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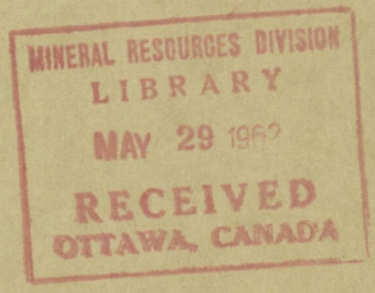
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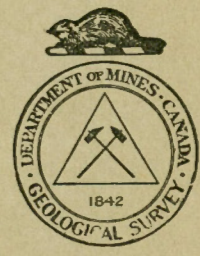
PRELIMINARY REPORT

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IN THE  
EDMONTON DISTRICT  
ALBERTA

BY

R. L. Rutherford

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PRELIMINARY REPORT ON SOME GRAVELS AND SANDS IN  
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R. L. RUTHERFORD

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Preliminary Report on Some  
Gravels and Sands in the Edmonton District, Alberta

By R. L. Rutherford

The name "Saskatchewan Gravels" was given by McConnell in 1885 to a series of sands and gravels that are older than the glacial drift and rest on the bedrock in places in southern Saskatchewan. The occurrence of similar gravels was also noted in Edmonton district by some of the early officers of the Geological Survey and others, but no special study of these gravels was made until 1936 when the writer examined the exposures along Saskatchewan river in the area covered by the Edmonton sheet. The writer's attention was first directed to these gravels in particular in 1934, when Mr. D. A. Taylor, at present one of his field assistants, was then preparing a thesis on the Edmonton district for the Department of Geology of the University of Alberta.

The present study indicates that these ancient sands and gravels are much more widespread than at first suspected, although the occurrences are somewhat patchy. It is of further interest to note that the best gravel deposits for industrial purposes thus far known in the Edmonton and Peace Hills map-areas, are composed largely, or almost entirely, of these Saskatchewan gravels.

In many places they lie directly on bedrock and are overlain by Glacial deposits of boulder clay and associated material. Thus far it seems that there are two types of these deposits, namely, those that are predominantly gravel and those that are largely sand with a minor amount of gravel. In the district immediately adjacent to Edmonton along the Saskatchewan valley to the west of the city the sands are the more prevalent material, whereas to the east of the city and in several places somewhat removed from the city gravels are more prevalent.

The gravels can be identified by their pebbles which are largely of three rock types, namely, quartzite, chert, and arkose of a particular type. The entire absence of pebbles similar to those found in the overlying glacial drift derived from the Keewatin centre of glaciation to the northeast is evidence that they are definitely older than the Keewatin drift. The sands are recognized by their character and association with respect to the gravels. Usually there are lenses of gravel at different horizons in the sand beds and these contain no Keewatin drift pebbles.

The best exposures of the sands with gravel lenses occur along Saskatchewan river west of the city of Edmonton, and more specifically in the north half of section 36, tp. 52, range 25, W. 4th Mer., and the west half of sec. 14, tp. 52, range 25, W. 4th mer., and northwest quarter of sec. 15 and northeast quarter of sec. 16, tp. 52, range 25, W. 4th mer. The last two occurrences where the exposed sands are up to 60 feet thick are the best places for detailed examinations. The sands overlies white to grey clays of the Edmonton formation and are capped by boulder clays and other glacial material. These sands carry layers of gravel up to a foot thick at or near their base, and in such places a zone saturated with water occurs at the contact with the impermeable bedrock below.

The gravels and sands of the bottom layers at various places were sampled and "panned", and in all cases where gravel occurred at or very close to the base, "colours" of gold were found. The colours appeared to be more numerous in samples taken from lower points along the undulating base of the deposits and where there was a stronger flow of seepage water. Sufficient pannings were made to warrant the assertion that the occurrence of gold in these beds is general. It would not be correct to say that the gold is more concentrated in these beds than in the later river bars and terrace deposits to which they have contributed,

but there may be zones within these gravelly sands that are richer than any of the river terraces or gravel flats that are "being washed" at present. The richest observed in a cursory examination is a deposit of gravel at the base of a 60-foot sand exposure on the east bank of the Saskatchewan in the west half of sec. 14, tp. 52, range 25, W. 4th mer. There a water line at the base of the deposit is very obvious and at the low points along the base every shovelful of gravel and sand showed a number of colours even with very rough washing on the shovel. At these places the gold-bearing gravels occur at the base of nearly vertical cliffs of sand and boulder clay more than 140 feet thick and because of the great thickness of overburden profitable mining of the gold-bearing sands may be impossible. The sands do not appear to be gold-bearing except at the contact with bedrock.

Various suggested origins for the gold in the bars along Saskatchewan river have been advocated. The writer is inclined to the view that, the Saskatchewan gravels are the main, and perhaps only, source. It has been known for many years that the river bars are relatively richer along the Saskatchewan in the vicinity of Edmonton than farther east or west along this stream. This is probably due to the fact that the Saskatchewan gravels are extensively present only along Saskatchewan river in the Edmonton district and do not extend to the west nor east for any great distance. The chief significance to these observations appears to be that although the known gold-bearing deposits may not be of economic importance, other deposits of importance may be discovered, since very probably considerable amounts of these gravels are concealed beneath the mantle of glacial drift. The question remains whether the reworking of these materials through the process of river erosion resulted in a concentration or dissipation of the gold in the present-day river flats.

The occurrence of reasonably large deposits of gravel of the "Saskatchewan" type at several widely separated localities is probably of greater significance than the fact that they are gold-bearing. Extensive road building programs have created a demand for good gravel deposits in proximity to projected highways and although the writer cannot speak with authority on the suitability or unsuitability of certain material for such purposes, he is inclined to the view that good gravel pits developed in the Saskatchewan gravels are much to be preferred to those of glacial or post-glacial origin.

The Saskatchewan gravels are usually composed of gravel and sand without clay bands. Rounded and smooth pebbles of quartzite make up over 60 per cent of the pebbles. Pebbles of chert, and others of arkose are abundant. With the pebbles occurs a small amount of fossil wood and clay-ironstone derived from bedrock. The hardness of most of the pebbles is about the same and when crushed they make very high-grade road-surfacing material.

The sands and gravels of glacial and later age are frequently interbedded with clay, poorly sorted, and composed of materials of varying hardnesses.

One of the largest deposits of gravels of the Saskatchewan type occurs south of Onaway, Alberta. It is situated in the northwest quarter of sec. 6 and the southwest quarter of sec. 7, tp. 54, range 1, W. 5th mer. (It is commonly known as the Huff gravel pit.) The developed pit has a length of over 1,500 feet, a width of 500 feet in places, and is over 40 feet deep. It has not been worked for some time, but the fresher faces reveal that only the upper 5 to 10 feet contain Keewatin drift material. In this case the Keewatin glaciation reworked the uppermost layers of the gravels. The lower 30 to 40 feet apparently rests on an uneven bedrock surface and consists of interbedded gravels and sands of the "Saskatchewan" type.

An extension of this deposit has been opened in part in the northwest quarter of sec. 12, tp. 54, range 2, W. 5th mer., where the thickness of the reworked surface layers appears to be less. Although this deposit lies in the valley of Klini creek it is to be noted that it is considerably removed from any major stream valley of the present river systems.

Because of the lack of recent operations it is difficult to obtain samples from the base of these deposits. Since they apparently lie on bedrock it might be worth while sampling such a contact and examining it for gold. If gold were present the returns might warrant attempts at recovery during the operations of the pit. At the present time, since operations are entirely suspended, these samples could not be obtained without considerable effort and a careful cleaning off to ensure clean samples from definite positions.

Gravel deposits of the same type in deposits of unknown size were observed on relatively high ground north of the village of Spruce Grove. A small local pit is utilized in the northeast quarter of sec. 28, tp. 53, range 27, W. 4th mer., and similar deposits with indication of greater extent occur in the southeast quarter of sec. 32, tp. 53, range 27, W. 4th mer. These deposits are ideally situated with regard to development, since they lie on a long slope that would permit easy removal of any undesirable surface material. The surface and glacial cover appears to be thin at these localities. Prospecting might reveal a more extensive deposit in this vicinity than that indicated by present outcroppings and development.

Just east of the city limits at Edmonton, gravels of the "Saskatchewan" type occur beneath boulder clay along Saskatchewan River valley at the Bush Mine in the southwest quarter of sec. 7, tp. 53, range 23, W. 4th mer. The overburden of boulder clay is thick and the gravels are not utilized to any extent at present,

although in places the gravel deposits are over 15 feet thick. They have been encountered in the workings of the Beverly mine (sec. 13, tp. 53, range 24, W. 4th mer.) at a depth of over 130 feet and are there related to old drainage courses since the coal seam has been eroded where the gravels occur.

Other occurrences were observed along Saskatchewan valley in the vicinity of Clover Bar, but there the gravels are of lesser quantity than the sand and their position along steep banks with glacial overburden does not lend to their utilization as gravel deposits.

Southeast of Edmonton, in the areas adjacent to Bremner and south, the surface is markedly irregular and boulder clay is abundant. At one locality a small part of Saskatchewan gravels is used for gravel -- in northwest quarter sec. 36, tp. 52, range 22, W. 4th mer. The significance of this occurrence is that it indicates the possibility of more extensive deposits of this type beneath the mantle of glacial drift. At several other places in the Edmonton map-area, especially in places relatively flat where glacial deposits are practically absent, it is not uncommon to observe a thin mantle up to a foot or so in thickness of Saskatchewan gravels lying on bedrock and exposed in highway and road ditches.

Extensive operations were carried on for a number of years in gravel deposits at Ferintosh, Alberta, both by the railway and by private interests. These deposits occur chiefly in the northeast quarter of sec. 34, tp. 43, range 21, and the southeast quarter of sec. 3, tp. 44, range 21, W. 4th mer. The pits in places are over 30 feet deep and the gravel is composed essentially of quartzite, chert, and arkose. The occasional boulder of Keewatin drift material is believed to have come from the upper layers that were reworked during glaciation. Lack of fresh surfaces prevents a determination of the



depth of this reworking, but since over 95 per cent of the gravel pieces are of the "Saskatchewan" type it is believed that the deposit is essentially of this type and not a glacial deposit. Gravel of this type underlies the village of Ferintosh and overlies bedrock white clays exposed in excavations at the south edge of the village. North of the village similar gravels occur as patches overlying bedrock on the slopes at several places along the road to New Norway in tp. 44, range 21, W. 4th mer.

One of the largest gravel pits in the Peace Hills map-area is located in sec. 33, tp. 45, range 20, W. 4th mer., along the Canadian National Railways grade at the west side of the north end of Driedmeat lake within the Battle River valley. The pit is over a half mile long paralleling the railway, and in places about 35 feet deep. A large amount of gravel was used from these pits, at first for railway ballast and later for highways. The pits have not been worked for some months and the sides are not clean, but as in the case of the Ferintosh deposits the gravel appears to be predominantly of the "Saskatchewan" type, with only occasional pieces of Keewatin drift. These are thought to be due to a reworking of the surface layers during glaciation and the deposit in the main is older than the glacial drift and rests upon bedrock which is exposed in some excavations in the pit and as outcrops at the north end. Surface indications here suggest that there are still large amounts of gravel available in these deposits.

At times when the pits are being worked it might be advisable to sample the bottom of the Ferintosh and Battle River valley deposits where gravels lie on bedrock, with a view to ascertaining the concentration of gold. There are no important stream valleys adjacent to either of these deposits and consequently there has been no sorting, or any great erosion, of the gravels as is the case along the Saskatchewan valley at Edmonton where gold

is recovered from river deposits.

A sampling with this end in view might be advisable when there is greater activity in working the gravel deposits and when the mechanical excavators are in operation. It would be somewhat futile to attempt such sampling at present since it would require much excavating to obtain a clean face. So far as the writer is aware no sampling of this nature was done while the pits were in operation.

Some of the commercial gravel deposits in the Edmonton and Peace Hills map-areas are glacial in age. Those near Ponoka, which have been extensively used for highway purposes by the provincial government, are glacial or post-glacial lacustrine deposits. Similar small deposits occur near Millet and the provincial government pits along Saskatchewan river near Clover Bar are river terrace gravels containing much clay and Keewatin drift material.

It is certain that at some places at least, the Saskatchewan gravels and sand, which are older than the glacial drift in the Edmonton district are gold-bearing and may warrant investigation as to gold obtainable. These gravels and sands are much more widely distributed in the Edmonton district than heretofore reported. They constitute in the writer's opinion the best gravel deposits for industrial purposes and will be extensively utilized when economic conditions warrant development requiring large quantities of gravel.

The best deposit for study from a standpoint of accessibility, occurs on the north bank of Saskatchewan river in a slumped exposure beneath the MacDonald Hotel in Edmonton. It may occur in place a short distance to the east below the Blemeys-Henry building.