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A PRELIMINARY SURVEY OF THE WATER SUPPLY PROBLEMS OF THE CORPORATION OF THE VILLAGE OF ORMSTOWN

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INTRODUCTION

The present report results from a brief survey of the water supply problems of the Corporation of the Village of Ormstown. The survey was ordered by the Deputy Minister of Mines on the request by letter of September 21, 1944, from the Corporation for advice on these problems. The investigation was limited in time to three days, and in character to a general review of the geology of the area between the present source of water supply and Ormstown village. Information also was gathered regarding some of the deeper wells in Ormstown and vicinity.

HISTORY AND PROBLEMS

The village secured the rights in the year 1912 to exploit certain springs near Franklin Centre for its water supply. The springs are located on the farm of Mr. M. Gervais, lots 15A and 16A of the 1st range of Russeltown, Franklin township, Huntingdon county. Three springs were linked up and their waters piped by gravity seven and a half miles to the village. The approximate arrangement of the head-works is shown on a plan accompanying this report. The system was put in operation in 1913. At a later date the direct pipe-line from the springs to the village was "broken" by a concrete reservoir of about 18,000 gallons capacity. This reservoir was located two and a half miles from the springs, on the top of,

but sunk into, a gravel ridge. The reservoir was designed to supply the village for about one-half day, and to supply water while repairs or changes were being made in the pipe-line between it and the springs. At the present time water is conducted from the springs by about two miles of 8-inch wooden pipe and then by one-half mile of 8-inch steel pipe to the reservoir. From the reservoir to the village, or for about five miles, the water is carried by 6-inch steel pipe. Within the village the mains are cast iron.

The system depends upon gravity for its flow. The springs are about 385 feet above sea-level, while the reservoir is at 325 feet and the village at an average elevation of about 140 feet. Thus, the difference in elevation between the springs and the village is close to 245 feet, and between the reservoir and the village it is about 185 feet. The above figures are approximated from the Chateaugauay map sheet of the National Topographic series, a copy of which accompanies this report.

The Gervais springs give an ample supply for present needs during the greater part of the year, the normal flow giving 100-105 pounds ordinary pressure and 80-85 pounds fire pressure in the mains in the village. However, after prolonged dry spells the flow from the springs seriously decreases, and pressures in the village mains are not sufficient to force water to the second stories of some of the buildings.

An effort to offset such decreases of supply was made in 1943 by drilling a well at the Town Hall in Ormstown. The object was to provide a reserve of water which could be pumped into the mains when needed. This arrangement did not prove entirely satisfactory for, during the last few days of the dry spell in 1944,

it was necessary to pump water from an adjacent spring into the head-works at Franklin Centre.

Thus, the immediate problem was to secure sufficient water reserves or sources to provide steady supply and pressure for present needs, and with particular regard to the summer months. At the same time it was hoped that a supply for expanded consumption, of the order of at least double that of the present, could be indicated at, or adjacent to, the present head-works of the Ormstown water system. Also, it was hoped that the present system or an expansion of it could be compared with the possibilities of supply from a well or wells bored within the village limits and of supply from the Chateauguay river. In summary, these three possibilities involve the following considerations:-

1. a) Possibilities of increasing the supply at the head-works of the present system.
   b) Initial and upkeep costs of expanded head-works; or, costs of acquiring water rights other than those now owned.
   c) Upkeep of 7½ miles of pipe-line.
2. a) Possibilities of obtaining adequate supply from a well or wells put down within the village limits.
   b) Initial cost of pump and accessories; cost of pumping.
   c) Initial cost and upkeep of reservoir.
3. a) Tests on Chateauguay and Outarde river waters to determine which would provide the better class of water.
   b) Installation of filtration and chlorination plant; initial cost and costs of replacements; involving also a reservoir and pumps.

This report makes no attempt to consider all of the points listed above. The total of the problems demands the services of a water supply engineer, who could suggest not only the best possible source and system of supply but provide also an estimate of relative costs.

The present report reviews the geology of the area concerned and the possibilities of obtaining adequate supply from wells within the village limits, as well as of increasing the supply at the head works of the present system.

Geology (1), and Its Relation to Water Supply from Wells at Ormstown

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(1) See, Logan, Sir William, Geology of Canada. Geol.Survey of Canada, Ann. Rep. for 1863.

Cole, L.H., Silica in Canada, Pt. 1. Canada Dep't of Mines, Mines Branch. Report No. 555, 1923.

Wilson, A.E., Map No. 660A. Canada Dep't of Mines and Resources, Mines and Geology Branch, 1941.

The bedrock underlying Covey hill and the area to the north as far as Ormstown is part of the Nepean (Potsdam) sandstone formation of Upper Cambrian age. The best section of the formation is shown in the "Gulf". Here, according to Logan, a thickness of 420 feet is exposed in the Gulf and the stream valley below, and an additional 120 feet in the hill above the "Gulf". Thus, the total of this measured section is 540 feet. The rocks are also well exposed in apparently flat-lying beds along the hill road from the summit at 1,113 feet elevation to shortly east of Covey Hill corners, and again about a mile still farther east. The difference in elevation between the end points of this section, in conjunction

with the nearly flat attitude of the beds, indicates that the formation is about 700 feet thick at the eastern end of Covey hill.

Other exposures may be seen here and there on the hill road and on highway No. 52 but these,being essentially flat, show little more than the surface of one bed. One of the best sections in the western part of the hill is in the east branch of the Outarde river at the bridge one and a quarter miles west of Franklin Centre. A thickness of 15 feet is exposed here. Between Covey hill and Ormstown the extensive "Blueberry plain" or "the Rock" has sandstone exposed at the surface or lying under a thin cover of woil. The area of outcrop is about one and one-half miles in north-south and six miles in east-west direction. This outcrop area, although large, shows no great thickness as the beds are flat or nearly so.

The general colour of the sandstones is grey both on fresh and weathered surfaces. Here and there they weather brownish. There are a few thin beds of greenish and reddish sandstones that usually are more or less shaly. The sandstones are generally coarse in grain. Beds of small-pebble conglomerate are common. These are composed mainly of sub-angular to rounded pebbles of quartz, with scattered, smaller, and more angular fragments of grey and pale brown feldspars, and with occasional flat pebbles of green and red shale. The quartz pebbles seldom exceed an inch and usually are under one-half inch in diameter. The upper part of the formation here, on the whole, appears to be somewhat finer in grain and more uniformly siliceous than the lower part.

The cement of the sandstones is siliceous for the most part. A little calcium carbonate is present locally, and the brown colour noted here and there implies the local presence of some iron carbonate also.

The beds or layers average between one-half and one foot thick, but beds of one inch and others of two feet thickness are present. Cross-bedding shows in some places and, rarely, ripple-marks have been noted.

The dips of the exposed beds of the Potsdam sandstones in this area are so gentle that they have been described as flat almost throughout. However, the distribution of the sandstones in this general area, and their relation to younger rocks, indicate that they are arranged in a broad anticlinal or up-fold plunging very gently towards the north-northeast. Dips of one degree and less to the north and northwest would be sufficient to bring the topmost beds exposed on Covey hill under the village of Ormstown. And within a mile to the north of Ormstown the sandstones go under the younger dolomitic limestones and calcareous sandstones of the March (Beekmantown) formation.

No tests to determine the porosity of this sandstone formation in this area have been made. However, its general grain size and general character would indicate that it should be a water-bearing formation almost throughout. The distribution and structure of the formation and the topography of the area are all favourable to the flow of water from Covey hill underground through these rocks towards Ormstown. Therefore, it is reasonable

to suppose that wells drilled at Ormstown would provide an adequate supply of water for present and for possible expanded needs.

The record of three "deep" wells drilled within or near the village limits supports these conclusions as to water supply only in part. The three wells referred to are the Borden Company well about 1,000 feet east of Ormstown station, the Corporation well at the Town Hall, and the S. Cullen well at the eastern edge of the village.

The information available on these three wells is as follows, in summary:-

Well Name	Borden	Town Hall	S. Cullen
Total depth	89'	149'	86'
Depth to bedrock	60'	60'	77'
Depth in bedrock	29'	89'	9'
Type of bedrock	?	?	?
Type of overburden	Clay	Clay	Clay (0'-20' = without boulders; 20'-77' = with boulders)
Depth to water	Main supply at 89'	Main supply at 149'	(no water in clay) 77'-86'
(Water stands at this level below ground surface) Static level	15'-20'	16'	14'
Level after pumping	15'-20'	Lowers to 29' then steady at 900 gals. per hour	
Quantity of water	52,800 gals. per day	Not fully tested	Failed
Character of water	Hard; some sulphur	Hard; some sulphur	Hard; much sulphur
Present condition	Active use	Active but intermittent use	Inactive

It should be added to the above records that the Borden well was tested by a pump of 2,200 gallons an hour capacity through a pumping period of 24 hours. The water level in the well was not appreciably lowered by this test. Also, the Town Hall well appears to yield 900 gallons per hour (pump capacity) after lowering from 16 to 29 feet. An actual test of this well is being considered by the Corporation.

A fourth well having a bearing on the possibilities of water supply from wells at Ormstown is that on the farm of W.R. Graham at Tullochgorum. This well is about three and three-quarter miles to the east of the Town Hall well. The conditions of underlying bedrock and overlying clay, and topography, repeat in general the conditions at Ormstown. The Graham well was drilled to 187 feet, - 82 feet to bedrock and 105 feet into the rock. This, it should be emphasized, is a flowing well. The quantity of flow has not been measured.

The Springs

The springs serving Ormstown are located near the base of the north slope of Covey hill. Their elevation is about 385 feet above sea-level.

The north slope of the hill is blanketed above the 525-foot elevation contour by a generally thin cover, perhaps averaging 10 feet thick, of stony glacial till. Similar material also covered the lower slopes, but this has been re-worked up to the 525-foot contour by marine wave action (1). This re-working resulted in

(1) Goldthwait, J.W., The St. Lawrence Lowland. Manuscript.

sorting of the stony till and the production of gravel beach deposits such as those immediately south of the springs and such as some near St. Antoine Abbé that are now being exploited for road and other material. The re-working also resulted in some transportation of till material down the slope so that below the 525-foot contour the loose material is thicker than above that contour. This consideration has a very direct bearing on the water-supply at the springs. It is a matter of observation that the springs issue from gravels. In view of the late geological history of the area it is probable that the gravels rest on boulder clay. If so the ground water supply feeding the springs is perched on the boulder clay and has no relation to the bedrock beneath. This would explain the lowering of the water supply in fairly quick response to droughts. Conversely it would also explain the reported very quick ("a day or so") response of the springs to a heavy rain.

Actually the case is not as simple as outlined above for the adjacent spring on the farm of P.N. April is said to flow without any serious lessening of volume regardless of dry weather. This spring is on the same "spring line" as those serving Ormstown, and the underlying ground evidently is about the same. An explanation is required for the difference in steadiness of flow between the Gervais and April springs. Towards this it may be said that ground water flowing through gravels is subject to a number of variables, including in particular rapid changes of type and thickness of deposit from place to place. Perhaps the April springs receive a steadier supply from the hill slope to the south, and they may be in fairly direct connection with the reportedly steady springs on

the farm of B. Johnson, one-half mile to the south of, and up-hill from, the April springs.

As shown on the accompanying plan, which is based on a rough survey, the waters from three surface springs and one shallow underground spring (or perhaps surface water) are diverted into the main leading to Ormstown. Each of the three surface springs was developed by an excavation sunk about five feet into the gravels and enclosed by cement walls. At the middle and west springs the area enclosed was about 175 square feet in each case, while at the east spring the area enclosed was about 225 square feet.

At the time of the writer's visit to the springs, on October 17, 1944, only the eastern spring showed definite signs of "boil". At the middle spring, which supplies the most water, the bottom may have been too stony to give direct evidence of boil. But it was reported that when this enclosure or reservoir was being cleaned out during the summer of 1944 the water seemed to be coming in mainly from under the east wall. At the west spring the stony bottom was covered with a thin layer of fine, dark silt, offering an excellent opportunity to observe boil, of which, however, there was no indication. This west spring or reservoir is linked with two other, and small, spring-houses located 25 feet and 125 feet further to the west. The "spring" 125 feet distant had no flow at all at the time of my visit, and the one 25 feet distant had very little flow. Practically all of the water coming in from the west to the main west reservoir was coming from a "blind" pipe leading into the nearer, small spring-house from the southwest. This flow was coming either from the surface or from a very shallow underground source. It was estimated that probably half of the water being

delivered from the west reservoir was coming from the "blind" pipe.

It will be noted from the plan of the springs that they are nearly in line on a course that is roughly east-west, and that the April spring also falls closely in line. The distance between the easternmost spring and the April spring is roughly 1,900 feet. Throughout this distance there is flat, swampy ground for some distance northward from the line of springs, and a fairly sharp rise of five to ten feet immediately south of the spring line. The slope in general is gradually upward and southward from the crest of the rise for a distance of about 2,300 feet, or to the 500-525-foot level along which highway No. 52 runs. South of the highway the slope steepens.

Possibilities of Increased Supply of Spring Water

The most obvious source of additional supply is the spring on the farm of P.N. April. Water might be piped by gravity from this spring into the Ormstown system either at the main west reservoir or at the junction. The entry chosen would be determined by the running of levels. If entry were made at the main west reservoir the amount of pipe required would be about 400 feet; and if at the junction the amount of pipe required would be about 750 feet. The water could be taken either from the cemented-in spring or from the discharge coming from under the apple shed. In either case the possibility of pollution would have to be guarded against, and such possibility would be more likely in the latter case. Also, if the discharge referred to is utilized it would be necessary to provide that the drainage under the shed is not blocked.

There is evidently a connection between the cemented - in spring and the discharge referred to, for it is reported that the flow of this discharge was decreased considerably when water was being pumped from the spring by the Corporation pump during the 1944 dry spell. It should be noted that the total discharge or waste from the April springs seemed about equal to the total quantity of water being delivered by the set of springs of the Ormstown system. This observation was made on October 17, 1944. It may not apply generally.A very rough calculation of the discharge indicated that its volume was about 50,000 gallons a day.

Additional supply might also be piped by gravity from the springs on the farm of Ben. Johnson. These are located one-half mile south of, and approximately 150 feet higher than, the springs supplying Ormstown. At the present time the Johnson springs supply the needs of two farms and a creamery. On October 17, 1944, the overflow or wastage seemed considerable but there was no opportunity of measuring the amount. It was reported that there was no threat of these springs failing during the dry spell of 1944.

Also, other possible but more remote sources of additional supply are offered by several other reported springs on the north slope of Covey hill. These include springs on the farms of Clifford Lamb and of Raymond Tremblay. The former are about one and a half miles south-southeast, and the latter about two miles south-southwest of the Gervais springs.

All of the possibilities mentioned above involve laying pipe lines and purchasing rights from the present owners. The

remaining possibility, that of developing the present springs, would have the advantage of requiring relatively little extra pipe. It might also have the advantage of being covered by the existing terms of deed, so that any additional water developed would not have to be purchased.

The presence of the swampy ground immediately to the north of the line of springs indicates that the three collecting reservoirs are trapping only a fraction of the available ground water, and that seepage to the surface takes place between the actual springs. This being so other collecting reservoirs of the same general type most probably would increase the supply that could be made available to the mains. On the basis of the report that at the middle reservoir the water seemed to be coming in mainly from under the east wall, it is reasonable to suppose that extension of that reservoir to the east would trap more water than is being trapped at present. An adequate supply for present needs, covering all seasons might be obtained by deepening and extending this middle collecting reservoir only. If this, or the construction of additional collecting reservoirs, is planned, the work should be undertaken at a time when the ground water level is low. This would ensure that the reservoirs were made deep enough to tap the underground flow when at a low stage. It would also have the advantage of reducing the difficulty of working.

The best locations for other collecting reservoirs could be determined by a series of borings along, and shortly to the southward of the spring line. Or, a favourable spot with relation to gravity flow to any of the present reservoirs, or to the

junction, could be selected and tested by a dug shaft or well to determine the supply.

A greater supply probably could be made available here by other methods, including:-

1.- Drainage trenches, extending roughly at right angles to any of the three present reservoirs, and curving gently up-grade from them.

2.- A series of two to four trenches at right angles to the slope south of the western and eastern reservoirs; these would be connected by a pipe which would lead off the water from each trench successively to the reservoir.

The trenches suggested above would be filled in with coarse stone overlaid successively by gravel, sand, and finally clay. Passage for water along the bottom of the trenches could be ensured by proper arrangement of the bottom stones or by the use of perforated pipe or drain tile. Under either of these methods the possibility of contamination should be carefully considered. It is suggested that no trenches be put in south of the middle reservoir, for this reservoir is dangerously close to farm buildings even now. The proximity of farm buildings, and the practice of pastoring stock over the spring line generally, are deterrents to more elaborate schemes of capturing the ground water, as, for example, by means of a subsurface dam.

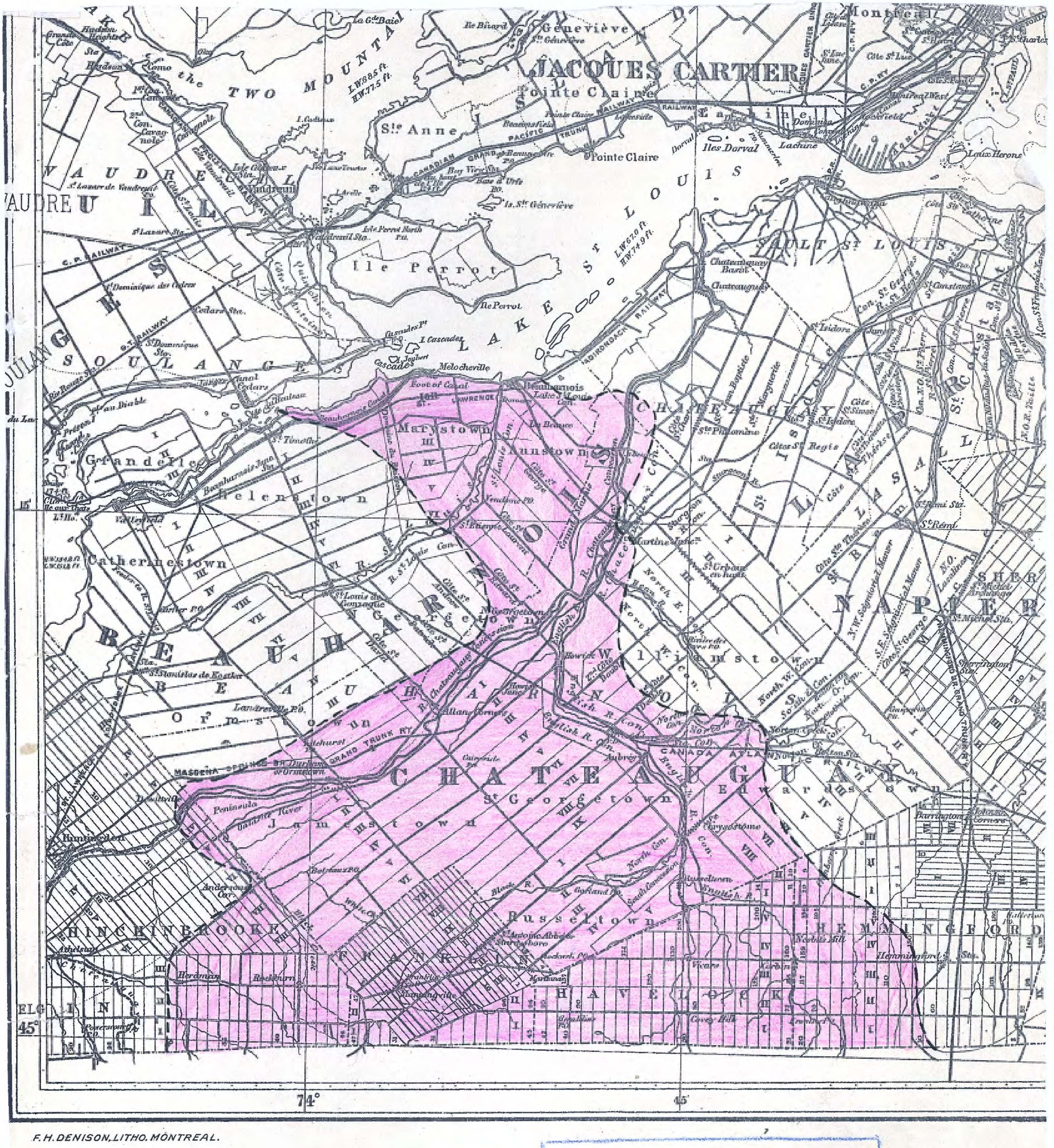
3.- Wells might be drilled in the hope of striking artesian flow. There would seem to be a good chance of striking such flow at around ten feet from the surface, inasmuch as the surface of the underground flow supplying the springs seems to be around that depth at the maximum. Also, it is reported that the

water in the middle reservoir has risen high enough, at times, to discharge from the overflow pipe, a fact which would indicate a few feet, at any rate, of artesian head.

If, as is strongly suspected, the ground water supplying the springs rests on boulder clay, it is reasonable to assume that artesian flow might also be obtained from a well drilled through the surface gravels and boulder clay to or into the underlying sandstone bedrock. It is impossible to forecast the depth to bedrock. Nor is it possible to predict the quantity of water that might be obtained from either a shallow or deep well at this location.

Finally, it should be pointed out that water could be piped from the lake and "Gulf" in abundant supply to the springs. However, this would require about six miles of pipe, and a pump capable of lifting water at least 125 feet.

The possibility of obtaining an adequate water supply from wells within the village limits has been considered. There is no doubt that the waters of the Chateauguay river could be used as the town supply, under standard methods of filtration and chlorination. But if such a project is considered it would be worth while to test and compare the waters of the Chateauguay and Outarde rivers, for it might be more advantageous to use the waters of the latter stream. The Outarde enters the Chateauguay about 3,200 feet upstream from the Ormstown bridge.



DISTRIBUTION OF POTSDAM SANDSTONE IN ORMSTOWN AREA

SCALE: 4 MILES TO 1 INCH

Accompanies report on Ormstown water supply by H. W. McGerrigle

16 mm November, 1944