

Surveys for Potential Sources of Aggregates

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Surveys for potential sources of aggregates have been an important aspect of the highway program in Wisconsin for more than 40 years. The surveys have become increasingly important in recent years because of a rapidly diminishing supply of acceptable aggregates in areas of former abundance, and the large volumes of aggregates required for highways of interstate standards.

The basic purpose of such surveys is to provide savings in the cost of transporting aggregates to the project.

• EXCEPT for the southwest quarter of Wisconsin, known as the Driftless Area, the entire State has been glaciated. The Driftless Area contains a few valley trains which in places provide sources of aggregates; however, the bulk of the aggregate deposits comes from sandstone and dolomite bedrock formations. Within the glaciated area gravel deposits provide the main source of aggregates. In some localities within the glaciated area, however, dolomitic bedrock, when it lies near the surface, may supply the main local source of aggregate.

It was recognized early in the history of the Commission that substantial savings could be made by using aggregate deposits on or near current highway projects as opposed to shipping in commercially produced materials. Although it is not always possible to find aggregate deposits of suitable quality on or near to the project, the Commission felt it worthwhile to instigate a program of exploration for aggregate deposits in areas within economical truck-haul distance of proposed projects. By mutual agreement between the Commission and the State Geologist, an annual program of aggregate surveys was begun in 1919 and continued up to the present time.

Exploration originally was confined to each side of the proposed project for a distance equal to that of the nearest railroad station. Searches now are extended to include the nearest productive area, or the nearest area of potential geologic structure.

PROCEDURE

The program of surveys for potential sources of aggregates is initiated annually when the Commission's Engineer of Materials requests information from the District Engineers as to proposed projects for which aggregate source information is required. Normally the surveys are performed at least three years prior to the anticipated date of construction. Information requested includes the project location and approximate mileage as well as the type and amount of material needed.

Following a tabulation of the Districts' information and Commission approval, a request for the next summer's survey requirements is forwarded to the State Geologist. On receipt of the request he makes arrangements for hiring the necessary personnel and proceeds with plans for conducting the surveys. The preliminary phases of preparation include organization and instruction of the survey parties and geologic studies.

Each survey party is composed of one party chief and two assistants. The party chief is a graduate geologist usually with previous field experience, and the assistants are undergraduate geology students. The party chief is directly responsible to the State Geologist for carrying out and completing the field work to the mutual satisfaction of the State Geologist and the Commission.

The geologic studies consist of gathering and examining all geologic data in the area of the specific projects. These data may consist of previous geologic notes, geologic and topographic maps, aerial photographs, well records or soil maps. Examination of

Shawano CO. REPORT NO. 1317 LOCATION NO. 188

DATE 8/6/49 GEOLOGIST Wright

The NE ¼ of the NE ¼ of Sec. 32 Tp. 25N R. 17E
Undeveloped Quarry Site:

This site is located in the SE part of a flat-topped ridge underlain by dolomite of the Lower Magesian formation. The thickness of the deposit is 30 feet but only 12 feet of vertical thickness is exposed. The rock is fairly hard, crystalline, gray, dense dolomite. Some chert was noted in a thin bed but it should not affect the quality of the material. Stripping varies from 0 to 4 feet. Estimated yardage 200,000 cubic yards. This location is recommended as a possible source of aggregate for concrete and bituminous pavements.

Shawano CO. REPORT NO. 1608 LOCATION NO. 221

DATE 7/18/62 GEOLOGIST Lamb

The NW ¼ of the NE ¼ of Sec. 20 Tp. 26N R. 16E

Gravel Pit and Undeveloped Location:

This deposit has had about 800 cubic yards of material removed. Drilling information has established that an additional prospect 200 yds. by 60 yds. by 3 yds. totalling 36,000 cubic yards is located to the east of the pit. The gravel is variable in size ranging from 1/4 inch to 5 inches with sand content diminishing eastward. The deposit appears to be outwash extending from a kame complex to the west. The material is recommended for bituminous and concrete aggregates.

Figure 1. Typical location reviews.

Shawano CO. REPORT NO. 1256 LOCATION NO.

DATE 7/27/46 GEOLOGIST Erickson

The SW ¼ of the NW ¼ of Sec. 22 Tp. 25N R. 17E

Sand Deposit, Negative Note

A small local sand deposit which appears at the surface on the N side of a drumlin-like hill in terminal moraine area was investigated. The deposit is .4 mi. S of the NW corner of sec. 22, T. 25N, R. 17E.

The material present is clean white coarse-grained sand which is present only as a small pocket 10'x10' at this point. The stripping proved to be too thick on all sides of the pocket to warrant use of the material. It is reported that the same sand outcrops on the south side of the hill where it was uncovered by a basement excavation. However a road cut through the drumlin-like hill shows a minimum stripping of 15' at the crest.

For this reason this deposit is not recommended for consideration for use as ballast on the STW 47 project.

Figure 2. Negative geologic note.

all the data may reveal certain areas which were not previously studied, areas of complex geologic structure which need further field investigation or general areas to re-survey.

FIELD WORK

Survey work in the field is begun by reviewing cuts, open pits and quarries in the vicinity of the project in order to evaluate known deposits as well as to familiarize the party personnel with the areal geology.

After the review of known deposits and exposures is completed, the survey party proceeds with examination of any new undeveloped potential sources brought to light by the field investigations or as extrapolated from the geologic studies. A power auger is usually available at this time to prove out and determine the extent of the suspected sources.

REPORTS

All investigated deposits or sites are written up in a report by the chief of the survey party (Fig. 1). Each location for a specific county is assigned a number from one on up and located by quarter section, township and range. Each location is then discussed with relation to the specific project for which the material has been investigated. Among the more important items discussed are type of deposit (such as outwash, esker, or kame), depth and nature of stripping, estimated yardage, length of haul to the project and for what use the material is best suited.

In addition to the described locations, negative geologic notes are submitted with the project report (Fig. 2). These notes pertain to sites that would not normally produce acceptable aggregates but appear by topographic form or other evidence to be worth investigating. The notes describe the general geology of the area and give locations of specific sites that were investigated with either test pits or auger holes. The notes provide good background for soils and detailed geologic studies of an area and help eliminate many sites from consideration during future investigations.

MAP PREPARATION

When the reports are completed they are forwarded to the Materials Section of the Highway Commission. Each location is plotted on a master county map at a scale of $\frac{1}{2}$ in. = 1 mi. Such data as the type of deposit (outwash, esker or rock formation), its nature (either a pit or a quarry), and the approximate yardage are indicated by a series of symbols and abbreviations. Also, each site described by a geologic or negative note is plotted in its approximate location and labeled with an identifying symbol. Figure 3 is a reproduction of the symbol sheet.

The main idea in the map preparation is to represent all the data possible and indicate on a single map all investigated locations or areas that have a geologic description of any sort.

Recently with more intensive subsurface investigation, another series of symbols has been developed to indicate the location of auger holes. It is felt that this type of information should be represented separately so that subsurface data can be easily isolated if needed.

After the maps are revised to include the most recent survey information, prints are prepared and distributed with the reports to the District Office concerned and the highway commissioner of the county in which the survey was conducted. Figure 4 shows a portion of a material survey map.

DEPARTMENTAL ACTIVITIES

At the present time some limited activities relative to surveys for aggregates are performed by personnel within the Materials Section of the Commission. Activities of this type are usually prompted by requests for supplemental aggregate information from the District Offices. These surveys may be made for a specific area adjacent to the proposed project or over a large area of a county where no known sources of

SYMBOLS & TYPES OF GLACIAL DEPOSITS	TYPES OF BEDROCK	NAMES OF ROCK FORMATIONS
X GRAVEL PIT-DEVELOPED	L Limestone	Pc PRE-CAMBRIAN IGNEOUS, METAMORPHIC & SEDIMENTARY ROCKS
X PROSPECT-UNDEVELOPED	Ss Sandstone	Cp Cambrian Sandstones
X QUARRY	Sh Shale	Ec Eau Claire
o NEGATIVE LOCATION	Q Quartzite	Dr Dresbach
u OUTCROP OR ROCK DEPOSIT	T Trap Rock	Fr Franconia
162 LOCATION NUMBER	Cgl Conglomerate	SL St. Lawrence & Lodi
D DELTA	Gr Granites, Pegmatite, etc.	J Jordan
Dk DELTA KAME	Dg Disintegrated Granite	Olm Lower Magnesian Dolomite (PRAIRIE DU CHIEN FORMATIONS)
K KAME		Osp St. Peter Sandstone
Ow Outwash		Otg Galena-Black River Dolomite (GALENA-DECORAH-PLATEVILLE F.M.F.)
Pow Pitted Outwash		Tr Trenton (Decorah-Plateville)
Tm Moraine, Terminal or Recessional		Ga Galena
E Esker		Or Richmond (Cincinnati) Shale
L Lacustrine Deposit		Sn Niagara Dolomite
C Crevasse Filling		
Km Kettle Moraine		
B Bar, Lake or River		
Bd Beach Deposit		
R River Gravels, Sand & Terraces		
D Sand Dune		
Kt Kame Terrace or Complex		
Al Alluvial Deposit		
Du Drumlin		

Examples:

X162
Ow-80 Means location 162 is a developed gravel pit and an outwash deposit with 80,000 cubic yards available. The yardage given is in thousands.

X10
Ow- Means location 10 is an undeveloped beach deposit with unlimited yardage.

05 Negative locations when accompanied by a number indicate a previously recommended deposit now exhausted or undesirable.

0A When the symbol is accompanied by a letter, such as 'A' or 'B' it indicates a negative note; the 'A' or 'B' as the case may be, refers to a report number which is shown in a legend at the bottom of the respective county map.

SA1 Drill hole indicated by a solid circle; the letter 'A' refers to a report number indicated in a legend at the bottom of the county map; the number refers to the drill hole number in the report.

Figure 3. Symbols and abbreviations used on material survey maps.

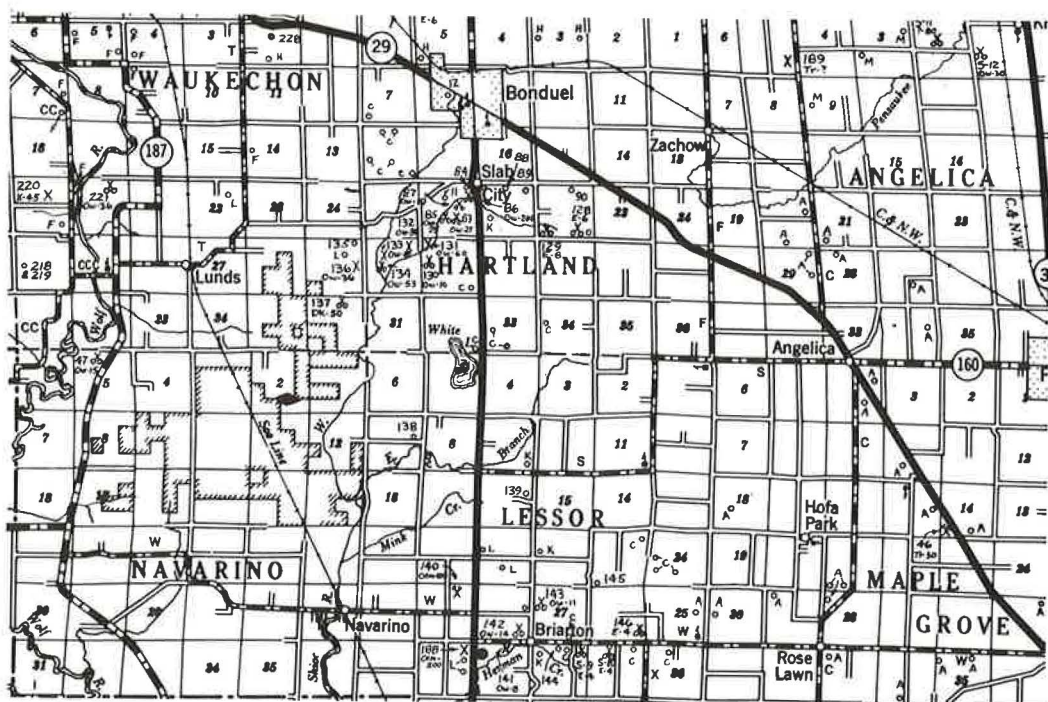


Figure 4. Portion of a typical material survey map.

acceptable aggregates exist, to expand on or verify the information provided by the State Geologist.

Such surveys are begun by gathering all geologic and pedologic data and plotting it on base maps or overlays. Aerial photographs are then examined and the probable boundaries of geologic provinces or areas are plotted. Sites which appear to be particularly promising as indicated by topographic form or geologic association are outlined on the base maps for field investigation.

The recently established Geophysical Unit of the Materials Section may later examine the suggested sites with seismic and resistivity instruments and report on the locations which appear to present the best possibilities. A power auger may later be used to prove out the character, depth and lateral extent of the selected locations.

USE OF SURVEY INFORMATION

As stated in the introduction to this paper, the basic purpose of surveys for potential sources of aggregates is to provide savings in the cost of transporting aggregates to the highway projects. The survey data, however, are also used as an aid in estimating the cost of projects, in providing information on the relative availability of aggregate deposits to contractors, and in suggesting to the road and bridge designer the general soil and rock conditions that may be expected in a specific project area.

The full value of the surveys is not always realized in each highway project, as for example, when no new acceptable aggregate deposits are found during a search on a specific project. The intentions of the search are valid, however, and the investment in the survey constitutes betting on the odds that a good local deposit might be found. If nothing else is achieved, the knowledge and experience gained by the personnel involved, the extension of soils and geological information, and the elimination of the project area from further investigation help to justify the expenditure of the survey. Also, the State Geologic and Natural History Survey derives invaluable information for its work from this cooperative activity.

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