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DIVISION OF MINES

GEOLOGICAL BRANCH

Open File Report

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Mineral Resource Survey

The United Counties of Prescott and Russell

Ontario

by

John Z. Fraser

1976

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E.G. Pye,
Director, Geological Branch

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MINERAL RESOURCE SURVEY

THE UNITED COUNTIES OF PRESCOTT AND RUSSELL

by

John Z. Fraser[1]

This report gives a brief description of the bedrock and surficial geology of the United Counties of Prescott and Russell and a discussion of the area's mineral resources.

LOCATION

The study area borders on the south bank of the Ottawa River east of Ottawa, and is comprised of the geographic townships; Russell, Clarence, Cambridge, North Plantagenet, South Plantagenet, Alfred, Longeuil, Caledonia, West Hawkesbury and East Hawkesbury. The area is covered by the following map sheets of the National Topographic System at a scale of 1:50,000; Thurso (31G11 E.&W.), Russell (31G6 E.&W.), Winchester (31G3 E.&W.), Hawkesbury (31G10), Alexandria (31G7), Lachute (31G9) and Vaudreuil (31G8 W.).

PREVIOUS WORK

The bedrock geology of the area is described by Wilson (1946) in G.S.C. Memoir 241. Figure 1 of this report which shows the bedrock geology of the United Counties has been reproduced from G.S.C. Map 852A which accompanies Memoir 241.

Surficial mapping of the area, though in progress is as

[1]Resource Geologist, Phanerozoic Geology Section, Geological Branch, Ontario Division of Mines. Manscript approved for publication by the Acting-Chief, Phanerozoic Geology Section, November 19, 1976.
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yet incomplete so that in some areas evaluation of granular resources must be made on a tentative basis. In such areas, soils maps (Wicklund and Richards, 1962) were consulted to gain a general understanding of the disposition of surficial materials. Richard (1972-1974) has completed preliminary mapping of the Thurso West, Russell West and Winchester West N.T.S. Sheets, which are on file with the Geological Survey of Canada. The surficial geology of the Thurso East and Russell East map sheets is described in unpublished manuscripts by N.R. Gadd. Gwyn (1973) has mapped the Alexandria N.T.S. Sheet (O.D.M. Preliminary Map P.906) and is in the process of mapping the Lachute East and Vaudreuil East N.T.S. Sheets. The author has been given access to field copies of these maps.

Information concerning pit and quarry names and locations is from the Ministry of Transportation and Communications, Downsview, Ontario and from field descriptions of pits and quarries for part of the study area supplied by Q.H.J. Gwyn.

Bedrock Geology

THE GEOLOGICAL SECTION

The following table shows the sequence of deposits found in the study area (after Wilson, 1946):

CENOZOIC

QUATERNARY

RECENT

Modern Alluvium: gravel sand, silt, clay

Swamp deposits: peat, marl, muck

PLEISTOCENE

Glacial, glaciofluvial and glaciolacustrine deposits: gravel, sand, silt, clay, till

Marine deposits (Champlain Sea): gravel, sand, silt, clay

Unconformity

PALEOZOIC

ORDOVICIAN

Queenston Formation: red shale

Russell Formation: grey shale and interbedded dolomitic limestone

Carlsbad Formation: grey shale with some dolomitic limestone and sandstone layers

Billings Formation: brown and black fissile shale

Eastview Formation: dark grey limestone with interbedded dark fissile shale

Disconformity

Ottawa Formation: Thick bedded crystalline limestone with varying interbedded impure limestone and shale

Disconformity

St. Martin Formation: thick bedded impure limestone with interbedded crystalline limestone

Rockcliffe Formation: green friable shale with sandstone lenses

Disconformity

Oxford Formation: thick bedded dolomite and limestone

March Formation: alternating grey sandstone and blue-grey dolomite

Nepean Formation: cream colored siliceous sandstone

Unconformity

PRECAMBRIAN

"Grenville" Metasediments: limestone and sandstone.

HISTORICAL GEOLOGY

The study area is underlain by Paleozoic rocks which form part of the Ottawa-St. Lawrence Lowland - a large basin lying between the Canadian Shield north of the Ottawa River and the Adirondack Mountains on the south. On the west and east, deposition in the basin during Ordovician time was influenced by structural features of the Precambrian basement - the Frontenac Axis which trends northwest through the Thousand Islands area, and the Beauharnois Anticline which trends north near the confluence of the Ottawa and St. Lawrence Rivers.

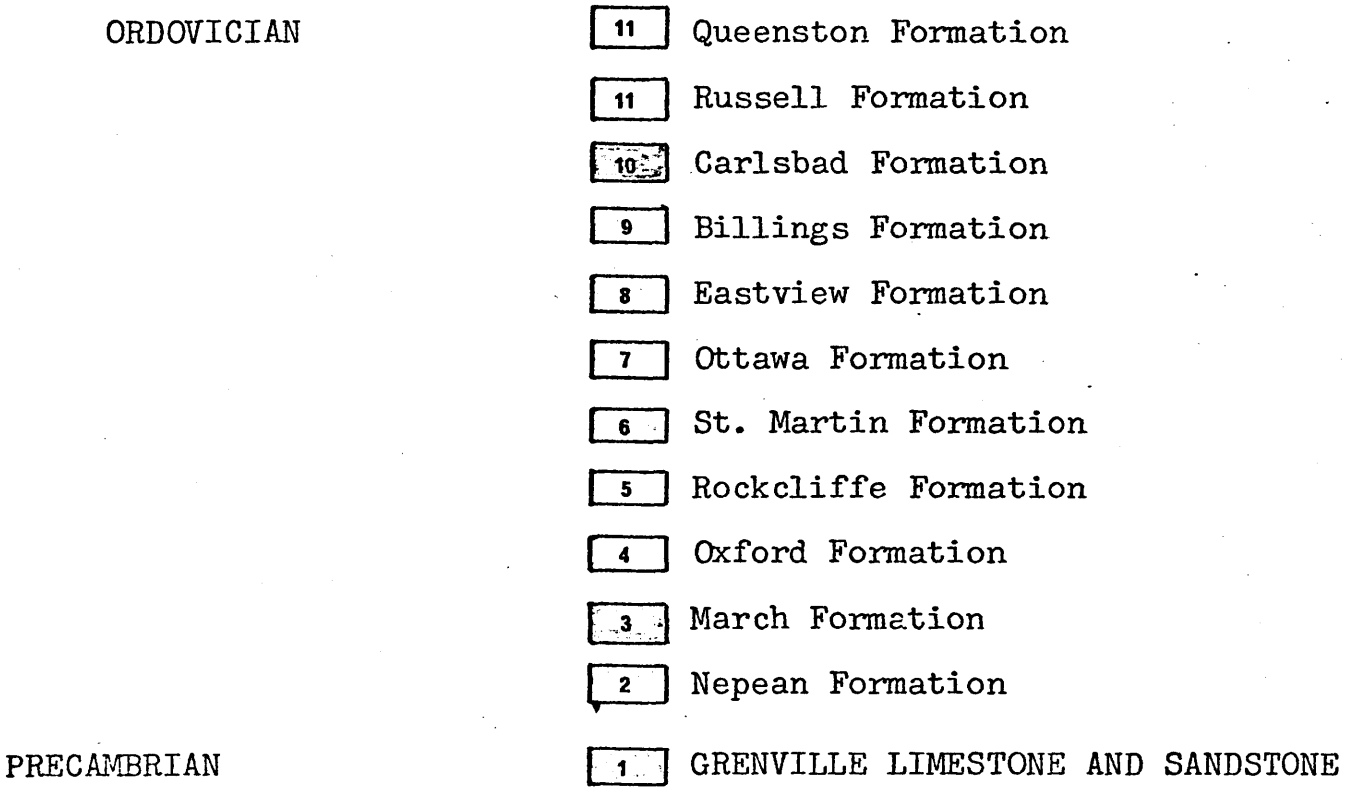
Extensive tectonic activity took place in the area of the Appalachian Mountains during Cambrian and/or Ordovician time and sediments from the area were carried northwest by a transgressing epiric sea and deposited over much of Ontario and northeastern United States. The sea deposited thousands of feet of sediment in the Ottawa-St. Lawrence Basin, beginning with basal sandstones of the Nepean (Potsdam) Formation (Wilson 1946).

Overlying the Nepean are a succession of limestones, dolomites and shales deposited during successive transgressive and regressive stages of the sea. Another episode of tectonic activity in the Appalachians (Taconic Orogeny) was followed by deposition in late Ordovician time of the Queenston Formation which is the youngest Paleozoic sediment found in the Ottawa-St. Lawrence Lowland. After deposition

of the Queenston extensive faulting took place in the area. The major faults and fault zones trend roughly east west and form what is called the Ottawa-Bonnechere Graben. The northern edge of the basin, in the United Counties of Prescott and Russell is defined by faulting and much of the area is underlain by a large downdropped block of paleozoic sediments which dips to the north.

Figure 1

BEDROCK GEOLOGY OF THE UNITED COUNTIES OF PRESCOTT AND RUSSELL (FROM WILSON, 1946)



CRUSHED STONE RESOURCES

Precambrian rocks occur near Lefaivre in Alfred Township and near Chevrier in East Hawkesbury Township. They consist of metamorphosed Grenville limestone and sandstone and are at surface in several places. Outside the study area the rocks have been used to produce lime and decorative crushed stone. Goudge (1938 P.153) states that a small quarry was established in Grenville limestone south of Lefaivre to produce road aggregate.

Siliceous sandstones of the Nepean Formation rest unconformably on the Precambrian and occur within the study area under relatively thin drift cover in the vicinity of Ste. Anne de Prescott in East Hawkesbury Township. The formation has been quarried extensively in the past, notably in Nepean Township where several large quarries were opened to provide building stone for the Parliament Buildings in Ottawa. The Nepean has also been used, outside the study area for the manufacture of abrasives, and in glass making (Wilson, 1946 P.40) Drift thickness in the vicinity of Ste. Anne de Prescott may be thin enough to permit quarrying operations.

The March Formation which attains a maximum thickness of 30 feet near Ottawa constitutes a transition from the Nepean sandstones to the overlying dolomites of the Oxford Formation. It rests conformably on the

Nepean and consists of alternating grey calcareous sandstone and sandy blue grey dolomite. Its occurrence is rare in the study area and is of little commercial value.

The Oxford Formation which, together with the March is called the Beekmantown Dolomite occurs in the southwest part of Russell Township and at or near the Ottawa River shore in Clarence, North Plantagenet, Alfred, West Hawkesbury and East Hawkesbury Townships, and also along the east boundary of East Hawkesbury Township. The Oxford attains a maximum thickness of 240 feet (near Ottawa) and consists of thick bedded dense grey dolomite which grades laterally to limestone in places. The upper layers become more argillaceous with shale predominating near the contact with the overlying Rockcliffe Formation. It has been quarried for building stone and crushed stone in the study area and to the east, where it is widely exposed. More recently the Oxford has been quarried for concrete and asphalt aggregate. Location 9 in Russell Township has been opened in the Oxford but is now abandoned. New quarries could be established in Russell Township, especially in the vicinity of Felton, where drift cover is not great.

The Rockcliffe Formation disconformably overlies the Oxford and consists of approximately 150 feet of friable

grey-green shale with lenses of fine grained sandstone. It occurs under generally thin drift, near the Ottawa River, and in the north part of East Hawkesbury Township. The Rockcliffe has been quarried in the past for flagstone and building stone, but can also be used for some types of subgrade aggregate (as is being produced at Location 23 in East Hawkesbury Township.

The St. Martin overlies the Rockcliffe and consists of 20 feet of impure limestone with minor interbedded shale and dolomite. It occurs in a discontinuous band parallel to the Ottawa River and underlies large parts of East and West Hawkesbury Townships. The St. Martin outcrops south and southeast of Hawkesbury and especially along the Little Rideau River. Wilson (1946) states that quarries have been operated to extract building stone in this area. The stone is also suitable in places for subgrade aggregate.

The Ottawa Formation which rests disconformably on the St. Martin underlies most of the central portion of the study area and constitutes a major source of road building and construction aggregate. It comprises approximately 700 feet of section near Ottawa and has been subdivided into two time units, then further into seven time-rock units on the basis of faunal assemblages. The following table (Table II) (adapted from Wilson, 1946 and Hewitt 1960) shows the subdivisions and lithologic character of the Ottawa Formation:

TABLE II

Lithostratigraphic Units of the Ottawa Formation

TIME UNIT		TIME-ROCK UNIT BASED ON FAUNAL ASSEMBLAGES (BRACKETED NOS. REFER TO UNIT NO. SHOWN IN FIGURE 1	LITHOLOGIC CHARACTERISTICS
Trenton	Upper	Cobourg Beds (7G)	Thin to thick bedded impure limestone with shaly partings
	Middle	Sherman Fall Beds (7F)	
	Lower	Hull Beds (7E)	Bluish grey medium crystalline thick bedded calcarenite limestone
Black River	Upper	Rockland Beds (7D)	Medium brownish grey Medium to micro crystalline limestone with some shale partings
		LeRay beds (7C)	
	Middle	Lowville Beds (7B)	
	Lower	Pamelia Beds (7A)	Impure grey lithographic limestone with shale and sandy dolomite interbeds

The Black River units of the Ottawa Formation occur in the northern parts of all townships bordering on the Ottawa River, except East Hawkesbury. Drift cover is thin and the beds often outcrop in a series of low north-facing escarpments, especially in North Plantagenet, Alfred and Longeuil Townships. Extraction has taken place near Rockland, Alfred, Evanturel, and near Embrun in Russell Township. In the past the material was used for building stone, railway ballast, lime and road aggregate. Goudge (1938) gives a very detailed description of the location, stratigraphy and products of many quarries in Russell and Prescott Counties. In Longeuil Township, Bertrand et Frère Construction operates a quarry in the Upper Black River beds of the Ottawa Formation. The quarry has been used for many years and production consists mainly of 7/8 inch crusher run gravel for road construction.

Chemical analyses of Black River beds from quarries in the Ottawa area show MgO content to be between 1 and 4 percent and SiO_2 content to be between 4 and 43 percent with the higher values in the lower Black River beds. Generally the Black River beds are well suited for the production of asphalt and concrete aggregate and possible reserves in the study area are very large, especially in the townships mentioned above.

The Lower Trenton, Hull beds which overlie the Black River units consist of thick bedded clastic limestone of high chemical purity (low MgO and SiO_2 content. (See

Hewitt, 1960 P.80). The area of occurrence of the Hull beds is similar to that of the Black River beds and they have been quarried at several places in the study area for lime, and for use in the pulp and paper industry. Reserves in the study area are considerable.

Limestones of the Sherman Fall and Cobourg beds are the youngest of the Ottawa Formation and underlie the central portion of the area. However, as shown in Figure I much of the area is heavily drift covered. Several small quarries have been opened in these units to supply fill and some subgrade aggregate for construction of highway 417. Generally, however, the stone is not used for concrete or asphalt aggregate. Reserves from the Sherman Fall and Cobourg beds are very large in the study area, but drift cover is generally greater.

The Eastview Formation which disconformably overlies the Ottawa is a thin (20 feet) unit consisting of thin bedded dark grey limestone with black friable shale interbeds. It underlies only a small portion of the study area, mainly in the southern portions of South Plantagenet and Caledonia Townships. It is considered to have little commercial value.

The Billings Formation conformably overlies the Eastview and consists of 260 to 300 feet of thick bedded black fissile shale. It has only minor occurrence in the

study area and has very little commercial value.

The Carlsbad Formation conformably overlies the Billings and consists of 500 to 550 feet of grey shale with a few limestone interbeds. Its occurrence is restricted to the northern part of Russell Township and it has little commercial value.

Representing the youngest paleozoic deposits in the area are shales of the Russell and Queenston Formations (both formations are included in Unit II in figure 1). The combined thickness of the deposits is approximately 100 feet and they are found only in the northwestern portion of Russell Township. The Queenston Formation outcrops occasionally and has been quarried just north of Russell for use in brick making.

SURFICIAL GEOLOGY

The disposition of unconsolidated sediments in the study area is the result of glacial activity during the Pleistocene. During the Wisconsinan Stage of the Pleistocene, ice of the Laurentide Ice Sheet advanced over and covered the study area. The advance resulted in the deposition of a dark grey to olive brown sandy silt pebbly till which is at surface in many parts of the area. The till is continuous with the surface till in the Cornwall area (Gwyn and Lohse, 1973) and is called the Fort Covington Till. Gwyn and Lohse also state that the maximum observed thickness of the till in the Alexandria area is 21 feet and that it almost always rests directly on the bedrock. Thus, areas where till is exposed at the surface may be favourable for quarrying, depending on the nature of the underlying bedrock. The till itself has some use as backfill for road construction.

Responding to climatic changes, the ice sheet then retreated rapidly to the north. The rapidity of the retreat is indicated by the fact that few outwash or ice-contact stratified drift deposits are found in the area. Following retreat of the ice to the north side of the St. Lawrence Valley the study area was inundated from the east by marine waters. The Champlain Sea, formed by this inundation extended west to Kingston and Carleton Place. To the

north the sea was dammed against the ice margin and extended along the Ottawa-Bonnechere Graben as far west as Petawawa. Marine sediments deposited during the life of the Champlain Sea are extensive in the study area and consist mainly of clay, silty clay and silty fine to medium sand. These deposits have relatively little commercial value and in many areas are classed as hazard lands because of their susceptibility to landsliding, as will be discussed in a later section.

In some places, especially in parts of Russell Township, beach and offshore bars were formed, mainly by wave action reworking the underlying till. The gravel is cobbly to bouldery and the deposits are seldom more than 15 feet thick. Extraction has taken place at several places in the beach deposits and small to moderate possible reserves of good quality material remain.

West of the study area, north of Lake Simcoe, recession of the ice sheet uncovered a drainage outlet at Fossmill allowing water from Glacial Lake Algonquin (which occupied the Lake Huron and Georgian Bay Basins) to flow east to the Ottawa River Valley. Large amounts of sand and silt were transported by the water and deposited in an extensive delta which was formed on the western shore of the Champlain Sea, near Petawawa.

Further northward recession of the ice sheet uncovered

a lower drainage outlet for Lake Algonquin, allowing water to flow east to the Ottawa River Valley near Mattawa. At about this time the Champlain Sea was receding to the east in response to elevation increases caused by "rebound" of bedrock which was previously depressed by the weight of glacier ice. The elevation increases allowed water flowing down the Ottawa River Valley to erode through the deltaic deposits near Petawawa and transport the eroded material downstream where it was re-deposited in a large delta, formed on the northwest shore of the much-reduced Champlain Sea just east of Ottawa. The deltaic deposits (called the Russell and Prescott Sand PLains by Chapman and Putnam, 1966, p.360) cover much of the study area and consist of 10 to 30 feet of silty sand and fine to medium sand, with gravel rarely present. A great number of sand pits have been operated in these deposits and the material is suitable for use as back fill, some types of subgrade aggregate and some grades of blending sand. Possible reserves in the study area are considerable.

Further isostatic rebound in the area allowed the Ottawa River to cut down through the delta forming several large clay floored channels which are now abandoned, and are considerably higher than the present river level.

HAZARD LANDS

A very serious and widespread hazard is present in Russell and Prescott Counties as well as in large parts of the Ottawa-St. Lawrence Lowlands in the form of sensitive marine clays. Sensitive clay is one which loses a large proportion of its strength once it has been disturbed. Numerous small bank failures and several large earth-flows were examined.

Bank failures are found throughout the counties and these occur annually. They consist of a single mass of material sliding along a failure plain sloping towards a river. They appear to be related to stream and river banks that are undergoing active erosion. They range in length along the bank from a few feet to several tens of feet, the smaller ones are more common. A typical bank failure occurred on Highway 17 east of Cumberland and several have occurred recently in the vicinity of St. Isidore de Prescott.

Of far greater hazard to property and life are earth-flows that occur in areas of locally high relief such as along modern river courses and terraces cut by ancestral rivers. Earth-flows are known as retrogressive slumps in that they develop from an initial bank failure and then rapidly progress into the bank of the river covering large areas up to eight square miles. The largest flows in Russell and Prescott Counties cover more than 100 acres. They are in

the order of three quarters of a mile wide and half a mile deep. It is estimated that 16 million cubic yards of material were involved in each of these larger flows. Smaller slides covering an area of up to 50 acres have an estimated volume of 3 million cubic yards.

The greatest concentration of earth-flows is in Clarence Township (see map). The most recent landslide occurred on South Nation River between Casselman and Lemieux in 1971 and included approximately 70 acres of land. Some nine landslides have been identified along the South Nation River between Casselman and Lemieux. A second grouping of landslides occurs on the South Nation River downstream from Plantagenet, however, these are all older slides, probably pre-settlement. In view of the distribution of these earth-flows it is disturbing to see the number of new buildings erected in potential hazardous areas with no apparent regard for the hazard, such as along the high banks on South Nation River immediately downstream from Casselman.

As well as the earth-flow hazard, the clay has a distinctly low bearing capacity. One result of this is the failure, settlement, or tilting of several new large farm silos in the study area.

AGGREGATE RESOURCE AREAS

ALFRED TOWNSHIP

STONE RESOURCES

Grenville limestone and sandstone is exposed or thinly drift covered in the northern part of the township, southwest of Lefaivre. The stone has many uses including road construction aggregate, but has not been extracted in the township.

In the central portion of the township, generally north of Alfred, the Ottawa Formation outcrops frequently and at least five quarries (locations 11, 14, 15, 16 and 17 - all of which are now abandoned) have been opened in the Black River beds which outcrop in a series of low northfacing escarpments which trend east-west across the township. The stone is well suited for use as concrete and asphalt aggregate and the old quarries could be reactivated, or new quarries established throughout the area. Locations 10, 12 and 13 are in the upper Trenton beds of the Ottawa Formation and are also now abandoned.

Generally, possible stone reserves in the township are large.

SAND AND GRAVEL RESOURCES

Seven pits, only one of which (location 1) is presently active, have been opened in the township. All are developed in deltaic silty fine to medium sand which

is suitable mainly for fill and for asphaltic blending sand in the less silty areas. Possible sand reserves are moderate and there are no appreciable gravel reserves in the township.

ALFRED TOWNSHIP
Extractive Activity

No.	M.T.C. No.	Name	Lot	Con.	Material
		A. Sand and Gravel Pits			
		i) Active Pits			
1.		M. Lavoie			Sand
		ii) Inactive Pits			
2.	H4-24	Tringue No. 1	8	6	Sand
3.	H4-25	LeMarche	10	5	Sand
		iii) Depleted or otherwise abandoned pits			
4.	H4-57	LaJunesse	6	5	Sand
5.	H4-73	R. Gratton	4	7	Sand
6.					Sand
7.					Sand
8.					Sand
9.					Sand
		B. Quarries			
		i) Active Quarries			
		ii) Inactive Quarries			
10.	H4-31	Ecole St. Joseph	8	6	Limestone Shale
11.	H4-75	C. LaLonde	11	4	Limestone
12.					Limestone
13.					Limestone
14.					Limestone
15.					Limestone
16.					Limestone
17.					Limestone

CALEDONIA TOWNSHIP

STONE RESOURCES

Two areas of thin drift cover, on the northern and southern boundaries of the township are underlain by the Sherman Fall and Cobourg beds of the Ottawa Formation. The only extractive activity in the township is a small quarry in these beds, from which subgrade aggregate is produced. Possible reserves of this material in the township are large.

SAND AND GRAVEL RESOURCES

There is a fairly extensive deltaic sand deposit stretching southwest from Routhier. The material is probably similar to the silty fine sands found elsewhere in the study area so can probably be used for fill and blending sand. There are no gravel reserves in the township.

CALEDONIA TOWNSHIP
Extractive Activities

No.	M.T.C. No.	Name	Lot	Con.	Material
		A. No known sand or gravel pits			
		B. Quarries			
		i) Active Quarries			
		ii) Inactive Quarries			
1.	A2-49	Leroux Bros.	12	8	Limestone

CAMBRIDGE TOWNSHIP

STONE RESOURCES

Two quarries have been opened in the township, both in the Sherman Fall beds of the Ottawa Formation. The production from both has been subgrade aggregate and some asphaltic stone. The three areas tested as quarry sites are also in the Sherman Fall beds and at each test area drift cover was less than 10 feet.

Stone from the Leray, Rockland and Hull beds may also be available under thin drift cover in the southwest corner of the township.

SAND AND GRAVEL RESOURCES

There are no gravel deposits in the township. Deltaic silty fine sand covers the northern half of the township and several sand pits have been opened, mainly to extract fill and blending sand. Possible reserves of this material are large.

CAMBRIDGE TOWNSHIP
Extractive Activities

No.	M.T.C. No.	Name	Lot	Con.	Material
		A. Sand and Gravel Pits			
		i) Active Pits			
		ii) Inactive Pits			
1	R9-15	L. Racine	14	7	Sand
		iii) Tested Areas			
2.	R9-2	L. LaFleche No. 2	5	7	Sand, Gravel
3.	R9-7	LaFrance	8,9	8	Sand
4.	R9-16	L. LaFleche No. 1	6	7	Sand
5.	R9-45	LaFleche	13	10	Sand
		iv) Depleted or otherwise abandoned pits			
6.	R9-27	F. Gagnon	26	2	Sand
		B. Quarries			
		i) Active Quarries			
7.	R9-11	V. Roy	29	5	
8.	R9-17	J. Richer	10	10	
		ii) Inactive Quarries			
		iii) Tested Areas			
9.	R9-30	Unknown	9,10	6	
10.	R9-42	Armstrong Bros.	30	5	
11.	R9-43	Richett	3	7	

CLARENCE TOWNSHIP

STONE RESOURCES

Areas of thin drift cover are found in several places in the township. In the area between North Indian Creek and the western border of the township, northwest of Hammond, the Sherman Fall and Cobourg beds of the Ottawa Formation are thinly covered. Location 15 in this area is a small quarry owned by the township (see Hewitt, 1964, P.40) which is suitable for production of subgrade aggregate.

There are extensive areas of outcrop and thin drift cover around and south of Rockland. Dolomite of the Oxford Formation is exposed in the immediate vicinity of Rockland and several quarries have been established in this material in the past. At Location 14 just north of the town concrete and asphaltic aggregate have been produced. Further south between Rockland and Clarence Creek, the Black River units of the Ottawa Formation are under thin drift cover. Location 18 has a 75 foot face of which the upper 25 feet is considered to be too shaley for asphalt or concrete aggregate. The material in the lower 50 feet however, is suitable for most uses.

East of Clarence and south of Highway 17 the Black River units are exposed in a low east-west trending escarpment. Several quarries could be developed in the area.

Generally, Clarence Township has very large possible reserves of high quality stone.

SAND AND GRAVEL RESOURCES

As with nearly all the townships in the study area, granular reserves in Clarence Township are virtually restricted to the deltaic silty fine sand deposits which cover much of the central and southern portions of the township. Of the 15 pits and tested areas noted by the Ministry of Transportation and Communications all are in silty fine to medium sand, which was used for fill or some types of blending sand.

There are no appreciable gravel reserves in the township.

CLARENCE TOWNSHIP
Extractive Activities

No.	M.T.C. No.	Name	Lot	Conc.	Material
		A. Sand and Gravel Pits			
		i) Active Pits			
		ii) Inactive Pits			
1.	R9-22	A. Longtin	17	5	Sand
2.	R9-23	Unknown	19	5	Sand
		iii) Tested Areas			
3.	T5-17	Lalonde	9	B.F.	Sand
4.	T5-18	Belanger	14	B.F.	Sand
5.	T5-19	Chartrand	D	4	Sand
6.	T5-20	Ritchie	1	4	Sand
7.	T5-21	Seguin	D	5	Sand
8.	T5-40	Henry	1	4	Sand
9.	R9-13	J. Guindon	19	10	Sand
10.	R9-19	J. Guindon	12	10	Sand
		iv) Depleted or otherwise abandoned pits			
11.	T5-23	Ramage	13	B.F.	Sand
12.	T5-28	Morris	Town of Rockland		Sand
13.	T5-30	Ditrusac	Town of Rockland		Sand
		B. Quarries			
		i) Active Quarries			
		ii) Inactive Quarries			
14.	T5-32	SynRock Enterprises Ltd.	Town of Rockland		Limestone
15.	R9-18	Township of Clarence	Town of Rockland		Limestone
16.	R9-1	Gagnier	21	7	Limestone
		iii) Abandoned Quarries			
17.	T5-16	Presley	4	B.F.	Dolomite
18.	T5-26	Talbot	B	B.F.	Limestone

EAST HAWKESBURY TOWNSHIP

STONE RESOURCES

Stone from the Nepean, Oxford and St. Martin Formations is available for extraction in the township. There are two small areas where drift cover is thin over the Nepean, just southeast of Ste. Anne de Prescott. Stone from the Nepean has been used elsewhere for subgrade aggregate, abrasives, and in glass making.

East of Little Rideau Creek there is a large area of thin drift cover over the St. Martin and Oxford Formations. In this area location 23 is an active quarry which produces acceptable granular base course "a". Locations 24, 25 and 26 are tested areas. Testing indicated that the top 15 to 20 feet of material was acceptable for subgrade aggregate but that increasing shale content lower restricted possible uses. Stone from the Oxford Formation is also available under thin drift cover to the east of Chute à Blondeau.

Possible stone reserves in the township are moderate and the stone is acceptable for most road building and construction uses.

SAND AND GRAVEL RESOURCES

More than 20 sand and gravel pits have been opened in the township, four of which are presently active. Locations 1 and 4 are developed in a buried ice-contact stratified drift deposit, which extends under deltaic sands

into West Hawkesbury Township. Pit-run gravel is produced from the pits, which is suitable for subgrade aggregate. There may be moderate possible reserves in the vicinity of these pits. Small to moderate possible reserves may be found in the vicinity of Locations 2, 9, 11, 12 and 21. The material in these pits consists of approximately ten feet of silty sandy gravel over till and is generally acceptable only as fill or lower grades of subgrade aggregate (due to poor stone quality).

Sand is common throughout the township and numerous pits have been opened in the past. The sand is used only for fill and some grades of blending sand because of its fineness and silt content.

EAST HAWKESBURY TOWNSHIP
Extractive Activities

No.	M.T.C. No.	Name	Lot	Con.	Material
		A. Sand and Gravel Pits			
		i) Active Pits			
1.	H4-34	A.R. Cadieux	37	1	Sand,Gravel
2.	L1-6	Henderson (operated by Dibblee)	1	1	Sand,Gravel
3.		Rosenstein			Sand
4.		L. Cyr			Sand,Gravel
		ii) Inactive Pits			
5.	H4-59	H. Montgomery No. 2	30	1	Sand
6.	L1-8	A. LaChaine	19	1 B.F.	Sand
7.	L1-9	A. LaChaine	18	B.F.	Sand
8.	L1-13	Kennedy	12	2	Sand
9.	L1-19	A. Belanger(operated by Dibblee)	1	1	Sand,Gravel
10.	L1-20	A. LaChaine	18	1	Sand
11.	L1-23	A. Snipman (operated by Dibblee)	2	1	Sand,Gravel
12.	L1-24	Gareau	4,5	1	Sand,Gravel
13.					Sand
14.					Gravel
15.					Sand
16.					Sand
		iii) Tested Areas			
17.	H4-78	Conway	25	2	Sand,Gravel
18.	VI-2	Unknown	6	7	Gravel
		iv) Depleted or otherwise abandoned pits			
19.	VI-20	Martineau	5	7	Sand
20	VI-21	K. Fraser	8	8	Sand
21.					Till
22.					Gravel
		B. Quarries			
		i) Active Quarries			
23.	H4-47	Hawkesbury Country Club	29	1	Limestone
		ii) Inactive Quarries			
		iii) Tested Areas			
24.	H4-72	H. Allison	28	4	Limestone, Shale
25.	H4-79	Hughes	26	2	Limestone, Shale
26.	H4-81	Leduc	25	3	Limestone, Shale

LONGEUIL TOWNSHIP

STONE RESOURCES

The Ottawa Formation is at surface or thinly drift covered over a considerable portion of the township. There is a large area of outcrop of the Black River beds of the Ottawa Formation in the vicinity of L'Ange Gardien, where the L'Original Quarry of Bertrand et Frere is presently being operated (location 4). Production from the quarry is 7/8 inch crusher run stone that is well suited as asphalt and concrete aggregate. Possible reserves of good quality crushed stone are very large in the township and quarries could be established at several places.

South and southwest of Cassburn the underlying bedrock is the Sherman Fall and Cobourg beds of the Ottawa Formation which can be used for some types of subgrade aggregate. Possible reserves of this material are large in the township.

SAND AND GRAVEL RESOURCES

M.T.C. files list only one sand pit in the township. Location 2 is a small sand pit which was operated for back fill and sand cushion. Testing in the area (Location 1) shows some further reserves of similar material. The soils map of the area indicates that the sand deposit may extend from Cassburn to Sandy HIlls and north to L'Orignal. There are no appreciable gravel deposits in the township.

LONGEUIL TOWNSHIP
Extractive Activities

No.	M.T.C. No.	Name	Lot	Con.	Material
		A. Sand and Gravel Pits			
		i) Active Pits			
		ii) Inactive Pits			
		iii) Tested Areas			
1.	H4-35	G. LaRiviere			Sand
		iv) Depleted or otherwise abandoned pits			
2.	H4-48	Chevrier			Sand
		B. Quarries			
		i) Active Quarries			
3.	H4-16	Bertrand		4	
		ii) Inactive Quarries			
		iii) Abandoned Quarries			
4	H4-42	Poirier			Limestone

NORTH PLANTAGENET TOWNSHIP

STONE RESOURCES

The Ottawa Formation is at or near the surface in a series of low east west trending escarpments southeast of Treadwell, just east of Jessup's Falls, and north and north west of Centrefield. Possible reserves of material from both the Black River and the Trenton beds are considerable and quarries could be established at several places to supply good quality concrete and asphalt aggregate.

The three quarries in the township (Locations 29, 30 and 31), though not presently active have large reserves of good quality stone and in the past have produced asphalt aggregate and granular base course "a" "b" and "c".

SAND AND GRAVEL RESOURCES

Twenty-eight pits have been operated in the township all of which are developed in deltaic sand deposits. Locations 1, 2 and 3 are large active pits which extract sand for fill, sand cushion and some grades of blending sand. Local variation of the silt content of these deposits can make material unsuitable for any use. For example, in all the tested areas shown (Locations 9 to 20) the sand was found to be either too fine or too silty for most uses. However, the sand can nearly always be used as fill. There are no gravel reserves in the township.

NORTH PLANTAGENET TOWNSHIP
Extractive Activities

No.	M.T.C. No.	Name	Lot	Con.	Material
		A. Sand and Gravel Pits			
		i) Active Pits			
1.		La Framboise		3	Sand
2.		R. James		4	Sand
3.		R. LaPointe		7	Sand
		ii) Inactive Pits			
4.		L. McKinnon		5	Sand
5.	A2-27	P. Sauve	7	9	Sand
6.	A2-59	N. Decaire	9	8	Sand
7.	A2-62	J.J. Seguin	7	9	Sand
8.	T5-1	Bercier Nos. 1 & 2	18	1	Sand
		iii) Tested Areas			
9.	T5-3	St. Denis	11	2	Sand
10.	T5-4	Portelance	11	2	Sand
11.	T5-10	J.M. Jubainville	27,28	2	Sand
12.	T5-11	Chateron	32	2	Sand
13.	T5-44	W. Gour	15	4	Sand
14.	H4-19	Daoust	5	4	Sand
15.	H4-29	E. Arpin	2	5	Sand
16.	H4-30	H. Campbell	3	4	Sand
17.	H4-66	A. Daoust	5	5	Sand
18.	A2-58	R. Derepentigny	11	8	Sand
19.	A2-64	E. Rehak	8	8	Sand
20	A2-65	D. LaLonde	8	8	Sand
		iv) Depleted or otherwise abandoned pits			
21.	T5-5	Prevost	14	2	Sand
22.	T5-9	Delorme	17	2	Sand
23.	T5-12	J. Gratton	34	2	Sand
24.	T5-39	Viau	35	2	Sand
25.	T5-41	M. Blondin	13	2	Sand
26	H4-20	Blondin	1	5	Sand
27.	H4-28	G. Fitzgerald	5	4	Sand
28.	H4-67	G. Fitzgerald	5	3	Sand
		B. Quarries			
		i) Active Quarries			
		ii) Inactive Quarries			
29.	T5-7	M. LaFleche	9	3	Limestone
30.	T5-13	Pidgeon	24	2	Limestone

No.	M.T.C. No.	Name	Lot	Con.	Material
31.	T5-8	iii) Abandoned Quarries Deschamps	19	2	Limestone

SOUTH PLANTAGENET TOWNSHIP

STONE RESOURCES

Most of the township is heavily drift covered with the exception of two small areas in the extreme southeast where two quarries have been opened in the Cobourg beds of the Ottawa Formation. Location 3 is active and produces crushed stone suitable for asphaltic stone and granular base course aggregate. The beds exposed at location 4 are more shaley and thus are more restricted in their use. Local shale content will be a major factor in choosing a quarry site in the Sherman Fall and Cobourg beds. There is a small area of thin drift cover, just northwest of Ste. Rose de Prescott which is also underlain by the Cobourg beds.

Generally possible stone reserves in the township are large.

SAND AND GRAVEL RESOURCES

The only source of granular material is the deltaic deposits which occur in a broad band across the centre of the township. Location 1, the only pit opened in this material, is abandoned and is developed in sand too fine and silty for most uses.

Generally South Plantagenet Township has low granular reserves and the material available is of poor to fair quality.

SOUTH PLANTAGENET TOWNSHIP
Extractive Activities

No.	M.T.L. No.	Name	Lot	Con.	Material
		A. Sand and Gravel Pits			
		i) Active Pits			
		ii) Inactive Pits			
		iii) Depleted or otherwise abandoned Pits			
1.	A2-48	Unknown	6	15	Sand
2.	A2-74	L. Lalonde	7	20	Sand
		B. Quarries			
		i) Active Quarries			
3.	A2-139	M. Ranger	7	20	Limestone
		ii) Inactive Quarries			
		iii) Abandoned Quarries			
4.	A2-28	E. Martin		20	Limestone

RUSSELL TOWNSHIP

STONE RESOURCES

Four quarries have been opened in the township, all of which are now inactive or abandoned. Location 9 is developed in the Oxford Dolomite and crushed stone from the quarry was used for subgrade aggregate. In the vicinity of Felton the Oxford outcrops frequently and several quarries could be established in this area. The Black River units of the Ottawa Formation outcrop just south of Embrun and stone has been extracted at Locations 7 and 8 to produce concrete and subgrade aggregate.

North of Russell, red shales of the Queenston Formation are available under relatively thin drift cover (as mentioned previously the till in the area is almost always deposited directly on bedrock and is usually less than 20 feet thick). The shale has been quarried in the area for use in brick manufacture.

SAND AND GRAVEL RESOURCES

In the vicinity of North Russell and Felton several beach and bar deposits have been developed on the till. They are similar to those described in West Hawkesbury Township, being generally 10 to 15 feet thick, and consisting of sandy cobbly to bouldery gravel. Pits have been developed in these deposits in the past but none are presently listed as sources by the M.T.C. Small to moderate possible reserves may be available in the vicinity of the abandoned pits.

One sand pit and 3 tested areas are shown in the deltaic sand deposit northeast of Felton. The deposit consists of silty fine sand and can be used as fill and some grades of blending sand. Further reserves of similar material are available in the northeast portion of the township.

RUSSELL TOWNSHIP
Extractive Activities

No.	M.T.C. No.	Name	Lct	Con.	Material
		A. Sand and Gravel Pits			
		i) Active Pits			
		ii) Inactive Pits			
1.	W7-130	J. Pattenaude	2	4	Sand
		iii) Tested Areas			
2.	W7-128	Heeney	2	4	Sand
3.	W7-129	N. Beaudin	3	4	Sand
4.	W7-133	M. Jaunsems	1	4	Sand
5.	W7-148	L. Marion	B	4	Sand
		B. Quarries			
		i) Active Quarries			
		ii) Inactive Quarries			
6.	R9-28	Dibblee Constn. Ltd.	9,10	10	
7.	R9-32	J.G. Boudreau	7	7	
8.	R9-53	G. Lanois (operated by Armstrong)	6,7	8	
		iii) Abandoned Quarries			
9.	W7-131	Buchanan	9	2	

WEST HAWKESBURY TOWNSHIP

STONE RESOURCES

Drift cover is thin over much of the eastern portion of the township, north of Vankleek Hill and stone from the St. Martin and Ottawa Formations is available for extraction at several potential quarry sites. Possible reserves in this area are considerable and a variety of good quality crushed stone products could be produced.

SAND AND GRAVEL RESOURCES

Extraction has centered on a series of Champlain Sea beach deposits stretching southwest from Vankleek Hill. More than a dozen pits have been opened and seven pits are presently active on some scale. The deposits are generally 10 to 15 feet thick and consist of cobbly to bouldery, silty sandy gravel. The stone, which has been derived from the underlying till is only of fair quality and in a few places is unsuitable for granular base course "a" and some grades of asphaltic stone.

Small to moderate further reserves can probably be found in the vicinity of existing pits and the material can be used for a variety of local road maintenance and road building purposes.

Locations 7 and 11 have been opened on the westward extension of the buried ice-contact stratified drift deposit described in East Hawkesbury Township. Small to moderate

possible reserves of fair quality gravel may be found in the vicinity of these pits.

Surficial mapping of the northern two thirds of the township has not been completed, but the soils map of the area indicates that fine deltaic sand may be available just southeast of Hawkesbury. Location 8 in this area is active and is developed in silty fine sand suitable for back fill and some grades of asphaltic blending sand. Possible sand reserves in the township are considerable.

WEST HAWKESBURY TOWNSHIP
Extractive Activities

No.	M.T.C. No.	Name	Lot	Con.	Material
		A. Sand and Gravel Pits			
		i) Active Pits			
1.	H4-60	Duval	10	6	Sand,Gravel
2.	H4-65	W.R. Newton	6	6	Gravel,Sand
3.	A2-67	E. Fitzpatrick	18	8	Sand,Gravel
4.	A2-97	A.J. MacCaskill	17	7	Sand,Gravel
5.	A2-96	J.F. Pollard	17	8	Gravel,Sand
6.					Sand
7.	H4-3	Atomic Const. Co.	1	1	Sand,Gravel
8.		Sinclair			Sand
9.	H4-1	McPhee	14	6	Gravel,Sand
10.					Gravel
		ii) Inactive Pits			
11.	H4-17	Parisienne	1	1	Sand,Gravel
12.	H4-64	J.D. Lalonde	4	6	Sand,Gravel
13.	H4-77	MacCallum No. 2	2	6	Sand,Gravel
14.	A2-20	Bertrand Bros.	15	7	Gravel,Sand
15.					Gravel,Sand
16.	H4-27	E.Duval	13	6	Sand,Gravel
		iii) Tested Areas			
17.	A2-93	S. Barton	18,19	8	Gravel,Sand
18.	A2-94	H. House No. 1	19	8	Sand,Gravel
		iv) Depleted or otherwise abandoned Pits			
19.	H4-15	MacCallum No. 1	3	6	Sand,Gravel
		B. Quarries			
		i) Active Quarries			
		ii) Inactive Quarries			
		iii) Tested Areas			
20.	H4-68	Dibblee	5	3	Limestone
		iv) Abandoned Quarries			
21.	H4-55	Stevens	9	3	Limestone

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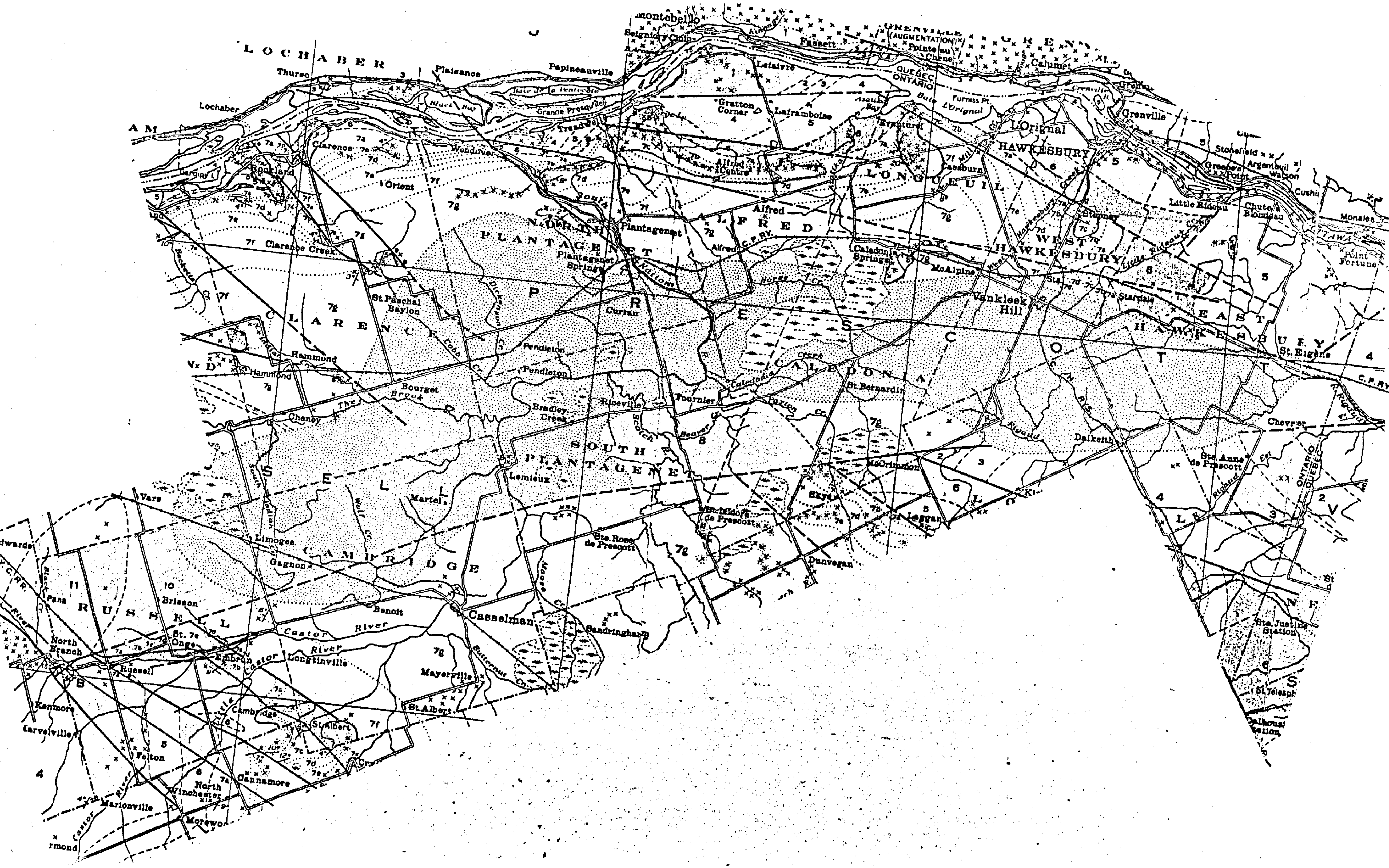

Montebello
LOCHABER
Thurso
Plaisance
Papineauville
Lochaber
Fassett
Pointe au Chêne
Calumet
GRENVILLE (AUGMENTATION)
QUEBEC
ONTARIO
Lefaivre
Gratton Corner
Laframboise
Grenville
L'Orignal
HAWKESBURY
Clarence
Rockland
Wendover
Treadwell
Orient
Alfred Centre
Cassburn
LONGUEUIL
Stonefield
Greece's Point
Argenteuil
Watson
Little Rideau
Chute à Blondeau
NORTH PLANTAGENET
Plantagenet
Plantagenet Springs
ALFRED
Alfred
Caledonia Springs
McAlpine
WEST HAWKESBURY
Clarence Creek
St. Paschal Baylon
CLARENCE
PRESCOTT
Curran
Vankleek Hill
Stardale
EAST HAWKESBURY
Point Fortune
Hammond
Pendleton
Bourget
CALEDONIA
St. Bernardin
St. Eugène
Cheney
Bradley Creek
Riceville
Fournier
Chevrier
Dalkeith
SOUTH PLANTAGENET
McCrimmon
Ste. Anne de Prescott
Lemieux
Martel
Skye
St. Isidore de Prescott
Laggan
Vars
Limoges
Ste. Rose de Prescott
CAMBRIDGE
Gagnon
Dunvegan
RUSSELL
Brisson
Benoit
Casselman
Sandringham
Castor River
North Branch
St. Onge
Embrun
Longtinville
Russell
Mayerville
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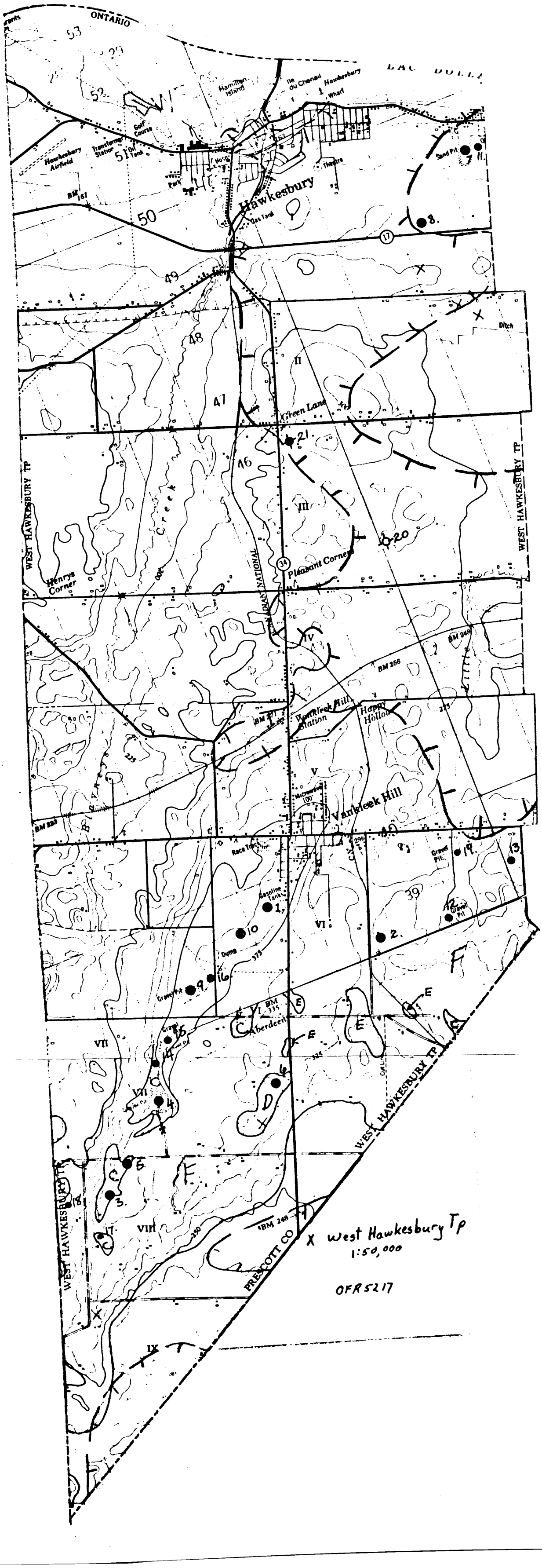

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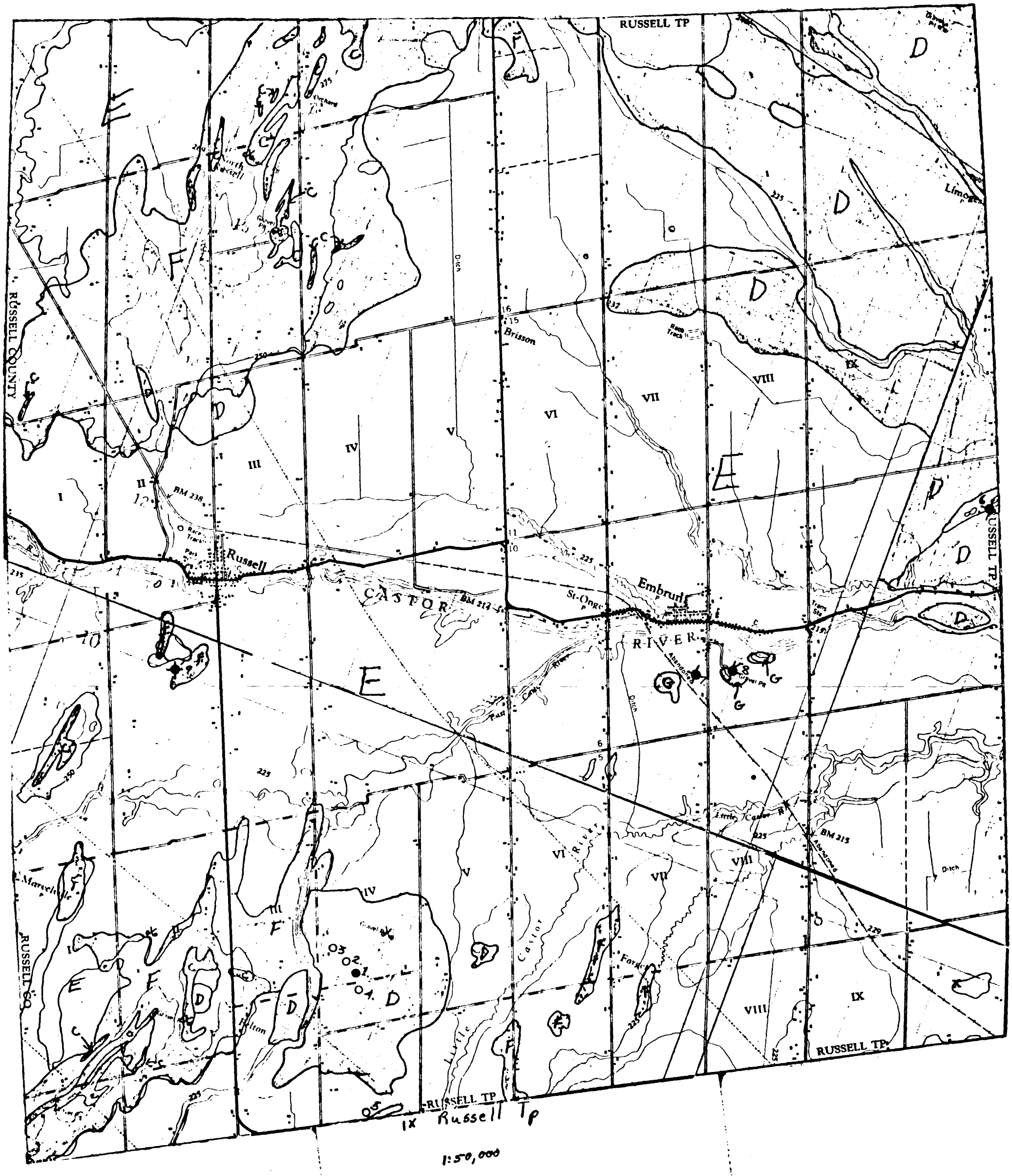

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SOUTH PLANTAGENET TP

SOUTH PLANTAGENET TP

PRESCOTT COUNTY

SOUTH PLANTAGENET TP

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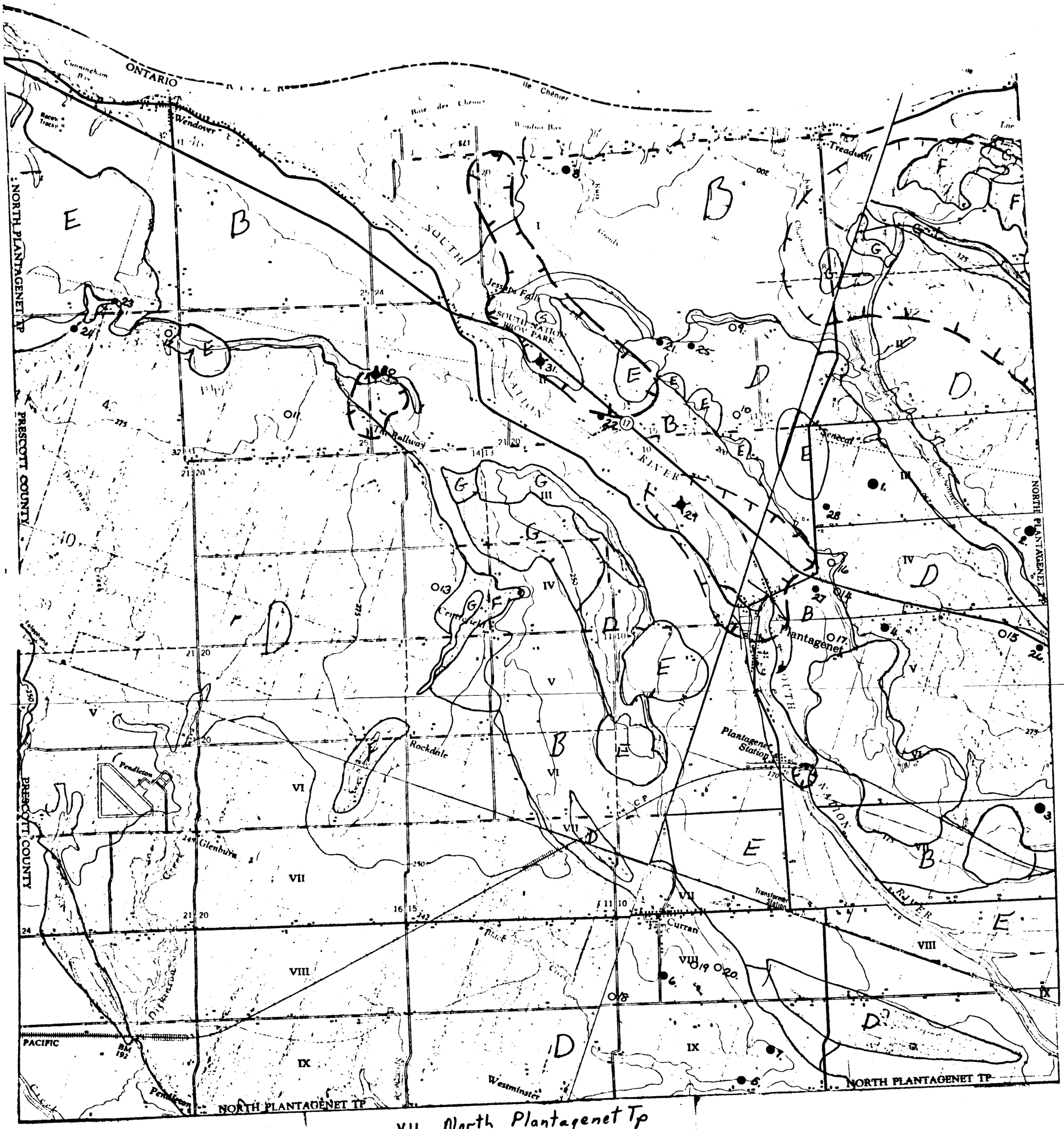

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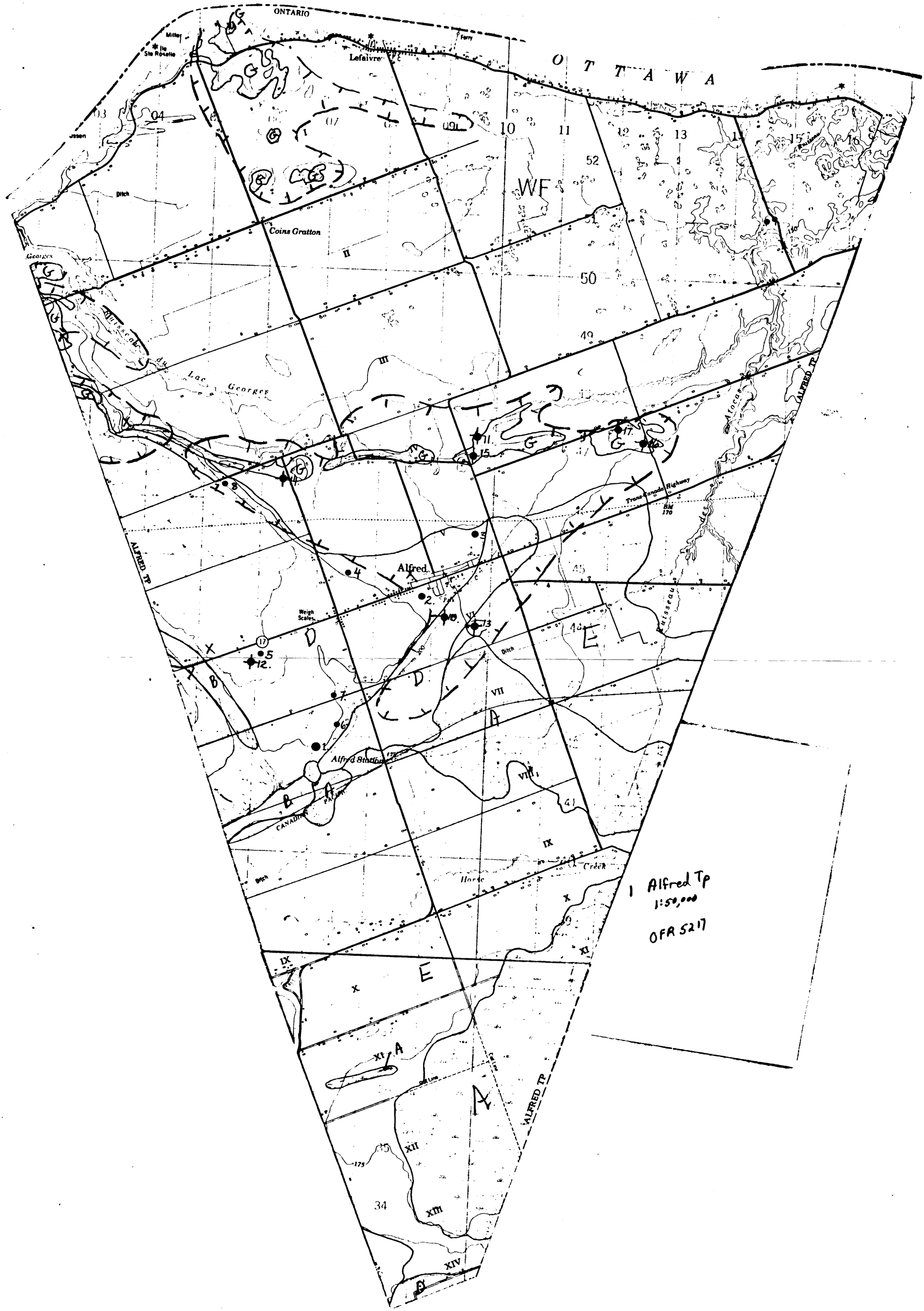
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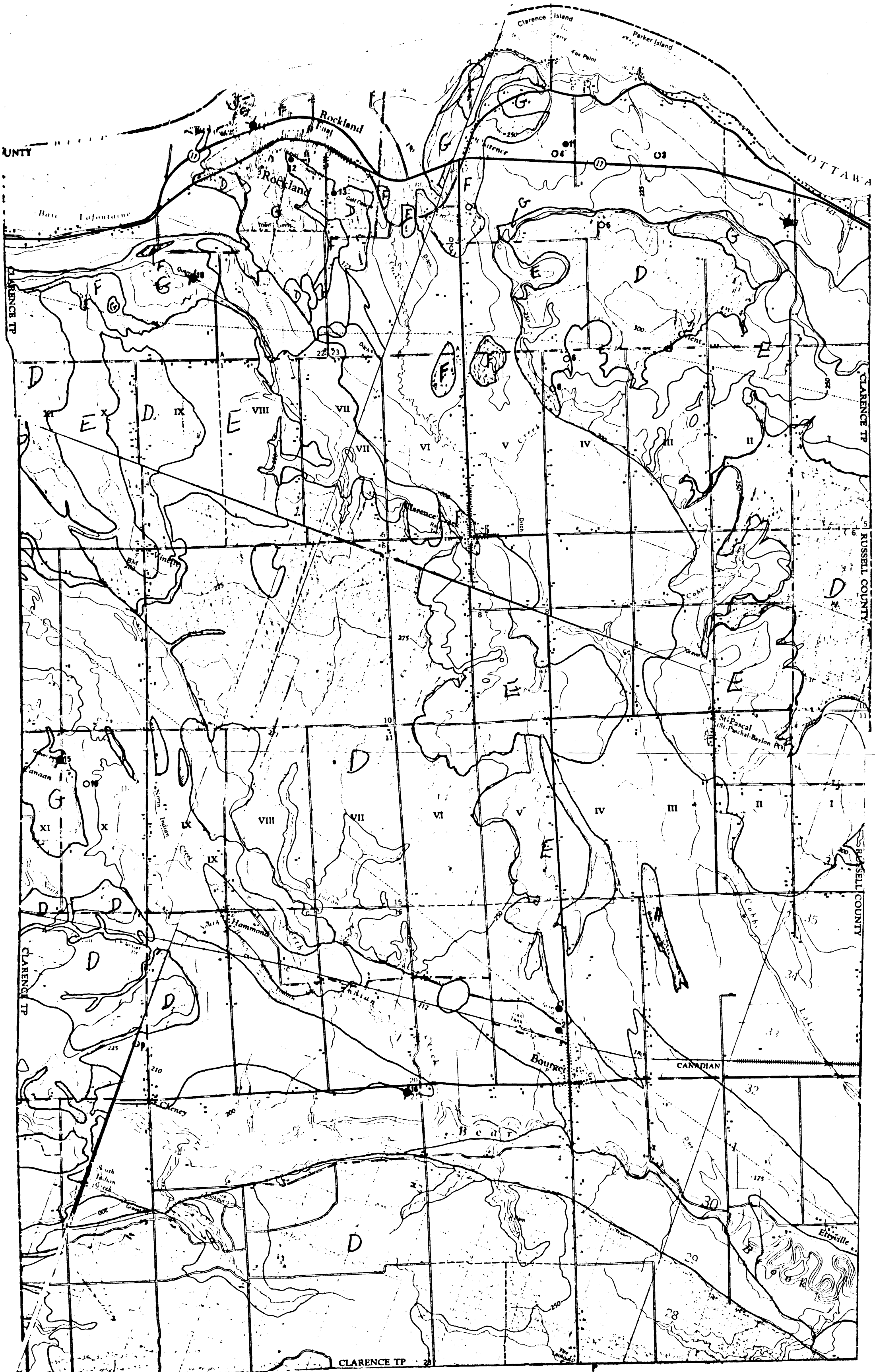

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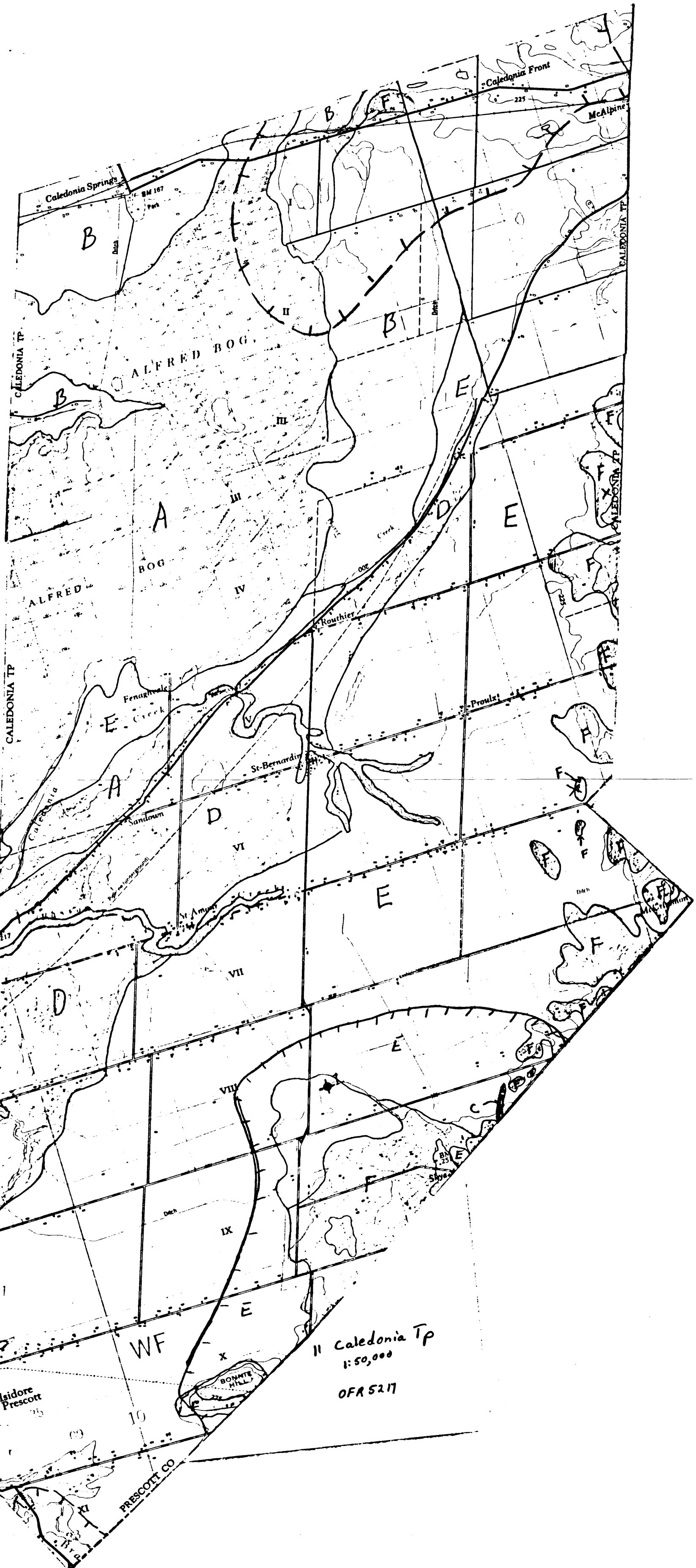

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CAMBRIDGE TP

CAMBRIDGE TP

Limoges

Gagnon

Martell Corners

Beaver

Castor

Little Castor River

Longueville

Benoir

Canadian

Canadian National

Russell County

Casselman

Moose Creek Bog

Maxville

St-Albert

Rockburn

RUSSELL CO

CAMBRIDGE TP

RUSSELL COUNTY Drain CAMBRIDGE TP

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111 Cambridge Tp.

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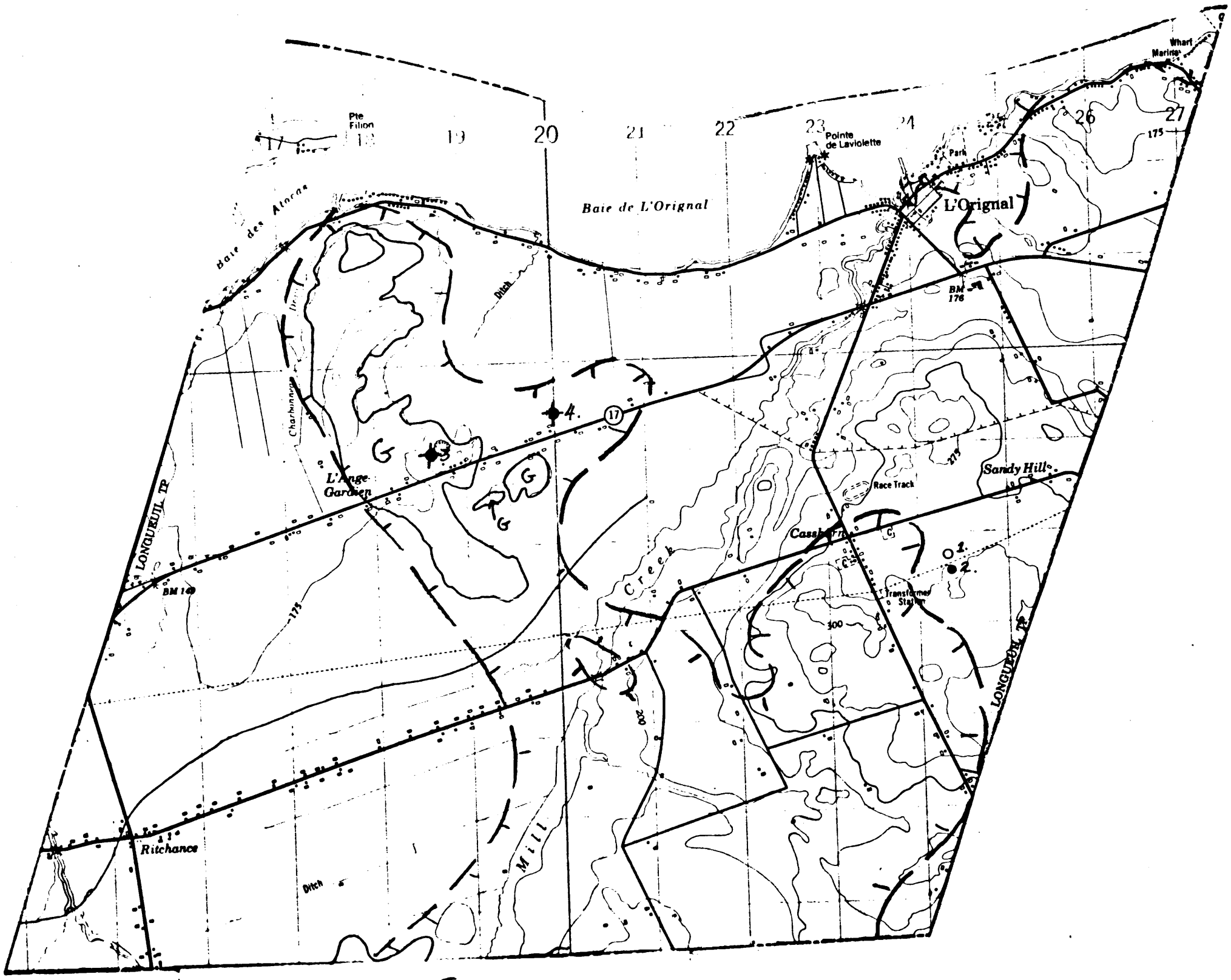

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