DOLOMITE RESOURCES OF BOONE AND DE KALB COUNTIES

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ILLINOIS STATE GEOLOGICAL SURVEY
John C. Frye, Chief

URBANA

CIRCULAR 379

1965
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ABSTRACT

The dolomite resources of Boone and DeKalb Counties are of interest because of their location near the greater Chicago area. As natural exposures are rare and quarries are limited chiefly to one area within the two counties, much of the information on the distribution and character of the dolomite formations must come from drill records. Maps in this report show distribution of bedrock formations, depth to bedrock, and depth to and thickness of dolomites. Chemical analyses of samples from active and abandoned quarries are presented.

Three or more dolomite rock units up to 300 or more feet in thickness are present in the area. Places where each of the carbonate units may be found with relatively thin overburden are suggested.

INTRODUCTION

The limestone resources of Boone and DeKalb Counties in north-central Illinois are of interest because of their location near the western margin of the Chicago metropolitan area (fig. 1). Widespread deposits of glacial drift and a lack of pronounced topographic relief generally result in a scarcity of outcrops. Thus, although there are several quarries, both active and abandoned, they are mostly limited to a narrow belt in western Boone County. Therefore, an assessment of the limestone resources of the two counties has involved not only location and sampling of exposures, but also a study of well records to determine areas where hitherto undetected limestone or dolomite may be present under a relatively thin cover. To this end, drilling data is given regarding depth to limestone or dolomite, even though the rocks may be considerably deeper than what is now regarded as within the range of depth of economical quarrying. Since the growth of northern Illinois or technological developments may change the depth to which quarrying is feasible, the information will indicate those areas of possible present and future interest.

Detailed records of the numerous wells involved in this study have not been included. However, they are available for examination at the offices of the Illinois State Geological Survey in Urbana.
The assistance of G. A. Burnett, J. E. Lamar, John P. Kempton, H. B. Willman, and T. C. Buschbach of the Geological Survey, in connection with certain phases of this investigation, and the cooperation of quarry operators, in allowing access to and sampling of their quarries, is gratefully acknowledged.

PRESENT QUARRYING INDUSTRY

Most of the outcrops of dolomite in Boone and DeKalb Counties are being worked or have been worked at some time. At present there are five active quarries in the area. They are listed below.

Boone County

Belvidere Blacktop and Stone Company, SW1/4 NW1/4 sec. 9, T. 43 N., R. 3 E., near Belvidere. Rock quarried is the Galena Dolomite.

Boone County Stone Company, SE1/4 SW1/4 NW1/4 sec. 9, T. 43 N., R. 3 E., near Belvidere. Rock quarried is the Galena Dolomite.

Charles Lee and Sons, NE1/4 NW1/4 SE1/4 sec. 32, T. 43 N., R. 3 E., near Kirkland. Rock quarried is the Galena Dolomite.

DeKalb County

Elmer Larson, Inc., NE1/4 NW1/4 NE1/4 sec. 15, T. 40 N., R. 5 E., near Sycamore. Rock quarried is the Edgewood Dolomite.

Macklin Brothers, SW1/4 SE1/4 NW1/4 sec. 30, T. 42 N., R. 3 E., near Fairdale. Rock quarried is the Galena Dolomite.

SOURCE AND CHARACTER OF DATA

The information on the lithologic character and thicknesses of rock and overburden exposed in outcrops and quarries is based on field examinations. Drilling information, which makes up most of the data on the maps (figs. 2-5), is based principally on well records supplied by drillers and to a lesser extent on samples saved during drilling and subsequently studied by geologists. Because records have been supplied by a number of drillers, there is probably a variation in the terms used to describe the formations penetrated and in the accuracy with which the well records were kept. As a result, the accuracy and uniformity of the maps vary. However, the maps do present the currently available data regarding
dolomite resources and are believed to give a reasonably good idea of the distribution, depth, and general character of the dolomites.

Chemical analyses were made in the laboratories of the Illinois State Geological Survey on samples collected during visits to the various exposures. At all the operating quarries (except the recently opened Boone County Stone Company) and any abandoned quarries whose geographic location or thickness of rock exposed appeared to warrant it, samples were taken at 1-foot vertical intervals. Such samples have numbers prefixed by "NF." At other abandoned quarries, particularly if the thickness of rock exposed was relatively small or if the exposure was poor or difficult to sample, a number of pieces were taken from the exposed face in order to represent the different beds or rock types in their correct proportions. The numbers of such samples are prefixed by "B."

EXPLANATION OF MAPS

Figures 2 and 3 combine data from well records and outcrops. Figure 2 shows the thickness of the unconsolidated materials that rest upon the bedrock, whether dolomite or shale. The patterns on the map indicate the geological identity of the bedrock strata. The map covers only those areas where bedrock was 100 feet or less deep because it was felt that stone having more overburden than this probably would not be of commercial interest in the foreseeable future.

Figure 3 indicates depth to the first dolomite encountered in wells and the thickness of the dolomite interval penetrated. The geological pattern is repeated on this map for convenience. Where the bedrock is Galena Dolomite, it is obvious that depth to bedrock (fig. 2) and depth to dolomite are the same. Where the bedrock is Maquoketa, however, it may be either shale or dolomite, and comparison of figure 3 with figure 2 will show whether the drill encountered dolomite at the top of the bedrock or whether it had to penetrate shale before dolomite was reached. These data are also limited to areas with less than 100 feet of unconsolidated overburden for reasons outlined above.

Figures 4 and 5 are similar maps for DeKalb County.

DESCRIPTION OF ROCK FORMATIONS AND OUTCROPS

The bedrock in Boone and DeKalb Counties consists of dolomite and shale of Ordovician and Silurian age that are overlain by unconsolidated glacial deposits of clay, silt, sand, and gravel. These deposits vary from 0 to more than 350 feet thick (McGinnis et al., 1963; Kempton, 1963). The rock units that are exposed are listed in table 1 in order of increasing age. Figures 2-5 show the probable distribution of these units beneath the glacial drift.

Platteville Group

The Platteville Group is not exposed in Boone and DeKalb Counties but forms a continuous dolomite interval with the overlying Galena, and in drilling samples, is a fine-grained, gray to brown dolomite. Its thickness varies from 95 to 125 feet.
EXPLANATION

Contours denoting approximate depth to bedrock in feet
• Well with sample study log
• Well with driller's log only
47 Depth to bedrock in feet
• Quarry, active
• Quarry, idle or abandoned
Δ Outcrop

BEDROCK UNITS WHERE THICKNESS OF SURFICIAL MATERIAL IS 100 FT. OR LESS

SILURIAN
S Alexandrian Group

ORDOVICIAN
M Maquoketa Group
G Galeno Group
Figure 2 - Depth to bedrock and distribution of bedrock units where surficial materials are 100 feet or less, Boone County.
Figure 3 - Depth and thickness of dolomite rock in areas where depth to bedrock is 100 feet or less, Boone County.
Galena Group

The strata of the Galena Group, as exposed in quarries in Boone and DeKalb Counties, are fine- to medium-grained dolomite, buff to light grayish brown when fresh, yellowish brown when weathered. The Galena is generally massive but weathers to thin beds in the top few feet of most quarries.

The full thickness of the Galena Group appears to be around 200 feet. Some sample study logs indicate thicknesses up to 230 feet, but this is believed to be too high a figure, occasioned by the difficulty of picking a boundary between the similar appearing Galena and Platteville Groups.

The Galena Dolomite is exposed in northwestern DeKalb County and in west-central and southwestern Boone County, and, with the exception of a quarry southeast of Sycamore in strata of Silurian age, it is the only rock quarried at present. Elsewhere the Galena is covered by strata of the Maquoketa Group, by thick glacial drift, or by both (figs. 2, 4). Wells in the vicinity of the quarries show thicknesses of 160 to 195 feet of Galena (figs. 3, 5), suggesting that the quarries are all in the upper part of the Galena. A zone of abundant fossils, Receptaculites oweni, present in some of the quarries, is the Upper Receptaculites Zone (Templeton and Willman, 1963). This zone marks the base of the Stewartville Member of the Wise Lake Formation in the upper part of the Galena Group.

Natural exposures in the two counties are rare and small. All the sampled exposures are quarries, both active and abandoned, and are described below. Also described are an old quarry, now water-filled, at Belvidere, and the recently opened quarry of Boone County Stone Company. Other exposures that were not sampled are listed in table 3.

Chemical analyses of Galena Group samples (table 2) show total carbonate contents (CaCO₃, MgCO₃) of between 95.37 percent and 99.28 percent, indicating a fairly uniform rock of moderately high to high purity.

No physical tests were made on the Galena Dolomite, but some of the quarries operating in the dolomite reported that their products have been tested and have passed specifications for 1-11 bituminous aggregate and portland cement concrete aggregate.

Sample Site NF 588

NW₁⁄₄ SE₁⁄₄ NE₁⁄₄ sec. 8, T. 44 N., R. 3 E., Boone County, 3½ miles northwest of Belvidere. Quarry, idle; contains portable machinery and stockpiles of crushed stone.

Overburden, silt, sandy, pebbly, 3-4 feet.

Dolomite, light brownish gray becoming yellowish brown towards top, largely medium grained, massive; top 3 feet thin bedded; lower 1 foot gray, fine grained, dense; Receptaculites fairly common in 5-foot zone 6 feet above base; sample NF 588 from lower 17 feet; 20 feet. (Galena Dolomite)

Sample Site NF 589

NE₁⁄₄ SW₁⁄₄ SE₁⁄₄ sec. 5, T. 44 N., R. 3 E., Boone County, 4 miles northwest of Belvidere. Abandoned quarry northeast side of road. The dolomite is higher in the Galena Group than NF 588.

Overburden, soil, 1 foot.

Dolomite, light brownish gray, weathers yellowish buff; lower 5 feet in 4- to 8-inch beds; upper part in 2-inch beds; sample NF 589; 12 feet. (Galena Dolomite)
Sample Site NF 591

SW\frac{1}{4} SE\frac{1}{4} NW\frac{1}{4} sec. 30, T. 42 N., R. 3 E., DeKalb County, 1 mile south of Fairdale.
Quarry of Macklin Brothers.
Overburden, soil and silt, 5± feet.
Dolomite, gray to light yellowish brown, fine to medium grained, mostly heavy bedded but thinner bedded in top 10 feet; lower 10 feet contains thin, reddish brown shale partings and zones of fine grained, dense dolomite 6 to 12 inches thick. *Receptaculites* abundant in 5-foot zone 9 feet above quarry floor; sample NF 591; thickness exposed, 30 feet. (Galena Dolomite)

Sample Site NF 592

Cen. SW\frac{1}{4} NW\frac{1}{4} sec. 9, T. 43 N., R. 3 E., Boone County, 3 miles southwest of Belvidere. Quarry of Belvidere Blacktop and Stone Company.
Overburden, sand and gravel, 10± feet, overlain by soil, 2± feet.
Dolomite, light brownish gray, heavy bedded; upper 5 feet breaks into thin beds in one place; very little weathering at bedrock surface; 10 feet. (Galena Dolomite)
Dolomite, brownish gray, fine grained, dense, massive; bottom few inches thin bedded with thin red brown shale partings; 1.5 feet. (Galena Dolomite)
Sample NF 592 from 11\frac{1}{2} feet of dolomite exposed.

Sample Site NF 593

NE\frac{1}{4} NW\frac{1}{4} SE\frac{1}{4} sec. 32, T. 43 N., R. 3 E., Boone County, 5 miles northwest of Kirkland.
Quarry of Charles Lee and Sons.
Overburden, silt, sandy, pebbly, 1-5 feet.
Dolomite, fine grained, light grayish brown, thin bedded; 9 feet. (Galena Dolomite)
Dolomite, fine grained, light brownish gray, heavy bedded becoming thinner bedded towards top; 15 feet. (Galena Dolomite)
Sample NF 593 taken from lower 22 feet of exposure.

Sample Site B 1

NW\frac{1}{4} NW\frac{1}{4} NW\frac{1}{4} sec. 3, T. 43 N., R. 3 E., Boone County, 2 miles southwest of Belvidere. Small abandoned quarry.
Overburden, soil, 2 feet.
Dolomite, brownish gray, fine grained, thin bedded; sample B 1; 4 feet. (Galena Dolomite)

Sample Site B 5

SW\frac{1}{4} SW\frac{1}{4} NE\frac{1}{4} sec. 19, T. 43 N., R. 3 E., Boone County, 6 miles southwest of Belvidere. Abandoned quarry with public road through it.
Overburden, soil, 1 foot.
Dolomite, light gray to light yellowish brown, fine grained, massive; sample B 5; 10 feet. (Galena Dolomite)

Sample Site B 8

SE\frac{1}{4} SW\frac{1}{4} SE\frac{1}{4} sec. 5, T. 44 N., R. 3 E., Boone County, 4 miles northwest of Belvidere. Abandoned quarry about 50 yards south of road.
Overburden, silt, sandy, 3-5 feet.
Dolomite, light brownish gray, fine grained, massive; *Receptaculites* common in lower 5 feet; sample B 8; 25 feet. (Galena Dolomite)
Sample Site B 10

E 2 1/2 NE 1 1/2 NW 1 1/2 sec. 20, T. 43 N., R. 3 E., Boone County, 2 1/2 miles southeast of Cherry Valley. Abandoned quarry 300 feet west of road.

Dolomite, light brownish gray, fine to medium grained, massive, mostly thin beds; a few thin films of red and green argillaceous material; sample B 10b; 10 feet. (Galena Dolomite)

Dolomite, like above but thicker bedded; sample B 10a; 13 feet. (Galena Dolomite)

Abandoned Quarry

NW 1 1/4 SW 1 1/4 NE 1 1/4 sec. 34, T. 44 N., R. 3 E., 1 mile west of Belvidere. Abandoned quarry, water-filled. Following rock description adapted from Krey and Lamar (1925, p. 92).

Dolomite, gray, fine to medium grained; in beds 3-24 inches thick; upper portion brown from weathering; 38 feet. (Galena Dolomite)

Boone County Stone Company

SE 1 1/4 SW 1 1/4 NW 1 1/4 sec. 9, T. 43 N., R. 3 E., Boone County, 3 miles southwest of Belvidere.

Quarry of Boone County Stone Company.

Overburden, sand and gravel, 0-10 feet; overlain by soil and silt, 2 feet.

Dolomite, medium grained, light brownish gray, vuggy; in 6-inch beds; 7 feet.

(Galena Dolomite)

Covered; 3 feet.

Maquoketa Group

The Maquoketa consists predominantly of shale in its upper and lower parts and dolomite in its middle (table 1). Its distribution is shown in figures 2 and 4.

Scales Shale

The lowest formation of the Maquoketa Group, the Scales Shale, is typically a shale with interbedded layers of generally silty or argillaceous dolomite. Lateral variations in lithology, however, may cause local thickening of the dolomite layers. In places, particularly parts of southern Boone County and northern DeKalb County, the Scales Shale appears to be largely dolomite, some of which is relatively pure. Because of the lateral variations, the boundary between the Scales Shale and the overlying Fort Atkinson Dolomite is difficult to pick with any consistency. However, it appears that outside of the abnormally dolomitic area the thickness of the Scales Shale is most commonly about 75 feet.

The Scales Shale is the most extensively distributed of the three formations composing the Maquoketa Group. It appears that the areas of Maquoketa on the maps (figs. 2, 4) are chiefly the Scales Shale.

Exposures of the Scales Shale were found at two places (table 3): 1) shale with interbedded, brown, impure dolomite in road cuts on the north and south sides of the South Branch of the Kishwaukee River, 1 mile west of Kingston; and 2) shale and interbedded dolomite along the south bank of the Kishwaukee River, about one-third of a mile east of location 1. Both exposures are in DeKalb County.

Fort Atkinson Dolomite

The middle unit of the Maquoketa Group, the Fort Atkinson Dolomite, is a fine- to coarse-grained, white, light gray or light brownish gray dolomite. Small
amounts of green or brown shale may occur in places. Limestone may be present in the Fort Atkinson in some parts of northeastern Illinois (Buschbach, 1964), but none was encountered in the few holes that cut this formation in Boone and DeKalb Counties.

The thickness of the Fort Atkinson Dolomite is not accurately known. Drill cuttings are available only from two wells that are located in T. 40 N., R. 5 E., DeKalb County. They show 35 and 50 feet of good dolomite. In both wells the Fort Atkinson is overlain by glacial drift, so that 50 feet is a minimum thickness figure. However, it is unlikely that the Fort Atkinson is much thicker than 50 feet.

The distribution of the Fort Atkinson in Boone and DeKalb Counties is apparently quite limited. A small abandoned quarry about 3 miles northwest of Kingston is probably in the Fort Atkinson and appears to represent an outlier of small areal extent and thickness. The quarry is described below. Drilling information indicates that except for the possibility of such occasional thin outliers, the Fort Atkinson outcrops or is present below glacial drift only in relatively narrow belts around two small isolated hills of Silurian—one in sec. 14, T. 43 N., R. 3 E., Boone County; the other in sec. 15, T. 40 N., R. 5 E., DeKalb County—and around the area of Silurian south of Capron in sec. 24, T. 45 N., R. 4 E., Boone County.

Sample site B 7

NW¼ NW¼ SW¼ sec. 8, T. 42 N., R. 4 E., DeKalb County, 3 miles northwest of Kingston. Small, abandoned quarry 100 feet south of public road; exposure poor.
Overburden, silt, sandy, 3-4 feet.
Dolomite, vesicular, light yellowish brown, very fossiliferous; sample B 7; 4 feet.
(Fort Atkinson Dolomite)

Brainard Shale

The uppermost formation of the Maquoketa Group, the Brainard Shale, was neither seen in outcrop nor encountered in drilling in Boone and DeKalb Counties. The only positive evidence of its presence in the two counties is its occurrence beneath the dolomite of Silurian age in the Larson quarry in sec. 15, T. 40 N., R. 5 E., DeKalb County. The thickness of the Brainard at this locality is not known, but it is presumed to be small because the elevation of the base of the Silurian strata in the quarry is not very different from the elevation of the top of the bedrock (Fort Atkinson) in drill holes in the vicinity. According to Buschbach (1964), the Brainard in northeastern Illinois is chiefly shale with varying amounts of interbedded silty dolomite.

Alexandrian Group

The Alexandrian Group, of Silurian age, is exposed only in three small areas in Boone and DeKalb Counties—a small outlier in sec. 14, T. 43 N., R. 3 E., Boone County; a small outlier in sec. 15, T. 40 N., R. 5 E., DeKalb County; and the southwest tip of an outlier mostly in McHenry County (figs. 2, 4). Quarries are present in all three of these areas.

The DeKalb County outlier, as exposed in the Elmer Larson quarry, consists of about 25 feet of thin-bedded dolomite with green argillaceous partings. A few thin nodular chert layers occur near the top and bottom of the quarry face. Shale, probably of the Brainard Formation, is encountered about 2 feet below the quarry floor.
No bedrock shallower than 100 feet in blank areas or in that part of DeKalb Co. not included in this map.
Figure 4 - Depth to bedrock and distribution of bedrock units where surficial materials are 100 feet or less, DeKalb County.
Two samples, NF 590 A and B, were taken from the quarry face and represent the lower 8 feet and upper 18 feet of exposed stone. Sample NF 590 A is somewhat less pure than the other sample. The stone is said to pass specifications for I-11 bituminous aggregate and portland cement concrete aggregate.

Another isolated outcrop area of Alexandrian rocks is found in a low hill in the Cen. W\(\frac{1}{2}\) sec. 14, T. 43 N., R. 3 E., Boone County. Two small abandoned quarries each expose an 8-foot thickness of the rock, but earlier excavations, now largely overgrown, are reported to expose as much as 18 feet of dolomite (Krey and Lamar, 1925, p. 93). Sample DS 79, taken in 1931, represents a 16-foot face. A driller's log of a water well near the north end of the hill reported 16 feet of dolomite overlying shale, which is probably Maquoketa. Sample B 6 was taken during the present investigation from one of the two 8-foot quarry faces. Analyses are listed in table 2 for samples DS 79 and B 6. Sample B 6 appears to represent strata of a somewhat higher degree of purity than sample DS 79. The small amount of chert at sample site B 6 would not affect the analysis to any appreciable extent since there is probably less than 0.5 percent of it.

The third occurrence of Alexandrian rocks, 2\(\frac{1}{2}\) miles south of Capron, is the southwest end of an outlier extending from McHenry County. A rather extensively dug-over area appears to represent an old shallow quarry that is now used in part as a public dump. Exposures are extremely poor, but apparently the thickness quarried was not more than 6 feet. One 4-foot exposure of weathered dolomite was found and sampled (sample B 2). Because of the weathered condition of the rock, the formation could not be identified. However, data from several wells in western McHenry County within a mile of the Boone County line suggested that there may be more than 50 feet of dolomite at the site of the old quarry and that the quarry is in the Kankakee Formation. The analysis (table 2, sample B 2) of stone from this outcrop shows a high-purity dolomite with more than 97 percent carbonate.

Exposures of dolomites of the Alexandrian Group are described below.

Sample Site NF 590

NE\(\frac{1}{4}\) NW\(\frac{3}{4}\) NE\(\frac{1}{4}\) sec. 15, T. 40 N., R. 5 E., DeKalb County, 3 miles southeast of Sycamore. Quarry of Elmer Larson, Inc.

Overburden, sand and gravel, 8± feet, over lain by till, 4± feet.

Dolomite, yellowish brown, fine grained, thin, wavy bedded; greenish argillaceous material in thin films along bedding planes and in rock; thin chert bands in upper part total 3\(\frac{1}{2}\) inches; sample NF 590b does not include chert; 18 feet. (Edgewood Dolomite)

Dolomite, light brown, fine grained, thin bedded; little greenish argillaceous material along bedding planes and in rock; thin chert bands in upper 3 feet total 2 inches; sample NF 590a does not include chert; 8 feet. (Edgewood Dolomite)

Sample Site B 2

Cen. NE\(\frac{1}{4}\) NE\(\frac{1}{4}\) sec. 24, T. 45 N., R. 4 E., Boone County, 2\(\frac{1}{2}\) miles southeast of Capron. Abandoned quarry used in part for municipal dump; largely overgrown; apparently worked a 6-foot thickness. Exposure described is on an isolated mound within quarry area.

Overburden, soil, 1 foot.

Dolomite, weathered, yellowish brown, 1-2 inch beds; sample B 2; 4 feet. (Kankakee Dolomite)

Sample Site B 6

Cen. W\(\frac{1}{2}\) sec. 14, T. 43 N., R. 3 E., Boone County, 3 miles south of Belvidere. Abandoned quarry; large dug-over area now much overgrown; exposure sampled is apparently site of recent work on west edge of area, about halfway north to south.
Overburden, silt, sandy, 3 feet.
Dolomite, light yellowish brown, very fine grained, somewhat argillaceous; 1-2 inch beds with argillaceous partings; small chert nodules along bedding planes at 6 and 6.5 feet from base; sample B 6 does not include chert; 8 feet. (Edgewood Dolomite)

Sample Site DS 79

SW 1/4 NW 1/4 sec. 14, T. 43 N., R. 3 E.; located in same quarried area as B 6; following description adapted from field notes in Survey files.
Overburden, soil and till, 4 feet.
Dolomite, weathered, blocks mixed with residual clay; 6 feet. (Edgewood Dolomite)
Dolomite, buff and light gray, fine grained, argillaceous, in 1-3 inch beds; chert nodules present locally; sample DS 79; 10 feet. (Edgewood Dolomite)

Pleistocene Deposits

The unconsolidated deposits, or overburden, that overlie the bedrock are chiefly glacial drift of Pleistocene age and recent alluvium in present-day stream valleys. The glacial deposits consist of glacial till and outwash deposits. The till is a mixture largely of clay, sand, and silt, and was deposited directly by the ice sheet. The outwash deposits are stratified beds of silt, sand, and gravel. They were laid by melt waters from glaciers, and they vary in thickness and extent. Present-day commercial sand and gravel operations are in outwash deposits.

The thickness of the glacial deposits as related to cost of removal is an important factor to the quarrying industry. Figures 2 and 4 show such thicknesses as known from drilling. Depth to bedrock may vary from less than 1 foot to over 300 feet. Smaller thicknesses of glacial drift are found in northern DeKalb County and western Boone County.

In a few places, glacial deposits of sand and gravel overlie bedrock deposits of dolomite. Such situations make it possible to utilize the overburden on the dolomite deposit rather than to discard it as is more usual.

DOLOMITE RESOURCES BY COUNTIES

Boone County

The most favorable areas for stone production in Boone County are in the western part of the county where Galena Dolomite is overlain by a relatively thin cover of glacial drift (figs. 2, 4). In these areas the available thickness of dolomite (Galena plus the underlying Platteville) is around 300 feet, and depth of quarrying presumably would be limited only by the mechanical aspects of the operation or the presence of water in the dolomite.

In those areas where the bedrock is Maquoketa, the possibilities for commercial stone production are largely unknown because of lateral variations in the strata and variable interpretations by drillers regarding type of rock penetrated. For example, figure 2 indicates several places within the Maquoketa area where the glacial drift is less than 30 feet thick. However, an inspection of these places on figure 3 shows great variation in depth to limestone. This indicates that some drillers' logs showed shale and others showed limestone for holes that penetrated
No bedrock shallower than 100 feet in blank areas or in that part of Dekalb Co. not included in this map.
EXPLANATION

- Areas where bedrock is less than 100 feet deep.
- Well with sample study log
- Well with driller's log only
- Indicates depth to dolomite
- Indicates thickness of dolomite
- Indicates bottom of dolomite was reached or passed
- Indicates total depth of well that did not reach dolomite

BEDROCK UNITS WHERE THICKNESS OF SURFICIAL MATERIAL IS 100 FT. OR LESS

SILURIAN
- Alexandrian Group

ORDOVICIAN
- Maquoketa Group

GOENO GROUP

Figure 5 - Depth and thickness of dolomite in areas where depth to bedrock is 100 feet or less, DeKalb County.
the same strata (Scales Shale), which in some instances were less than a mile apart. Sample study logs for northern DeKalb County indicate that the Scales Shale is relatively pure dolomite in places. However, for southern Boone County, test drilling will be necessary to determine whether the same change takes place.

Of the two small areas of Silurian age strata (fig. 2, 3), the one near Capron appears to warrant further attention as a source of commercial stone. The possible thickness of 50 or more feet of stone and the analysis (table 2, sample B 2) that suggests a high-purity dolomite are encouraging factors. The Silurian outlier 3 miles south of Belvidere (sample B 6) is a rather impure dolomite with limited areal extent and thickness and, consequently, is of uncertain promise as a source of crushed stone. However, its thin, even-bedded nature suggests that it may be suitable for flagstones and other similar uses.

DeKalb County

The Galena Dolomite is the most favorable rock unit for the production of crushed stone in DeKalb County because of its availability and its chemical and physical characteristics. There are two areas in the northwest corner of the county (fig. 4) where Galena Dolomite has a thin overburden. They are located west and northwest of Kirkland. The two areas are separated by a deep valley in the surface of the bedrock (McGinnis et al., 1963). Macklin Brothers operates a quarry in the first area. The second area is defined by a line of drill holes that encountered bedrock at shallow depths (fig. 4). Drilling information in northwest DeKalb County indicates that the Galena Group and the underlying Platteville Group together probably approximate 300 feet in thickness (fig. 5). They are likely to be water bearing at depth.

In the area where the Maquoketa forms the bedrock surface (fig. 4), the glacial drift is for the most part relatively thick. Isolated exceptions to this are two areas of exposures. One, along the South Branch of the Kishwaukee River about half a mile west of Kingston, consists of interbedded shale and impure dolomite and is not considered a commercial source of crushed stone for general use. The other, a small abandoned quarry in dolomite (sample B 7) about 3 miles northwest of Kingston, probably belongs to the Fort Atkinson Formation. Little is known of the thickness or areal extent of this latter occurrence. However, both areas are likely to be small, since relatively deep bedrock valleys limit their eastward extent (fig. 4).

In addition, wells immediately to the west show no near-surface dolomite and contain only substantial thicknesses of shale under varying amounts of glacial drift (figs. 4, 5).

Drilling in two other areas (figs 4, 5) indicates the presence of dolomite under less than 30 feet of cover that consists of glacial drift plus shale in the Maquoketa. One area is defined by a single well at the northwest corner of Genoa and is underlain by 37 feet of "limestone" under 28 feet of drift, according to the driller's record of the well. The area requires test drilling to establish its detailed character. The "limestone" is probably dolomite within the Scales Shale. The other area is contiguous to the outlier of Silurian age southeast of Sycamore. Here, the Fort Atkinson Dolomite underlies 30 feet or less of glacial drift in 4 wells (fig. 5). No samples of the Fort Atkinson were available for analysis, but visual examination of the drill cuttings suggested a fairly pure carbonate rock.

The Silurian outlier, presently being quarried by Elmer Larson, Inc., is the only known occurrence of Silurian age in DeKalb County.
EFFECT OF GROUND WATER ON QUARRYING

Ground water is most likely to occur in the dolomites of Boone and DeKalb Counties in porous zones, open crevices, or channels dissolved out of the rock. Where the rock to be quarried lies above the water table (that is, above the level of water in the ground), it is unlikely that a serious water problem will be encountered. However, where such rock is below the water table, the possibility of water must be considered.

Data from water wells in Boone and DeKalb Counties show that depth to the water table is variable, but generally is around 30 feet. The best possibilities for maximum thicknesses of dolomite above the water table, up to 70 feet or more, are believed to be under topographically high areas that have a capping of relatively thin glacial drift. The records of water wells in the area of thin glacial drift in western Boone County and northwestern DeKalb County (figs. 2, 4) find the water table to be 30 to 50 feet deep.

The amount of water that might be encountered is of particular interest in connection with the possibility of deep quarrying or underground mining of dolomite. At the present time this cannot be predicted with any degree of certainty. The rocks of the Galena and Platteville Groups and, locally, those of the Fort Atkinson Formation are important sources of water for farms and other comparatively small quantity users. Production from such wells in these counties commonly ranges from 5 to 30 gallons per minute. However, many of these wells probably are not pumped to capacity. In general, therefore, the amount of ground water that might enter any excavation below the water table in the dolomites is largely unknown.

It is possible that in the vicinity of a deep quarry or mine the volume of water available from domestic wells might be decreased, perhaps markedly, by removal of water from the quarry or mine. On the other hand, it is possible that the quarry or mine water may have an economic use or that eventually an abandoned quarry could be used as a recreational lake.

REFERENCES


TABLE 1 - FORMATIONS EXPOSED OR ENCOUNTERED IN WELLS IN BOONE AND DE KALB COUNTIES

<table>
<thead>
<tr>
<th>Geologic System</th>
<th>Name of rock unit</th>
<th>Maximum thickness encountered, feet</th>
<th>Maximum description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pleistocene</td>
<td>Pleistocene</td>
<td>400</td>
<td>Clay, silt, sand, gravel</td>
</tr>
<tr>
<td>Silurian</td>
<td>Alexandrian Series</td>
<td>50±</td>
<td>Dolomite</td>
</tr>
<tr>
<td>Ordovician</td>
<td>Maquoketa Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>*Brainard Shale</td>
<td>-?-</td>
<td>Shale, interbedded dolomite; not identified in drilling in Boone and DeKalb Counties.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fort Atkinson Dolomite</td>
<td>50</td>
<td>Dolomite</td>
</tr>
<tr>
<td></td>
<td>Scales Formation</td>
<td>75</td>
<td>Shale, interbedded dolomite</td>
</tr>
<tr>
<td></td>
<td>Galena Group</td>
<td>230</td>
<td>Dolomite</td>
</tr>
<tr>
<td></td>
<td>*Platteville Group</td>
<td>125</td>
<td>Dolomite</td>
</tr>
<tr>
<td></td>
<td>*Glenwood-St. Peter</td>
<td>435</td>
<td>Chiefly sandstone</td>
</tr>
</tbody>
</table>

* Not exposed in Boone and DeKalb Counties.
TABLE 2 — CHEMICAL ANALYSES OF BOONE AND DE KALB COUNTY SAMPLES*
(Analyses by Juanita Witters and David B. Heck in the laboratories of the State Geological Survey)

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Formation or Group</th>
<th>T.</th>
<th>R.</th>
<th>Sec.</th>
<th>y</th>
<th>x</th>
<th>a</th>
<th>Near</th>
<th>Thickness feet</th>
<th>CaCO₃ †</th>
<th>MgCO₃ †</th>
<th>CaO</th>
<th>MgO</th>
<th>SiO₂</th>
<th>Al₂O₃</th>
<th>Fe₂O₃</th>
<th>CO₂</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td>3E</td>
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<td>SE</td>
<td>NE</td>
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<td>54.07</td>
<td>43.50</td>
<td>30.30</td>
<td>20.80</td>
<td>1.63</td>
<td>0.30</td>
<td>0.66</td>
<td>45.87</td>
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<tr>
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<td>3E</td>
<td>5</td>
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<td>SW</td>
<td>SE</td>
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<td>54.16</td>
<td>42.83</td>
<td>30.35</td>
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<td>0.84</td>
<td>0.59</td>
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<tr>
<td>NF 592</td>
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<td>—</td>
<td>NE</td>
<td>NE</td>
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<td>NE</td>
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<tr>
<td>B 6</td>
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<td>W₅</td>
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<td>48.51</td>
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<td>SE</td>
<td>SW</td>
<td>SE</td>
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<td>6.35</td>
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<td>5E</td>
<td>15</td>
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<td>NE</td>
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<td>0.57</td>
<td>45.91</td>
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<tr>
<td>B 7</td>
<td>Atkinson</td>
<td>42N</td>
<td>4E</td>
<td>8</td>
<td>NW</td>
<td>NW</td>
<td>SW</td>
<td>Kingston</td>
<td>4</td>
<td>54.52</td>
<td>43.65</td>
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<td>4.60</td>
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<td>1.04</td>
<td>43.87</td>
</tr>
</tbody>
</table>

* CO₂ by wet gravimetric analysis; other items by X-ray fluorescence.
† Calculated from CaO and MgO data.
** Analysis from Lamar et al., 1934.
<table>
<thead>
<tr>
<th>T.  R. Sec.</th>
<th>Near</th>
<th>Formation or Group</th>
<th>Kind of Rock</th>
<th>Thickness exposed, feet</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>43N 3E 18</td>
<td>NW SE NE Cherry Valley</td>
<td>Galena</td>
<td>Dolomite</td>
<td>12</td>
<td>Abandoned quarry on SW side of road.</td>
</tr>
<tr>
<td>43N 3E 29</td>
<td>NE NW SE Irene</td>
<td>Galena</td>
<td>Dolomite</td>
<td>—</td>
<td>Exposed in bottom of ditch on N. side of railroad.</td>
</tr>
<tr>
<td>43N 3E 30</td>
<td>NE NE SE Irene</td>
<td>Galena</td>
<td>Dolomite</td>
<td>12</td>
<td>Abandoned quarry.</td>
</tr>
<tr>
<td>44N 3E 5</td>
<td>SE SE SE Belvidere</td>
<td>Galena</td>
<td>Dolomite</td>
<td>0.2</td>
<td>Ledge in roadside ditch.</td>
</tr>
<tr>
<td>44N 3E 5</td>
<td>SW NW SW Belvidere</td>
<td>Maquoketa</td>
<td>Dolomite</td>
<td>0.2</td>
<td>Ledge probably interbedded with shale.</td>
</tr>
<tr>
<td>44N 3E 8</td>
<td>NE NW NE Belvidere</td>
<td>Galena</td>
<td>Dolomite</td>
<td>18</td>
<td>Abandoned quarry in E. bank of stream.</td>
</tr>
<tr>
<td>44N 3E 8</td>
<td>NW NE NW Belvidere</td>
<td>Galena</td>
<td>Dolomite</td>
<td>4</td>
<td>Weathered outcrop in stream bank.</td>
</tr>
<tr>
<td>44N 3E 19</td>
<td>SE NE SW Belvidere</td>
<td>Galena</td>
<td>Dolomite</td>
<td>—</td>
<td>Floor of abandoned gravel pit; not presently exposed.</td>
</tr>
<tr>
<td>42N 4E 20</td>
<td>SE SE NE Kingston</td>
<td>Scales</td>
<td>Shale &amp; Dolomite</td>
<td>8</td>
<td>Outcrop consists of 4 beds of shale totalling 5½ feet thick and 4 beds of dolomite totalling 2½ feet; roadcut.</td>
</tr>
<tr>
<td>42N 4E 21</td>
<td>NW SE NW Kingston</td>
<td>Scales</td>
<td>Shale &amp; Dolomite</td>
<td>6</td>
<td>Exposed in S. bank of river and tributary gully; interbedded shale and dolomite similar to above.</td>
</tr>
</tbody>
</table>

**DE KALB COUNTY**
Illinois State Geological Survey Circular 379
22 p., 5 figs., 3 tables, 1965

Printed by Authority of State of Illinois, Ch. 127, IRS, Par. 58.25.