percent.
126	155	Platteville-(McGregor)	Limestone, light-gray and buff; little calcite and pyrite; trace green shale.
155	173	Platteville-(Pecatonica)	Dolomite, gray and light-gray, mottled; trace pyrite 155-160.
173	175	Platteville-(Glenwood)	Shale, green; phosphate nodules; fair pyrite.
175	294	St. Peter	Sandstone, large to medium grained, with pyritic inclusions; little green and gray shale; considerable pyrite; 2-2.5 percent from 285-294.
294	305	St. Peter	Shale, green and red-brown, with sand grains; little pyrite.
305	355	Prairie du Chien	Dolomite, buff; sandy 325-340; little green and brown shale abundant 325-330; trace pyrite.
355	400	Prairie du Chien	Quartz and chert; dolomite 368-375, 380-386; trace pyrite and marcasite, little green and gray shale.
400	475	Prairie du Chien	Dolomite, buff and pink; little quartz, abundant 411-417; little quartz sand 425-430, pyrite and marcasite, trace-fair; cherty oolite 470-475.
475	496	Prairie du Chien	Dolomite, buff and pink; sandstone 475-478; fair pyrite and marcasite; cherty oolite 475-480, 490-495; little black to green shale.
496	520	Trempealeau-(Jordan)	Sandstone, pink and buff; some dolomites; little pyrite, marcasite, and quartz; green to black shale, 496-500.

Analyses

Feet From	Feet To	Zn	Fe
75	80	1.90	2.65
80	85	1.00	1.90
85	90	.65	2.00
90	95	.50	1.50
120	125	1.40	2.40
285	290		2.40
290	295		1.90
455	460		2.35
465	470		1.30
490	495		1.00

Kennedy no. 2

Location: 1230 ft east and 630 ft north of southwest corner sec. 29, T. 1 N., R. 1 E.
Date begun: 10/3/49 — Elevation collar: 809.9
Date completed: 10/27/49 — Total depth: 560 ft
Water table struck: 75 ft — Driller: Judd and Co.

Churn Drill Log

Footage From	Footage To	Unit	Description
0	100	Galena	Dolomite, yellow-buff and buff, cherty; sphalerite, pyrite and marcasite; trace-fair from 40-100; trace galena 45-72, 85-100.
100	117	Decorah-(Ion)	Dolomite, light-gray and buff; little sphalerite, marcasite, pyrite, and calcite.
117	125	Decorah-(Ion)	Dolomite, blue-gray, mottled; slightly sandy; trace sphalerite, pyrite and marcasite.
125	135	Decorah-(Guttenberg)	Dolomite and limestone, light-tan, dense; very good sphalerite, abundant marcasite and pyrite; little galena.
135	138	Decorah-(Spechts Ferry)	Limestone, buff, mottled, fossiliferous, with phosphate nodules. Fair sphalerite, marcasite and pyrite common, trace galena and calcite.
138	148	Platteville-(Quimbys Mill)	Limestone, chocolate-brown, dense; fair sphalerite, marcasite and pyrite; trace galena; calcite.
148	180	Platteville-(McGregor)	Limestone, light-gray to buff, mottled; sphalerite, marcasite and pyrite trace-fair. Calcite 150-160, trace gray shale 165-175.
180	201	Platteville-(Pecatonica)	Dolomite, light-gray to buff; trace pyrite and marcasite.
201	205	Platteville-(Glenwood)	Shale, green, very sandy; fair pyrite.
205	295	St. Peter	Sandstone, medium to large grains; trace pyrite and marcasite; black opaque grains 240-295.
295	340	Prairie du Chien	Dolomite, buff; cherty oolite 325-340; little green, gray, and brown shales; pyrite trace-fair.
340	365	Prairie du Chien	Dolomite, buff, and green, brown, and gray shale; with cherty oolite; quartz common; trace pyrite and marcasite.
365	520	Prairie du Chien	Dolomite, pink and buff; considerable quartz; trace pyrite and marcasite; dolomitic sandstone 505-515.
520	530	Trempealeau-(Jordan)	Sandstone; with quartz; trace pyrite and marcasite.

Analyses

Feet From	Feet To	Zn	Fe	Pb
82	85	1.75	5.60	Tr.
85	87.5	2.65	7.85	Tr.
87.5	90	3.35	7.55	Tr.
90.0	92.5	1.50	4.65	0.10
92.5	95	1.00	4.40	Tr.
95	97.5	.70	3.15	Tr.
125	130	8.10	16.10	---
130	132.5	7.40	22.40	---
132.5	135	5.00	10.70	---
135	137.5	1.40	6.90	---
137.5	140	.40	2.10	---
140	145	1.50	1.60	Tr.
145	147.5	.80	1.20	Tr.
155	160	.50	1.60	---

Kennedy no. 3 (Core Drill Log)

Location: 1305 ft N. 60° E. of southwest corner sec. 29, T. 1 N., R. 1 E.
Date begun: 8/8/49 — Elevation collar: 808 ft
Date completed: 8/16/49 — Total depth: 240.9 ft
Water table: not reached — Driller: Frank Balcar

Kennedy no. 3 (Core Drill Log)-Continued

Footage From	Footage To	Unit	Description
0	6		Surficial material.
6	104.5	Galena	
104.5	120.5	Decorah-(Ion)	
120.5	129	Decorah-(Ion)	
129	142.5	Decorah-(Guttenberg)	
142.5	146	Decorah-(Spechts Ferry)	
146	155	Platteville-(Quimbys Mill)	
155	189	Platteville-(McGregor)	
189	210	Platteville-(Pecatonica)	
210	213	Platteville-(Glenwood)	Shale, green; sandstone; phosphate nodules.
213	229	St. Peter	Sandstone, gray.
229	240.9	St. Peter	Sandstone, white to yellowish.

Kennedy no. 3A (Churn Drill Log 0-291 feet,

Diamond Drill Log 291-424 feet)

Location: 990 ft N. 63° E. of southwest corner sec. 29, T. 1 N., R. 1 E.
Date begun: 8/20/49
Date completed: 9/3/49
Water table: not reached
Elevation collar: 808.7 ft
Total depth: 424 ft
Driller: 0-291, Judd & Son
291-424, Frank Balcar

Footage From	Footage To	Unit	Description
0	10		Soil and residual material.
10	50	Galena	Dolomite, buff, oxidized, cherty; trace limonite.
50	85	Galena	Dolomite, buff, cherty; trace limonite, pyrite.
85	90	Galena	Same, with trace sphalerite.
90	95	Galena	Same, no sphalerite.
95	100	Galena	Same, shine sphalerite.
100	110	Galena	Same, no sphalerite.
110	115	Decorah-(Ion)	Dolomite, gray, trace shale, green, marcasite and pyrite, limonite; shine sphalerite.
115	125	Decorah-(Ion)	Same, no sphalerite.
125	130	Decorah-(Ion)	Same, trace sphalerite.
130	144	Decorah-(Guttenberg)	Limestone, buff; brown shale; pyrite.
144	145	Decorah-(Spechts Ferry)	Shale, green.
145	156	Platteville-(Quimbys Mill)	Limestone, brown; shale, brown pyrite.
156	188	Platteville-(McGregor)	Limestone, gray.
188	210	Platteville-(Pecatonica)	Dolomite, gray.
210	212	Platteville-(Glenwood)	Shale, green, sandy.
212	285	St. Peter	Sandstone.
285	291	St. Peter	Sandstone, pink; light-green shale.
291	311	Prairie du Chien	Dolomite, gray, siliceous; shale, green cryptozoon.
311	312.1	Prairie du Chien	Sandstone.
312.1	319	Prairie du Chien	Dolomite, gray.
319	319.7	Prairie du Chien	Shale, green and red; glauconite.
319.7	352.5	Prairie du Chien	Dolomite, gray, and dolomitic sandstone, glauconitic to 322.
352.5	365.2	Prairie du Chien	Shale, green, sandy, glauconitic; trace pyrite.
365.2	389.4	Prairie du Chien	Dolomite, buff, cherty; glauconite.
389.4	405.6	Prairie du Chien	Shale, grayish-green; dolomite, buff sandstone and oolite at base.
405.6	409.1	Prairie du Chien	Sandstone, dolomitic, argillaceous.
409.1	411.3	Prairie du Chien	Dolomite, shale, green; sandstone.
411.3	414.3	Prairie du Chien	Sandstone.
414.3	417.3	Prairie du Chien	Dolomite; sandstone.
417.3	422	Prairie du Chien	Dolomite; oolitic; glauconite.
422	424	Prairie du Chien	Cotton rock.

Kennedy no. 3B (Churn Drill Log)

Location: 990 ft N. 63° E. of southwest corner sec. 29, T. 1 N., R. 1 E.
Date begun: 2/9/50 — Elevation collar: 808.7
Date completed: 2/28/50 — Total depth: 525 ft
Water table struck: 80 ft — Driller: Judd and Son

Footage From	Footage To	Unit	Description
0	20		Residual Soil.
20	98	Galena	Dolomite, yellow-buff and tan, cherty. Trace pyrite. Trace pyrite. Trace sphalerite 55-65, 90-98.
98	120	Decorah-(Ion)	Dolomite, gray and buff, mottled. Trace pyrite and sphalerite 110-115.
120	129	Decorah-(Ion)	Dolomite, gray, mottled. Trace pyrite, sphalerite, calcite.
129	143	Decorah-(Guttenberg)	Limestone, light to dark-tan, dense, fossiliferous. Trace pyrite, trace sphalerite 129-135.
143	146	Decorah-(Spechts Ferry)	Limestone, light-buff to tan, mottled, phosphatic, fossiliferous, little brown and green shale. Trace pyrite.
146	155	Platteville-(Quimbys Mill)	Limestone, light- to dark-brown, dense. Trace pyrite; marcasite, and brown shale.
155	189	Platteville-(McGregor)	Limestone, light-gray and tan, mottled. Trace pyrite 175-189.
189	206	Platteville-(Pecatonica)	Dolomite, light-gray and tan. Trace pyrite and marcasite 195-206.
206	213	Platteville-(Glenwood)	Shale, green, and tan dolomite; with rounded, colorless quartz grains, phosphatic. Pyrite and marcasite 3 percent.

Kennedy no. 4 (Churn Drill Log)

Location: 655 ft N. 60° E. of southwest corner sec. 29, T. 1 N., R. 1 E.
Date begun: 10/15/49 — Elevation collar: 845 ft
Date completed: 10/29/49 — Total depth: 570 ft
Water table struck: 120 ft — Driller: Gille Bros.

Footage From	Footage To	Unit	Description
0	20		No sample.
20	35	Galena	Dolomite, buff.
35	142	Galena	Dolomite, buff, cherty; trace limonite.
142	155	Decorah-(Ion)	Dolomite, gray, trace pyrite and marcasite.
155	161	Decorah-(Ion)	Limestone, gray mottled.
161	175	Decorah-(Guttenberg)	Limestone, buff; shale, brown; little pyrite.
175	180	Galena-(Spechts Ferry)	Limestone, white argillaceous, phosphate nodules; pyrite 2%.
180	190	Platteville-(Quimbys Mill)	Limestone, brown; shale, brown; trace pyrite.
190	225	Platteville-(McGregor)	Limestone, grayish, argillaceous, trace pyrite.
225	245	Platteville-(Pecatonica)	Dolomite, brownish; little pyrite.
245	251	Platteville-(Glenwood)	Shale, green; sandstone, argillaceous, pyrite 7%.
251	295	St. Peter sandstone	Sandstone, pyrite 3%.
295	325	St. Peter sandstone	Sandstone, little pyrite.
325	330	St. Peter sandstone	Sandstone; shale, light green; trace pyrite.
330	340	Prairie du Chien	Dolomite, gray to brown, siliceous, trace pyrite.
340	345	Prairie du Chien	Same, with oolite; trace pyrite.
345	385	Prairie du Chien	Same, no oolite; glauconite; shale, green, with white mica.
385	390	Prairie du Chien	Green shale as above; shale, red, micaceous.
390	400	Prairie du Chien	Shale, red, micaceous.
400	450	Prairie du Chien	Dolomite, buff, cherty, oolitic 405-410, 425-430; glauconitic 430-435, trace of pyrite; shale, green, red.
450	465	Prairie du Chien	Same, but no pyrite; oolite; shale, green, red.
465	495	Prairie du Chien	Shale, purplish, green; oolite, chert, dolomite.
495	550	Prairie du Chien	Chert, shales as above, dolomite and oolite at base.
550	570	Jordan	Chert, siliceous dolomite; sandstone; green shale, little pyrite.

JAMES MINE AREA

James no. 1 (Diamond Drill Log)

Location: 1510 ft S. 53° E. of northwest corner SW¼ sec. 9, T. 1 N., R. 2 E.
Date begun: 7/29/49 — Elevation collar: 943.8 ft
Date completed: 8/30/49 — Total depth: 494.8 ft
Water table struck: not recorded. — Driller: Frank Balcar

Footage From	Footage To	Unit	Description
0	13		No core (surficial and residual material).
13	43.8	Galena	Dolomite, grayish buff, cherty; little pyrite and marcasite.
43.8	44.2	Galena	Same, with sphalerite 2%.
44.2	71.6	Galena	Same, no sphalerite.
71.6	71.8	Galena	Same, with sphalerite 0.5%.
71.8	89.9	Galena	Same, no sphalerite.
89.9	103.2	Decorah-(Ion)	Dolomite, light gray, shaly partings, trace marcasite.
103.2	110.0	Decorah-(Ion)	Limestone, gray, shaly partings.
110.0	122.7	Decorah-(Guttenberg)	Limestone, tan; brown shale.
122.7	123.3	Decorah-(Spechts Ferry)	Shale, green; limestone, greenish buff; phosphate nodules; little pyrite.
123.3	137.2	Platteville-(Quimbys Mill)	Dolomite and limestone, brown; brown shale partings; trace pyrite, barite.
137.2	167	Platteville-(McGregor)	Limestone, gray, argillaceous.
167	191.7	Platteville-(Pecatonica)	Limestone, grayish brown.
191.7	194.1	Platteville-(Glenwood)	Shale, green; sandstone.
194.1	197.5	St. Peter sandstone	Sandstone, white; pyrite 3%.
197.5	261	St. Peter sandstone	Sandstone, white to gray, trace pyrite.
261	295.5	St. Peter sandstone	Sandstone, gray to brown; trace pyrite.
295.5	356.9	St. Peter sandstone	Sandstone, yellow to red.
356.9	359.7		No core.
359.7	362	St. Peter sandstone	Shale, red.
362	385.9	St. Peter sandstone	Limestone; shale, red and green; red chert.
385.9	397.9	St. Peter sandstone	Shale, red; sandstone.
397.9	405.2	St. Peter sandstone	Dolomite, buff-gray; shale, red.
405.2	434.5	St. Peter sandstone	Sandstone; shale, red; oolitic chert near top.
434.5	446.9	St. Peter sandstone	White chert; dolomite, buff, siliceous; sandstone, brown.
446.9	470	St. Peter sandstone	Sandstone; shale, green and brown; white chert; white siliceous dolomite.
470	491.1	Prairie du Chien	Dolomite, tan; chert.
491.1	493.7	Prairie du Chien	No core.
493.7	494.8	Prairie du Chien	Dolomitic sandstone; oolitic chert; shale, green.
			NX core 0-457.5 ft AX core 457.5-494.8 ft

MEEKERS GROVE AREA (RAISBECK PROPERTY)

Raisbeck no. 1 (Churn Drill Log)

Location: 92 ft N., 445 ft W. of southwest corner of SE¼ sec. 21, T. 2 N., R. 1 E.
Date begun: 10/29/49 — Elevation collar: 1002.6 ft
Date completed: 11/5/49 — Total depth: 475 ft
Water table struck: 165 ft — Driller: Judd and Co.

Footage From	Footage To	Unit	Description
0	18		Soil.
18	33	Galena	Dolomite, yellow-buff, cherty, limonitic.
33	45	Decorah-(Ion)	Limestone, gray, mottled, fossiliferous; limonitic.
45	52	Decorah-(Ion)	Limestone, blue, mottled, limonitic.
52	66	Decorah-(Guttenberg)	Limestone, tan, buff; trace pyrite; little calcite; phosphate nodules.
66	71	Decorah-(Spechts Ferry)	Limestone, buff, very fossiliferous; abundant phosphate nodules; little green shale; trace pyrite.
71	78	Platteville-(Quimbys Mill)	Limestone, chocolate brown; tan and dense; trace pyrite.
78	110	Platteville-(McGregor)	Limestone, light gray and buff; fossiliferous 90-110; trace pyrite.
110	132	Platteville-(Pecatonica)	Limestone and dolomite, gray, tan; trace pyrite, calcite.
132	136	Platteville-(Glenwood)	Shale, green, with sand grains. Pyrite common, little galena.
136	368	St. Peter sandstone	Sandstone, grains well-rounded; orange colored 150-350; black opaque grains 235-368; trace galena, little pyrite at top.
368	397	Prairie du Chien	Dolomite, buff and pink; cherty 368-375; trace pyrite and marcasite; little pink and green shale.
397	426	Prairie du Chien	Shale, green, red-brown, with little sand grains; trace pyrite and marcasite.
426	450	Prairie du Chien	Sandstone; chert 30%; secondary silicification 30%; trace green shale, marcasite, and pyrite.
450	455	Prairie du Chien	Chert and quartz; little green and red shale; trace pyrite and marcasite.
455	460	Prairie du Chien	Chert, brown-green shale, and quartz; trace pyrite and marcasite.
460	475	Jordan	Sandstone; red-green shale common; trace pyrite and marcasite.

Raisbeck no. 2 (Churn Drill Log)

Location: 1840 ft N., 930 ft. W. of southwest corner SE¼ sec. 21, T. 2 N., R. 1 E.
Date begun: 10/29/49 — Elevation collar: 914 ft
Date completed: 11/7/49 — Total depth: 445 ft
Water table struck: 30 ft — Driller: Gille Bros.

Footage From	Footage To	Unit	Description
0	7		No samples (soil and residual material).
7	10	Decorah-(Ion)	Limestone, gray; trace pyrite.
10	22	Decorah-(Guttenberg)	Limestone, brown; trace brown shale.
22	25	Decorah-(Spechts Ferry)	Limestone, gray, little pyrite.
25	32	Platteville-(Quimbys Mill)	Dolomite, brown; brown shale, little pyrite.
32	67	Platteville-(McGregor)	Dolomite, gray, argillaceous; trace pyrite.
67	95	Platteville-(Pecatonica)	Dolomite, buff to gray; pyrite 1%.
86	95	Platteville-(Glenwood)	Shale, green, sandy, glauconitic; pyrite 2%.
95	120	St. Peter sandstone	Sandstone, pyrite 3%.
120	130	St. Peter sandstone	Sandstone, pyrite 0.5%.
130	145	St. Peter sandstone	Sandstone, argillaceous; pyrite 2%.
145	285	St. Peter sandstone	Sandstone, pyrite 0.5%.
285	415	St. Peter sandstone	Sandstone, gray, little pyrite.
415	420	St. Peter sandstone	Sandstone, shale, light green, pyrite 0.7%.
420	435	St. Peter sandstone	Shale, red; shale, olive; shale, light gray; sandstone; trace pyrite.
435	445	Cambrian?	Dolomite, siliceous, glauconitic.

Raisbeck no. 3 (Churn Drill Log)

Location: 2832 ft N., 1195 ft W. of southwest corner SE¼ sec. 21, T. 2 N., R. 1 E.
Date begun: 11/7/49 — Elevation: 890.5 ft
Date completed: 11/17/49 — Total depth: 450 ft
Water table struck: 42 ft — Driller: Judd and Company

Footage From	Footage To	Unit	Description
0	65	Galena	Dolomite, yellow-buff; cherty, little limonite, pyrite and marcasite - 4-8% at 50-65; calcite common.
65	82	Decorah-(Ion)	Dolomite, gray and buff, mottled; calcite common; pyrite and marcasite 2%.
82	88	Decorah-(Ion)	Dolomite, blue, mottled; pyrite and marcasite 4-10%, little sphalerite; calcite.
88	98	Decorah-(Guttenberg)	Limestone, tan, dense, fossiliferous; calcite; pyrite and marcasite 2%; little sphalerite.
98	102	Decorah-(Spechts Ferry)	Shale, green and limestone, buff, very fossiliferous; phosphate nodules; little pyrite and marcasite, trace galena.
102	105	Platteville-(Quimbys Mill)	Dolomite, tan-brown, fine-grained; calcite common, pyrite and marcasite 1.5%.
105	111	Platteville-(Quimbys Mill)	Limestone, tan-brown, partially dolomitized; calcite common; pyrite and marcasite 1.5%, trace sphalerite.
111	140	Platteville-(McGregor)	Limestone, buff; trace sphalerite; fair pyrite and marcasite; calcite.
140	160	Platteville-(Pecatonica)	Dolomite, light gray; little calcite, trace pyrite and marcasite.
160	161	Platteville-(Glenwood)	Shale, green-white; pyrite 2.5%.
161	289	St. Peter sandstone	Sandstone; little green shale 161-175, black opaque sand grains 250-289; trace pyrite and marcasite.
289	292	St. Peter sandstone	Shale, green, sandy; trace pyrite and marcasite.
292	295	Prairie du Chien	Sandstone and dolomite, buff.
295	300	Prairie du Chien	Dolomite, buff; little green shale, trace pyrite.
300	310	Prairie du Chien	Shale, green and dolomite, buff-pink; trace pyrite and marcasite.
310	450	Prairie du Chien	Dolomite, buff, pink; little shale, green and white; abundant at 305-310; 405-410; 440-445; cherty oolite 380-395; trace pyrite and marcasite.

VINEGAR HILL ROASTER PROPERTY

Vinegar Hill Roaster no. 1

Location: NE¼NE¼NE¼ sec. 6, T. 1 N., R. 1 E.
Date begun: 12/5/49
Date completed: 12/21/49
Water table struck: 30 ft

Elevation collar: 950.3 ft
Total depth: 500 ft
Driller: Gille Bros.

Churn Drill Log

Footage From	Footage To	Unit	Description
0	15		Soil and residual material.
15	32	Galena	Dolomite, yellow buff to gray, cherty; trace pyrite, marcasite, limonite.
32	90	Galena	Dolomite, buff to gray, cherty, considerable pyrite, limonite, sphalerite.
90	100	Decorah-(Ion)	Dolomite, light blue gray; trace sphalerite, pyrite, marcasite.
100	108	Decorah-(Ion)	Dolomite, blue gray; abundant pyrite and marcasite; and trace of sphalerite.
108	112	Decorah-(Guttenberg)	Limestone, tan; abundant pyrite and marcasite, trace of sphalerite.
112	115	Decorah-(Spechts Ferry)	Shale, green; some limestone, buff; trace sphalerite, little pyrite and marcasite.
115	120	Platteville-(Quimbys Mill)	Limestone, brown; trace sphalerite, marcasite and pyrite.
120	142	Platteville-(McGregor)	Limestone, gray-buff; trace sphalerite, marcasite, pyrite.
142	168	Platteville-(Pecatonica)	Dolomite gray buff; trace sphalerite, marcasite and pyrite.
168	175	Platteville-(Glenwood)	Shale, green, sandy; trace pyrite and marcasite.
175	220	St. Peter sandstone	Sandstone; trace pyrite.
220	225	St. Peter sandstone	Sandstone; green and white shale; trace pyrite.
225	235	Prairie du Chien	Dolomite, buff; trace pyrite.
235	260	Prairie du Chien	Dolomite, buff; trace pyrite, glauconite.
260	275	Prairie du Chien	Dolomite buff; trace pyrite; marcasite.
275	285	Prairie du Chien	Dolomite, buff; cherty; trace cherty oolite, trace pyrite, glauconite.
285	300	Prairie du Chien	Dolomite and dolomitic sandstone; chert, oolite; trace pyrite and marcasite.
300	320	Prairie du Chien	Dolomite, buff; trace pyrite, glauconite.
320	325	Prairie du Chien	Dolomite, and dolomitic sandstone; trace pyrite.
325	370	Prairie du Chien	Dolomite, buff, silicified, cherty; trace pyrite.
370	385	Prairie du Chien	Dolomite and sandstone; cherty oolite; trace pyrite and marcasite.
385	405	Prairie du Chien	Dolomite, buff, cherty and silicified; cherty oolite; trace pyrite and marcasite.
405	445	Prairie du Chien	Same without the oolite.
445	450	Prairie du Chien	Dolomite, tan, silicified; cherty oolite, little marcasite and coarsely crystalline sphalerite; quartz, fractured ground.
450	455	Prairie du Chien	Same, without the oolite, trace chalcopyrite.
455	470	Prairie du Chien	Dolomite, tan, silicified, cherty; little marcasite, oolite.
470	475	Prairie du Chien	Same, without the oolite.
475	490	Prairie du Chien	Dolomitic sandstone and dolomite; trace marcasite and pyrite.
490	492	Prairie du Chien	Shale, green; dolomitic sandstone.
492	500	Jordan	Sandstone, little sphalerite, marcasite and pyrite; trace glauconite.

Analyses

Feet From	Feet To	Zn	Fe
50	55	1.3	3.00
55	60	1.1	3.15
65	70	1.35	4.75
70	75	3.25	4.55