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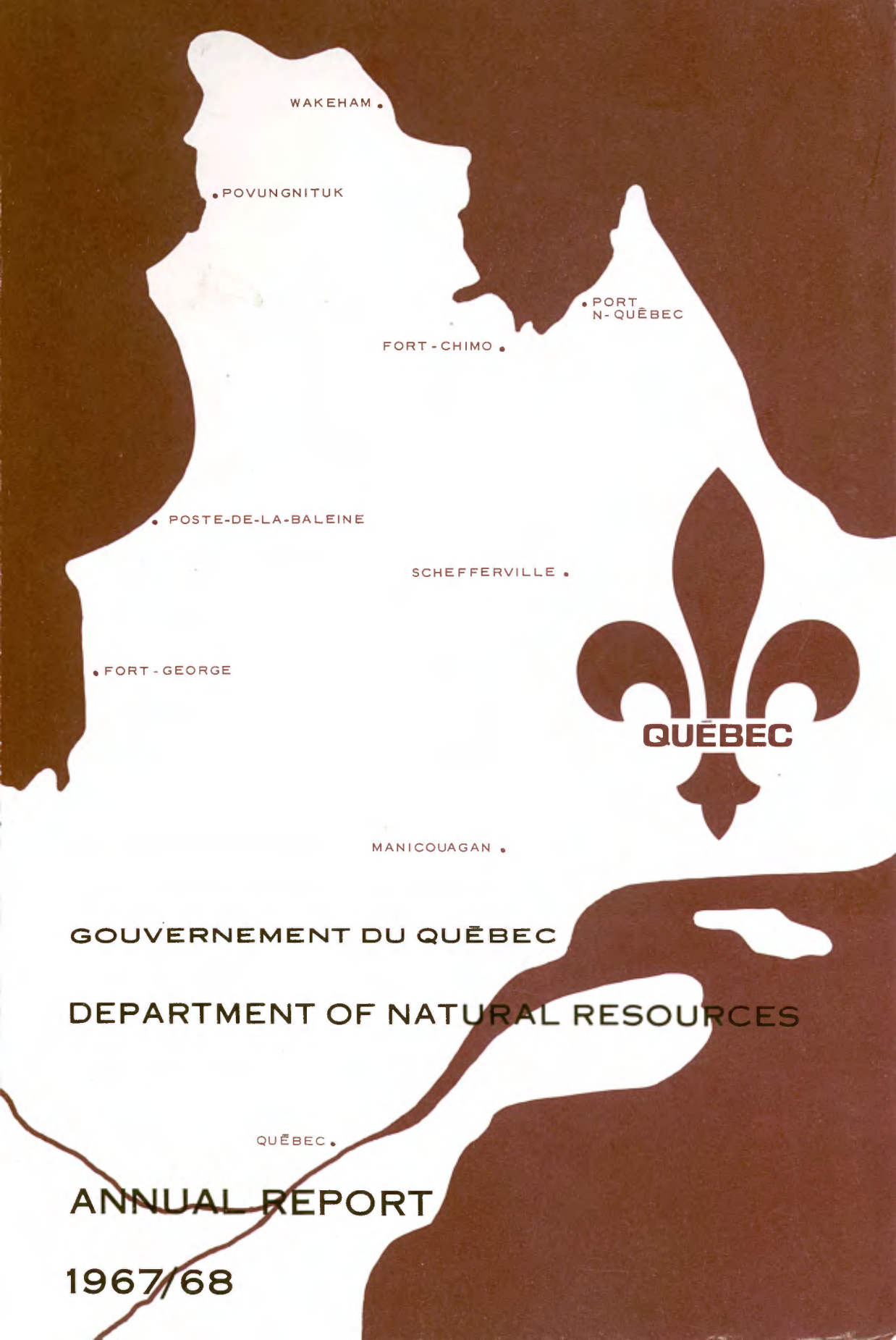


GOUVERNEMENT DU QUÉBEC

DEPARTMENT OF NATURAL RESOURCES

ANNUAL REPORT

1967/68

GOUVERNEMENT DU QUÉBEC

DEPARTMENT OF NATURAL RESOURCES

ANNUAL REPORT

1967/68

To His Honor
The Lieutenant-Governor HUGUES LAPOINTE, P.C., Q.C.,
Quebec

Your Honor:

I have the pleasure to submit to you the report
of the Department of Natural Resources
for the fiscal year ending March 31st, 1968.

Your respectful servant,

PAUL-E. ALLARD,
Minister of Natural Resources

Quebec, March 1, 1969

HONORABLE PAUL-E. ALLARD,
Minister of Natural Resources,
Quebec, Que.

Sir:

I have the honor to submit to you
the annual report of the Department
of Natural Resources covering the fiscal year
extending from April 1st, 1967, to March 31st, 1968.

It is made up of notes prepared
by the directors and the chiefs of services.

Your obedient servant,

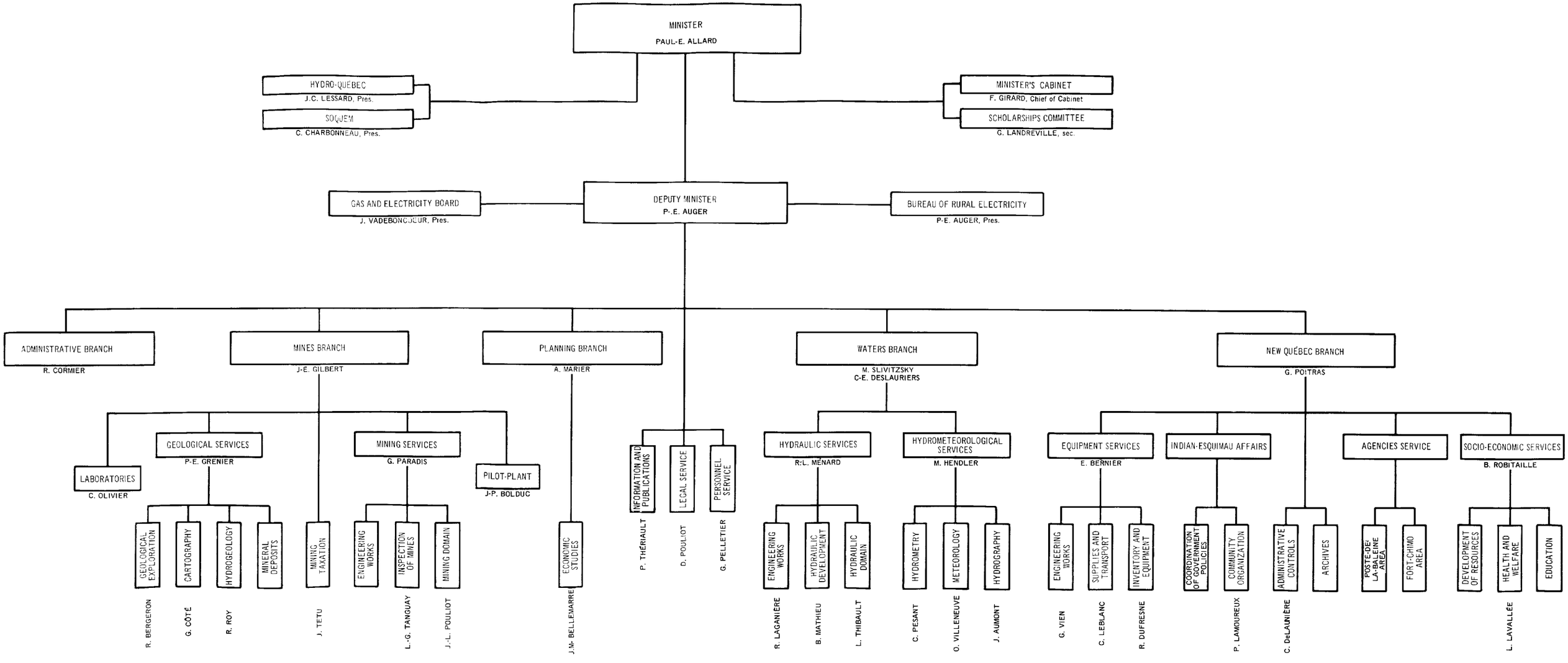
P.-E. AUGER,
Deputy Minister

Quebec, February 28, 1969

GOUVERNEMENT DU QUÉBEC

DEPARTMENT OF NATURAL RESOURCES

DIAGRAM OF UPPER ADMINISTRATIVE STRUCTURE



FEBRUARY - 1969

LIST OF BRANCHES AND SERVICES WITH NAMES OF CHIEFS

OFFICE OF THE DEPUTY MINISTER	
Information and Publications Branch	P. THÉRIAULT
Personnel Service	G. PELLETIER
Legal Service (Department of Justice)	D. POULIOT
Scholarships	G. LANDREVILLE
ADMINISTRATION BRANCH	R. CORMIER
Accounting Service (Department of Finance)	R. PLANTE
Purchasing Service	G. DURAND
Equipment Service	C. R. STANIFORTH
PLANNING BRANCH	A. MARIER
Economic Studies Service	J.-M. BELLEMARRE
MINES BRANCH	J.-E. GILBERT
Mining Taxation Service	J. TETU
Geological Services	P.-E. GRENIER
Geological Exploration Service	R. BERGERON
Mineral Deposits Service	
Regional Geological Office:	
Rouyn-Noranda, at Rouyn	J. MACINTOSH
Val-d'Or – Matagami, at Bourlamaque	M. LATULIPPE
Chibougamau – Lac Bachelor, at Chibougamau	G. DUQUETTE
Eastern Townships, Gaspé and Lac Saint-Jean, at Quebec	
Hydrogeology Service	R. ROY
Cartography Service	G. CÔTÉ
Mining Services	G. PARADIS
Mining Domain Service	J.-LS POULIOT
District Registrars at:	
Quebec	R. LANGLOIS
Amos	F. ADAMS
Chibougamau	R.-H. LEFEBVRE
Rouyn	T.-H. THÉBERGE
Montreal Agency	R. RICHER
Bourlamaque Agency	M. LAFOREST

Inspection of Mines Service	Ls-G. Tanguay
District Inspectors at:	
Montreal	M.-O. Lafontaine
Noranda	G. Courtemanche
Thetford	F. Cloutier
Quebec	G. Moscu
Chibougamau	G. Duchesne (Noranda)
Engineering Service (Mines)	
Laboratories Services	C. Olivier
Pilot-Plant Services	J.-P. Bolduc
WATERS BRANCH	M. Slivitzky
Assistant Director General	C.-E. Deslauriers
Hydraulic Services	R.-L. Ménard
Engineering Service (Waters)	R. Laganière
Hydraulic Domain Service	L. Thibault
Hydraulic Development Service	B. Mathieu
Hydrometeorological Services	M. Hendler
Hydrography Service	J. Aumont
Hydrometry Service	C. Pesant
Meteorology Service	G.-O. Villeneuve
NEW QUEBEC BRANCH	G. Poitras
Administrative Controls	C. De Launière
Archives	
Equipment Service	E. Bernier
Engineering Works	G. Vien
Supplies and Transport	C. Leblanc
Inventory and Equipment	R. Dufresne
Indian-Esquimau Affairs	
Coordination of Government Policies	
Community Organization	P. Lamoureux
Agencies Service	
Poste-de-la-Baleine Area	
Fort-Chimo Area	
Socio-Economic Services	B. Robitaille
Development Resources	
Health and Welfare	L. Lavallée
Education	

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OFFICE OF THE DEPUTY MINISTER

INFORMATION AND PUBLICATIONS BRANCH

For the purpose of facilitating the recruiting of geologists, mining engineers and other specialists for the mining industry, as well as for the government, the Information and Publications Branch pursued a program of orientation in secondary schools of Quebec.

The Branch thus complied with the second part of an elaborate plan extending over several years. It continued to make use of the information center created by the Bureau of Information for making available the best audio-visual techniques.

As in preceding years, the permanent committee on education of the Quebec chapter of the Canadian Institute of Mines and Metallurgy, in collaboration with the Department of Natural Resources, organized a series of meetings in secondary schools in order to brief students in the principal professions involved in the mining industry.

Each meeting consisted of a summary explanation of the various professions, by a representative member of the committee, the presentation of a film and, finally, by a forum in which students expressed their views and asked questions. These meetings have been featured for the last three years, and they are always a source of enthusiasm on the part of school authorities and of the students themselves, these latter being anxious to discuss, with members of the panel, the possibilities of careers in the mining industry.

Exhibitions

During the fiscal year reviewed here, the Information and Publications Branch discontinued its practice of participation in regional exhibitions upon the suggestion of the Quebec Bureau of Information and Publicity, which body prepared a general project for all Departments. The establishing of this project should begin at the end of the year 1968.

Nevertheless, the Branch took an intensive part in the geology week that took place at the École Polytechnique in Montreal, and it undertook, in collaboration with the Exhibition Service of the Department of Agriculture, the building of a large-scale animated and lighted model, which is to be used at the Audio-visual Information Center on Bourlamaque Avenue in Quebec.

Other Activities

The Branch continued its collaboration with the Subcommittee on Information of CPAR (Comité permanent d'aménagement des Ressources). The task of this Subcommittee is to ensure publicity for projects approved by the CPAR. The latter advises the Government concerning works to be carried out under Federal Provincial agreements relating to ARDA (Agriculture and Rural Development Act).

In general, it is the responsibility of the Information Branch to publicize, usually in the form of press releases, administrative decisions as they are made by officers of the Department and also to prepare publicity articles and communiqués intended for various newspapers and scientific journals.

The demand for information addressed to the Branch is ever on the increase, especially on the part of students whose interest seems inclined toward the study of Quebec's natural resources. Many requests for information originate in other provinces and likewise from the United States. An effort is made to reply to all requests as quickly as possible either by forwarding to interested parties brochures or publications destined better to answer questions or by referring these inquiries to one or the other of the several services of the Department and even to other departments when preferable.

Editing

The Editing Division is responsible for the preparation, in view of their publication, of manuscripts of a scientific nature coming from the various Services of the Department, and it also attends to their translation and printing. Moreover, the Division has the task of preparing for the printer leaflets, circulars and forms for public and internal administrative use. More than a million and a quarter copies of various publications were printed under the supervision of this Division.

Following is a list of the brochures published during the fiscal year 1967/68:

Preliminary Geological Reports

567 – Northwest quarter of Rinfret township, by Gilles-O. Allard
568 – Southeast quarter of Nelligan township, by J. A. MacIntosh

Final Geological Reports

127 – Belleau – Desaulniers Area, by A. R. Philpotts
131 – Woburn – Mégantic-East – Armstrong Area, by R.-A. Marleau
132 – Hart – Jaune Area, by Leslie Kish
134 – Quinze Lake – Barrière Lake Area, by J.-Y. Chagnon
135 – Louvicourt Township, by J. I. Sharpe

Meteorology Service Publications

M. – 25 – Nuages et précipitations, by R. Gagnon, R. Perrier, and G.-O. Villeneuve

M. – 26 – Température minimale au niveau du sol, by R.-M. Gagnon

M.P. – 14 – Données météorologiques de la forêt Montmorency, by G.-O. Villeneuve

M.P. – 15 – Calcul de la longueur du jour, by G.-O. Villeneuve

M.P. – 16 – Programme des études du service de la Météorologie 1968

M.P. – 17 – Données météorologiques, station agronomique Université Laval

M.P. – 18 – Données météorologiques de la forêt Montmorency pour l'année 1967

Hydrography Service Publications

H.P. – 14 – Altitudes et description des repères

H.R. – 1 to H.R. – 68 – Quadrants

Hydrometry Service Publications

H.P. – 15 – Ajustement mathématique d'une courbe de tarage par juxtaposition de cubiques (méthode des points pivots), by Robert Théorêt

H.P. – 16 – Répertoire des stations hydrométriques en service au 31 mars 1968

A.H. – 4 – Annuaire hydrologique (1965)

Hydrological Decade Publications

D.H.Q. – 1 – Données météorologiques pour la rivière Eaton

D.H.Q. – 2 – Débits journaliers de la rivière Eaton

D.H.Q. – 3 – Relations entre les facteurs d'ordre géologique et les caractéristiques de l'écoulement, by H. St-Martin

New Quebec Publications

N.Q.E. – 6 – Mon premier livre d'esquimau

Special Series Publications

S. – 96 – Catalogue of Publications

S. – 103 – Field Work in 1966

S. – 104 – Report of the Department of Natural Resources, 1966/67

S. – 105 – List of Airborne Geophysical Surveys, by R. Paquet

S. – 106 – List of Maps Published by the Geological Services

S. – 107 – Bibliography on Heavy Minerals, by J. Radziminska-LaSalle and P. LaSalle

S. – 109A – Code Governing Gas Installations (reprint)

Various Publications

Forêt Montmorency (folder), by J. Déziel and J.-G. Fréchette
Carrières en Hydrologie (folder)

Reprints

During the year reviewed, the Editing Division, because of the great demand for certain publications, had to have reprinted the following:

6 preliminary geological reports;

1 final geological report;

8 final reports of the Meteorology Service;

3 preliminary reports of the Meteorology Service;

4 special series reports.

Library

Publication of the monthly bulletin that had been started in January 1966 was continued under a new format in 1967/68. In addition to certain summary information pertaining to the statistics and set-up of the library, the publication contains a list of the catalogued books and brochures, as well as a résumé of periodicals received.

During the year reviewed here, the library received 2,687 new publications consisting of 1,647 books and 1,040 brochures. A goodly part of these acquisitions were supplied to the Department of Natural Resources without charge. To this total it is necessary to add about 100 geological and other maps which were for the most part received gratuitously.

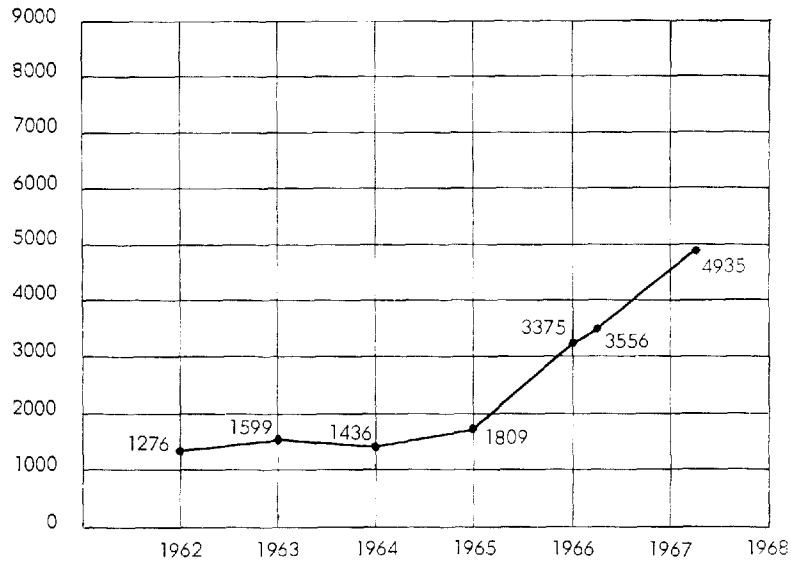
The number of volumes lent increased to 4,935, of which 370 publications were lent on an exchange basis with other libraries. Moreover, 4,167 visitors came to the library to consult its volumes.

The Library Division cancelled 344 subscriptions, 86 of which were free. Moreover, 48 subscriptions of members of various organizations and associations were paid from the library's budget. It is worthy of note that the Department's library has now 33,000 volumes (not counting bound periodicals) in its principal collection.

Activities of the library's lending section are demonstrated below.

STATISTICS

PUBLICATIONS LENT



NOTE :

The above totals do not include publications consulted in the library.

Distribution of Publications

The following is a summary of the work accomplished by the personnel responsible for the distribution of publications.

Publications distributed free of charge : 72,349 (maps excluded).

Publications sold : 6,534 studies and 4,582 maps.

Notices and press releases announcing the publication of 12 preliminary reports, 9 geological reports, 5 notices of various types and 13 different communiqués, making a cumulative total of 28,305 copies.

Collections of mineral and rock samples : 2,768 collections sold; 64 distributed free of charge.

Pamphlets and meteorological bulletins distributed free of charge : 34,226.

Personnel Service

The fiscal period of 1967/68 was a rather difficult one for the Personnel Service. Indeed, because of a reduced personnel, the Service was obliged to exert itself considerably in order to give the Department of Natural Resources the regular services which that body has a right to expect from the Personnel Service.

After the introduction of the austerity program, its activity in the field of recruiting was diminished. On the other hand, the interpretation and administration of the various collective agreements necessitated greater effort on the part of the menagement officers of the Personnel Service. Complaints were more numerous and required the Director of Personnel to give much more of his time to their study and settlement. Contacts with units of the central management, such as the Labor Relations Branch, the Civil Employees Commission, Personnel Control Branch, etc., multiplied and forced officers of the Personnel Branch to devote much more of their time to this type of work.

Personnel

On April 1, 1968, the Department, including the Gas and Electricity Board, had 812 persons in its employ. During the fiscal year reviewed here, 130 new employees joined the Department and 91 persons left its service. The 812 employees of the Department were distributed according to the following categories:

1. Professionals and Staff	214
Agronomist	1
Surveyors	3
Lawyers	3
Librarians	2
Biologists	3
Chemists	10
Accountants	4
Industrial relations officers	2
Economists	10
Geographers	5
Geologists	30
Civil engineers	60
Chemical engineers	7
Electrical engineers	6
Forestry engineers	4
Geological engineers	22
Mechanical engineer	1
Metallurgical engineers	7
Mining engineers	14

Engineering physicists	2
Physician	1
Metallurgist	1
Meteorologists	5
Notery	1
Philosopher	1
Physicists	2
Politicologist	1
2. Civil Employees	557
3. Laborers	41
Total	812

LEGAL SERVICE

The Legal Service has the responsibility of studying legal problems with a view to solving them and of carrying out multiple other tasks relating to the application of the prescriptions of the Mining Act, the Mining Duties Act, the Water-courses Act, and related Acts.

As in previous years, the Legal Service provided assistance and counsel on all questions within its jurisdiction, notably on those pertaining to the drawing up of leases and contracts, as well as to the drafting of Orders in Council.

The Legal Service made several recommendations for the solution of numerous conflicts and, on certain occasions, pleaded cases before the Mining Tribunal.

Expressing legal opinions continues to be an important part of the Legal Service's work. These opinions are given upon request from the various Branch directors and directors of Services of the Department of Natural Resources. They concern the mines themselves and necessitate the study of agreements made between the Department and different organizations. Legal opinions are likewise issued by the Service at the request of the general public.

SCHOLARSHIPS

The Legislature voted the sum of $100,000 for scholarships to students in mining engineering, geology, metallurgy, hydraulics, hydroelectricity, hydrology, meteorology or other related sciences.

The Minister appointed two separate selection committees to study the files of applicants for these scholarships.

Selection committees for the fiscal year 1967/68:

MINERAL SCIENCES	HYDRIC SCIENCES
Eugène LAROCHELLE, chairman	Yvon DEGUISE, commissioner, Hydro-Québec, chairman
Arthur DUBÉ, director, Department of Mines and Metallurgy, Faculty of Science, Laval University	Raymond BOUCHER, director, Department of Civil Engineering, École Polytechnique
Robert SABOURIN, director, Department of Geology, Faculty of Science, Laval University	Bernard MICHEL, professor, Department of Civil Engineering, Faculty of Science, Laval University
Paul-E. RIVERIN, president, Corporation de l'École Polytechnique	Michel NORMANDIN, dean of the Faculty of Science, Sherbrooke University
V. A. SAULL, professor, Department of Geologic Sciences, McGill University	Svenn ORVIG, professor, Department of Meteorology, McGill University
J.-E. GILBERT, director general of mines, Department of Natural Resources	Gisèle LANDREVILLE, secretary
Gisèle LANDREVILLE, secretary	

First of all, the committees study requests of candidates wishing to pursue studies leading to a master's degree or a doctorate. They then consider students taking regular courses, starting with those candidates seeking a renewal of their bursary.

In both these cases, the academic attainments and financial circumstances of the applicants are the main considerations.

The total number of scholarships awarded in 1967/68 was 132. These scholarship students were enrolled at the following universities.

Post-graduate Grants

	Mineral Sciences	*Hydric Sciences*	*Others* *
Laval University	7	5	1
École Polytechnique	4	—	—
University of Montreal	7	—	—

* Economic sciences.

	Mineral Sciences	*Hydric Sciences*	*Others* *
McGill University	1	—	—
University of Waterloo	—	1	—
Harvard University	—	1	—
University of Purdue	1	1	—
University of Kansas	1	—	—
University of Illinois	1	—	—
Imperial College, London	2	—	—
	24	8	1
TOTAL		33	

Candidates in regular courses

Laval University	47	2	—
École Polytechnique	36	—	—
University of Montreal	4	—	—
McGill University	9	—	—
Loyola College	1	—	—
	97	2	
TOTAL		99	
GRAND TOTAL		132	

ADMINISTRATION BRANCH

The main tasks of the Administration Branch are the preparation and the control of budgetary expenditures by the Department of Natural Resources.

The Branch includes the Purchasing Service, the Equipment Service, and the Secretariate. It also embraces the Maintenance Division, which, in collaboration with the Department of Public Works, attends to problems arising from the installation and maintenance of the different premises of the Department.

With the retrocession to the Government of Quebec, in 1966, of the assets of Metal Mines Limited, in Chicoutimi, the Administration Branch assumed responsibility for the upkeep of that property.

Equipment Service

The number of vehicles belonging to the Department increased from 156 to 187, during the fiscal year under review here. It is the responsibility of the Equipment Service to keep these vehicles in good operating condition.

The Service likewise supplied the technical instruments and the camping material necessary for the 47 field parties assigned to carry out the Department's work programs. These field parties were directed by geologists, hydrologists, and by the engineers supervising the construction work on mine roads.

The Equipment Service was called upon for assistance by inspectors from the Meteorological Service before they started out on their circuits.

It may be pointed out that, whereas the Department's geological expeditions were less numerous than those of the preceding year, they were, nevertheless, considerably more extensive, and, as a consequence, the supply of material was virtually the same.

The Service continued to keep an inventory of all its equipment, the value of which is in excess of one million dollars. This equipment is stored in the Department's four warehouses: two in Quebec and two in Montreal.

PLANNING BRANCH

The Planning Branch was established in 1961 with the formation of the Department of Natural Resources by virtue of the Act which instituted the Department and made it responsible "for elaborating plans for the development, exploitation and transformation of the natural resources" of Quebec for the benefit of its population. To this end, the Branch was occupied during the following years with the analysis of the structure of sectors of natural resources under the jurisdiction of the Department or the Minister, such as electricity, mines and waters. This work introduced a suitable rationalizing of the best use of these resources in view of the economic growth and development of the territory. With this objective in sight, the Planning Branch contributed to projects specially by planning the regrouping of electricity distributing companies within Hydro-Québec in 1962, by establishing La Société québécoise d'Exploration minière (SOQUEM) in 1965 and, more recently in 1967/68, by proposing the formation of a technical Mission for the control of the waters of the Yamaska River basin, and the creation of La Société québécoise des Eaux for the realization of plans for the management of the entire basin of the area.

However, as its global studies of the sectoral order advanced and led to the application of diverse policies, so was the Planning Branch called upon to give economic advice at the request of the various services of the Department of Natural Resources in such manner that its initial role extended to that of counsel or liaison between the several units of the Department for the analysis and solution of their current problems. In this respect, the Branch was requested to examine the issuance of certain mining concessions and permits for processing concentrated ore, to study the advantages of work on the Chaudière River bed, to settle conflicts of an administrative order dealing with the management of resources, and to give advice concerning development projects in New Quebec. Thus the Planning Branch carries out more thoroughly its role of studying and coordinating, in respect to the Department as a whole, those matters which particularly concern socio-economic administrative decisions.

As the result of this evolution, it was deemed necessary to form the Planning Branch along the lines of the various sectors of the Department of Natural Resources in order that it might be more compatible with their present undertakings. Instead of all our economists being more or less occupied in the study on one occasion dealing with general problems and on another bearing on very specific questions relating one day to mines and on the next to waters, they were allocated during the fiscal period under review here to four sections which correspond to the major sectors of activity entrusted to the management of the Department. These four sectors are those of Mining Economy, New

Quebec, Waters and Energy. Such a division of studies permits each of these crews to study the files of the problems and works of the management services and to become specialized in those fields making up the Department of Natural Resources.

At the end of March 1968, the four sections of the Planning Branch were made up of 10 economists, one of whom was on study leave at L'École Nationale d'Administration, one geographer and one geologist who was lent by the Geological Services. Moreover, from September 1967, the Branch had the help of two French economists who were stationed in Quebec for 14 months under National Service, by virtue of agreements between the governments of France and Quebec. In addition to these the personnel of the Branch had a director general, one assistant and two associates. One of these, an electrical engineer and vice-president of the Bureau of Rural Electricity, was responsible specifically for questions pertaining to electricity having to do with Hydro-Québec, whereas the other was engaged more or less with incidental questions submitted for the consideration of the personnel of the Planning Branch by the various units of the Department of Natural Resources and sometimes on the request of other departments or organizations related to the Department.

Indeed, it is only normal that the Minister of Natural Resources would need, as the Minister responsible for the Bureau of Rural Electricity and of La Société québécoise d'Exploration minière (SOQUEM), to consult and be informed in view of the decisions to be taken. In this respect, the Planning Branch carries out the role of counsel and liaison. The same role applies to the collaboration that it is often called upon to lend to other departments, especially in the field of committees, of which the Permanent Committee for the Development of Resources (PCDR) and the committees formed by the Conseil d'orientation économique du Québec are other examples. It is within similar committees that the Planning Branch has, for example, taken part, during the fiscal year reviewed, in studies for promoting the development of resources in eastern Quebec (Lower North Shore, Sept-Iles, and its axes of development toward Labrador and southern Ungava) and for furthering the services of air transport necessary for our territory as a whole.

It is advisable to describe in more detail, on the one hand, the work accomplished by the various sections of the organization and, on the other hand, the work accomplished by the more qualified personnel of the Branch itself in response to problems submitted for its study.

Mining Economy Section

Studies conducted by the Mining Economy Section during the fiscal period reviewed were inspired by two main incentives; those were to extend the area under mining exploitation and to increase the role of the secondary mining sector by stressing the advantage of transformation of our mineral substances in Quebec itself.

For instance, it was in response to the first of these problems that a study of the stimulating effects of a highway network in mining regions such as Joutel, Matagami, the North Shore and Gaspésia was undertaken. The possibility of building access roads to the unexplored or undeveloped areas was given special consideration. This was done with a view to helping mining prospecting in particular and economic development in general rather than to continue to build roads exclusively upon request from mining companies for the purpose of extracting the ore after discovery or development of a deposit. Considering the advantages of such an investment, this study was conducted in collaboration with the mining engineering services, to propose a program of access roads to resources and to extend these general plans so that they would be equally applicable to other similar programs. On the other hand, another research of the same type, bearing on a project of a railway for the transport of ore from Hudson Bay to ports on the St. Lawrence, showed that this investment would not favor exploitation needs in this case. Moreover, the Mining Economy Section studied means to be adopted for the production of peat and building stone so as to make these items profitable. The results of its works were sent to the operators of these raw materials for the benefit of their operations.

It is well known, moreover, that the weakness of our mining industry results from the fact that most of the mineral substances mined in Quebec are exported as concentrates. This means that its creative opportunities in our general economy risk remaining almost negligible, since our ores will not, for the most part, be refined and much less be transformed in Quebec into finished products. On this score, the Mining Economy Section has sought first to identify and to evaluate the concentrates exported from Quebec, and then to examine the state of internal and external markets for these concentrates as finished products. The purpose of this study is to know the possibility of inducing the appropriate type of enterprise to transform these concentrates in Quebec. Up to the present it has thus studied the markets for salt, silica, mineral waters, asbestos, talc, vanadium, titanium and lithium.

One should also mention the participation of economists from the Mining Economy Section in the works of committees, be they internal or interdepartmental, established for the purpose of studying specific problems. There was, in one case, the examination of modifications concerning rentals, provided for by the Mining Duties Act, from certain mining companies, the leases of which matured in 1968. There were, in other cases, questions arising from circumstances which gave rise to the formation of governmental committees. One of these committees, presided by a representative of the Department of Labor, studied the possibility of forming a mining fund in Quebec for the purpose of obviating, through a program of readaptation of workers, dismissals when mines are closed. But the principal contribution of these interdepartmental committees unquestionably dealt with the thorough analysis of the report of the Commission of Inquiry (Carter) on the financial system in Canada and the results of its eventual application. An economist of the Mining Economy Section took part, over a period of several months, in the governmental committee formed for this end, and he prepared a special report for the Department

of Natural Resources on the repercussions of the recommendations of the Carter Commission on the mining industry of Quebec.

Lastly, the first bulletin on the mining situation, prepared by the Mining Economy Section and distributed among the various units of the Department in February 1968, was to establish a basis from the value of the mineral production of Quebec in 1967. It was then deemed advisable to form, within the Department of Natural Resources, a committee to revitalize mining activity with the collaboration of the services of the Mines Branch and the Planning Branch for the purpose of adopting measures designed to assist a constant growth and a more complete integration of the mining industry with the general economy of Quebec. Relying on the network of analysis of governmental activity in the mining domain, the work of this committee should lead to the reconsideration, in a rational manner, of budgetary programs in what pertains to the management of our mineral resources.

Waters Section

During the fiscal year 1967/68, the Waters Section was engaged especially in reconciling the elements deemed necessary for the elaboration of a global policy on water. This was done in direct collaboration with the Waters Branch and in response to the problems facing Quebec in this field. Moreover, it carried out studies especially for the Department of Natural Resources and other organizations.

In fact, the management of waters creates numerous problems in Quebec. The first of these problems are those resulting from our archaic laws, the conflicts stemming from jurisdiction between different administrations and the divided intervention of several Quebec departments and municipalities in the domain of water. There is, on the one hand, a growing demand for water especially in the urban centers for domestic, industrial and sportive needs, whereas the sources of pure water are becoming more and more rare and distant by reason of pollution of our lakes and streams. For example, it is necessary to provide for harmonizing the use of water for the various needs of drinking, log floating, swimming and the life of fauna, while carrying on the fight against flooding and erosion. But these objectives would not be attained in a satisfactory manner, even at great expense, by organizations or municipalities in an isolated state. Rather the interest of all users of this commodity should urge them to collaborate in a rational management of all streams or of a hydrographic basin according to a plan which respects the diversity of uses and needs. The elaboration and carrying out of similar plans of control depend no less on the coordination of administrative services and collective efforts, the imposing of the common disciplines, and the knowledge and the research associated with the analysis and control of waters.

From a consideration of the various aspects relating to the problem of water, the Waters Section lists the elements of a solution under four headings as follows:

1. the judicial and administrative aspect of the management of water;
2. the integrated control of water resources;
3. the drawing up of these plans for control; and
4. the scientific and technical research, the formation of specialists.

A comparative study of the judicial and administrative aspect of water management in Quebec and in certain foreign countries has been conducted, during several years, to propose the institution of a study commission on the judicial problems connected with water. It would appear that, indeed, the revision of our laws and the reorganization of administrative services would constitute the first element of a general policy on water in Quebec. The Waters Section took part in the definition of the mandate and of this commission which the Government is getting ready to create at the close of the fiscal year.

On the other hand, the interdependence between the various uses of water should lead to the obligatory integrated management of the water resources of a basin, of which multi-purpose works should meet the many objects and at the same time reconcile the numerous uses and the most advantageous technical solutions for common ownership. Such is the second element of a general policy on water. To whom is the elaboration of these water management plans of hydrographic basins confided? Research undertaken on this subject has prompted the recommendation of the interdepartmental technical Mission charged with the direction of studies and the preparation of the liaison plan with a consulting committee representing the regional interests. It has been proposed to put this formula to the test for the management of the waters of Yamaska River basin, which should be commenced in 1968.

Moreover, it is necessary to implement a management plan, once it is defined. Thus, the third element of the water policy should consist in the recommendation to set up organizations for the control of basins, such as "Sociétés régionales des Eaux", responsible before the users of the water management plans being realized, particularly for the carrying out of collective works as reservoir dams. One can conceive these regional companies placed under the direction of a central control, a "Société québécoise des Eaux" (SOQUAUX), which could supply them, as subsidiaries, with technical and financial aid. However, one need not see in this proposal only a project, which was moreover submitted in plans of great detail at the close of the fiscal year 1967/68 to the departments and organizations concerned in a manner to know their opinions and observations.

Lastly, scientific and technical research, as well as the formation of specialists in the domain of waters, has occupied the attention of the economists of the Waters Section. Having concluded that the teaching of sciences pertaining to water is very insufficient in Quebec, in view of the problems of pollution, scarcity, and control arising from the rational management of waters, the Planning Branch came to the decision that a Research Institute dealing with water would be able to fill this gap by linking information with research within the framework of the University of Quebec project, such as is being promoted by the Department of Education.

In addition to these elements of a water policy, the Water Section is responsible for certain special studies which were prepared for the Waters Branch and other organizations. Thus it examined a number of questions concerning litigation between the Federal administration and the Government of Quebec, for instance, the subject of jurisdiction pertaining to navigation for pleasure or the transfer of beach or deep-water lots to the Federal Government. Moreover, a study was undertaken with a view to defining financial standards applicable to works that the Department of Natural Resources carries out on streams at the request of the municipal councils. In fact, the chief of the Waters Section took part, in the name of the Department of Natural Resources, in works of the technical subcommittee on western Quebec, which the Permanent Committee for the Development of Resources (PCDR) had formed for the purpose of submitting to the government the means deemed suitable for stimulating the development of western Quebec.

New Quebec Section

The Planning Branch continued, during the fiscal period 1967/68, to participate in committees on Indian affairs in collaboration with the Mines Branch, the Department of Intergovernmental Affairs and representatives of the Federal Department of the Canadian North and Indian Affairs for the purpose of finding concrete solutions to the problems confronting groups of Indians living near certain mining villages. These efforts were frequently directed toward helping these Indians to become integrated into the environment of White society by giving them easy access to dwellings as well as school and municipal services. Having no authority to bind their departments and make loans, the members of these committees were in many cases obliged to acknowledge their inability or to accept inadequate solutions, the most evident result of which was to demonstrate the present need of setting up, in Quebec, of an authorized governmental organization with a view to elaborating and applying an original policy with the cooperation of the Indians and for their well-being.

Moreover, various works undertaken by other sections of the Planning Branch were able to clarify the development projects of New Quebec. One such case is the analysis of the advantage of a railroad that would connect western New Quebec with the St. Lawrence; another is the study of conditions for profit from the initial investments that the government made at Matagami. Any development project of mineral resources, wherever it might be in Quebec, can be equally applied to the improvement project of New Quebec, where mining operations will undoubtedly be the prime factor for progress. Besides, the research now going on relating to air transport in Quebec will help to establish the groundwork necessary to penetrate and manage our northern territories.

Having been called upon to collaborate more directly with the New Quebec Branch, the Planning Branch has, moreover, assigned one of its economists to the study of certain economic restraints which militate against

the resources of northern Quebec. His work was to set up guidelines for a development plan. To this end, authorities of the Planning Branch decided, at the close of the fiscal year reviewed here, to form a work group, that is to say a New Quebec Section, the task of which would consist in carrying out systematic research into means of developing this vast territory for the benefit of the aborigional population and the general economy of Quebec.

Energy Section

The management mandate which the Mining Act entrusted to the Department of Natural Resources over petroleum exploration and the authority to direct, which the Minister of Natural Resources exercises over Hydro-Québec and the Gas and Electricity Board, oblige the Planning Branch to study energy problems in such manner as to provide guidance for the administration in the decisions to be taken. Such is the task of the economists attached to the Energy Section. During the fiscal year reviewed, they were employed in collecting essential information on the importance of the energy sector in modern economy, on the market for energy, relations between the various forms of energy in use, and the problems of industries of the Energy Sector in Quebec, in order to establish the principal guidelines of an energy policy suitable to our economic development.

The first characteristic brought to light by these studies was the stimulating role of energy in modern economy. Indeed, the Energy Sector draws its importance less from the place (which is often reduced) that it occupies in the national raw produce of a country than from its great influence on the economic development and growth and on the stability of the balance of trade. The importance of the Energy Sector for national economic growth is estimated, in reality, in terms of available energy, production characteristics and creative opportunities. That is to say, it is necessary, on the one hand, to dispose of energy in sufficient quantity and at a fair price for the needs of industrialization. On the other hand, the energy industry requires, by reason of its nature, vast investments and the maximum use of its installations in proportion to the demand. In consequence, there results an intensity of creative opportunities attributable mainly to the changing character of the techniques which the energy industry calls forth. One may also measure these creative opportunities in terms of productivity and the innovations by the users of energy especially by those who use electricity for the extraction of metals and in the manufacture of synthetic products and in equipment manufacturing, to which the Energy Sector supplies a very important outlet.

Another fact made evident by the analysis of the Energy Sector is the high rate and strong progression of energy consumption in Quebec compared with other developed and industrialized countries. The Quebec consumption of energy was valued in 1966 at some $775 million and represented an increase of 65 per cent in relation to that in 1960. This use was divided as follows: petroleum, 68.8 per cent; electricity, 21.5 per cent; coal, 6.1 per cent; and

natural gas, 3.6 per cent. In general, the amount of coal used decreases constantly and that of electricity shows very little change as it ranges between 23.5 and 21.5 per cent, whereas natural gas and petroleum increase steadily.

Now, as the use of energy becomes greater throughout Quebec, so does the expansion of the energy industry pose new problems, especially those concerning the relationship between the various forms of energy and the allocation of one or the other of these to specific uses. For example, does the profit derived from the vast sums of money invested in Hydro-Québec warrant the risk of being eclipsed by the growth of other forms of energy? Would it be advisable to set aside quantities of gas or electricity for specific industrial needs? And, in this connection, would it be advantageous to allow the expansion of the natural gas network to the cities of the Montreal – Sherbrooke – Quebec triangle? In this contex, what would be the significance of the sale of the network of manufactured gas which Hydro-Québec possesses in Quebec? Under what conditions would it be necessary to facilitate the formation of a monopoly for the distribution of gas in Québec? Moreover, what steps should one take to create, in Quebec, decision centers capable of utilizing the dynamism of our petroleum market for the benefit of our industrialization, while offsetting certain present tendencies? In fact, it is necessary to be concerned, on the one hand, lest the revision of the National Oil Policy be prejudicial to Quebec's interests, after having reduced its market in 1961 at the Ottawa – Brockville frontier, and, on the other hand, lest the refineries now being built in the Maritime Provinces with the financial help of local and Federal authorities monopolize part of our market at the risk of thus compromising the installation of new refineries which the increasing natural demand would justify in Quebec. Would it not be in the public interest to revise the control and safety standards in the distribution of hydrocarbons and to define these norms where they do not exist? All these problems demonstrate the necessity of confiding to the Minister the responsibility of studying them and, in consequence, taking the decisions and steps which they require, while drawing on the assistance of an administrative organization such as an Energy Branch.

Counsel and Liaison Activity

The Planning Branch not only conducts studies on the sections relating to the obligations of the Department of Natural Resources but it also gives counsel, which action frequently takes on the role of special liaison with related organizations as they come under the authority of the Minister of Natural Resources.

Collaborating with Hydro-Québec

Such is the situation of Hydro-Québec, the public enterprise statute of which provides for State control of a commercial character, while at the same time leaving extensive scope in its internal structure. In fact, the Hydroelectrical Commission must submit its important decisions for the approval of the Executive Council through the intermediary of the Minister of Natural Resources. It is therefore the duty of the Planning Branch to examine Hydro-

Québec projects and to inform the Minister in such manner as to enable him to form a clear judgement and make his decisions. Of the some fifty Orders in Council or decrees thus adopted in 1967/68 by the Executive Council for the operating of Hydro-Québec, some dealt with the budget, some referred to long-term bank loans and to the issuance of bonds, as well as the nomination and remuneration of auditors. Five other Orders in Council pertained to the sale of lands and immovables, but the greatest number, that is 24, related to the acquisition of land and the construction of sub-stations, to power lines, and to the distribution of electricity or to service centers. Moreover, the contracts of service or electricity supply to clients were submitted to the Planning Branch for study and later to the Executive Council for approval.

Hydro-Québec was also authorized in 1967 to acquire the municipal networks of electricity distribution at Chapais, Murdochville, Tadoussac and Port-Cartier, as well as the Electric Companies of Mont-Laurier and of Ferme-Neuve. The last-mentioned companies were, moreover, the object of fairly long negotiations before agreement was reached to the satisfaction of both parties. It will probably be the same with the electricity service of the City of Sherbrooke, the production and distribution network of which supplies several neighboring municipalities at rates higher than those charged by Hydro-Québec in similar territories, with the result that the citizens of these municipalities have the feeling that they are thus paying injustly an indirect tax to the City of Sherbrooke. This situation would evidently be remedied were Hydro-Québec to acquire and exploit, at its usual rate, this part of the municipal electrical network extending beyond the limits of the City of Sherbrooke. However, at present the provisions of the Hydro-Québec Act are such that it is not allowed to expropriate in this case, and the City of Sherbrooke may not, by virtue of a section of its charter, sell a part or the whole of its electrical network. Faced with this problem, the Planning Branch recommended, as the first step toward an amicable solution, the modification of Sherbrooke's charter in such a way as to authorize the municipality to dispose of its electrical network. Conferences undertaken with the municipal authorities of Sherbrooke then led to the preparation of a study of the advantages of this network and this work was carried out in collaboration with the electrical service of Sherbrooke and Hydro-Québec in order to supply all the data necessary for the eventual negotiations between the parties.

Moreover, the Planning Branch gave special attention to projects of Hydro-Québec like the one for establishing a center of research into electricity at Boucherville. It likewise undertook in 1967/68 a study, which was later followed up by Hydro-Québec, into the possibility of micro-stations to replace the electrogenerating units which at present are used to produce, in a costly way, the electricity destined to supply the isolated establishments on the Lower North Shore.

At certain times there arises the question of establishing a plant for the treatment of aluminum on the North Shore. To this end, the Planning Branch prepared an information file in conjunction with the Department of Industry and Commerce, and took part in discussions with representatives of industrial

companies and Hydro-Québec on the subject of energy costs. It was also suggested, at these talks, that a company might be able to exploit part of the hydraulic potential of Moisie river to meet the needs of an aluminum smelter. Even if these works and undertakings have not materialized, they will, nevertheless, have emphasized the industrial profits of the Sept-Iles region and will have contributed toward urging Hydro-Québec to assign to that area, in view of the installation of large industrial users of energy, 500,000 kilowatts, which it would sell at the same price as electricity derived from Churchill Falls.

In addition to this, the Planning Branch was called upon to examine the long-standing dispute which exists between the Government of Quebec and that of Ottawa on the subject of financial participation of the Federal Government in the control which was necessary to the canal leading from the hydroelectric plant at Beauharnois for the construction of a navigable outlet to the St. Lawrence. It likewise contributed to the correction of an anomaly which has been existing since a rather long time. This involves an annual rental of $45,000 which Hydro-Québec pays to the Federal Government for the hydraulic rights sub-leased in 1929 to the former Beauharnois Light, Heat and Power Company (this became the property of Hydro-Québec in 1944) for the use of an inflow of water derived from the St. Lawrence at Valleyfield. It was the responsibility of the Planning Branch to prepare the documents necessary to the negotiations which led to the transfer, to the Government of Quebec, of the administration and control of the installations which the Federal Government held through the intermediary of the Department of Transport, at the Chaussée Street supply canal, along with appurtenances, in Valleyfield.

Bureau of Rural Electricity

One of the members of the personnel of the Planning Branch, Jérôme Lépine, an engineer, is especially responsible, as vice-president of the Bureau of Rural Electricity, for settling the remaining business of this organization. As a matter of fact, since 45 of the 46 cooperatives which depended on the Bureau of Rural Electricity have chosen to integrate with Hydro-Québec, the Bureau is now mainly occupied in supervising the distribution, among stockholders, of the sums which each cooperative derived from its sale to Hydro-Québec. In this respect, it is necessary to answer the requests for information and correction which were directed to the Board by some of the companies. Thus, about 40 cases were submitted to it in 1967. These involved certain irregularities, which, after studies and investigations, were corrected by the payment of the moneys due to the companies. Several of these claims came from shareholders of Cooperative d'électricité d'Abitibi-Est, which was dissolved on August 20, 1967, after a satisfactory settlement with all claimants was brought about.

In 1967, at the request of Hydro-Québec, it was agreed that all payments by this organization due to the Bureau of Rural Electricity, including those of former companies which became its subsidiaries, as Lower St. Lawrence Power Company and Southern Canada Power, be consolidated and paid in the future by trimestrial instead of monthly disbursements. The agreement con-

cluded to this effect provides that neither the Government nor Hydro-Québec will profit from this change of dates, which will be fixed, starting from the end of September 1968, for March 15, June 15, September 15, and December 15 of each year.

Miscellany

It is advisable to mention certain other very different tasks which are brought before the Planning Branch by reason of its role of coordinator or liaison within the Department of Natural Resources or with other departments. Thus the Branch represents the Department in the allocation of lands which were returned to the public domain by Metal Mines Limited in Chicoutimi after this company had abandoned, under the name of Eastern Mining and Smelting Corporation Ltd., the project of building a nickel and zinc refinery on the lands ceded by the Department of Natural Resources, as well as the holdings of the former company of Quebec Pulp and Paper Corporation. Moreover, the Branch serves as spokesman within the Department of Natural Resources in dealing with the Department of Interdepartmental Affairs for the exchanging of ideas and for cooperation between France and Quebec. In this respect, it collects requests for French collaborators coming from the various services of the Department; it is responsible for the secretariate of the Franco-Quebec cooperation committees in the field of hydrology and geology; and it is engaged in facilitating the exchanges or development steps especially within the framework of the *Association pour l'organisation des stages en France (ASTEF)*. Two members of the Planning Branch have themselves profited from these agreements during the fiscal year reviewed here: one attended *Électricité de France (EDF)*; the other studied energy economy at the University of Grenoble.

MINES BRANCH

Powers conferred on the Minister of Natural Resources by virtue of statute 9-10, Elizabeth II, Chapter 48, include the administration of the Mining Act (13-14, Elizabeth II, Chapter 34) and the Mining Duties Act (13-14, Elizabeth II, Chapter 35). The application of these two Acts has been assigned to the Mines Branch of the Department by the Minister. The responsibilities incident to each of the administrative units comprising the Branch, as well as their activities during the year 1967/68, are described at some length below.

As of March 31, 1968, the Mines Branch had a personnel of 312 employees, of whom 101 were professional. Most of these were highly qualified in the scientific research fields of mineral deposits, ore beneficiation, and mining operations.

During the year reviewed there was a drop of 13 persons in the personnel, whereas, in the preceding fiscal period, the number of employees decreased by eight. This falling-off in the personnel, though quite normal in the present context, was undoubtedly related to the decline prevalent in mining investments and mineral production in Quebec at the time. In fact, during the fiscal year 1967/68, mineral production in the Province decreased 3.4 per cent, whereas in Canada (including Quebec) mineral output increased about 9 per cent.

Disbursements of the Mines Branch during the fiscal year reviewed here were some $5 million, of which $1 million was capital expenses and about $0.5 million is recoverable from mining municipalities. This drop in investments compared with the outlay for the preceding year is accounted for in the report by the Mining Roads Division of the Engineering Service (Mines).

Mining Taxation Service

All mines in the Province of Quebec are subject to mine duties and each operating mine has to pay annually duties in accordance with the prescriptions of the Mining Duties Act (13-14, Elizabeth II, Chapter 35). Legally, the Minister and the Deputy Minister of Natural Resources have the joint task of applying and carrying out this Act. However, on the administrative level, this task is the responsibility of the Mining Taxation Service, which, for practical reasons, must assess the duties levied on profits of mining companies.

During the fiscal year 1967/68, the Mining Taxation Service collected $20,163,585 as duties derived from the global taxable profit of $153,994,395. The average rate of duties paid during the year is therefore established at 13.09%. The Public Accounts Service for the fiscal period reviewed here shows

a net revenue of $18,838,256, which is $1,325,329 less than the total reported by the Mining Taxation Service. The difference is accounted for by the fact that the auditor closed his preceding fiscal year on April 14, 1967, instead of on March 31, 1967. March 31, 1968, was the opening date of the auditor's books, as well as those of the Department. Consequently, in the future, there will be no difference in revenue between the totals of these two groups.

It is important to note that of the 70 mine operators liable to assessment pursuant to the Mining Duties Act, only 49 of these actually paid duties during the year under review. Thus, 21 operators were exempt from taxes by the fact that their operations resulted in a deficit or showed a profit less than $50,000. The number of producing mines remained the same during the fiscal period 1967/68, for the opening of two new mines was counterbalanced by the closing of two former operators.

The application of the new Mining Duties Act has led to certain conflicts as to interpretation, particularly in what concerns related persons, capital expenditures, and allowance for treatment. With few exceptions, the Service was in a position to apply an interpretation compatible with that recognized by the legislators. As of March 31, 1968, seven operators objected to the duties levied by the Department, and, of these, three will probably see their case brought before the courts.

During the fiscal year being reviewed, 240 concession holders paid the sum of $69,251 as annual tax on mining concessions. Likewise, 141 concession holders were exempted from the annual tax after giving proof of having conducted statutory works on a cumulative area of 40,843 acres. During the summer of 1967, the Minister ordered the revocation of 26 concessions representing a total area of 4,794 acres. The Public Accounts Service recorded a revenue of $70,551 for the fiscal period 1967/68. This figure is $1,300 over that reported by the Mining Taxation Service. The difference is accounted for by the fact that the auditor closed his books on April 14, 1967, instead of on March 31, 1967. There was no difference reported on March 31, 1968, for the books were closed on the same date.

Mining Conflicts Division

The Mining Conflicts Division is concerned mainly with conducting investigations deemed necessary for the settlement of conflicts arising from the staking of mining claims that were already recognized or under development license. The Division is under the direction of J.-René Dallaire, who, in addition to carrying out investigations and inspections, summarizes various reports and makes recommendations to the Director General of Mines.

The Division has as its personnel, engaged on a full-time basis, three investigators stationed at Noranda and two at Quebec. Moreover, it employs two stenographers: one serving the Noranda office and the other working in Quebec. During the year being reviewed, the investigators studied 24 conflicts, all of which have been definitively settled.

The Noranda investigators were assigned to study nine conflicts that arose in the Amos and Rouyn agencies. They were obliged to travel about 3,600 miles by car and to walk some 230 miles in forests in order to conduct their inquiries and make inspections of claims and certain statutory works that were reported for the purpose of obtaining development licenses or, in some instances, to keep these licenses in force.

The Quebec investigators worked on 15 conflicts, of which nine originated in the Quebec agency, three in the Montreal agency, and three in the Chibougamau agency. Six of these conflicts related to properties in Gaspesia. In order to carry out the investigations and inspections required for the settlement of these 15 conflicts, the investigators had to travel more than 8,000 miles by car and to walk about 250 miles in forested country, mostly in the mountainous areas of Gaspesia.

In fine, during the fiscal period 1967/68, the Mining Conflicts Division studied a number of documents at the request of the Mining Domain Service.

GEOLOGICAL SERVICES

Paul-E. Grenier, director, submits the following summary report on the Geological Services for the fiscal year extending from April 1, 1967, to March 31, 1968:

The role of the Geological Services is to study the geology and mineral resources of Quebec, and to make the results of the work available to all interested parties — this in order to foster the development and logical utilization of Quebec's minerals and like resources.

The four Services that comprise this group are: (1) the *Geological Exploration Service*, directed by Robert Bergeron; (2) the *Mineral Deposits Service*, directed by J. R. Assad; (3) the *Hydrogeology Service*, directed by Raymond Roy; and (4) the *Cartography Service*, directed by Gérard Côté. The last-named unit also serves other branches of the Department but, since its functions pertain mainly to the geologic work, it is grouped most properly with the Geological Services. The activities of each of the four Services are given separately in the reports of their respective Directors, which follow this résumé.

As the principal functions and general operations of the Geological Services are well summarized in the Annual Report for 1966/67, they are not detailed herein.

One especially important change in the administrative ranks of the Geological Services was made during the year. On December 18, 1967, Gérard Côté was named Director of the Cartography Service, replacing Armand Blanchette, who had headed that unit since 1961. This change was owing to Mr. Blanchette's being on extended leave of absence because of serious illness. [1]

[1] We report with regret Mr. Blanchette's demise on July 9, 1968. He had diligently served the Department for nearly 35 years.

It is appropriate to mention that in April, 1967, Robert Bergeron, director of the Geological Exploration Service, was elected a Fellow of "The Royal Society of Canada". He thus joins four other geologists who are either former on present officers of the Department — namely, I. W. Jones, B.-T. Denis, P.-E. Auger, and H. W. McGerrigle — in having received this notable honour.

A total of 52 projects comprised the 1967 field program of the Geological Services. The Geological Exploration Service undertook 22 projects, the Mineral Deposits Service was responsible for 23, and the Hydrogeology Service conducted 7 programs.

Mention must be made here of the work of H. W. McGerrigle, senior geologist of the Department and Technical Adviser in the Geological Services. During the summer of 1967 he carried out much of the field investigation necessary for the preparation of another booklet in the proposed new series of geologic publications entitled "Popular Geology Series". The purpose of these illustrated brochures, with accompanying maps, is given in the Department's annual report for 1966/67.

This booklet will cover the circuit tour of Gaspé Peninsula, following Highway 6 clockwise from Sainte-Flavie (Mont-Joli) to Percé, thence to Matapédia, and back to Sainte-Flavie — a total distance of some 550 miles. Outstanding geologic, topographic, and other related features at many points along and near the route will be described. Particular coverage will be given to localities close to villages and towns which are easily accessible to the district school children and their teachers. It is foreseen that this booklet (and others in the proposed series) will be of much interest to visiting tourists, as well as to the local population, especially school students.

Summaries of the results obtained from the individual geologic surveys and other projects carried out during the 1967 field season appear in special booklet S-112, which is accompanied by index map N°. 1659.

The Geological Services continued to support the program of aeromagnetic surveys of certain parts of the Province that is being carried out jointly by the Quebec Department of Natural Resources and the Federal Department of Energy, Mines and Resources. To give the results of these surveys, maps showing isomagnetic lines are published at the scale of 1 inch = 1 mile. Such maps are very useful in aiding geologic interpretation, and are also valuable in indicating localities where mineral deposits might be found, following detailed ground investigations. As soon as the maps are completed and printed, they are made available to the public simultaneously by the two Departments, which share equally in the cost of the program, now in its fifth year. Additional details on these, and other, aeromagnetic surveys are given in the report of the Director of the Mineral Deposits Service.

On February 21, 1968, Ovide Maurice of the Mineral Deposits Service left for France to begin a two-month program within the framework of the exchange of scientific personnel between France and Quebec. His tour was jointly sponsored by the "Bureau de Recherches Géologiques et Minières" (BRGM) of France and the Quebec Department of Intergovernmental Affairs. Following

a brief stay in France, during which he visited the laboratories and research facilities of BRGM at Orléans, Dr. Maurice proceeded to Africa where he spent most of his tour in several French-speaking countries, comprising Sénégal, Ivory Coast, Cameroon, and Mauritania. He was enabled to visit various mining operations, including iron, copper, phosphate, and diamond. He also called at many places where geologists and prospectors of BRGM were carrying on prospecting and mineral research programs. Dr. Maurice cooperated with the BRGM personnel by offering certain suggestions based on his wide experience in exploration, both in Canada and other countries.

On March 13, A.-F. Laurin of the Geological Exploration Service left for a two-month lecture tour in France, sponsored by the "Ministère des Affaires Étrangères" of France. Up to March 31, Dr. Laurin had given a total of 8 lectures, presented at 4 different universities, and much interest was shown in them. His topics included various aspects of the geology of the Grenville metamorphic province, the several methods of geologic mapping being practised in Quebec, as well as the extensive use being made of aeromagnetic maps in geologic interpretation and mineral exploration.

While in France, Dr. Laurin will also try to arrange for the hiring through ASTEF (Association pour les Stages Techniques en France) of some French students for summer field work on the Department's geologic mapping parties.

On March 26, Pierre St-Julien of the Geological Exploration Service left for a two-month study tour in France, sponsored by ASTEF. His investigations will pertain especially to tectonics and startigraphy, and the research methods being employed in these fields by geologists in France.

Since 1964, no fewer than 8 officers of the Geological Services have benefited from this exchange of scientific personnel between France and Quebec through visits to that country. During these visits, the Department's geologists make many contacts with officers of various governmental research bodies and institutes, as well as professors at different universities and specialists in industry. The exchange of scientific views, the comparison of methods of investigation, and similar discussions that result from these meetings are proving of much value, not only to the officers directly concerned but also to their respective organizations and their fellow colleagues therein.

It should be noted that the Department of Natural Resources, through its Geological Services, participates reciprocally in this program of exchange of scientific personnel. Since 1964, several geologists from French governmental organizations and universities have made study tours in Quebec under the guidance of officers of the Geological Services. Moreover, 3 geologists from France are at present holding temporary full-time positions in the Geological Services. Finally, during the past two summers a number of students from France have been employed as assistants on field parties of the Geological Services. This group comprised 4 students in 1966, and 7 students in 1967. The Department receives the cooperation of ASTEF in making these engagements.

The Director of Geological Services holds various posts in several scientific organizations. In the "National Advisory Committee on Research in the

Geological Sciences", he is a member of the Executive Committee, a member of the Subcommittee on Mineral Deposits, and also acts as the Department's representative to that body. He is a member of the Associate Committee on Geodesy and Geophysics of the "National Research Council of Canada". He is also chairman of the Quebec City Branch of "The Canadian Institute of Mining and Metallurgy".

During the year reviewed, the Director authored the following communication: "Le Développement Minier au Québec": lecture to a dinner meeting organized by the Cartier regional council of La Société Saint-Jean-Baptiste de Québec, at Quebec, May 11, 1967 — also issued as a 24-page separate by Que. Dept. Nat. Res.

Geological Exploration Service

Robert Bergeron, Director, reports as follows on the activities of this Service during the 1967/68 fiscal year:

At March 31, 1968, the professional staff comprised 15 geologists and geological engineers, the same number as at the close of the preceding year. However, during the year, 2 geologists — Claude Hubert and M. B. Katz — resigned, to accept university teaching posts; on the other hand, 2 geologists — Maurice Rive and Antoine Franconi — joined the Service. Moreover, it must be mentioned that another staff officer is at present absent; in October 1967, Richard Grenier was transferred temporarily to the Planning Branch of the Department. The effective professional staff is thus only 14, the lowest number during the last 5 years and only 4 more than 10 years ago. In addition to the above group, the Service includes 5 office assistants and clerks, and 6 secretaries and stenographers.

It should also be noted that, for the present, it is impossible to increase the staff. This is because in the autumn of 1967 the Government established a freeze on the hiring by the Civil Service Commission of any additional full-time personnel.

Despite the shortage in geologists, the Service had a fairly active year in carrying out its principal function, which is to map the geology and explore the mineral potential of Quebec. In this work, the geologists examine the nature, distribution, structure, and economic possibilities of the rock formations in various selected areas. They subsequently prepare geologic reports and maps giving the results of their investigations. Such work has, in some instances, led to the discovery of mineral deposits of commercial value, and in others has indicated where further exploration would be warranted. The published results are used extensively, mainly by those searching for metallic ore deposits, natural gas and petroleum, materials suitable for industrial use, building stone, and other mineral wealth. However, the maps and reports are also useful to many others — such as road and railway builders, hydroelectric and forestry engineers, those engaged in locating and tapping groundwater reserves, agronomists, teachers and students, sportsmen and tourists.

The explorations in the field are, for the most part, carried out from mid-May to the end of September. During the winter months, the geologists are occupied mainly in compiling their maps, preparing their reports, and doing the scientific research and office studies connected therewith. However, they are also called upon to carry out, or assist on, numerous projects of diverse kinds, such as: investigations on specific problems, special reports, map compilation programs, regional studies, fossil collections, logging of bore-hole cores, etc.

During the course of the field work, some of the parties were visited by geologists, engineers and prospectors. Throughout the year, many persons connected with the mining industry called at the Quebec office and obtained much valuable information on the geology of all parts of the Province. Moreover, many inquiries and requests for data were answered by phone or correspondence.

The 1967 field program comprised 22 projects, 2 more than in 1966 but 9 less than the all-time record of 31 set in 1961.

Sixteen parties carried out geologic mapping at various scales. Of these, 4 teams (led by Katz, Laurin, Murtaugh and Rondot) did reconnaissance mapping. In all, they covered about 19,000 square miles at scales that will permit the publication of maps at either 2 or 4 miles to the inch.

Another 9 parties did regional mapping, covering a total of about 1,800 square miles. Most of these maps will be issued at 1 inch = 1 mile; however, the work by 3 parties (Hubert, Léonard, and St-Julien) was sufficiently detailed to allow publication at 1 inch = ½ mile.

The last 3 groups (headed by Gittins, Philpotts, and Valiquette) carried out detailed mapping and special studies in restricted areas; these maps will be issued at 1 inch = 1,000 feet.

In addition, 2 parties (Dubé and LaSalle) studied unconsolidated surficial deposits in separate regions.

Finally, 4 field projects were of a miscellaneous nature. They were:

(*a*) micropaleontologic and other detailed studies in the Portneuf area, by Globensky;

(*b*) sundry work in the vicinity of Montreal, by Clark;

(*c*) special studies in the Shawinigan area, by Martignole;

(*d*) a continuing program of drill-core logging, by Warren.

Only 10 of the 22 field projects were headed by geologists of the permanent staff; however, another 4 of our present full-time officers — J.-P. Bassaget, J. Radziminska-LaSalle, M. Rive, and A. Franconi — acted as either subparty chiefs or assistant chiefs for an equal number of programs. The other 12 project leaders had again to be recruited on a short-term basis from outside sources — 6 were professors from university staffs, and 6 were graduate students pursuing advanced research towards the obtainment of their doctoral degrees. The parties engaged 37 other graduate geologists, 46 university students, and 57

other men (for varying periods of time) as canoemen, packers, helpers and cooks.

Professor F. F. Osborne of Université Laval, enlisted for many years on a part-time basis, spent most of the 1967 field season as a vice-chief on P. St-Julien's project. However, he was also available for advising on various other geologic problems.

Three staff geologists — Richard Grenier (up to the time of his transfer), Bertrand Warren (since November), and M. M. Ritchie — assisted the Director in administrative, editorial and other duties.

During the field work, 12 of the mapping parties collected systematically, for geochemical analysis, some 3,000 stream-sediment samples from small watercourses encountered on their traverses. These, along with pertinent data on locations, etc., have been submitted to the Mineral Deposits Service. They are being analysed by suitable methods for indicative values of certain metals, such as: copper, nickel, lead, zinc, molybdenum, and uranium. It is foreseen that results of this research can sometimes indicate localities favorable for the discovery of certain types of mineral deposits.

The geologists also cooperate with the Mineral Deposits Service by examining, and reporting on, various mineral occurrences, prospects and showings in their respective areas.

Although the various publications actually issued by the Department during the year are listed elsewhere in this volume, mention is made here of a special compilation authored by two of this Service's officers, and released in December 1967. It is "Une Bibliographie sur les Minéraux lourds — A Bibliography of Heavy Minerals", by M[iss] Jolanta Radziminska and D[r] Pierre LaSalle. This 46-page mimeographed booklet is a nearly complete list of reference of all the important articles concerning heavy minerals published since 1950. Included are ones on the separation of heavy minerals, their identification and mineralogy, and their provenance. A few references dealing with the iron-sands of Quebec are listed.

Several of the Service's officers hold important posts in various scientific bodies. The Director is a member of the "Commission de la Géographie de Québec" and is on the board of directors of the "Centre d'Études nordiques de l'Université Laval". Within the "National Advisory Committee on Research in the Geological Sciences", he is a member of the Standing Committee on Storage and Retrieval of Geological Data, and chairman of its subcommittee on Geological Field Data. He is also a member of the General Committee on Education of "The Canadian Institute of Mining and Metallurgy". D[r] Dimroth is a member of the subcommittee on Structural Geology of the "National Advisory Committee on Research in the Geological Sciences". D[r] Globensky is on the executive of "La Société Géologique de Québec". D[r] Laurin is a member of the Education committee of the Quebec City branch of "The Canadian Institute of Mining and Metallurgy".

During the year, staff members presented papers and lectures at universities and scientific meetings, or had them published in technical journals, and gave talks to various groups. The main contributions were:

By Robert Bergeron

"Geological History of Marine Clays of Southern Quebec": paper presented to the 1st Conference of the Canadian Congress of Soil Mechanics, at Quebec, September 24, 1967;

"Importance de la géologie pour expliquer le comportement mécanique des argiles marines": paper presented to the 35th Congress of l'Association canadienne-française pour l'Avancement des Sciences, at Sherbrooke, November 3, 1967;

"Richesses minières de la région de Chicoutimi": talk to the Club Richelieu, at Kénogami, November 13, 1967;

"Quebec 1968 — Hopes in New and Old Mineral Districts": paper presented to the 36th Annual Convention of the Prospectors and Developers Association, at Toronto, March 13, 1968.

By J.-P. Bassaget, et al.

"Les rodingites et les ophisphérites du massif ultrabasique de la province de Mugla, Turquie": paper published in Trav. Lab. Grenoble, No. 43, 1967.

By Erich Dimroth

"Structures in the Grenville Province North of Montreal, Quebec": paper (presented by A. F. Laurin) to the 20th Annual Meeting of The Geological Association of Canada, at Kingston, September 1, 1967;

"Faciès sédimentaire et origine des roches ferrifères de la région du lac Castignon, Nouveau-Québec": lecture to the Dept. of Geology, Université de Montréal, at Montreal, March 11, 1968.

By Yvon Globensky, in association with Can. Inst. Min. Met. (Quebec City Branch)

"Le rôle du géologue dans l'exploration": talk to senior students of: Collège de Baie-Saint-Paul, at Baie-Saint-Paul, December 1967; l'Académie de Québec, at Quebec, March 1968.

By Claude Hubert

"Tectonics of Part of the Sillery Formation in the Chaudière-Matapédia Segment of the Québec Appalachians": contributory paper published in "Appalachian Tectonics", Royal Soc. Can. Special Publications, No. 10 (Ed. — T. H. Clark), Univ. of Toronto Press, 1967.

By Pierre LaSalle

"Sands of the Péribonca Area, Québec": paper presented to the 35th Annual Convention of the Prospectors and Developers Association, at Toronto, March 1967;

"Déglaciation de la vallée du Saint-Laurent": lecture to the Dept. of Geography, Université Laval, at Quebec, December 1967;

"La statigraphie pollinique": lecture to the Dept. of Geography, Université Laval, at Quebec, March 6, 1968.

By Pierre LaSalle and *Jehan Rondot*

"New ^{14}C Dates from the Lac Saint-Jean Area, Quebec": paper published in Can. Jour. Earth Sci., Vol. 4, No. 3, pp. 568–571, June 1967.

By A. F. Laurin

Series of 8 lectures presented at 4 universities in France, during March, 1968, as follows:

1. "Faciès épidote-amphibole de la province métamorphique de Grenville du Québec": Université de Lyon, March 19;
2. "Faciès granulite et ses relations avec la série de Morin": Université de Lyon, March 21; Université de Clermont-Ferrand, March 26; Université de Montpellier, March 29;
3. "Méthodes de cartographie géologique au Québec et utilisation des cartes aéromagnétiques": Université de Lyon, March 19; École des Mines de Saint-Étienne, March 23; Université de Clermont-Ferrand, March 27; Université de Montpellier, March 30.

By A. F. Laurin, in association with Can. Inst. Min. Met. (Quebec City Branch)

"Le rôle du géologue dans l'exploration": talk to senior students of: La Chaudière region, at Saint-Georges de Beauce, November 21, 1967; Séminaire de Saint-Georges de Beauce, November 21, 1967; Jean-Talon region, at Charlesbourg, December 12-13, 1967.

By Pierre St-Julien

"Tectonics of Part of the Appalachian Region of Southeastern Québec (Southwest of Chaudière River)": contributory paper published in "Appalachian Tectonics", Royal Soc. Can. Special Publications, No. 10 (Ed. — T. H. Clark), Univ. of Toronto Press, 1967;

"Esquisse tectonique de la chaîne de Stoke": paper presented to the 35th Congress of l'Association canadienne-française pour l'Avancement des Sciences, at Sherbrooke, November 3, 1967;

"La zone allochtone de la région de Québec": paper presented to La Société Géologique de Québec, at Quebec, December 19, 1967; and to the Depts. of Geology of Université de Montréal and McGill University, at Montreal, February 24 and 25, respectively, 1968.

LIST OF GEOLOGICAL FIELD PROJECTS — 1967

Following is a list of the 1967 field projects, including the title of each and the name of the chief. Summaries of these projects are given in special booklet N°. S-112, which is accompanied by index map N°. 1659.

Mapping Projects

1.	Roberts Lake Area: New Quebec — (1″ = 1 mi.)	Richard Hardy
2.	Romanet – Castignon Lakes Area: New Quebec — (1″ = 1 mi.)	Erich Dimroth *
3.	Corrugated Hills Area: New Quebec — (1″ = 1 mi.)	Gérard Woussen
4.	Alder Lake Area (South Half): New Quebec — (1″ = 1 mi.)	J. P. Mills
5.	Gaschet – Manet Lakes Area: Mistassini Terr., Roberval and Chicoutimi Counties — (1″ = 1 mi.)	E. H. Chown
6.	Obedjiwan Nepheline Syenite: Abitibi-East Co. — (1″ = 1,000′)	J. Gittins
7.	Bressani – Chambalon Area: Abitibi-East Co. — (1″ = 1 mi.)	J. H. Remick *
8.	Mouchalagane – Manicouagan Structure Area: Saguenay Co. — (1″ = 2 mi.)	J. G. Murtaugh
9.	South-central Pontiac Area: Pontiac Co. — (1″ = 2 mi.)	M. B. Katz [1]
10.	Vermillon River Area: Laviolette, Saint-Maurice, and Maskinongé Counties — (1″ = 2 mi.)	Jehan Rondot *
11.	Saguenay – Laurentides Park Area: Roberval, Chicoutimi, Montmorency Charlevoix, and Other Counties — (1″ = 4 mi.)	A. F. Laurin *
12.	Lake Saint-Jean Area: Roberval, Lac Saint-Jean, Jonquière-Kénogami, and Chicoutimi Counties — (Unconsolidated deposits)	Pierre LaSalle *
13.	Québec Area: Québec, Montmorency, Lévis, and Other Counties — (1″ = ½ mi.)	Pierre St-Julien * and F. F. Osborne

* Indicates full-time staff officer.
[1] Resigned — Sept., 1967.

14. Orléans Area (West Half) : Montmorency, Bellechasse, and Montmagny Counties — (1″ = ½ mi.) ..... Claude HUBERT [1]

15. Trois-Pistoles Area: Rivière-du-Loup and Rimouski Counties — (1″ = ½ mi.) ..... M.-A. LÉONARD

16. Disraeli Area: Wolfe, Frontenac, and Mégantic Counties — (Unconsolidated deposits) ..... J.-C. DUBÉ

17. Brome and Shefford Mountains: Brome and Shefford Counties — (1″ = 1,000′) ..... Guy VALIQUETTE

18. Saint-Bruno and Rougemont Mountains: Chambly, Rouville, and Saint-Hyacinthe Counties — (1″ = 1,000′) ..... A. R. PHILPOTTS

MISCELLANEOUS PROJECTS

(*a*) Portneuf Area — micropaleontologic and other detailed studies ..... Yvon GLOBENSKY *

(*b*) Montreal District — guide-book for Mount Royal; sundry work ..... T. H. CLARK

(*c*) Shawinigan Area — special studies ..... J. MARTIGNOLE

(*d*) Drill-core Logging — continuing program ... Bertrand WARREN *

Mineral Deposits Service

J. R. Assad, director of the Mineral Deposits Service, submits the following report on the activities of the Service during the fiscal year 1967/68.

The Mineral Deposits Service is responsible for compiling geological information and providing the public with as many documents as possible dealing with exploration and exploitation of metalliferous deposits, industrial minerals, building stone, peat-bogs, petroleum, and natural gas.

The responsibilities of this Service are assumed by the main office in Quebec and by the offices of the resident geologists of the Department. The personnel, at the close of the year 1967/68, comprised 18 engineers and geologists, one agronomist, and 29 technicians and office clerks. These employees were stationed at the regional offices of Rouyn (3), Val-d'Or (2), Chibougamau (3), and Quebec (40).

John I. Sharpe, resident geologist at Rouyn, resigned during the fiscal year reviewed here. On the other hand, Marc van de Walle, geologist, joined the Service in the month of May. Moreover, by virtue of agreements between the governments of France and Quebec, the Mineral Deposits Service acquired the services, in September, of a geologist in the person of Paul André, a recent

graduate from École Nationale Supérieure de Géologie appliquée et de Prospection minière de Nancy.

Activities of the Mineral Deposits Service for the fiscal year 1967/68 are grouped under the following headings: Quebec office, regional offices, and participation in scientific and industrial meetings.

Quebec Office

The personnel attached to the Quebec office is responsible for the execution of various field works, such as geological and geophysical surveys, for drawing up and editing reports, for classifying and filing documents relating to statutory works, for studying various technical problems, and for answering requests for information on the part of the public.

The Quebec office comprises four divisions, namely: Technical Documentation, Industrial Minerals and Building Materials, Peat-bogs, and Natural Gas and Petroleum.

Technical Documentation Division

The Technical Documentation Division comprises two sections: one confidential, the other public. In the confidential section are filed reports on development work submitted by mining companies, reports dealing with visits to mining properties made by the personnel of the Department, and sundry documents; in the public section are filed reports on statutory work on claims reverting to the Crown. During the fiscal year reviewed, the confidential section received 2,577 reports and 2,884 plans. In the same period, 1,308 files were closed and the 3,497 documents they contained were transferred to the public section. In order to satisfy requests from mining companies and persons interested in exploration, 19,994 pages of reports and 1,786 plans were photocopied.

The compilation of index plans showing the areas covered by documents was continued during the year reviewed. Apart from keeping up to date the plans already in existence, the Technical Documentation Division completed 70 new plans, and thus brought the number of plans to a total of 529. It may be mentioned here that each plan covers a township and is accompanied by a booklet giving a list and description of the documents indicated on each of the plans. A total of 1,202 copies of these plans was distributed during the fiscal year under review.

In view of the imposing number of documents (in excess of 70,000) in the Service's classified files, Raymond Paquet has undertaken a study for the purpose of exploring the possibility of modernizing the procedure of indexing and classifying. With this goal in view, he visited the Documentation Service at Université Laval and the archives of various provincial departments, and also attended several conferences and exhibitions relating to modern techniques in information. In a report presented during the year 1967/68, he recommended the adoption of a microfilm system as the first step toward modernizing the services and the use of a computer for rapid selective retrieving of information.

Industrial Minerals and Building Materials Division

The Industrial Minerals and Building Materials Division, under the direction of O.-D. Maurice, is responsible for promoting the utilization of Quebec's resources in industrial minerals and building materials. The personnel of the Division aims at maintaining contact with producers and consumers, encouraging publicity for materials, and compiling lists of producers confronted with common problems. The Division likewise prepares an inventory of the mineral resources of the Province of Quebec and studies the possibilities of new uses of these resources. Members of the personnel visit mineral deposits, give technical guidance to operators, and, in some cases, point out localities warranting exploration for increased ore reserves. Finally, they provide a great deal of information through correspondence.

Jean-Y. Chagnon, who is in charge of the section dealing with soil mechanics, continued his investigations of landslides in the Province. This work consisted mainly in bibliographical research and in the compilation of data obtained previously. Dr. Chagnon actively participated in a study project on the unconsolidated deposits of the Lac Saint-Jean region, a project carried out under the auspices of ARDA (Agricultural and Rural Development Act). His work within the framework of the project dealt with soil conditions near the village of Desbiens and on the many landslides that have taken place regularly in that region. The study of the industrial properties of the soil being an important aspect of this project, a soil mechanics laboratory was created at the pilot-plant of the Department during the year reviewed, and research work was conducted there. In addition to these tasks, he also studied certain soils at Joliette, Sainte-Monique-de-Nicolet, Gayhurst, Mistassini and Tadoussac.

Roger Sirois, who is in charge of the Building Materials section, put into effect part of the program that was drawn up in 1966 for revitalizing the Quebec granite industry. Among the objectives attained during the fiscal period reviewed, mention may be made of the formation of the Association of Granite Producers of Quebec and the publication of a booklet on Quebec granites. The booklet serves as a purchase guide for architects and includes standards relative to the cutting of granite.

Of the substances that received special study by this Division during the year 1967/68, one might site those of mica, ocher, limestone, industrial sands, quartzite, expanded granules and aggregates, asbestos, marine shells and sandstone. Mr. Sirois, moreover, took part in works of the committee concerned with the standardization of Quebec brick, and collaborated with the Canadian Subcommittee on Mineral Statistics. He likewise prepared a report on the needs of the Department in the domain of mining statistics and on the methods to be adopted for meeting these requirements.

Dr. Maurice visited some of the talc operations in the Eastern Townships, the silica operations near Montreal, the ocher operations near Trois-Rivières, the granite quarries at Lac Saint-Jean, and the asbestos mines at Asbestos. He also visited a cement plant near Joliette and made several trips to other places

in response to various requests for information. During the summer, he went to the Magdalen islands in order to ascertain the progress being made in the study of the gypsum deposits that had been undertaken by Marcel Tiphane, professor at the University of Montreal. Mr. Tiphane mapped, at a very detailed scale, all the gypsum outcrops and associated rocks for the purpose of determining the possibilities of mining the gypsum.

Peat-bogs Division

The Peat-bogs Division, which is under the direction of Antoine Simard, agronomist, comprises two technicians, one clerk, and one typist. The main tasks of the Division consist in preparing an inventory of peat-bogs and surveying drainage networks of exploitable peat-bogs; it also interests itself in scientific research, in the improvement of peat production methods, in finding a market for peat, and, lastly in formulating a program for promoting the peat industry.

Inventory

During the year under review, the peat-bog inventory comprised:

1. Topographic surveying of the following peat-bogs: "Du Caveau" and Pointe Lebel, in Manicouagan township, Saguenay county; Sainte-Marguerite, in Racine and Dolbeau townships, Lac-Saint-Jean-Ouest county; Cayer, Génois and Saint-Léonard in Saint-Raymond parish, Portneuf county; Ferme de Tourbe at Saint-Antonin, Malenfant at Saint-Arsène, and Michaud at Ile-Verte, all in Rivière-du-Loup county; and Saint-Jean, Orléans island.
2. Preliminary examination of all the peat-bogs situated north of Saint-Jean lake and Saguenay river, between Dumais and Tremblay townships.
3. Special studies on the commercial value of the peat from the peat-bogs of Pointe-aux-Outardes, Les Buissons, Petite-Rivière (baie Saint-Ludger) and Pointe Lebel.

During the course of these operations, 146 samples were gathered for the purpose of a more intensive study of the absorbent capacity of peat, of its acidity and its percentage of ash, etc. These samples were, moreover, the object of 527 determinations in laboratories.

Drainage

The drainage networks of 32 peat-bogs situated in Rimouski, Rivière-du-Loup, Kamouraska, Saguenay, Bellechasse, Lévis, Charlevoix, Portneuf and Yamaska counties were surveyed by Ghislain St-Pierre and Gilles Otis. This work was carried out with a view to bringing up to date the plans of the drainage network of every peat-bog in production in the Province and for the purpose of controlling the distribution of the annual grants for peat-bog drainage.

Research

The scientific research programs pursued during the fiscal year reviewed are the following:

1. Study of the effects of natural peat and treated (humus) peat as mineral soil additives. This study, which was undertaken in August 1964, is carried out on sandy soils from the Research Center of Les Buissons, Saguenay county.
2. Comparative study of peat litter and straw litter. This study, which was begun in November 1964, is pursued at the Provincial Farm-School in Deschambault, Portneuf county. The study includes two distinct experiments: (*a*) the systematic utilization of peat and straw as litter under animals subjected to various methods of wintering and (*b*) comparison of the yield in harvested fodder and potatoes in fields fertilized with a mixture of peat and manure with land treated with straw and manure.
3. Comparative study of natural peat and processed peat as fertilizer in the Royer orchard, at Saint-Pacôme, Kamouraska county.

Production and Commerce

With a view to creating a greater output and a better market for peat, Mr. Simard continued to work, in collaboration with the Association of Peat Producers of Quebec, for the development of mechanization methods at every stage of production. At this point, most of the peat producers are provided with two mechanical processes of exploitation: mechanical dryers and cutters. As regards commerce, a sales promotion program was studied in conjunction with peat producers from New Brunswick, peat distributors, and peat brokers. An agreement was reached which permitted the collection of two cents a bag of peat for the purpose of creating a fund of $500,000 for the realization of this program.

Planning

A project designed to promote the production of peat through the drainage of peat-bogs was studied in collaboration with the Economic Studies Service of the Department. This program, which is to be spread over a period of five years and which will necessitate a sum of the order of $500,000, would make it possible to double the peat production within the next 10 years.

During the fiscal term 1967/68, the Peat-bogs Division prepared reports dealing with the preliminary examination of the peat-bogs of Rivière-aux-Cerises, Granby township, Shefford county; Ruisseau-Rouge, Orford township, Stanstead county; and Pont-Fort at Shawinigan-Sud, Saint-Maurice county. They also published inventory reports on the Villeroy, Mer-Bleue and Francoeur peat-bogs in Lotbinière county, on the Sainte-Marguerite peat-bogs in Lac-Saint-Jean county, and on the Saint-Jean peat-bog, Île d'Orléans, Montmorency county.

As in years past, the Quebec Department of Natural Resources made grants for the drainage of peat-bogs. These grants amounted to $20,000 and were allocated to 26 peat operators.

Natural Gas and Petroleum Division

The Natural Gas and Petroleum Division includes W. B. Skidmore, geologist, and Paul-P. Simard, engineer.

This Division is responsible for the application of the law and regulations concerning research, exploitation and underground storage of petroleum and natural gas. It also has the task of gathering and compiling technical information relating to these resources and of being ready to give information and to supply technical assistance to interested companies.

During the fiscal year under review, 10 companies held research permits for petroleum and natural gas in the Province. The Shell Company undertook seismic surveys in the St. Lawrence Lowlands and the Sarep Company carried out similar studies in the Gulf. Sun Quebec Ltd. bored a hole during the winter to the west of Matapédia lake.

During the year, the personnel of the Division

1. pursued studies concerning amendments to be applied to the Mining Act in what relates to natural gas and petroleum;
2. worked on the preparation of new regulations pertaining to research and exploitation of natural gas and petroleum, as well as to underground storage;
3. followed closely all activity directed toward the search for petroleum and natural gas and classified the samples and information resulting from such work;
4. satisfied itself that the work was done according to methods conforming to those used in the petroleum industry;
5. verified the presence of presumed discoveries of natural gas on private lands and saw to the blocking of holes drilled during the engineering works or in searching for water in places where natural gas was encountered;
6. conducted detailed geological work in eastern Gaspé (This work, which lasted two seasons, was carried out by G. D. Mason, graduate student from Carleton University); and
7. accompanied eminent European geologists to Gaspesia.

In addition to the above-mentioned accomplishments by the Division, the Quebec office was engaged in the following activities:

Detailed Geological Surveys

The Mineral Deposits Service conducted detailed geological surveys, or had them carried out, in the following regions:

Lac Madeleine, Gaspesia Park	H. S. de Römer *
Northeast quarter of Lemoine township, Chibougamau	G.-O. Allard
Southeast quarter of Obalski township, Chibougamau district	G. Duquette * and A. Mathieu *
Northwest quarter of Lesueur township, Bachelor Lake area	M. van de Walle *
Blondeau township, Témiscamingue area	L. Kish *
Northwest quarter of Cléricy, Rouyn-Noranda area	J. A. MacIntosh *

Geochemistry

Alluvium samples are collected by geological crews in the proximity of streams met in traverses. These samples are sent to the Mineral Deposits Service, where G. Boiteau does their classifying before having them analysed in the laboratories of the Department of Natural Resources for copper, zinc, lead, molybdenum, nickel and uranium. As these analyses are completed, the results are recorded on localization maps for the purpose of studying and recording them on preliminary geological maps. During the fiscal year considered here, as many as 8,224 samples were collected.

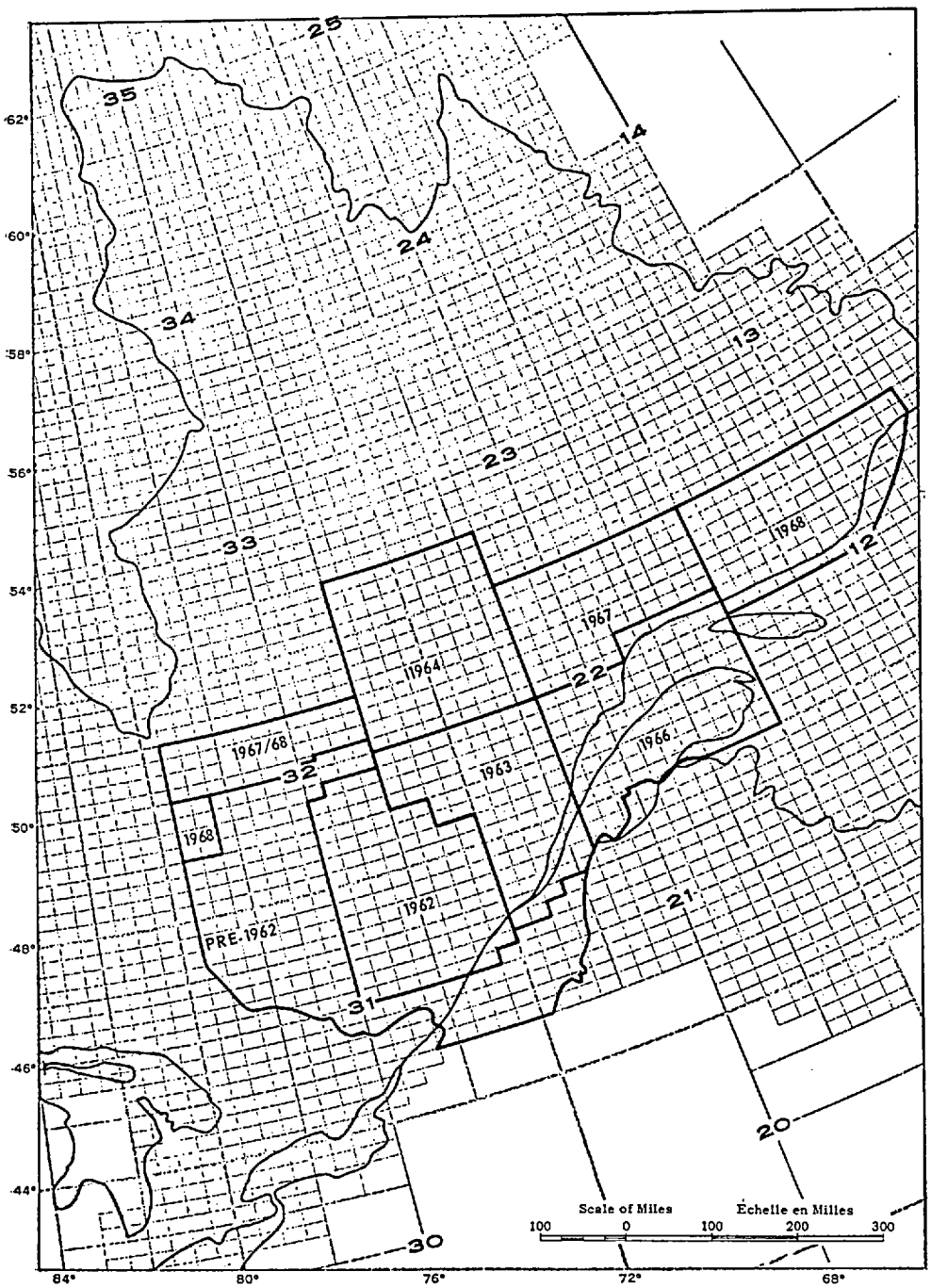
A special geochemical crew of 21 men, directed by R. Kelly and L. Imreh, geologists, completed a project of strategic prospecting of alluviums on a tract covering 16 townships in the region of Kipawa lake, Témiscamingue county. In all, 4,579 samples were collected, dried and sifted in the field, so as to expedite the work of the laboratories of the Department of Natural Resources and avoid all outside contamination. The samples were later analysed in the laboratories of the Department for the elements mentioned previously and also for cobalt, manganese, tin, tungsten, antimony and silver.

Numerous compilations were likewise made for the purpose of establishing histograms for certain geological maps. One example is map N°. B-894, which has been prepared for the region of Lesseps creek and Madeleine lake, in Gaspesia.

Geophysics

The Mineral Deposits Service carries out aeromagnetic surveys of the lands of Quebec. To this end, it prepares the preliminary documents (requests for tenders, drawing up of contracts and specifications, agreements for technical supervision with the Federal government, etc.), verifies map proofs, announces the distribution of maps, and generally is engaged with numerous details,

* Full-time staff member.



Aeromagnetic Survey Locality Map

financial as well as technical, which are incident to the programs, jointly or otherwise, of aeromagnetic surveys.

The second joint program of aeromagnetic surveys was continued during the fiscal year reviewed here. At the completion of this project nearly half of the territory of the Province of Quebec will have been covered by aerial surveys (see map). The first set of maps of this program was distributed in December 1967.

In addition to the surveys accomplished by the joint program, the campaign of aeromagnetic surveys during the course of the fiscal year under study was marked by the purchase of certain compiled data by the firm of Lockwood Survey Corporation Ltd. for an area to the west of Matagami and by the granting, by the Department, of a contract for the surveying of an area north of the town of Matagami.

Technical Revision

The following works were revised before they were transmitted to the Editing Division for the purpose of publication:

Mineral deposit map of the Rouyn-Noranda area
(Preliminary map by J. I. Sharpe)

Geology of the northwest quarter of MacKenzie township
(Preliminary report by G. Duquette)

Geology of Clermont township
(Final report by C. Thibault)

Copper in the Province of Quebec
(Compilation by G. W. Waddington)

Report on the Geology and Geochemistry of the Molybdeniferous Region of Mounts Sainte-Cécile and Saint-Sébastien
(Special study by R. Kelly)

In addition to the above accomplishments, the Division edited the report that followed the geophysical and geochemical surveys carried out in the Otelnuk Lake area by L. Kish in 1965 and 1966. It was later translated and mineographed, so that the interested public could consult it in the offices of the Service. This report is identified by number GM-21977.

Courses in Prospecting

The Mineral Deposits Service is in charge of courses in prospecting. These courses are of six weeks' duration and are given by universities. In 1967, the courses were held at École Polytechnique and at Université Laval. In the first-mentioned institution, 40 persons were present for the course and 29 students received certificates. At Laval the course was given to 30 students. The study program consisted in instruction in mineralogy and petrography, chemistry, general and economic geology, geophysics, prospecting, and analyses and treat-

ment of ores. It also included the study of maps and photographs, the showing of films, and field excursions.

Shorter courses are given by geologists of the Department of Natural Resources at various places in the Province. None of these were organized in 1967, owing to lack of demand.

During the year reviewed, Raymond Paquet gave a one-week course on mineralogy and geology at the Jeunes Biologistes camp, Port-au-Saumon, Charlevoix county.

Mineralization Maps

Within the scope of the inventory of mineral resources of the Province, the Mineral Deposits Service produced a map, at the scale of one inch equals four miles, which shows the mineralization of various localities. The Appalachian region (Maps B-790, B-791 and B-792) and the Noranda – Matagami – Val-d'Or – Chibougamau region (Map 1600) have been already covered. During the fiscal period under review, Dr. Dugas completed the manuscript of the map covering the Labrador Trough and commenced the compilation of the mineralization in the stretch of territory between Cape Smith and Wakeham Bay.

Mineral Deposits and Metallogenic Maps

The Mineral Deposits Service has been interested in the production of mineral deposits and metallogenic maps for years. The project has passed from the preliminary work, which consisted in preparing a legend and experimenting on its use, to tangible realizations. On this subject, one might mention that, at the close of the year reviewed, 187 production sheets on deposits and 80 on output were completed, that J. I. Sharpe prepared a mineral deposit map of the Rouyn-Noranda area by using a system of experimental symbolization, and that G. Duquette drew up a mineral deposits map of his area by following the legend adopted by the Service.

J. Dugas took part in a meeting of the Committee of the Metallogenic Map of North America. His contribution consisted in the preparation of a metallogenic map of Quebec at the scale of 1 : 5,000,000, according to the symbolization adopted by the committee. This map is one of the sections of the preliminary metallogenic map of North America that was presented to the International Geologic Congress of Prague in August 1968.

Moreover, Dr. Dugas undertook the preparation of a metallogenic map of the region west of Quebec at the scale of one inch to four miles.

Informatic

The National Committee on Geologic Research has the task of drawing up a national index of geologic documents. The Mineral Deposits Service, with the assistance of Dr. Assad, took part in the meetings of various committees and

worked on the drafting of several original documents. The Service undertook certain preparatory works with a view to classifying the documents under its charge. In this connection, 40 production-sheets on deposits were set up.

Revocation of Mining Rights

It is the responsibility of the Service to carry out surveys and to proceed with inquiries relating to the revocation of mining rights on mining concessions in virtue of Section 206 of the Mining Act. During the fiscal year reviewed here, Raymond Paquet examined five properties in this connection.

Fossil Collections

The Service put René Bureau of Université Laval in charge of enlarging the collection of fossils found in the sedimentary rocks of Quebec. This collection is exhibited on two floors in the Department's building located at 1620 Boulevard de l'Entente, Quebec City.

Regional Offices

The resident geologists of the regional offices accomplished an indispensable part of the work of the Mineral Deposits Service. It is the responsibility of each of these geologists to keep himself up to date on the mineral exploration and mining development works being carried out within the limits of his respective district. These geologists have to compile geological information, correlate this information, and answer all requests for information coming from mining companies and prospectors interested in their districts. These resident geologists likewise visit mining properties and prepare a geological report and a summary of the economic value of the mineral deposits, as well as the stage of development, of each of these properties. Moreover, they supervise the issuing of maps that show, on a detailed scale, the geology of their districts. Mention may be made here also that these resident geologists collaborate in the setting up and carrying out of projects organized by the government and unversity research teams. As a means of helping the resident geologists in the execution of their various tasks, the Service and other agencies provide them with as complete a collection as possible of reports, maps and similar documents bearing on the geology and mining activities of the district over which they have charge.

G. Duquette, resident geologist of the Chibougamau district, visited 10 mining properties and helped in the detailed geological mapping of the southeast quarter of Obalski township. Dr. Duquette also prepared a preliminary geological report subsequent to the detailed mapping of the northwest quarter of McKenzie township. He received more than 300 visitors at his office.

In the Val-d'Or district, M. Latulippe made six visits to mining properties and spent 13 days carrying out geological mapping in the field. He also received visits from 562 persons, including 362 geologists, engineers, or mining technicians, and 169 prospectors.

At Rouyn, J. A. MacIntosh replaced J. Sharpe in the month of June. He prepared a map, to the scale of one inch to 1,000 feet, of the geology of the north-west quarter of Cléricy township. Mr. MacIntosh, moreover, accompanied several geologists from the United States, France and the Geological Survey of Canada on their visits to mining properties in his district. He visited seven properties and prepared five reports concerning them. Most of his time was taken up with these visitors.

Participation in Scientific and Industrial Meetings

During the fiscal year 1967/68, geologists of the Mineral Deposits Service were present at or lent their assistance to various scientific and industrial undertakings.

Maurice Latulippe presided over a geological excursion in the Val-d'Or district that was part of a Centenary project organized by the C.I.M.M. (Canadian Institute of Mining and Metallurgy). On this occasion Mr. Latulippe gave a talk entitled "Géologie de la région de Val-d'Or – Malartic". He gave two other talks at a convention of the mayors of the cities of the Province of Quebec held at Val-d'Or and also spoke at a meeting of the Kiwanis Club. The titles of these talks were: "Géologie et Mines de la Région de Val-d'Or" and "Géologie et Avenir Minier de la Région de Val-d'Or".

J. A. MacIntosh took part in the Centenary excursion organized by the C.I.M.M. in the Noranda district.

Jean-Y. Chagnon assisted at a conference held jointly by the Geological Survey of Canada and the National Council of Research at Niagara Falls from October 22 to October 27, 1967. The conference dealt with geophysical exploration of mineral and underground waters. Dr. Chagnon also gave a talk at the conference of the Corporation of Quebec Engineers (Saguenay Chapter) and before members of the Canadian Institute of Engineers. The conference pertained to the activities of the Department of Natural Resources in the Lake Saint-Jean and Saguenay districts and, more especially, to studies carried out at Desbiens concerning mineral deposits.

O. D. Maurice took part in a meeting held jointly by the division of Industrial Minerals of the C.I.M.M. and that of the A.I.M.E. at Ville d'Estérel, from October 1 to October 4, 1967. Dr. Maurice also presided at sessions held on the 3rd of October.

H. S. de Römer gave a talk at a meeting of the Gaspé Branch of the C.I.M.M. held at Cap-Chat on September 19, 1967. Dr. de Römer spoke on certain aspects of geology and exploration in the areas that he had mapped in Gaspesia park.

W. B. Skidmore presented a paper before members attending the international conference of the G.A.C., M.A.C., M.S.A. and A.Z.O.P.R.O. held at Kingston, Ontario, from August 31 to September 2, 1967. The paper, which dealt with the structure of the Appalachians, was reproduced in the series of special publications of the Royal Society of Canada. Moreover, Dr. Skidmore

assisted at the Ministers of Mines Conference at Regina, from September 17 to September 20, 1967, and at the annual congress of the Ontario Petroleum Institute, held in London, Ontario, from November 1 to November 3, 1967.

J. Dugas and L. Kish also attended the international conference in Kingston mentioned in the preceding paragraph.

P. Simard gave a talk before members of the ACFAS, at their meeting in November 1967. The subject of this conference dealt with the gas-bearing reservoir of Pointe-du-Lac.

During the winter of 1967/68, A. Simard presented, in collaboration with officials of the Fédération de l'U.C.C. of Eastern Quebec, a series of conferences on the utilization of peat and peat-bogs in agriculture. These meetings were held in Portneuf, Lotbinière, Lévis and Bellechasse counties. Mr. Simard's contribution to the meeting was featured by a showing of slides illustrating agricultural results obtained from the peat-bogs of Newfoundland.

Hydrogeology Service

Raymond Roy, director of the Hydrogeology Service, reports as follows on the activities of his Service for the fiscal year 1967/68.

As of March 31, 1968, the personnel of the Hydrogeology Service comprised 4 engineer-geologists, 3 technicians, 1 technician assistant, 1 secretary-stenographer, and 2 typists. Moreover, two French hydrogeologists have recently joined the Service: one engaged by the ARDA administration and the other, as a technical co-operator. The two employees are to remain about two years. During the year under review, two employees left the Service, namely: J.-J. Tremblay, geologist, who opened a consulting office specializing in underground waters, and Lewis J. Duchesnay, who retired.

As in past years, the Service continued making an inventory of underground waters while stressing the advantages of its research on a regional scale.

The list of undertakings comprises the following seven projects:

1. hydrogeological study of the Eaton River basin;
2. hydrogeological study of the Eaux Volées Creek basin, Montmorency forest;
3. hydrogeological study of the Aylmer and Saint-François Lakes area;

4a. inventory of the underground waters of the Magdalen Islands;

4b. drilling four test wells in four rural municipalities of the Province;

5. inventory of the underground waters of Saint-Hyacinthe and Rouville counties;
6. exploratory drilling in the Lake Saint-Jean area.

All told, the Service completed 10,608 feet of drilling in the areas under study.

PROJECT N°. 1: *Hydrogeological study of the Eaton River basin, a contribution to the International Hydrological Decade,* — G. Simard.

This study, which is carried out jointly with the Waters Branch of the Department of Natural Resources, is now in its third year of progress.

The Eaton River basin is in the Appalachians between longitudes 71°10′ and 71°45′ and latitudes 45°10′ and 45°30′. It has an area of 250 square miles. During the year reviewed here, this work consisted in installing piezometric stations. A series of five stations was installed. The Service completed a total of five observation wells and ten piezometers through the overburden and into the bedrock. In all, 2,077 feet of drilling was carried out in holes ranging from 15 to 200 feet. These wells and piezometers will be of use in determining the rate of continuous supply and the depleting of aquiferous sheets, as well as the rate of drainage of underground waters. To this end, fluctuations of the water table are studied regularly by means of water-level recorders. It is the aim of the Hydrogeological Service to intensify these drillings and to complete another series of piezometric stations in the fiscal period 1968/69.

PROJECT N°. 2: *Hydrogeological study of the Eaux Volées Creek basin, Montmorency forest, a contribution to the International Hydrological Decade* — C. Grenier and F. Rochette.

This study, which is being conducted jointly with the Waters Branch of the Department, began during the year under review. The Eaux Volées Creek basin is situated approximately at the intersection of the coordinates 71°09′10″ of longitude and 47°16′20″ of latitude and covers an area of 3.54 square miles. The purpose of the study is to ascertain the contribution of underground water to the basin and thereby to know its influence on the hydrological cycle.

Under the direction of Claude Grenier, François Rochette commenced the preliminary work of identifying consolidated rock and overburden by conducting a seismic survey and some stratigraphic drilling (156 feet). The bedrock is fairly fractured granite of Precambrian age. The orientation and opening of the fractures lead one to suppose that the rock is permeable down to a certain depth and probably could be considered as a favorable aquifer. In some places, these fractures provide sources of renewable supply. The surficial deposits, which are from 25 to 30 feet thick (except in one place where they attain 90 feet), consist essentially of a heterogeneous till made up of sand and gravel having an average granular size ranging from fine to medium. Drilling has shown that the saturated sand, where it does occur, is found in artesian conditions.

During the fiscal period 1968/69 it is planned to conduct other seismic and stratigraphic soundings and also to install more piezometric stations.

PROJECT N°. 3: *Hydrogeological study of the Aylmer and Saint-François Lakes area* — G. Simard.

This study is being carried out in conjunction with the Geological Exploration Service, the function of which was the mapping of the Pleistocene surficial

deposits. The area covers about 265 square miles and lies between longitudes 71°05′ and 71°25′ and latitudes 45°45′ and 46°00′. It is situated 70 miles south of Quebec city and includes part of Wolfe and Frontenac counties.

This study was started in 1966 for the purpose of finding the zones of groundwater runoff between Saint-François and Aylmer lakes, the former draining into the latter through Allard dam. A three-student field party surveyed the preglacial valleys connecting the two above-mentioned lakes with a seismic apparatus (mark FS-3). Seismic readings, both direct and inverse, were taken along lines transversal to the axis of these valleys in order to determine the thickness of overburden at regular intervals. The students were successful, through this survey, in recording more than 200 feet of surficial sediment along the river connecting the two lakes. Some 600 feet of drilling was done to complete the seismic survey.

In July, the Hydrogeology Service undertook a thermometric survey in Aylmer lake for the purpose of finding possible underground water channels. A number of anomalies were traced and it would seem from this work that there is, at certain places, a flow of underground water toward the lake.

At the time of writing, data obtained by seismic and thermometric work lead one to presume the presence of zones of one or more groundwater runoffs between the two lakes. In fact, some of the waters of Saint-François lake could flow through ways other than the Allard dam in order to reach Aylmer lake. Additional information is evidently needed, and for this reason the Service intends to accelerate research in the course of the 1968/69 fiscal period.

PROJECT N^{o} 4: (ARDA PROJECT N^{o} 765):

(a) *Inventory of the underground waters of the Magdalen Islands* — R. Dessureault.

(b) *Boring of test wells in four rural municipalities in the Province* — C. Grenier.

(*4a*) This research is financed by the ARDA administration. It was started in 1966 and completed during the course of the fiscal period reviewed here.

The aquiferous potential of the principal inhabited centers of the Magdalen Islands was determined. During the fiscal year 1967/68, a total of 2,639 feet of drilling was completed. This work represents five test wells and two observation wells. Pumping tests of a 60- to 72-hour duration showed flows ranging from 85 to 250 gallons a minute. These very encouraging results made it possible to affirm that use of underground waters by means of wells would be feasible for the group of municipalities covered in the study.

In order to avoid the over-exploitation of aquiferous sheets and a possible invasion of sea water, the Service, with a view to the conservation of a natural resource such as underground water, established a network of six observation wells, which will serve, in a permanent way, to watch variations of the water table.

(*4b*) These works are supported by the ARDA administration and financially incorporated with the ARDA project N°. 765. The works are part of a project in its second year of realization, having begun in 1966; they concern 11 municipalities in all. During the year reviewed here, a total of 1,323 feet of drilling was completed.

In Champlain county, the Service tried to develop screen wells at Saint-Luc, Saint-Maurice and Saint-Louis-de-France. The thinness of the aquiferous formations and the elevated position of fine sand lead one to conclude that it would be possible to establish a network of small-dimension wells from which a flow ranging between 10 and 15 gallons a minute could be derived. At Saint-Damien, Berthier county, a seismic survey made it possible to choose a site for a screen well. A preliminary pumping test indicated a flow of about 50 gallons a minute. A pumping test over a long period will supply more detailed information concerning the actual capacity of this well.

The Hydrogeology Service plans to develop test wells in five other rural municipalities in 1968.

PROJECT N°. 5: (ARDA PROJECT N°. 1053):
Inventory of the underground waters in Saint-Hyacinthe and Rouville counties — J.-M. Prévôt.

During the course of 1966, certain dairy farmers, specially those from ranges III and IV of Saint-Charles parish (Saint-Hyacinthe), were urged by Montreal dairies to find suitable drinking water for their animals, otherwise their milk would be refused. The ARDA authorities, having been approached on this subject, decided that the Quebec Water Board and the Hydrogeology Service be put in charge of a study of the surficial and underground waters for the group of municipalities of Saint-Hyacinthe and Rouville counties (an area of 600 square miles). The Quebec Water Board studied surficial waters and the Service, underground waters.

From an examination of the documents on hand of a geological and hydrogeological nature, it seems that the problem of underground waters in these two counties relates essentially to the chemical quality of these waters, that is the presence of chlorides in important quantity. Consequently, a partial geochemical study was undertaken in order to discover the quantity of chlorides in various zones.

At one point at Saint-Hyacinthe, two superimposed aquiferous sheets were noted. The first, on the surface (0–10 feet), occurs in slightly porous clayey sand. It contains little water but has a good chemical quality. The water is polluted here and there by deposits of stable-litter or cesspools. The second sheet, at depth (below 80 to 90 feet), lies in a more permeable zone of sand or gravel, in many places found under a 70-foot-thick bed of more or less plastic clay. In general, the water from this sheet supplies a fairly good flow, but it has a very high content of chlorides (more than 1,000 p.p.m.). In another section of Rouville, the two preceding water sheets are non-existent and give place to one and the same sheet, which contains water of good chemical composi-

tion in large enough quantity. The hydraulic separation of these two areas seems to have come about in the geologically disturbed zone (fractures) of the Monteregian massifs.

PROJECT N°. 6: (ARDA PROJECT N°. 1017):
Exploratory drilling in the Lake Saint-Jean area — R. Dessureault.

This work was carried out jointly with the Geological Services of the Department and financed by the ARDA administration.

During the year reviewed, the Service completed 3,813 feet of drilling into the surficial deposits and took samples for the purpose of granulometric analysis. Most of the drill-holes were subjected to an electric logging test, which made it possible for the observers to distinguish between sand and gravel zones and clay zones. This research, in addition to being useful to geological studies, revealed the presence of favorable aquifers. The information obtained lightened the task of the Service's experts of finding underground water in sufficient quantities at Normandin, Notre-Dame-de-Lorette, and Notre-Dame-du-Rosaire.

Upon the recommendation of the Service, Normandin's municipal authorities bored one screen well into sand and gravel. This source of supply can yield 250 gallons a minute. At Notre-Dame-de-Lorette, the Service had a reservoir well put down, and, during one flow test, 15 gallons a minute was observed, which is amply sufficient for the water needs of this municipality. Moreover, at Notre-Dame-du-Rosaire another aquiferous formation made it possible for the Hydrogeology Service to develop a reservoir well providing a flow of 135 gallons a minute, which is more than double the present consumption.

Plans for the fiscal period 1968/69 provide for some 4,000 feet of drilling and for meeting the needs of hydrogeological surveys on a local scale.

OTHER WORK

The assistance which this Service would normally give to municipalities has been somewhat reduced because of the limited personnel and the length of time that the Service had to give to essential studies in progress. Officers of the Service were able, however, to visit about ten rural localities for the purpose of carrying out a preliminary survey of certain sites, a pumping test or some drilling.

It should be pointed out here that a technician from the Service continued to take an inventory of the wells in the region of the St. Lawrence Lowlands, more specifically in the vicinity of Montreal. This work consisted in making an inventory of existing wells by the quadrillé method and in supplying a brief description for each.

Professional personnel of the Service had an opportunity of increasing their scientific knowledge while attending congresses, colloquys and seminars dealing with hydrogeology. Special mention should be made of the annual

congress of the American Water Resources Association held in San Francisco in November 1967, at which C. Grenier assisted. Within the scope of the International Hydrological Decade, the Canadian National Committee organized, in September, a work meeting at Montmorency House dealing with the flow network of underground and surficial waters. The director of the Service assisted at this meeting as one of the organizers. At this meeting also F. Rochette presented a paper entitled: "Hydrogeological Study of the Eaux Volées Creek Basin, Montmorency Forest". This paper was also presented at the ACFAS congress, held at Sherbrooke in November of the same year. R. Dessureault prepared a paper within the framework of the International Conference for Water for Peace. This conference took place in Washington in May 1967. The title of this conference was: "Drinking Water Resources and Problem of Supply on the Magdalen Islands".

Cartography Service

Gérard Côté, director of the Cartography Service, gives the following report on the activities of his Service during the fiscal year 1967/68.

The Cartography Service is attached to the Geological Services and operates especially for the Mines Branch and for certain sections of the Waters Branch. The main task of the Service is the preparation of the lithographic printing of maps which are issued by the Geological Exploration Service, the Mineral Deposits Service, the Hydrogeology Service, the Mining Domain Service, the Information Service, the Meteorology Service and several of the Hydrological Services.

The staff comprises 22 persons: 16 topographic technicians, one technician in graphic arts, two polycopy operators, one secretary and one messenger clerk.

Of the principal technicians, André Lehoux, co-ordinator, is in charge of the Division concerned with the printing of maps and plans, whereas Raymond Tanguay, compiler, is assigned to the preparation of planimetric and topographic base maps, aerial photographs, and information on surveying. Yvon Lebel, chief of the Geological Map-tracing Division, sees to the making of maps for publication, and Réjean Belley, chief of the Claim-maps Tracing Division, likewise supervises the drawing up of claim maps and mining property maps.

Geological Maps

The most important work of the Cartography Service consists in preparing maps destined to accompany geological reports, as well as various thematic maps, and in supervising the printing of these maps as they are produced by the lithographer. On the maps of reconnaissance, regional, detailed, or surficial geology are recorded the topography, the subdivisions of counties and townships, the limits of mining properties, and, since two years, the sedimentary stream samples gathered in the field.

Two types of maps are published with preliminary of final reports. The preliminary maps are in colored lines only, whereas the final maps, completed after more extensive studies, are prepared in such manner as to be printed in colored lines and in solid colors.

Publications

Of the 91 maps prepared during the fiscal period reviewed here, the following 19 preliminary maps were printed.

No.
1354 – Quesagami Lake Area
1355 – Angle River Area
1356 – Subercase River Area
1357 – Grenier Lake Area
1358 – Newiska Lake Area
1359 – Adam River Area
1627 – Percé Area
1628 – Forillon Peninsula (Cap Bon Ami Park)
1636 – Beauvoir Area
1637 – Ascot-Corner Area
1639 – Southwest Quarter of Perron Township
1640 – Southeast Quarter of Perron Township
1641 – Lesseps Creek Area
1644 – Ours Lake Area
1648 – Mount Richardson Area
1649 – Northwest Quarter of Rinfret Township
1650 – Southeast Quarter of Nelligan Township
1657 – Baskatong Reservoir Area (West Part)
1666 – Chefs Lake Area

To the above list may be added three special maps as follows:

No.
1658 – Geological Field Parties, 1966
1659 – Geological Field Parties, 1967
1667 – Mining Activities North of the 50th Parallel

Nine final geological maps were printed in solid colors, namely:

No.
1591 – Félix Lake Area
1592 – Gras Lake Area
1612 – Mégantic – Armstrong Area
1613 – Woburn Area
1620 – Baie-Saint-Paul – Saint-Urbain Area
1623 – Northwest Quarter of Louvicourt Township
1624 – Northeast Quarter of Louvicourt Township
1625 – Southwest Quarter of Louvicourt Township
1626 – Southeast Quarter of Louvicourt Township

At the close of March 1968, there were in press 28 preliminary and final geological maps, as well as 10 aeromagnetic maps in the first stages of preparation for publication. At the same time the Cartography Service drew up, for distribution to interested persons, Index Map N^{o} 1671 accompanied by a list (S-106) of published geological maps and indicating also the number of the reports, the name of the author of the geological survey, the year of the survey, and the scale of each available map.

To the work involved in the preparation of the maps named above, mention may be made of the 225 tracings of figures for illustrating reports, as well as two tracings, one of the Lesseps Creek area and the other of the Madeleine Lake area, which are two special studies on geochemical analyses.

Moreover, those in charge of the Topography Division responded to 536 requests concerning toponymy, legends, texts for figures, histograms and sketches.

Since 1967, authorities of the Quebec Department of Natural Resources provided the Cartography Service with two machines for the reproduction of plans through the ammonia process.

All told, 38,385 ozalid or polyester copies were run off from tracings of geological studies, hydrological studies and claim-maps, as well as of base maps for field work. This work was entirely satisfactory to the public and to the technical personnel.

Compilation of Claim-maps

The Compilation Division attended to the producing of planimetric maps, topographic maps, aerial photographs, and geodesy plans for the 35 geological research crews sent into the field during the summer of 1968.

For its part, the Claim-maps Division keeps up to date two sets of township maps on tracings at the scale of 1 inch to 40 chains. From the first series, this Division struck off 108 new township maps, added 134 corrected copies to the total of 1,466 tracings already made, on which 38,709 mining claims or concessions have been recorded. The polycopy ran off 16,501 copies of these tracings to meet the demands from prospectors, proprietors of mining properties, geologists, engineers, and of officials of the regional offices. On the 612 maps of the second series, the Division keeps up to date the boundaries of mining properties. The maps are especially prepared for the purpose of giving a general view of the mining lands held by companies. A total of 300 copies was requested by these firms.

Finally, technicians of this Division made 37 tracings on linen, traced 17 special figures, 18 plans for the Hydrogeology Service and also compiled the geology on 10 provisionary maps of metropolitan Quebec.

MINING SERVICES

The Mining Services comprises the following three administrative units:

(*a*) the Mining Domain Service,

(*b*) the Inspection of Mines Service, and

(*c*) the Engineering Service (Mines).

Each of these units has the responsibility of seeing to the application of certain sections of the Mining Act by controlling the various stages of mining activity and more particularly by:

1. The granting of mining titles on Crown lands. This consists in the registration of mining claims, the issuance of development licenses or of special permits, the selling or the renting of lands for mining operation purposes, according as the case may be. The Services also ascertains whether holders of mining rights meet the obligations inherent in their titles.
2. Inspections in order to ensure that work in mines, quarries and ore-milling plants is carried out in conformity with prescriptions of the Mining Act and regulations pertaining to the safety of workmen.
3. The preparation and execution of engineering works necessary to the opening of new mining districts or new mining installations. These works include construction of access mining roads, founding of mining villages, etc.

Mining Domain Service

Jean-Louis Pouliot, director of the Mining Domain Service, submits the following report on the activities of his Service during the fiscal year 1967/68.

The Mining Domain Service is responsible for granting mining titles on Crown lands. It also has the task of seeing that those having titles to mining rights fulfill the obligations that are inherent in these rights, and of studying requests addressed to the Quebec Department of Natural Resources relating to the sale or rental of lands for the purpose of mining operations. The Service, moreover, investigates exploration and development work reports, receives and compiles the reports that all operators must supply each year, and, finally, supervises the application of the "Unwrought Metal Sales Act".

During the fiscal year under review here, the personnel of the Service comprised two engineers, one geologist, one research agent, two administrative agents, three technicians, four claims recorders, and 40 office clerks and stenographers. This personnel carried out the work of the various offices of the Service situated at Quebec, Amos, Rouyn, Chibougamau, Montreal, and Bourlamaque.

The tasks of the Mining Domain Service are allocated to five divisions: Claims Division; Licenses, Leases and Concessions Division; Economy of Laws Division; Mining Operations Division; and Mineral Statistics Division.

Claims Division

The Claims Division, which is directed by Félix Turcotte, attends to all operations relating to the issue of prospector's licenses, the recording of mining claims, and the transfer of mining rights, in accordance with Sections 12, 38, 45, 195 and 196 of the Mining Act (13-14, Elizabeth II, Chapter 34). These operations represent a multitude of tasks and involve several varied and different procedures.

The regional offices of Quebec, Amos, Rouyn, Chibougamau, Bourlamaque and Montreal issue prospector's licenses and collect the fees for the issuance of various mining titles and for the recording of transfers of mining rights. Moreover, staff members of these offices have to answer the various demands for information that are made to them.

Mining claims situated in the respective districts are recorded at all regional offices, except those in Bourlamaque and Montreal. In Hull, Ville-Marie and Campbell's Bay, prospector's licenses are issued by authorized agents.

It is, however, important to note that the Quebec office is the only one where the recording of transfers of mining rights and all related acts takes place, and this is done in conformity with Sections 195 and 196 of the Mining Act. The Quebec office also has charge of compiling and publishing the semi-weekly list of lapsed claims. These lists make it possible to keep up to date the registered claims, as well as claim maps, in all the offices of the Department. They are therefore very useful for the efficient administration of the offices and to persons interested in the staking out of claims. The Quebec office, moreover, sees to the supply of claim maps for those requesting them. This office likewise answers various requests relating to mining rights.

The schedule of operations for the Claims Division during the fiscal year under review may be set forth as follows:

Issuance of 11,503 prospector's licenses;

Acknowledgement and recording of 37,699 mining claims covering an area of about 1,777,500 acres;

Registration of 1,781 transfers of mining rights and other legal documents;

Supplying 16,600 copies of claim maps;

Answering 2,000 requests for information;

Issuance of 13,297 analysis coupons pursuant to the prescriptions of Section 26 of the Mining Act.

It is worth while mentioning that the claims recording office in Quebec was very active due to the favorable showings found on the North Shore, in the Mistassini district, and north of Chibougamau, as well as in the Monts Marie-

Victorin district (Otish). About 15,000 mining claims were acknowledged and recorded at Quebec during the fiscal year 1967/68. Moreover, it may be pointed out that approximately 700 claims were staked in New Quebec in the name of one company alone.

By virtue of Section 29 of the Mining Act, the Minister of Natural Resources granted during the fiscal period reviewed twenty-four authorizations for staking of claims within the limits of eight different towns and villages. The Lieutenant-Governor in Council likewise authorized, in accordance with Section 30 of the Mining Act, three stakings for gold and silver only in Broughton, Wolfestown and Marston townships. Pursuant to Section 202 of the Mining Act, the Lieutenant-Governor in Council revoked, because of default of payment of the tax provided under Section 119, twenty-four mining concessions. Moreover, he declared open to staking the said lands revoked in conformity with Section 210.

Finally, it may be stated here that, during the fiscal period 1967/68, three requests for withdrawal of staking on lands were approved by the Lieutenant-Governor in Council pursuant to Paragraph 1, Section 268 of the Mining Act. These requests pertained to:

1. A parcel of land situated in the bed of the St. Lawrence river, opposite the parish of Saint-Tite-des-Caps, Seigniory of Côte de Beaupré, electoral district of Montmorency;
2. A parcel of land situated in Manicouagan township, electoral district of Saguenay;
3. Block "A" of the original surveying of Tonnancourt, and Block "B" of the original surveying of Quévillon township.

Licenses, Leases and Concessions Division

The responsibilities of the Licenses, Leases and Concessions Division are assumed by a personnel engaged exclusively in the Qubec office, under the direction of Adélard Fortin. This Division has the task of issuing or renewing development licenses, exploration licenses, special licenses, exploration permits, mining leases, mining concessions, and operating leases. It likewise is responsible for preparing and recommending the issuance of letters patent. These functions are carried out by virtue of Sections 62, 68, 136, 189, 210, 270, 89, 113, 117, and 160 of the Mining Act (13-14, Elizabeth II, Chapter 34).

The Licenses, Leases and Concessions Division has also the task of seeing that holders of mining titles abide by the prescriptions of the Mining Act and fulfill all the obligations laid down for the retention of their titles.

In respect to the activities briefly described above the operations of the Licenses, Leases and Concessions Division for the fiscal year being reviewed may be divided as follows:

Issuance or renewal of 7,365 development licenses;

Sale of two mining concessions and the granting of eight mining leases

upon the recommendation of the director of the Mining Services, by virtue of Sections 113 and 89 of the Mining Act.

It is worthy of note that, according to solemn declarations submitted by claim-holders in conformity with the provisions of Sections 62 and 68 of the Mining Act, development work carried out on the lands concerned for the fiscal period reviewed here was equivalent to a total of 8,020,187 hours.

This Division equally assumes the task of issuing the exploration licenses authorized by the Minister of Natural Resources, by virtue of Division XVI of the Mining Act.

During the fiscal year 1967/68, the Minister authorized the issuance of seven exploration licenses for petroleum and natural gas in Gaspesia on the following tracts:

(*a*) a tract of 19,850 acres in the electoral district of Gaspé-Nord;

(*b*) a tract of 38,600 acres in the electoral district of Gaspé-Nord;

(*c*) a tract of 46,650 acres in the electoral district of Gaspé-Nord;

(*d*) a tract of 36,300 acres in the electoral district of Gaspé-Nord;

(*e*) a tract of 55,900 acres in the electoral district of Gaspé-Nord;

(*f*) a tract of 49,500 acres in the electoral district of Gaspé-Nord;

(*g*) a tract of 36,300 acres in the electoral district of Gaspé-Nord.

Moreover, pursuant to the prescriptions of Section 210 of the Mining Act, the Lieutenant-Governor in Council also authorized the issuance of six special licenses as follows:

(*a*) The first, in Garthby township, electoral district of Wolfe, is valid for minerals other than gold and silver;

(*b*) The second, in Duhamel township, electoral district of Témiscamingue is valid for all minerals except petroleum and natural gas;

(*c*) The third, in Onslow township, electoral district of Pontiac, is valid for all minerals except petroleum and natural gas;

(*d*) The fourth, in Guigues township, electoral district of Témiscamingue is valid for all minerals except petroleum and natural gas;

(*e*) The fifth, in Rouyn township, electoral district of Rouyn-Noranda, is valid for all minerals except petroleum and natural gas;

(*f*) The sixth in Chester township, electoral district of Arthabaska, is valid for all minerals except gold, silver, petroleum and natural gas.

By virtue of Section 270 of the Mining Act, the Minister of Natural Resources may also authorize the issuance of exploration permits for the search of mineral substances, except petroleum and natural gas, in the territory of New Quebec. During the fiscal year reviewed here, the Minister authorized one such permit covering an area of 72 square miles in the region of Cambrien lake, in the territory of New Quebec.

Economy of Laws Division

The Economy of Laws Division, which is under the direction of Camille Thibault, has the task of examining the documents submitted in proof of the work declared by claim-holders. In order to conform with the obligations incident to his titles and to comply with the provisions of Divisions VIII and IX of the Mining Act, claim-holders must, within the prescribed delay, carry out, declare and submit exploration and development works on lands if they wish to keep the mining rights they have already obtained. Each study necessitated the preparation of a memorandum for the purpose of formulating recommendations.

During the fiscal period 1967/68, this Division approved 118 geological surveys, 103 geochemical studies, 472 geophysical land surveys, 50 airborne geophysical surveys, 321 reports on diamond drilling work, and 10 statements submitted on laboratory research work, metallurgical assays and treatment of ore. Moreover, the Division had to refuse 14 geophysical land surveys, one airborne geophysical survey, two geological studies and five reports on diamond drilling.

Moreover, the Economy of Laws Division was given the task of studying two reports that had been submitted in support of mining concessions and also eight reports as vouchers in support of mining leases, in compliance with prescriptions of Divisions X and XI of the Mining Act.

As in previous years, the Department of Natural Resources continued to study requests for information relating to the reports that every mining company has the obligation of supplying under the provisions of "regulations made under the Quebec Securities Act" (3-4, Elizabeth II, Chapter 11, and its amendments) for obtaining the issuance or renewal of its registration as a security issuer. During the year under study here, the Department received from the Quebec Securities Commission 50 requests for information bearing on mining companies that had submitted reports to it.

In collaboration with the Legal Service, this Division worked toward elaborating a new request or renewal form for development licenses which will conform with Sections 64 and 69 of the Mining Act. On February 8, 1968, the Lieutenant-Governor in Council approved Order in Council N°. 312, which concerned regulations pertaining to the said form to be used in the application of the Mining Act.

During the fiscal period reviewed here, the Division also took part in the preparation of three regulations relating to certain mineral exploration works that could be counted as hours of work. These regulations were approved by the Lieutenant-Governor in Council on September 12, 1967, by virtue of Order in Council N°. 2401.

As in previous years, all documents submitted in support of the work declared and examined by this Division, as well as those that are sent to the Department voluntarily, are directed to the technical archives of the Mineral Deposits Service.

Mining Operations Division

The Mining Operations Division is under the direction of Clément Tremblay and is concerned with studying the requests submitted to the Department of Natural Resources for the approval by the Lieutenant-Governor in Council and relating to the locating of installations necessary for mine operations and tailings sites, as well as requests presented to the Minister for granting of mining leases and of the exploitation of sand and gravel deposits. This Division operates in virtue of the provisions of Sections 99, 133, 223, and 243 of the Mining Act (13-14, Elizabeth II, Chapter 34).

At the present time, eight mining companies hold leases on Crown lands which were consented to under the former Quebec Mining Act at prices and rates and upon conditions established by Order in Council entitling them to deposit their waste or tailings on these lands. One of these companies works a sand and gravel deposit; another has obtained a rental on a strip of land for the right of way of a pipe-line.

During the course of their 28 inspection trips, the chief of this Division and a mines technician visited 53 active or abandoned mines and gathered from these samples for the purpose of studying the effects of effluence from mine waste dumps into adjacent hydrographic basins. During these visits, they carried out inspections on claims in order to verify and to control declared development works in accordance with Sections 64 and 69 of the Mining Act.

It is likewise the responsibility of the Mining Operations Division to dispose, in conformity with conditions determined by regulations, of the right of working sand and gravel deposits. All demands made to the Department of Natural Resources are studied by the Mining Operations Division and, for the most part, these requests necessitate inspection visits to the lands making the object of the inquiry. If there is no objection relating to public interest, the requested permit is then granted.

The Department, in collaboration with that of Roads, issued and renewed, during the course of the fiscal year 1967/68, 41 operating licenses for the exploitation of sand and gravel deposits on public lands, in accordance with Section 129 of the Mining Act.

Mineral Statistics Division

C.-O. Beaudet directs the Mineral Statistics Division. As in previous years, this Division is concerned with keeping up to date a list of the operators of mines and quarries of the Province. This work is carried out to conform to Section 250 of the Mining Act. The Division collaborates with the compilation of Quebec's mineral statistics.

The main sources of information which help in adjusting and keeping up to date the list of operators are notices to the Minister submitted in conformity to Section 249 of the Mining Act, reports from mining inspectors, and press

releases from newspapers. This list, which is sent to the Quebec Bureau of Statistics, is very useful to the Bureau for dispatching, to the operators of mines and quarries, questionnaires pertaining to the preparation of the annual report by operators.

Since 1963, the Quebec Bureau of Statistics has charge of gathering and compiling statistics pertinent to the mining industry. However, as the result of an agreement with the Mining Domain Service, the Bureau must transmit to the Department of Natural Resources a copy of all reports that it receives and to supply the Department with all the compilations needed. As its contribution, the Mineral Statistics Division notifies the Quebec Bureau of Statistics concerning the corrections or additions to be inserted in reports from mining companies and it assists the Bureau in the compilation and interpretation of the information these reports contain.

Inspection of Mines Service

The Inspection of Mines Service is responsible for the application of regulations concerning the health and safety of workers in mines, in accordance with Sections 256 to 267 of the Mining Act. This involves regular inspections of mines, open-pit operations, quarries, sand-pits, clay-pits, and peat-bogs to examine their electrical and mechanical installations, as well as those of ore-dressing plants. It also requires testing the cleanliness of air in mine workings, investigating accidents or other occurrences which may affect the lives of workmen in the mining industry, and directing an annual training program for mine rescue.

In the course of their regular inspections of mines and quarries, engineers of the Service obtain information on current and future operations of operators that is useful in governmental administration.

Engineers of the Service proceeded, during the fiscal year 1967/68, to carry out 511 safety inspections in mines and quarries. These inspections, conducted during working hours, enabled the engineers to examine working conditions and work in progress and to ascertain whether safety regulations were being duly observed as to disposition of working premises, conditions of machines, methods employed, and protection of workers.

Moreover, engineers of this Service conducted inquiries into 16 fatal accidents and investigated other unusual events, following which reports were published.

On the other hand, electrical engineers of the Service conducted 153 inspections of electrical installations, verifying whether these conformed to regulations of the Mining Act, and, on the other, they examined detailed plans of new or modified installations for which approval was sought from the Department.

The Department of Natural Resources approves and inspects mechanical installations, such as mine hoists, compressors, diesel engines, etc. The Mech-

anical Section of the Inspection of Mines Service examines all new mine hoist equipment and other types of heavy machinery in mines and quarries and conducts periodic verifications to ensure that the equipment in use conforms to safety regulations and that its maintenance is satisfactory.

During the fiscal period under review, 24 special inspections of hoisting equipment were carried out. Moreover, a number of mines and quarries were visited in order to investigate mechanical accidents and to discuss various specific problems. The Service received 229 hoist-cable registration reports. One hundred and seventeen of these cables were put to use and 112 were removed. The Service also received 346 rope-breaking test reports, 119 steam-boiler inspections reports, and 259 vouchers confirming that medical certificates are held by hoist operators. The study of these documents enables the engineers to exercise a strict control over all hoist cables and boilers used in mines and quarries.

For several years now, some mines have voluntarily adopted the electro-magnetic method of cable testing. During the 1967/68 fiscal year, 190 tests of this type were carried out.

Air cleanliness is an indispensable condition to the health of miners. For this reason, engineers of the Service regularly control the ventilation and dust in mine workings. They conducted 95 control inspections and made 1,268 microscopic analyses of air containing dust in order to determine the degree of dust saturation in various places of work.

Order in Council N^{o} 887, dated August 30, 1956, requires that workers exposed to dust in all mining operations in the Province, including groups one, two, and three of class five of the tariff table of the Workmen's Compensation, hold a medical certificate renewable each year. The Inspection of Mines Service thus received 18,086 radiographic examination certificates submitted by miners during the year under review.

Moreover, it is common practice that miners, chosen by aptitude, be trained in rescue and first-aid work in all large underground mines. The mining companies pay the cost of the course or exercises which are organized and directed by the Inspection of Mines Service. During the year reviewed, 36 mines benefited from these exercises, which have trained, since 1948, 1,562 first-aid attendants, of whom 342 are, at the date of writing, available in case of emergency. Interest in rescue training is stimulated by competitions and tests between teams from various mines. The annual competition took place at Thetford Mines in May 1967, between the eight finalists of the original 21 teams that had taken part in preliminary competitions. The team from Bell Asbestos Mines Ltd. won the trophy.

The second paragraph of Section 266 of the Mining Act states that: "If an association of employees is certified according to the Labor Code to represent a group of the operator's employees, the inspector may require it to designate one of them to accompany him". Before applying this part of Section 266, it was necessary to amend a Section of the Workmen's Compensation Act so that

a union's representative be covered by this Act in case he meet with an accident while accompanying a mining inspector. In November 1967, a ministerial memorandum set forth the conditions in which this second paragraph of Section 266 would be applied.

In order to work more directly in the field of accident prevention, the Inspection of Mines Service acquired a movie projector for showing films relating to safety for workers. This material is at the disposition of mining companies and labor unions. It is hoped that this will contribute to the common effort of lowering the already too high accident rate among workers.

The Service introduced changes in the statistical field relating to mining accidents. It is believed that, for the first time in this country, in addition to fatal and compensable accidents, accidents classed as non-compensable, that is those that do not result in a loss of work for three days, but which at the same time necessitate a visit to a doctor, and the use of Form S-1 of the Workmen's Compensation Commission, are analysed, classified and processed by a computer in order to obtain the following information:

1. the location, type and registration of the entreprise;
2. the age of the accident victim;
3. the marital status of accident victim;
4. the date of the accident;
5. the period of time the accident victim was employed;
6. the place where the accident happened;
7. the cause and material agent;
8. the kind of injury sustained and the part of the body affected;
9. the class of accident: fatal, compensable, non-compensable.

En 1967, the Service classified 6,254 accidents in this manner. If only fatal and compensable accidents had been considered, only 1,219 would have been studied. One may reasonably conclude that, if the number of non-compensable accidents can be reduced, the rate of compensable and even fatal accidents will consequently be lowered.

Engineering Service (Mines)

The Engineering Service of the Mines Branch is responsible for the preparation, execution and supervision of various engineering works destined to permit and facilitate the discovery, development and mining of the mineral deposits of Quebec.

The main activities of the Service may be divided into two closely connected categories: road engineering works and municipal engineering works.

Works relating to road engineering take two forms: those promoted to build access roads into mining properties whose exploitation worth has already

been established and those representing the construction of penetration highways destined to expedite mineral exploration in districts holding promise to that end.

The most up-to-date information on townplanning and municipal engineering is used by the Service in the founding and locating of towns in which employees of new mines in isolated districts will live.

The Engineering Service must also supervise projects geared to the growth of existing mining villages and recommend that municipal funds be used to the greatest advantage of the community.

For administrative purposes, the Engineering Service of the Mines Branch comprises the Mining Roads Division and the Mining Villages Division.

Mining Roads Division

Under the provisions of Section 235 of the Mining Act (13-14, Elizabeth II, Chapter 34) the Minister of Natural Resources, with the consent of the Lieutenant-Governor in Council, has the authority to open, construct, improve, and maintain, after a manner that he may judge appropriate, in whole or in part at the expense of the Province, roads, bridges or other public works that he considers necessary for promoting the development of mining in Quebec.

(A) CONSTRUCTION OF MINING ROADS

Funds allocated in 1967/68 to the Mining Roads Division amounted to $1,119,500, and, for reasons which will be given farther on in this report, disbursements were only $485,648.

During the fiscal year under review here, the principal accomplishments with respect to construction of mining roads are summarized below.

I – *Waconichi Lake – Albanel Lake Road*

The greater part of the construction cost of this road was shared with the Federal Government. However, as the maximum amount allocated by that government was reached in 1966/67, the Province was obliged to continue alone with the work that remained to be completed, namely:

1. Completion of the road itself which services Témiscamie river as far as Albanel lake for a distance of 5 miles;
2. Construction of a 115-foot-long bridge across Métawishish river at Mile-post 82 along the road.

Disbursements for these works came to $271,401, and included professional fees and expenses for supervision by personnel from the Provincial Government.

II – *Roads in Gaspé Provincial Park*

During the fiscal year under study, the Engineering Service started to prepare the construction project of roads leading into Gaspé Park.

1. From Mount Albert lodge to the property of Mines Madeleine Ltée, a distance of 7.3 miles.

   Having decided to mine the deposits discovered in the Mount McGerrigle area, this company applied to the Department for financial assistance for the construction of an access road.

   Studies necessary to the preparation of the plans and estimates of this road-building project were completed during the year by the personnel of the Service. However, it was impossible to proceed with the actual construction of the road because a section of this road was to be built by virtue of a Federal-Provincial agreement, and this agreement has not yet been ratified. Of the sum of $150,000 allocated to the budget, only $20,000 was therefore used for the preparation of the project.

2. From Mount Albert lodge to Lesseps creek stretching along the west slope of Mount McGerrigle.

   The purpose of this road is to promote geological exploration in this very rough and highly inaccessible region.

   In 1967/68, the personnel of the Service collected in the field all the data necessary to the preparation of the plans and estimates for this project and disbursements in this work amounted to $42,864, which left a balance of $107,135. This balance remains unused in the budget, for this construction work cannot start before the Federal-Provincial agreement is signed.

III – *Various Roads*

1. Access road to the property of Eagle Gold Mines, Joutel township — 3.3 miles long.

   This road was built by the company itself but nevertheless according to the requirements of the Department as to the standard of construction and the procedure to follow in calling for tenders. The cost of construction was also financed by the company which later received a contribution of $60,000 from the Department. This explains why the amount of $150,000 provided in the budget for the total financing of the project was not spent.

2. Access road to the property of Icon Sullivan Joint Venture, O'Sullivan township — 1.3 miles long.

   The same procedures as in the preceding case were followed for the realization of this project. The mining company executed and financed the work on its own and later received a contribution of $52,400. The funds available in the budget for the completion of the project, which amounted to $150,000, were consequently not entirely used.

3. Access road to the property of "Le Granite Lecarme Inc." Milot township — 2.5 miles long.

   The Department made a contribution of $15,516 for the first stage of construction of an access road to this quarry. This project was not included in the budget and was brought about by applying to this work part of the funds intended for the second stage of construction of the Chimo Gold Mines road, this company having discontinued its operations.

4. Access road to the gravel bank of Aux Anglais river — Laflèche township.

   The Department undertook the urgent repair of this road, which had become extremely dangerous, and spent $4,555 on the work.

5. Bridge across Waswanipi river.

   This bridge was completed in 1962. However, a litigation involving the sum of $56,069 against the Department of Natural Resources and the bonding company of the contractor charged with the erection of the steel structure was settled out of court with each party having to pay half, that is $28,035.

(B) MAINTENANCE OF MINING ROADS

On November 2, 1966, the Department of Natural Resources ceded to the Department of Roads its jurisdiction over most of the mining roads. It is for this reason that disbursements in 1967/68 on this score were only $24,606 for maintenance of the following roads:

1. Road leading to Joutel township, west of Harricana river — 5 miles long.
2. Waconichi Lake – Albanel Lake road, starting from Témiscamie river to Albanel lake itself — 5 miles long.
3. Mount Albert Lodge road to the property of Candego Mines Ltd. — 4 miles long.

   This road was improved and kept in repair for the purpose of facilitating access to mining developments in the Mount McGerrigle area.

Division of Mining Villages

PURPOSE

The Division of Mining Villages was organized in 1936 for the purpose of promoting the rational development of the different types of urban buildings in the mining districts of Quebec and to ensure that persons who settle in mining towns and villages have the same advantages offered to them as are available to those dwelling in small towns close to large cities.

PRESENT ROLE

In addition to exercising a control over the subdivision of lands into building lots and to establishing the manner and the price of the ceding of lots on mining concessions, the Mining Villages Division is becoming more and more involved since the past few years, owing to the fact that it has occupied itself with the founding of mining towns and villages on Crown lands in order to ensure that persons who choose to live in these new settlements will have from the very beginning adequate municipal, cultural and educational services.

ACCOMPLISHMENTS

The first two mining villages to be entirely established under the direction of the Quebec Department of Natural Resources were those of Chibougamau in McKenzie township, by Order in Council N°. 436 dated April 19, 1950, and Matagami in Isle-Dieu township by virtue to Order in Council N°. 1493, dated June 30, 1961. The respective populations of these two towns were, as of January 1, 1968, 9,800 and 3,000.

Order in Council N°. 565 of March 23, 1965, authorized the Minister of Natural Resources to undertake the work of establishing the mining village of Joutel, in the township of the same name, 80 miles north of Amos and 50 miles southwest of Matagami, opening its streets, and setting up its municipal services.

This new mining village, which will soon be incorporated into a town municipality, according to the provisions stated in Chapter 194, R.S.Q. 1964, of the "Mining Villages Act", has at present municipal services that can accommodate 300 families.

METHOD OF CEDING LOTS

(A) On Mining Concessions

Mining concession holders may now, according to conditions determined by the Minister of Natural Resources and the Minister of Municipal Affairs, cede lands for building lots by pure and simple deed of sale.

The conditions, as permanently fixed by the two Departments, are the following:

(*a*) Approval, by the two Departments, of the subdivision of building lots and the selling price of these lots;

(*b*) For each lot, the concession holder shall pay into the consolidated fund of the Province a sum representing 1 cent per square foot of the land surface;

(*c*) After the deduction of dues payable to the consolidated fund, the mining company shall remit to the Department of Natural Resources, to be deposited in the municipal fund, an amount usually representing

seventy per cent (70%) of the balance of the transfer price of each site. The balance of the selling price is retained by the mining company in compensation for the expense of division into lots, surveying and legal fees, and administration costs involved in the transfer of the sites.

(*d*) In the case of transfers brought about for cultural, educational, municipal, or religious purposes, or other ends relating to public interest, it is the current practice to authorize the transfer of lots acquired at a nominal price of one dollar and the company retaining the mining concession is not obliged to pay the amount to the consolidated fund of the Province, nor has he to pay the cost of land surveying and subdivision of the lot or the expense of the deed of sale.

(B) On Crown Lands

In mining towns and villages constructed on Crown lands, the sale of lots is made by the Department of Natural Resources and the revenue from the sale of lots, less a sum representing 1 cent per square foot of surface, which is payable to the consolidated fund of the Province, is deposited in the municipal fund of the municipality concerned.

The method of ceding lots is as follows:

(*a*) *Option Contract*

Upon payment of the sum of $100 for each residential lot and of $1,000 for every commercial or industrial lot, the Department of Natural Resources consents to a 12-month option. This option, which is non-transferable, gives the right of ownership and is renewable for another period, which may not exceed 12 months, upon the additional payment of an amount equal to the initial sum mentioned above.

(*b*) *Letters Patent*

The future holder must, before the expiration of his option or of its prolongation, pay the total cost of the assignment. Once all the conditions of an option are fulfilled, the sale is concluded and this sale is effected through letters patent.

From April 1, 1967, to March 31, 1968, the Department of Natural Resources ceded, by letters patent, 176 lots situated in mining towns and villages built on Crown lands.

MUNICIPAL FUND

The municipal fund is designed as capital created by means of revenue provided from the sale of lands situated in mining concessions or from sale of lands under the jurisdiction of the Quebec Department of Natural Resources.

The main purpose for the existance of a municipal fund is the sharing of the revenues derived from the transfer of lands in favor of the municipal

MINING TOWNS AND VILLAGES

Population, Letters Patent, Municipal Fund

April 1, 1967, to March 31, 1968

Municipality	*Approximate Population as of January 1, 1968*	*Lots Held by Letters Patent Mar. 31, 1968* [1]	*Amounts Deposited in the Municipal Fund*	*Balance of Municipal Fund as of March 1968*	*Amounts Withdrawn from Municipal Fund and Given to Municipalities for Municipal Works*
BELLETERRE	850			$ 686.28	
BOURLAMAQUE	4,300		$ 509.94	1,007.95	$ 2,400
CADILLAC	1,400	4	6,079,98	6,865.90	
CHAPAIS	2,800		3,804.27	8,792.06	
CHIBOUGAMAU	9,800	99	182,117.78	244,952.17	11,000
JOUTEL	800	1	17,018.61	16,018.61	
MALARTIC	7,000		586.79	2,932.69	1,000
MATAGAMI	3,000	50	57,858.07	84,162.83	
MURDOCHVILLE	3,000		10,138.03	10,325.59	
NORANDA	11,400		7,174.71	7,174.71	
ROUYN	18,900	73	4,325.40	3,947.88	24,000
SCHEFFERVILLE	4,200	314	2,333.32	38,295.37	
VAL-D'OR	12,150	16	2,224.21	7,402.47	22,000
	79,600	557	$294,171.11	$432,564.51	$60,400

[1] These figures include only lots under the jurisdiction of the Department on Crown lands.

corporation in order that it may be able to reimburse more rapidly the Province for the financial help given toward the setting up of permanent municipal services, such as the construction of water-mains and sewers, the opening of streets, the building of sidewalks, and the landscaping of streets. Moreover, the various moneys of the municipal fund serve as payment of subsequent municipal works carried out by municipalities.

The municipal fund is held in trust by the Minister of Finance and administered by the Minister of Natural Resources and the Minister of Municipal Affairs.

Since the municipal fund system was first set up, the sum of $2,893,969 has been paid to mining towns and villages. During the fiscal period ended March 31, 1968, payments to municipalities totalled $60,400.

In May 1967, the Federal Government, represented by the Department of National Defense, paid to the Department of Natural Rsources an amount of $187,000 for the transfer of jurisdiction and administration of lots 1230 and 1576 of Block "D" of McKenzie township in the town of Chibougamau. The lots had been used for several years by the Department of National Defense as a residential center and an administrative center for the personnel connected with the radar base operations of Chibougamau. Out of this amount, the sum of $30,483 was returned as dues to the consolidated fund of Quebec and the balance of $156,516 was paid to the municipal fund of the town of Chibougamau.

WORKS IN THE FISCAL YEAR 1967/68

The sum of $458,939 was spent during the fiscal year under review for the completion of the principal municipal works relating to the village of Joutel, Joutel township, Abitibi-East county. The networks of the water-mains, sewers and rain-water pipes, the lighting of streets, the construction of sidewalks, and the landscaping of streets are now completed along 16,000 linear feet of streets and these municipal services provide a potential accommodation for more than 300 homes in this new mining village.

A water filtration plant, located at the entrance of the village and built along most modern lines, was put into operation at the very beginning of the fiscal year 1967/68. This plant, having a daily capacity of 300,000 U.S. gallons a day, treats water drawn from Harricana river with alum, carbonate of soda, calcium chloride, and chlorine. A fluoridation treatment will be given as soon as Joutel has a permanent municipal engineer to control the process, the mechanism for which is already installed.

The Department of Natural Resources has to assume the responsibility of the operation and upkeep of all municipal services, from the incorporation of the village of Joutel until such time as it becomes a municipality with a town having a municipal council. In order to carry out its obligations a sum of $57,399 was spent by the Department during the fiscal period under review.

Cadastration of new subdivisions on Crown lands in the mining towns and villages of Chibougamau, Joutel, Matagami, and Rouyn involved an expenditure of $8,121.

Disbursements by the Department during the fiscal year 1967/68 attained $524,497 for both mining towns and mining villages.

LABORATORIES SERVICES

The purpose of the Laboratories Services is to aid prospectors and the mining industry by conducting, in the best possible manner, analytic studies and research in order to promote the discovery and development of new mineral deposits.

Since October 1967, the laboratories have been under the direction of Charles-A. Olivier who took over this post from Maurice Archambault. Dr. Archambault founded this service in 1932 and directed it until the transfer. It was he who brought the laboratories to their present stage of development and who, in 1949, set up a research division. During his long and fruitful career as director of laboratories, Dr. Archambault wrote several scientific papers and obtained a number of patents on inventions.

For administrative purposes the Laboratories Services is divided into four sections, namely: chemistry, physics, mineralogy-petrography and metallurgical research. The three first sections have as their main purpose the mineralogical determination and elementary analysis of ores and minerals. They likewise develop new analytic methods as dictated by the needs of the services. The Metallurgical Research section is engaged in perfecting hydro- and pyro-metallurgic processes in view of the beneficiation or the transformation of ores and concentrates.

Given below is a summary table of the analytic studies carried out by the laboratories during the fiscal year reviewed here.

TABLE I

Quantitative analyses	77,720
Semi-quantitative analyses	13,692
Mineralogical and petrographic determinations	8,509
X-ray diffraction determinations	1,933
Radioactivity determination analyses	570
Total analyses and determinations	102,424
Number of samples received	18,168

Chemistry

The Chemistry Service consists of three distinct laboratories: that of general chemistry, in which are made all analyses by conventional methods (gravimetry,

volumetry, colorimetry, etc.); that of geochemistry, in which are determined trace elements of soil and rocks; and that of instrumental chemistry, in which are conducted analyses by flame photometry, atomic absorption, polarography, chromatography, etc. This Service also carries out the necessary research for perfecting methods as needed.

During the fiscal year 1967/68, this Service made 65,799 analyses, as shown in more detail in the following table.

TABLE II

Routine analyses	12,217
Geochemical analyses	53,582
Total	65,799
Analyses of precious metals	5,101
Complete analyses of rocks	32
Complete analyses of water	14
Gas analyses	4

The chemistry laboratories acquired, during the year reviewed here, an atomic absorption spectrophotometer. This apparatus makes it possible to have an accurate determination of several elements at low percentage and even their smallest amount. It is especially useful for geochemical analyses.

Physics

The Physics Service comprises three principal laboratories. These are the emission spectrography, the X-ray diffraction, and the X-ray spectrometry.

The first two make quantitative and semi-quantitative determinations, whereas the X-ray spectrometry laboratory makes only quantitative determinations.

During the fiscal year 1967/68, the Service carried out 28,116 analyses and determinations divided as shown in the following table.

TABLE III

Laboratories	*Quantitative Determinations*	*Semi-quantitative Determinations*	*Total*
Emission spectrography	10,070	13,692	23,762
X-ray diffraction	173	1,760	1,933
X-ray spectrometry	1,834	—	1,834
Radiometry	570	—	570
Zeta potential	17	—	17
Total	12,664	15,452	28,116

Over the past several years the equipment of the Physics Service has been gradually renewed. This work has been very laborious particularly because of exiguity of the Service's quarters and because of the difficulty in carrying out the required services in these quarters.

Mineralogy-petrography

The functions of this Service are the following: 1) identification of the mineral substances in the samples submitted to the laboratory for analysis and making a report to the parties concerned; 2) directing to the proper laboratories the samples sent in for study; 3) supplying technical information and collaborating in research work; 4) controlling and supervising the preparation of rock and mineral collections for educational purposes.

The following table gives a summary of the main activities of the Mineralogy-petrography Service.

TABLE IV

Mineralogical determinations	8,509
Letters and reports edited	433
Thin and polished sections prepared	63
Mineral collections:	
— regular	100
— small chips	300
Rock collections:	
— regular	300
— small chips	0

In 1967, the Service resumed the preparation of the regular collections owing to an increase in demand. The regular collections sell for $5 and those of small chips for $1. An initiation into the knowledge of minerals and rocks of Quebec is thereby effected.

Metallurgical Research

The main object of the Metallurgical Research Service is the search for transformation processes and the beneficiation of ores and concentrates. It is therefore to this Service that requests for information relating to metallurgy are directed.

The Service had to compile and supply to the Department of Public Works all the needed information relating to the Laboratories Services' project of the Mineral Research Center. This work consisted in establishing an operational organigram and the inventory of the equipment, the movables and the services. Starting with these facts and estimates, which the Service was obliged to establish, the personnel determined the space, the services and the staff required

for the period from 1968 to 1975, as well as figuring out the rhythm of the needs and the physical arrangement of the different services.

During the fiscal year reviewed, the Metallurgical Research Service commenced a study of the various fields of activity apt to be the most promising for the Province and of projects which normally should have, as their object, priority works of the Mineral Research Center.

Listed below is a resumé of the different research projects on which work has been undertaken :

Project N°	*Subject and Work Accomplished*
154	Charles-E. Beaulieu and Jean-Jules Panneton continued their beneficiation work in iron-poor ores; this work was conducted to obtain patents in France and Germany. M[r]. Panneton started experimenting on a process, in the local pilot plant, for transforming laboratory results to the semi-industrial scale.
158	With a view to the beneficiation of asbestos wastes, Jean-Louis Caouette and Bernard Kieller determined the nickel content in the different constituents of these wastes. This information is essential in order to know the maximum quantity which could be recovered in the form of a commercial concentrate.
159	François Simonyi worked on the milling of asbestos waste in order to recover a short fiber which would be as pure as possible and other by-products that could be used as base material. The results obtained to date appear very encouraging.
160	Jean-Louis Caouette and Réal Allen studied the various possibilities of treating titaniferous magnetite containing vanadium. There exists in the Province a very large number of these magnetites which cannot be processed by conventional methods. These magnetites represent a very great value, provided that their principal constituents, which are vanadium, titanium and iron, can be extracted.
162	At the request of a mining company, Jean-Louis Caouette and Réal Allen had to determine the roasting temperature of a magnetite concentrate. Results obtained to date lead one to believe that they will contribute to the advancement of an industrial achievement.

During the year under review, Charles-A. Olivier and Jean-Louis Caouette visited a magnesia and lime production plant of Alcan at Wakefield. This plant was obliged to terminate its operations, which had become inefficient, owing to the market for magnesia.

PATENTS

To date, the Metallurgy Service has obtained 64 patents from six countries. Seven of these patents were received during the fiscal period reviewed.

Canada

762,844 Production process of various lithium salts:
Maurice Archambault, Charles-A. Olivier,
Jean-Jules Panneton and Paul Fortier
July 11, 1967

United States

3,343,910 Lithium hydrosoluble compounds:
Maurice Archambault, Charles-A. Olivier
September 26, 1967

Germany

1,240,054 Production process of various lithium salts:
Maurice Archambault, Charles-A. Olivier,
Jean-Jules Panneton and Paul Fortier
September 14, 1967

1,237,080 Production process of lithium carbonate with simultaneous regeneration of reagents:
Maurice Archambault
July 25, 1967

1,242,197 Extraction of lithium from its ores with the help of sodium and ammonium compounds:
Maurice Archambault, Charles-A. Olivier,
Henri-Paul Lemay and Michel Savard
October 16, 1967

Great Britain

1,052,747 Hydrosoluble compounds of lithium:
Maurice Archambault and Charles-A. Olivier
April 19, 1967

1,082,250 Carbonating grating of lithium ores:
Maurice Archambault and Charles-A. Olivier
January 3, 1968

PUBLICATIONS

Jean Plamondon published an article entitled "Rapid Determination of Uranium in Geochemical Samples by Paper Chromatography". This work appeared in "Economic Geology", Volume 63, 1968, pp. 76–79.

Charles-E. Beaulieu and Jean-Jules Panneton presented a paper entitled "The Low Temperature Partial Reduction of Iron Oxides", at the Metallurgists' Conference held at Kingston in the month of August 1967.

Charles-E. Beaulieu and Jean-Jules Panneton presented a paper entitled "L'influence de la surface spécifique sur la cinétique de réduction" at the congress of ACFAS of Sherbrooke, in November 1967.

Charles-E. Beaulieu and Frédéric Abesque published an article entitled "Identification by X-ray Diffraction of an Artificial Solid Solution in the Iron-Oxygen System". This work appeared in "Canadian Metallurgical Quarterly", Volume 7, N°. 2, April–June 1968, pp. 67–71.

SERVICES RENDERED

Several employees of the Laboratories Services contributed to the organization of the XIII International Colloquy of Spectroscopy by translating, in various languages, resumés of the papers that were presented at the colloquy.

PILOT-PLANT SERVICES

Since its inauguration in February 1960, the Pilot-Plant Services has resolutely pursued the objectives assigned to it at its inception, namely:

(*a*) to aid in the development of the mineral resources of Quebec;

(*b*) to promote the exploitation of new mineral deposits; and

(*c*) to contribute to the expansion of operating mines.

The Pilot-Plant Services, therefore, brings to the potential mineral domain, as well as to industry already established, the scientific and technological services necessary for the development of the mining industry. These services consist mainly in studies and research projects, either in the laboratory or in the pilot-plant, their goal being to determine the commercial value of new mineral deposits, to elaborate on methods of concentration for the ores of these deposits, and to supply useful information for the industrial transposition of these processes. In other words, the work of the Services lies in finding solutions to problems pertaining to the concentration of ores submitted, or, again, developing processes which will make possible the recovery and sale of the by-products of mines now in production.

In fine, the Pilot-Plant Services plays an essential role in the expansion of one of the most important of the nation's basic industries. Its personnel is aware of the invaluable part it plays and is proud of the contribution it makes toward the economic growth of Quebec.

A scientifically competent personnel under the direction of Jean-Paul Bolduc, engineer, with Gérard Castonguay, engineer, as assistant, supplies, despite its reduced numbers, a constant and sustained effort in the pursuit of these objectives. The following tables demonstrate the effectiveness of the work accomplished.

The 37 employees who make up the staff of the Pilot-Plant Services are allocated as follows:

2 engineers, respectively director and assistant

5 engineers directly engaged in research

1 professional chemist

5 secretary, office and store employees

1 chief technician of workshops

16 technicians and assistant technicians (laboratories and workshops)

1 maintenance foreman

1 vehicle driver

5 laborers and night watchmen

During the fiscal year 1967/68 the Pilot-Plant Services undertook 35 new research projects on 74 different lots of ore, the total weight of which was 1,300,280 pounds. It is further pointed out that all these projects involving the services of the Department are regrouped under the same project number, which is 526.

Table I gives in alphabetical order the names of the shippers as well as the weight and nature of the ores submitted for metallurgical studies.

TABLE I

Shipper	*N°. of Lots*	*Weight in Pounds*	*Nature of Ore*
Anglo American Molybdenite	2	1,304	Molybdenite
Arba Baton Limitée	1	1,622	Aggregates
Beaulieu, Dr. Charles and J.-J. Panneton	1	40,000	Iron
Carey Canadian Mines Limited	1	2,000	Asbestos rejects
Compagnie Minière Péribonka	1	70	Sands (Au)
Corgemines Limitée	5	566,053	Iron
Credo Mining (Y. Germain)	1	1,138	W, U, Mo
Golden Age Company Limited	2	546	Asbestos
Gulf Titanium Limited	1	422	Ilmenite, hematite
Industrial Engineered Products	2	219	Calcite
Labrecque, R.	1	186	Asbestos
Laurentian Titanium Mines Limited	1	95	Titanium iron
Laurentide Mineral Products Limited	1	3	Graphite
McAdam Mining Company	2	581,350	Asbestos
McIntyre Porcupine Mines Limited	1	120	Copper
Department of Mines and Hydrocarbides of Venezuela	2	3,937	Asbestos

TABLE I (continued)

Shipper	*N°. of Lots*	*Weight in Pounds*	*Nature of Ore*
Department of Natural Resources			
Geological Services			
Assad, Robert	1	105	Fe, Ti. V
Assad, Robert	1	6	Apatite
Laurin, André	1	94	Nepheline
Noiseux, Michel	1	10	Ilmenite
Simard, Antoine	2	420	Peat
Sirois, Roger	1	25	Limestone
Hydraulic Services			
Engineering Works	2	243	Gravels
Department of Roads (laboratories)	16	42,277	Aggregates
Marco Mines Limited	2	1,550	Cyanite
Patino Mining Corporation	1	10	Asbestos
Penarroya Canada Limited	1	336	Copper
Séguin, Émilien	1	230	Fe, Ti, P
St. Lawrence Columbium and Metals Corporations	1	1,360	Pyrochlore
SOQUEM (la Hache)	2	24,196	Magnetite, ilmenite, apatite
Terra Nova Explorations Limited	1	130	Copper
The Ruberoid Co.	6	67	Asbestos
Upton Copper Limited	1	68	Cu, Pb, Zn, Ag, Cd
Wayne, Keith & Associates	4	1,490	Asbestos
White Asbestos (Australia)	4	28,598	Asbestos
Total	74	1,300,280	

Table II, in which are regrouped the same projects according to the nature of ores or the elements they contain, indicates the most active domains and, in this respect, their respective numerical importance.

TABLE II

Ferrous metallic minerals		
Magnetite-hematite-ilmenite	8	631,111
Non-ferrous metallic minerals		
Sulfides and precious metals, etc.	9	6,526
Non-metallic minerals		
Asbestos	8	612,253
Others	10	50,390
Total	35	1,300,280

During the same 12-month period, the Pilot-Plant Services reviewed 41 engineering reports covering many studies and completed projects. Table III presents these reports in numerical order. This nomenclature likewise indicates the party that requested these works, the nature of the work, and the firm responsible for its execution.

TABLE III

Project N°

501–2 *Terra Nova Explorations Limited*
"Concentration tests in order to produce a concentrate of magnetite, ilmenite and apatite"
Naldo Richard, Eng.

516 *Pierre Lacombe, consulting engineer*
"Concentration tests on graphite ores derived from Notre-Dame-du-Laus and Sainte-Thérèse"
Gérard Castonguay, Eng.

526 *Quebec Department of Natural Resources*

–3 *Robert Assad*
"Concentration test on an ilmenite"
Gérard Castonguay, Eng.

–4 *Robert Assad*
"Davis tube concentration tests"
Gérard Castonguay, Eng.

–10 *Roger Sirois*
"Concentration tests of a limestone gravel"
Georges-H. Cloutier, Eng.

–12 *Robert Assad*
"Preliminary tests on a sample containing apatite and ilmenite"
Georges Castonguay, Eng.

536–1 *Great West Mining and Smelting Corporation Ltd.*
"Beneficiation tests on an iron-titanium ore"
Georges-H. Cloutier, Eng.

537 *Portneuf Mineral Corporation*
"Concentration tests on a molybdenum ore containing mica"
Gérard Castonguay, Eng.

539 *St. Lawrence Columbium and Metals Corporation*
"Processing of a columbium ore" (first part)
"Processing of a columbium ore" (second part)
"Processing of a columbium ore" (third part)
Georges-H. Cloutier, Eng.

Project N°

543 *Pilot-Plant*

"Magnetic separation on A.C.L.'S superfine and fibrous mineral filler"
Gontran Foy, Eng.

546 *Terra Nova Explorations Limited*

–1 "Treatment of a copper ore"
Georges-H. Cloutier, Eng.

–2 "Concentration tests on a copper ore derived from an oxide zone"
Naldo Richard, Eng.

547 *McIntyre Porcupine Mines Limited*

"Flotation tests on Wexford copper ore"
Naldo Richard, Eng.

548 *White Asbestos Mining Co. (Watts, Griffis & McOuat)*

"Extraction and evaluation of asbestos fibers from Australia" (four reports)
Gontran Foy, Eng.

549 *Department of Mines and Hydrocarbides of Venezuela*

"Extraction and evaluation of asbestos fibers from Venezuela" (two reports)
Gontran Foy, Eng.

550 *Wayne, Keith and Associates*

"Extraction and evaluation of asbestos fibers sent in from the Eastern Townships" (four reports)
Gontran Foy, Eng.

551–1 *Corgemines Limitée*

"Production of 100 tons of a magnetite concentrate at 62% Fe sol"
Gérard Castonguay, Eng.

"Study of concentration and grinding in closed circuits" (Preliminary Report)
Gérard Castonguay, Eng.

"Re-processing in the laboratory of a magnetite concentrate"
Gérard Castonguay, Eng.

551–2 *Corgemines Limitée*

"Grinding and production tests of concentrated magnetite"
P. Bélanger, Eng.

552–2 *Émilien Séguin*

"Davis tube concentration tests"
Gérard Castonguay, Eng.

Project N°

556–1 *Laurentian Titanium Limited*
"Concentration tests on an ore containing magnetite and ilmenite"
Naldo Richard, Eng.

557–1 *Upton Copper Limited*
"Treatment of a zinc ore"
Naldo Richard, Eng.

561 *R. Labrecque*
"Extraction and evaluation of asbestos fibers derived from the Thetford Mines region"
Gontran Foy, Eng.

562 *Patino Mining Company*
"Extraction of asbestos fibers coming from Ontario"
Gontran Foy, Eng.

567 *Industrial Engineered Products Limited*
"Classification of a calcite ore"
Georges-H. Cloutier, Eng.

The Ruberoid Company
"Calibration of Quebec Standard Testing Machine" (six reports)
Gontran Foy, Eng.

The Analytic Service of the Pilot-Plant Services, under the direction of Robert Cloutier, professional-chemist, carried out 3,036 chemical determinations. Moreover, owing to the collaboration existing between the Pilot-Plant Services and the Laboratories Services, the Laboratories did 2,707 determinations of elements and 19 complete mineralogical studies for the Pilot-Plant. All told, research works by the Pilot-Plant Services necessitated 5,743 determinations of elements, of which 53 per cent were carried out on the spot; the analytic works consigned to the Laboratories Services required the use of instrumental methods.

The year 1967/68 established a record for the amount of ore received for testing. It surpassed by 244,000 pounds the previous high figure set in 1961/62. Two projects in the laboratory gave rise to special interest: studies on the concentration of a vanadium-bearing magnetite and work on the concentration of pyrochlore. At the plant, the Pilot-Plant Services carried out an important pilot test on an iron ore from Corgemines Limitée and started a second which necessitated the temporary installation of heavy grinding equipment needed in order to study some asbestos ore from McAdam Mining Company. It is reasonable to believe that in pursuing this work the Pilot-Plant Services has contributed in a direct way to the future establishment of two new mining operations in Quebec.

WATERS BRANCH

HYDRAULIC SERVICES

As the result of a reorganization of administration on November 1, 1967, the Division of Exploitation was transferred from the Hydrometeorologic Services to the Hydraulic Services, and, consequently, the personnel of the Hydraulic Domain Service engaged in the study of lakes was transferred to the Hydrography Service of the Hydrometeorologic Services.

In this same reorganization, the Hydraulic Studies and Research Service became the Hydraulic Development Service and the Engineering Works Service (Waters) is now the Hydraulic Engineering Service.

The new name given to the Hydraulic Development Service denotes more effectively the objectives which are its responsibility, that is the preparation of general plans for developing hydrographic basins and sub-basins.

As during the preceding fiscal period, the Hydraulic Services attended, especially through its Hydraulic Domain Service, to the administration of the rights of the Province on domanial surface waters and to the application of the Water-courses Act.

Moreover, through its Hydraulic Engineering Service, the Hydraulic Services concerned itself with the carrying out of works and projects favorable to the conservation and the development of the hydric resources of the Province.

During the course of the fiscal year under review, certain amendments to the Water-courses Act were submitted to the Legislature and these were sanctioned at the beginning of the following fiscal period, that is on May 28, 1968. The Hydraulic Services continued to prepare the basic texts and statistics supporting the necessity of such amendments.

Moreover, as the judicial statute governing waters is not very clear, the Services collaborated in preparing the basic texts necessary for the formation of a "Study Commission on the Judicial Problems of Water", which has been in operation since July 1968.

During the fiscal year reviewed, the director of the Hydraulic Services took part in numerous committees and assisted, as an observer representing the Province of Quebec, at the semi-annual reunion of the Great Lakes Commission which was held at Niagara Falls, New York State, at the end of June 1967.

Given below is an account of the activities of each of the three Services making up the Hydraulic Services.

Hydraulic Engineering Service

During the fiscal year 1967/68, the Hydraulic Engineering Service consisted of five divisions, the activities and accomplishments of which for this period are described below.

In the course of the year reviewed, this Service received 266 requests for intervention, of which 199 were presented by various municipalities of the Province and 67 by different departments or other organizations. Of this number, 83 requests were made as the result of inspections. The recommendations, given after a study of each request, may be classified as follows.

Two hundred and seven requests were rejected, since they failed to meet the standards for intervention laid down by the Department.

Forty-one requests were set aside until additional information required to give a final decision as to intervention by the Department is obtained. Out of this number, about 10 inspections could not be undertaken because of the winter season and, consequently, these were transferred to the program for the next fiscal period. The other requests are still to be studied and will be eventually the object of a recommendation for execution or of a refusal, according to whether or not certain criteria safeguarding the public domain will have been established.

Eleven requests were granted, and work relating to them will be included in the program for the next fiscal year.

Seven requests were attended to by the carrying out of work during the course of the fiscal year reviewed because of their urgent character and because they affected the public domain.

During the fiscal year 1967/68, the major part of the program of works, as well as an important part of the budget, was devoted to the pursuit of remedial works in connection with the general Chaudière project.

It should likewise be mentioned that, during the fiscal period reviewed here, most of the projects prepared and accomplished by this Service and which could be a part of the context of the Federal-Provincial agreement on the economic advancement of rural areas, for the years 1965 to 1970, were previously submitted to the ARDA organization. The expenses entailed in these undertakings conforming to established standards were or will be eventually reimbursed to the Department.

The Hydraulic Engineering Service likewise contributed $18,991 to the costs of studies that went into the preparation of two reduced-scale models. These studies, which were started during the fiscal year 1965/66, were pursued, in collaboration with the Hydraulic Development Service of the Department, by Université Laval and Lasalle Hydraulic Laboratory, and were concluded during the 1967/68 fiscal period. The implementing of these models had for its object the study, before the dams were set up, of an ice boom on Chaudière river at Rapide-du-Diable and of a section of Saint-François river at Bromptonville for the prevention of floods.

In the carrying out of the projects described above, the Service employed local manpower whenever possible. The engineer or the technician in charge of organizing these works applied at the regional Provincial Manpower Center, in order to obtain a list of persons available in the regions concerned.

All this manpower was paid in accordance with the recommendations of the Department of Labor of the Province of Quebec and in conformity with the Fair Wage Scale established for the various zones of the Province.

Remedial Works Division

PERSONNEL

During the fiscal year reviewed the Remedial Works Division had as personnel an engineer in charge of the Division, three other engineers and seven public works technicians.

ACHIEVEMENTS

The program carried out by the Remedial Works Division during the fiscal year 1967/68 includes the completion of 22 projects costing $239,817.05. Eight of these were accomplished within the framework of the general Chaudière plan at the cost of $43,075.49.

A summary description of each of the 22 projects that were undertaken during the fiscal year 1967/68, as well as a recapitulative table (N°. 1) showing costs of the works carried out, is given farther on in this report.

LIST OF REMEDIAL WORKS ACCOMPLISHED IN 1967/68

BEAUCE COUNTY

1. *Chaudière River:* lot 158, range I, SW. Saint-Joseph-des-Érables parish:

   Heightening and levelling the river bank along 350 feet; protection of this bank with a stone facing over the same distance. Most of this work had been done during the previous fiscal year and the remainder was completed in the course of the fiscal period reviewed.

2. *Des Plaines River:* lot 695, range I, NE., Saint-Joseph parish:

   Correcting the bed of Des Plaines river along 1,000 feet; construction of two sills with stone only; protection of the banks by a stone facing over an approximate distance of 675 feet. These works had been carried out for a goodly part during the fiscal year 1966/67 and were completed in the course of the fiscal period under review.

3. *Chaudière River:* lot 894 and lots 594 to 600, range I NE., Saint-Georges:

   Complete removal of Gilbert island, cadastral N°. 894; construction of an embankment about 2,000 feet long; protection of this embankment by a retaining concrete wall over a distance of 200 feet and by a stone facing for a length of 1,800 feet.

4. *Morency River:* lots 767 to 769, range I NE., Enfant-Jésus parish:

   Excavating a gravel bank situated in Chaudière river along the above-mentioned section; straightening the mouth of Morency river so as to direct the course of this tributary in the same direction as that of Chaudière in order to reduce the formation of deposits at the mouth of this affluent; protecting the banks with a stone facing at the mouth of Morency river and along the right bank of the Chaudière immediately upstream from Morency river. This work, which had been started in the fiscal year 1965/66, was completed in the 1967/68 fiscal period.

5. *Chaudière River:* lot 34, range NE., Saint-François parish:

   Construction of a retaining wall of about 100 feet in length.

6. *Des Plantes River:* lots P-9 to P-16, range I NE., Saint-François parish:

   During the fiscal period reviewed here, the Department of Natural Resources planned on protecting the banks of Des Plantes river fronting the lots mentioned above. However, because of a break-up on this river during the month of December, the contractor to whom the Department of Natural Resources had granted the contract of carrying out this work was unable to commence the project. During the winter of 1967/68, the contractor gathered a reserve of stones, which will make it possible for him to start this work as soon as the weather is suitable in the course of the next fiscal year.

7. *Chaudière River:* lots 198 to 205, range SW., Saint-François parish:

   During the fiscal year under review, the Hydraulic Engineering Service levelled off the ground in the vicinity of the works carried out in 1965 on the property of Joseph Bernard.

CHARLEVOIX COUNTY

8. During the fiscal year 1966/67 the Service undertook the construction of a retaining wall bordering the *rivers of Bras, Mares and Gouffre,* at Baie-Saint-Paul. These works were completed in the fiscal year under review.

DORCHESTER COUNTY

9. *Chaudière River:* lots 744 to 746, range Bord-de-l'Eau, at Scotts Junction:

   During the fiscal year reviewed here, the Service repaired a bridge which had been damaged during the construction, by the Department, of a revetment bordering Chaudière river at Scotts Junction in 1965.

Table No. I — REMEDIAL WORKS CARRIED OUT DURING THE FISCAL YEAR 1967/68

County	*River*	*Municipality*	*Description of Works*	*Cost*
Beauce	Chaudière	Saint-Joseph-des-Érables	Protection of bank	$ 434.45
Beauce	Des Plaines	Saint-Joseph	Correction of bed and protection of bank	2,023.22
Beauce	Chaudière	Saint-Georges	Correction of bed and protection of bank	30,965.97
Beauce	Morency	Enfant-Jésus	Correction of bed and protection of bank	3,178.80
Beauce	Chaudière	Saint-François parish	Protection of bank	1,991.24
Beauce	Des Plantes	Saint-François parish	Protection of bank	3,345.99
Beauce	Chaudière	Saint-François parish (Joseph Bernard isle)	Levelling of ground	803.47
Charlevoix	Bras Mares Gouffre	Baie-Saint-Paul	Protection of bank	13,721.06
Dorchester	Chaudière	Scotts Junction	Repair of bridge damaged in former work	332.35
Duplessis	Moisie	Pointe de Moisie, Letellier township	Construction of jetties	10,016.90
Gaspé-Nord	Grande-Vallée	Grande-Vallée	Cleaning of bed and protection of bank	20,849.63
Gaspé-Nord	Grande-Vallée	Grande-Vallée	Repair to the retaining wall built in 1964	179.28
Mégantic	Bécancour	Thetford Mines	Construction of masonry wall	8,873.69

Table N°. I — REMEDIAL WORKS CARRIED OUT DURING THE FISCAL YEAR 1967/68 (continued)

County	*River*	*Municipality*	*Description of Works*	*Cost*
Montmorency	Sainte-Anne	Saint-Féréol	Dynamiting of a rock ridge and cleaning of the river bed	$ 12,323.04
Montmorency	Sainte-Anne	Beaupré	Construction of a concrete wall	18,769.17
Montmorency	Sainte-Anne	Beaupré	Levelling of ground	338.32
Richmond	Weedon lake	Weedon Center	Removal of clusters of vegetative material	16,071.65
Rimouski	Métis	Sainte-Angèle-de-Mérici	Cleaning of bed and evening of channel section	10,903.16
Saguenay	Escoumins	Des Escoumins parish	Construction of a retaining wall	3,932.49
Saguenay	St. Lawrence	Des Escoumins village	Construction of a retaining wall	4,817.02
Saguenay	St. Lawrence	Godbout	Protection of bank	74,466.15
Saint-Maurice	Petite Yamachiche	Sainte-Anne-de-Yamachiche	Gabion retaining wall	1,480.00
			Total	$239,817.05

DUPLESSIS COUNTY

10. *Moisie River:* Pointe-de-Moisie, Letellier township:

The Department of Natural Resources built at this place, during the fiscal period reviewed, 13 stone jetties in order to check the erosion which threatened to dislodge a whole group of cottages.

GASPÉ-NORD COUNTY

11. *Grande-Vallée River:* lots 39 to 45, range I, Grande-Vallée seigniory:

Consruction of a stone retaining wall along 1,000 feet and cleaning the bed of the river for a distance of 3,000 feet.

12. *Grande-Vallée River:* lots 28 and 29, range I, Grande-Vallée seigniory:

During the fiscal year under review, the Service made certain improvements to the pile-wall built along the border of Grande-Vallée river. This work consisted in filling, with gravel, certain sections where the embankment constructed in 1964 had been eroded from under the wall.

MÉGANTIC COUNTY

13. *Bécancour River:* section of Bécancour river comprised within the limits of Thetford Mines:

During the fiscal year 1966/67, the Hydraulic Engineering Service constructed a 600-foot-long masonry wall bordering Bécancour river at Thetford Mines. In the spring of 1967, this wall collapsed over a distance of 100 feet. The Service was therefore obliged, during the fiscal period reviewed here, to rebuild this part of the wall.

MONTMORENCY COUNTY

14. *Sainte-Anne River:* lots 280 and 281, Saint-Féréol parish:

At this locality, the Department undertook the dynamiting of a rock ledge upstream from the bridge connecting Saint-Féréol to Saint-Tite-des-Caps and it also straightened the bed of Sainte-Anne river for a distance of about 1,000 feet downstream from the same bridge.

15. *Sainte-Anne River:* lots 377 to 378, Beaupré:

Construction of a 100-foot concrete wall along the left bank of Sainte-Anne river at Beaupré.

16. *Sainte-Anne River:* lot 415, Beaupré:

During the fiscal period under review, the Service levelled the ground in the vicinity of the work carried out in the winter of 1966/67 on the Sainte-Anne river at Beaupré.

RICHMOND COUNTY

17. *Weedon Lake:* Weedon Center:

Removal of the islets of vegetative material lodged on the shores of Weedon lake.

RIMOUSKI COUNTY

18. *Mitis River:* Sainte-Angèle-de-Merici:

Cleaning and correcting the channel section of Mitis river over a distance of about 2,000 feet.

SAGUENAY COUNTY

19. *Les Escoumins River:* part of lot 12-A, Les Escoumins parish:

Construction of a retaining wall along 800 feet in order to protect a municipal road.

20. *St. Lawrence River:* lots 15-A-4 and 15-A-8, Les Escoumins township, Les Escoumins village:

Construction of a retaining wall along 210 feet in order to protect a public road.

21. *St. Lawrence River:* lots 10 to 18 and lots 24 to 28, Godbout village:

Construction of a stone retaining wall over a distance of 1,100 feet fronting lots 10 to 16 and repair of the retaining wall that is already in place between lots 24 to 28 along an interval of 1,200 feet, all of which work was done for the protection of a public road. These works had been commenced during the fiscal year 1966/67 and were completed in the course of the fiscal period under review.

SAINT-MAURICE COUNTY

22. *Petite Yamachiche River:* lot 699, north concession of the parish of Petite Yamachiche:

During the winter of 1967/68, the Department of Natural Resources supplied the municipality of Sainte-Anne-de-Yamachiche with gabions, which were needed to protect the right bank of Petite Yamachiche river. These works were carried out by the municipality itself, which took advantage of the aid provided by the "Winter Works Program". The Hydraulic Engineering Service supplied the municipality with 37 gabions measuring 5 m. by 2 m. by 3 m.

Dams Division

PERSONNEL

The personnel of the Dams Division was slightly increased during the fiscal year under review. It now consists of an engineer in charge of the Division, four other engineers and one technician of public works.

This Division likewise drew upon the services of several members of other divisions of the Hydraulic Engineering Service during the summer of 1967 in order to meet the needs of its undertakings.

ACHIEVEMENTS

The work program carried out by the Dams Division during the fiscal period 1967/68 consisted in the completion of nine projects distributed as follows:

(A) *MAINTENANCE AND REPAIR OF DAMS OWNED BY THE DEPARTMENT*

1. *Montmorency River* — Gauger dams:

   After a year of operation, it became evident that it would be necessary to make certain improvements and changes to the three gauger dams built in 1966 in Montmorency Forest for the Hydrometry Service. These works consisted chiefly in the construction of masonry aprons for protection against erosion and in the cleaning and enlargement of the basins upstream. Since the work has been finished the condition of the dams appears excellent.

2. *Delorme Creek* — Gauger dam:

   Following the damage caused by the severe spring flood which occurred at this place, the Division concerned itself with applying necessary corrective measures, especially by the erection of a retaining wall for stabilizing the right bank.

3. *Saint-François River* — Aylmer dam:

   In order to improve the funtioning of the Aylmer dam so as to meet with the request made by the Operations of Dams Division, this Division commenced the installation of the equipment necessary for horizontal mechanization of the lifting apparatus.

4. *Au Sable River* — Pibrac-Ouest dam:

   In order to cope with the problem resulting from the breaking up of some monoliths from the sluice gate section, a condition caused by the inferior quality of the original concrete, the Division succeeded in anchoring these blocks by the installation of steel supports of considerable diameter destined to stabilize everything until such time as a decision is taken relating to the extensive works which the situation demands. Meanwhile the safety of the work is not involved.

5. *Chaudière River* — Ice boom:

   The experimental period for this work having terminated, the Dams Division attended to the repair of the ice boom.

6. *Nord River* — Manitou and Lac Brûlé dams:

   At these two places, a few minor repairs were made in order to ensure that these dams are maintained in good operating condition.

(B) *CAPITAL EXPENDITURES*

7. *Chaudière River* — Sartigan dam (Plates I, II, III and IV):

During the summer and autumn of 1967, from April to December, the Dams Division had the responsibility of supervising the construction operations of Sartigan dam. At the cost of a little less than $1,500,000, this work, in reinforced concrete, is 650 feet long and has a maximum height of 55 feet. It is situated upstream from Saint-Georges in Beauce county. Its main object is to put an end to the threat of annual floodings created by the stranding of major ice-packs downstream from the city of Saint-Georges. To this end, it has provided gratings especially designed to stop the progress of the ice-floes in the reaches upstream. During the flood of the spring of 1968 the results of these gates were seen to be even better than expected. The engineering of this project was wholly the work of the Dams Division.

8. *Montmorency River* — Lac des Neiges dam:

An engineer of the Dams Division supervised the construction work done by a private firm following public tenders. The Lac des Neiges dam measures 325 feet in length, has a height of about 16 feet and serves to regulate the waters of Neiges lake as it drains into Montmorency river. Owing to the short period during which the local roads are serviceable, only part of the work was done in 1967. The remainder was completed in the summer of 1968. This work consisted essentially of an earthen embankment with a control section in reinforced concrete. All the engineering connected with this project was carried out within the Division.

9. *Saint-François River* — Allard dam:

The program of renovating the Allard buttress dam was continued. A call for tenders was made and a contract given to a private firm for repairing the facing downstream, fixing the slots of the small beams and the control building, and attending to other related works. These operations were commenced during the winter of 1967/68 and should be continued during the fiscal year 1968/69.

(C) *STUDY OF PROJECTS*

1. *Jacques-Cartier River* — Lac Saint-Joseph dam:

Lac Saint-Joseph dam formerly was the responsibility of the Department of Lands and Forests and lately was transferred to the Department of Natural Resources. This dam has an insufficient evacuation capacity of such proportion that each spring it is the cause of numerous complaints due to flooding. Since this increase cannot be attained economically, the complete reconstruction of the dam must be considered. The study and the planning of this project were pursued during the year reviewed.

PLATE I — Upstream view showing details of spillway, such as the profile, vertical keyways, steel frame and elevation of pillars.

Chaudière

SARTIGAN

Beauce

PLATE II — General downstream view, toward the east, after five months of work.

River

DAM

County

PLATE III — General view, toward the west, showing the erection of coffers, according to the method of successive lifts.

PLATE IV — Detail of the downstream, apron slabs, energy dissipators at three different stages of construction.

2. *Lièvre* — Kiamika dam:

The Kiamika dam is used by the James McKlaren Company. The necessary improvements to the sluice gates have been long delayed and their operation has become difficult. The Dams Division therefore prepared a project for replacing the gates, and plans were submitted to the company which is responsible for the maintenance of the dam.

3. *Bourbon River* — Plessisville:

Within the scope of the study undertaken by the Hydraulic Development Service concerning the feasibility of regulating Bourbon river at Plessisville, the Dams Division supplied the preliminary data on the possible types and costs of such a construction according to the extent of the project, which will be determined later.

4. *Aulnaies Creek* — Gauger dam:

The Dams Division of the Hydraulic Engineering Service prepared the plans and estimates and conducted a call for tenders for a gauger dam for the Hydrometry Service. The carrying out of this project, however, was delayed owing to budgetary conditions.

5. *Loup River* — Moveable dam at Saint-Alexandre:

A study was undertaken on the construction of a moveable dam, which would be of the rocking or rolling sluice-gate type. This study complements that started by the Hydraulic Development Service for eliminating floods at this locality.

6. *Chaudière River* — Dam at Beauceville:

The Dams Division submitted a preliminary report which contained an estimate and summary project of a dam for holding back ice at Beauceville. However, this work will not be started until the efficiency of the Sartigan dam for the prevention of floods at this locality is completely known.

CONTRIBUTION OF THE DEPARTMENT

Yamaska-Nord River

During the fiscal year 1967/68, the Department of Natural Resources contributed to the redevelopment plan of Boivin lake on Yamaska-Nord river with a view to increasing the reserve of drinking water for the City of Granby and of improving the quality of that water.

It was therefore agreed, to this end, that the Department would make to the City of Granby a grant of $500,000 divided in portions of $100,000 over a period of five years, as a contribution to the realization of a part of a global project estimated at $2,800,000. This contribution was applied to the work of excavation and of building embankments in Boivin lake.

Topometry Division

PERSONNEL

The staff of the Topometry Division comprised, during the fiscal year reviewed here, one land-surveyor as chief of the Division, one first-class technician and six technicians of public works. Throughout the summer of 1967, the Division had at its disposition nine students who, under the direct supervision of the technicians, helped with the surveying.

ACCOMPLISHMENTS

The Topometry Division carried out the topographic surveys required by the Hydraulic Engineering Service in a similar manner and it also worked in close cooperation with the Hydraulic Development Service and the Hydraulic Domain Service.

During the fiscal year 1967/68, the Topometry Division completed 28 topographic surveys, six of which served or will be used to develop undertakings related to the general Chaudière project. Other surveys were performed in various parts of the Province.

Further mention of these surveys is given in Table II, which shows the various places and costs of work accomplished.

Inspections and Costs Division

The Inspections and Costs Division employs on a full-time basis an engineer and a clerk. Its activity for the fiscal period reviewed was virtually the same as that for the preceding year. This Division made 63 inspections following requests submitted by municipalities. These requests came from 27 counties throughout the Province.

It has always been the function of this Division to gather, compile and examine all available information in order to build up a documentary file on the subject of unit costs pertaining to the work performed by the Hydraulic Engineering Service.

Technical Assistance Division

The Technical Assistance Division was created during the month of October 1967 for the purpose of coming to the immediate aid of engineers responsible for the preparation of projects of dams or of remedial works along streams. The Division engages two technicians of public works and two topography technicians.

It is the task of this Division to prepare the plans relating to construction projects by starting from a rough draft and seeing to the initiation in less detail.

This Division is likewise responsible for making the introductory plans for topographic surveys by using the notes taken in the field by the topometry crews.

Table N°. II — LAND SURVEYING DONE DURING THE FISCAL YEAR 1967/68

County	*River*	*Place*	*Cost*
Abitibi-East	David Creek	Chibougamau	$ 417.95
Beauce	Chaudière	Beauceville	2,079.86
Beauce	Du Loup	Jersey Mills	1,685.89
Beauce	Bras	Beauceville	439.62
Beauce	Chaudière	Jersey Mills dam	7,759.21
Beauce	Plantes	Beauceville	22.50
Bonaventure	Nouvelle	Nouvelle-Ouest	495.81
Brompton	Saint-François	Bromptonville	218.05
Charlevoix	Gouffre	Baie-Saint-Paul	539.07
Duplessis	Rat Musqué	Camp Otis	941.76
Frontenac	Chaudière	Drolet	243.69
Gaspé-Nord	Cap-Chat	Cap-Chat	3,765.30
Gaspé-Nord	Grande-Vallée	Grande-Vallée	905.59
Gaspé-Nord	Sainte-Anne des Monts	Sainte-Anne-des-Monts	1,035.64
Kamouraska	Du Loup	Saint-Alexandre	2,884.95
Kamouraska	Théberge Creek	Saint-Eleuthère	1,456.78
Mégantic	Bécancour	Black Lake	503.71
Mégantic	Bourbon	Plessisville	234.05
Missisquoi	Yamaska	Cowansville	2,549.33
Montcalm	Assomption	Saint-Charles-Borromée	1,180.17
Montmorency	Aulnaies Creek	Laurentides Park	189.53
Nicolet	Nicolet	Sainte-Monique	323.32
Portneuf	Lake Saint-Joseph	Duchesnay	124.54
Saguenay	Saguenay	Tadoussac	142.64
Saint-Maurice	Yamachiche	Yamachiche	206.96
Témiscouata	Aux Perches	Sainte-Rose-du-Dégelis	273.58
Wolfe	Saint-François	Allard Disraëli dam	75.24
Yamaska	Yamaska	Yamaska	251.32
		Total	$30,946.06

Hydraulic Domain Service

The Hydraulic Domain Service of the Quebec Department of Natural Resources is responsible mainly for supervising the application of the Water-courses Act (R.S.Q. 1964, Chapter 84) and of the Timber-driving Companies Act (R.S.Q. 1964, Chapter 96).

Moreover, the Service conducts studies and makes recommendations concerning the rental of lands needed for electrical power transmission-lines, rights of way, sub-stations, log-flumes and waterworks.

Finally, the Hydraulic Domain Service, in the absence of tribunal decisions, issues administrative opinions concerning whether or not certain lakes and rivers in Quebec are to be considered navigable and floatable. These opinions serve as an administrative guide for the Department of Natural Resources, as well as other departments, in the establishment of rights of the Province over its watercourses.

Appendix II of this report gives comparative statements of revenue for the fiscal year 1967/68 and for the preceding fiscal period 1966/67.

(A) Main activities of the Hydraulic Domain Service pertaining to the administration of the Water-courses Act:

(*a*) By the provisions of Section 2 (Division I) of the Water-courses Act and certain Orders in Council, the Hydraulic Domain Service issues leases covering certain parts of the beds of domanial streams, lakes and rivers, or certain parts of the foreshores and sand-flats of the ocean.

Leases issued under Division I cover all uses of domanial properties on watercourses not covered by Division III and subsequent provisions of the Act.

The Department's conservation policy, which is to keep in the public domain as much as possible of the ownership of the beds and shores of streams and lakes of the Province, was continued. The Hydraulic Domain Service administered the 1,241 leases issued under Division I. During the fiscal period reviewed here, 850 new leases were drawn up by the Service.

Also, during the 1967/68 period, the Hydraulic Domain Service, sanctioned, by Order in Council, the tariff to be applied for all works done on river beds before the actual leasing.

On receipt of requests for rental of large surface areas of river beds to be used for industrial development, the Service draw up the particular Orders in Council. Two Orders in Council were thus approved.

Revenue from the administration of all leases of this nature issued by the Hydraulic Domain Service amounted to $71,937 during the fiscal year under review, compared with $69,830 during the preceding fiscal year.

(*b*) Division III of the Water-courses Act provides for the approval of plans and specifications concerning the harnessing of hydraulic power and rental of Crown rights and lands needed for such work.

During the course of the year under review, three dams were given the pre-cited approbation. Also, a contract between the Government and Alcan was drawn up with regards to the storage of Commissaires lake.

As most of the leases issued under Division III provide for the payment of an annual rental based on the production of each plant, in addition to the fixed rental, the Hydraulic Domain Service must attend to the control and inspections necessary to evaluate rental.

Moreover, technicians of the Service supervise the royalties paid by the various companies concerned on profits resulting from the use of storage dams built and maintained by the Department. The cumulative revenue, during the fiscal year reviewed, from storage-dam profits, whether maintained by the Department or by private concerns, amounted to $471,111, compared with $353,573, during the preceding fiscal period.

Following negotiations with a company interested in energy derived from Outardes river, royalties increased from 50¢ to $3 per thousand kilowatt-hours produced.

During the same period, the Hydraulic Power Division verified, on site or at the head offices of Hydro-Québec, production from all its stations.

Technicians and engineers of the Hydraulic Domain Service also carried out the verifications and controls necessary in order to determine the additional dues payable by holders of hydraulic power plants under the provisions of clauses (*c*) and (*d*) of paragraph 3 of the Act to ensure the Progress of Education (10, Geo. VI, 1946, Chapter 21).

During the year reviewed, revenue from the leasing of hydraulic power sites on Crown lands amounted to $2,526,199 and revenue arising from the Act to ensure the Progress of Education amounted to $2,552,485.

During the preceding fiscal period, revenue from these sources was $2,628,501 and $2,438,481 respectively. Since January 1, 1964, all rental fees and royalties payable by Hydro-Québec were replaced by a single royalty amounting to 50¢ per thousand K.W.H. produced. Under this arrangement Hydro-Québec paid, during the fiscal year 1967/68, a total amount of $22,179,172, compared with $21,851,124 for the preceding fiscal year.

(*c*) Division IV of the Water-courses Act deals with the approval of plans and specifications of dams and other works needed for log-driving, as well as with rentals of Crown lands necessary for the maintenance of these dams.

Work related to all log-driving dams maintained by companies carrying out log-boom works on the streams of the Province has been brought up to date, as well as its legalization.

During the course of the year under review here, nine Orders in Council sanctioned by the Executive Council authorized the approval of plans and specifications, as well as the rental of lands needed for the maintenance of 18 log-driving dams.

The program set up last year to legalize log-boom works was continued and four Orders in Council were sanctioned in this respect. Thus, twenty-two leases were drawn up.

Revenue derived from all leases issued by virtue of this Division of the Water-courses Act amounted to $182,765, compared with the $175,258 of the preceding fiscal year 1966/67.

(*d*) Division VII of the Water-courses Act provides for the approval of plans and specifications, as well as for the rental of lands needed for the establishment of reservoirs for municipal or industrial water-works.

During the course of the year, an inventory of all dams used for aqueducts was undertaken. This work involved visiting each of the health units operated by the Department of Health and revealed that in the Province there are 260 storage dams for the pre-cited purposes, 37 installation projects on an aqueduct system bearing on the construction of a dam, and 268 water intakes on the beds of streams, rivers and lakes.

Moreover, initial works of inspection, surveys, draughts, and calculations of the stability and capacity of the pre-cited works were undertaken in Portneuf county. Results obtained have allowed the Service to revamp its method of procedure so that, in the forthcoming year, this work will be done as effectively as possible for each of the above-mentioned works.

(B) Other activities of the Hydraulic Domain Service:

(*a*) As mentioned previously, the Hydraulic Domain Service is responsible for the rental of rights of way on lands belonging to the Crown, for power transmission lines and all other related purposes.

In this respect, the Service has, at the present time, 43 requests under study, 15 awaiting technical documentation, and seven of which the leases will be returned to the Service duly signed by the applicant. All told there are 65 cases.

To these requests may be added some 53 dams which were formerly used for log-driving but are now the property of Hydro-Québec and for which the Department must establish, by an Order in Council, operation rights.

Work undertaken in 1966/67 in order to determine the various jurisdictions of the Laflèche Township territory was pursued and an agreement between the company interested and the Department of Natural Resources was tabled to bring about a definitive solution to this problem.

Revenue derived from the above-mentioned rights of way amounted to $21,288, as compared with $26,141 during the preceding fiscal period. This decrease was due to the replacement of the rental fees and royalties to be paid by Hydro-Québec by the fixed royalty paid to the Government by the commission in question.

(*b*) As mentioned earlier in this report, the Hydraulic Domain Service issues, in the absence of a court decision, certain opinions as administrative guidance to the Department of Natural Resources and other departments concerning the character of navigability of lakes and rivers of this Province. During the fiscal year reviewed in this report, 42 lakes were the object of special surveys at their sites by technicians of the Service responsible for this work in order to prepare these opinions.

Appendix I contains a list of the lakes on which surveys were conducted during the fiscal year 1967/68.

In addition to the surveys mentioned above, these technicians patrolled more than 97 lakes in order to determine whether the lakes are in their natural state and also to see to what degree the riparian property holders have encroached upon them.

A program of supervision by the Hydraulic Domain Service relating to the conservation and protection of the public domain was conducted throughout the Province. The list of lakes, as well as the nature of the work accomplished, is shown in Appendix I.

Inspectors assigned to this work accomplished the following:

1. 465 inspections after complaints, encroachments, location of protective walls, verification of works at time of renewal or cancellation of leases, establishment of yacht clubs and marinas, verification of surveying plans.
2. 866 inspections to carry out technical surveys (sketch maps).
3. 155 inspections for operation of dams used for recreational purposes and on un-operative or demolished dams.
4. 94 inspections so as to determine the norm of control sills of lakes in their natural state.

In addition to this, inspectors completed the mapping of all technical surveys, prepared 2,131 reports on a wide variety of topics, and, using township maps, elaborated the charting of 44 lakes to the scale of 220 feet to the inch. These linen charts will be used to compile existing and future installations.

To these pre-cited inspections may be added an inquiry into the level of lakes for the Deputy Director General on behalf of the 162 riverside proprietors of Saint-Louis and Saint-François lakes, as well as the 250 proprietors of Saint-Joseph lake.

(*c*) In addition to the requests for the establishment of dams, the construction of which is provided for under various Divisions of the Water-

courses Act, the Hydraulic Domain Service also receives numerous requests for the erection of dams for other purposes.

Under present legislation, the Hydraulic Domain Service may intervene only if the construction of these dams affects parts of the streams or lands belonging to the Crown. In other cases, the Hydraulic Domain Service can only warn the owner that he is responsible under the Civil Code in the event that damages are caused to third parties.

It is hoped that in the very near future amendments to the existing legislature will be passed in order to permit the Hydraulic Domain Service to exercise a closer surveillance of such works as could, in certain cases, constitute a real danger.

Furthermore, during the course of the year being reviewed here, a general census of hunting and fishing clubs in the counties of Roberval, Chicoutimi, Lac-Saint-Jean, Saint-Maurice and Laviolette was carried out, revealing the presence of 545 dams, 201 of which were used and maintained by sport clubs. These dams had been built by officials of private clubs or were repaired by them after being abandoned by companies that had maintained the dams for forestry operations.

(*d*) The Montréal-Nord overall project which consists in encouraging riverside dwellers to extend their land up to the permissable encroachment line as established by the Department. This line would logically be determined from the state of encroachment as found when these sites were entrusted to the Hydraulic Domain Service in March 1968.

This project was outlined and put into realization in 1964. In March 1968, statistics taken at the time this project was initiated revealed the following:

The Department gave full consideration to regulations concerning 100 cases. Only 16 of them were given a final regulation by means of a land concession by letters patent, and 40 riverside proprietors signed an agreement of promise of purchase. Moreover, among the remaining, 44 riverside proprietors who had not encroached on the bed of the des Prairies river, facing the city of Montréal-Nord, were included in the project. The aim of this project was to draw a line from which no further encroachments would be tolerated.

APPENDIX I

Names of lakes	*County*	*Township*	*Preliminary Detections*	*Systematic Detections*	*Defining Natural Crest*	*Inspections for Navigability*
Caribou	Argenteuil	Wolfe			x	
Proctor	Argenteuil	Montcalm			x	
Louisa	Argenteuil	Wentworth	x		x	
Clair or Sylvère	Montcalm	Lussier			x	
Saudien	Montcalm	Chilton	x		x	x
Sicotte	Montcalm	Chilton	x			x
Franc	Montcalm	Chilton	x			x
Moore	Terrebonne	Grandison			x	
Calué	Terrebonne	Grandison			x	
Samau	Terrebonne	Grandison			x	
Renaud	Terrebonne	Grandison			x	
Lily	Terrebonne	Grandison			x	
Équerre	Terrebonne	Wolfe			x	
Des Français	Terrebonne	Wolfe			x	
Gélinas	Terrebonne	Salaberry			x	
Duhamel	Terrebonne	Salaberry			x	
Forget	Terrebonne	Salaberry			x	
Dufour	Terrebonne	Salaberry			x	
Durocher	Terrebonne	Archambault			x	
Orignal	Terrebonne	Archambault			x	
Saint-François d'Ass.	Labelle	Montigny			x	
Simon	Labelle	Clyde			x	
Clyde	Labelle	Clyde			x	
Mercier	Labelle	Clyde			x	
Des Marais	Labelle	Clyde			x	
Aux Barges	Labelle	Campbell	x		x	x
Noir	Joliette	Saint-Jean-Matha		x		
Petit Brochet	Labelle	Mousseau	x			x
Des Piles	Champlain	Par. Sainte-Flore			x	
Perchaude	Saint-Maurice	Caxton			x	
Goulet	Saint-Maurice	Caxton			x	
Brûlé	Saint-Maurice	Caxton			x	
Trudel	Saint-Maurice	Caxton			x	
Vert	Saint-Maurice	Caxton			x	
Petit Garrot	Saint-Maurice	Caxton			x	
Petit Lac Long	Saint-Maurice	Caxton			x	
Long	Saint-Maurice	Caxton			x	
Pins Rouges	Saint-Maurice	Belleau	x			x
Des Français	Joliette	Kildare		x	x	
Cloutier	Joliette	Kildare			x	
Vert	Joliette	Cathcart			x	
Corbeau	Berthier	Berthier			x	

APPENDIX I (continued)

Names of lakes	*County*	*Township*	*Preliminary Detections*	*Systematic Detections*	*Defining Natural Crest*	*Inspections for Navigability*
Noir	Rimouski	Neigette		x	x	
Des Joncs	Rimouski	Sei. Nic. Rioux			x	
Pierre-Paul	Laviolette	Saint-Thècle	x			x
Malobès	Rimouski	Sei. Nic. Rioux		x	x	
Saint-Fabien	Rimouski	Sei. Nic. Rioux			x	
Petit Saint-Simon	Rimouski	Sei. Nic. Rioux		x	x	
Grand Saint-Simon	Rimouski	Sei. Nic. Rioux		x	x	
Boisboucané	Rimouski	Sei. Nic. Rioux			x	
Pointu	Rimouski	Duquesne		x	x	
Petit Ferré	Rimouski	Macpès		x	x	
Grand Ferré	Rimouski	Macpès		x	x	
Dépôt	Rimouski	Macpès			x	
Chic-Choc	Rimouski	Macpès			x	
Taché	Rimouski	Macpès		x	x	
Gros-Ruisseau	Rimouski	Saint-Octave	x			x
Malfait	Matane	Matane	x			x
Des Îles	Matane	Matane	x		x	x
Du Portage	Matane					
	Matapédia	Matane	x		x	
Michaud	Matapédia	MacNider	x		x	
Malcolm	Matapédia	MacNider	x		x	x
Deschênes	Matapédia	Massé	x			x
Humqui	Matapédia	Pinault	x			x
Massé	Matapédia	Massé	x			x
Labrecque	Chicoutimi	Labrecque		x	x	
Chaud	Chicoutimi	Labrecque		x	x	
Chabot	Chicoutimi	Labrecque		x	x	
Clair	Chicoutimi	Falardeau		x	x	
Petit lac Clair	Chicoutimi	Falardeau	x	x	x	
Emmuraillé	Chicoutimi	Falardeau		x	x	x
Grenon	Chicoutimi	Falardeau		x	x	
Labonté	Chicoutimi	Bourget		x	x	
Cageux	Chicoutimi	Tremblay		x	x	
À la Croix	Chicoutimi	Caron		x	x	x
Bouchette	Chicoutimi	Mésy			x	x
Hébert	Chicoutimi	Mésy		x	x	
Rouge	Chicoutimi	Saint-Germain	x			x
Saint-Germain	Chicoutimi	Saint-Germain	x			
À Goth	Chicoutimi	Otis	x		x	
Otis	Chicoutimi	Otis	x		x	
À la Croix	Chicoutimi	Otis	x			
Landrieux	Gatineau	Bouchette	x			x

APPENDIX I (continued)

Names of lakes	*County*	*Township*	*Preliminary Detections*	*Systematic Detections*	*Defining Natural Crest*	*Inspections for Navigability*
Portage	Gatineau	Bouchette	x			
Edja	Gatineau	Bouchette	x		x	
Kénogamichiche	Chicoutimi	Mésy		x		x
Blue Sea	Gatineau	Bouchette	x			
Grant	Gatineau	Bouchette	x		x	
McGregor	Gatineau	Templeton			x	
Perkins	Gatineau	Templeton			x	
Sucker	Gatineau	Templeton			x	
Rhéaume	Gatineau	Templeton			x	
Létourneau	Gatineau	Templeton			x	
Guillemette	Gatineau	Wright	x		x	x
Paquin	Gatineau	Wright	x		x	x
Perreault	Gatineau	Wright	x			x
Duclos	Gatineau	Wright	x			
Northfield	Gatineau	Wright	x			x
Métayer	Gatineau	Wright	x			x
Profond	Gatineau	Wright	x		x	x
De la Montagne	Gatineau	Portland			x	
McClashan	Gatineau	Portland			x	
Wakefield	Gatineau	Portland Wakefield			x	
Girard	Gatineau	Wakefield			x	
Battle	Gatineau	Templeton	x		x	
Cardinal	Gatineau	Denholm	x			x
Beaulieu	Gatineau	Cameron	x		x	x
Beaudoin	Gatineau	Kinsington	x		x	x
Saint-Joseph	Gatineau	Aumond	x			x
Cameron	Gatineau	Cameron	x			x
Lac Sans-Nom	Papineau	Lochaber	x		x	x
Duclos	Pontiac	Dorion	x			
Trois-Milles	Frontenac	Whitton			x	
Truite	Frontenac	Adstock	x			
Bolduc	Frontenac	Adstock	x	x		
Grelots	Frontenac	Forsyth	x			x
Lambton	Frontenac	Lambton	x		x	
Clapham	Mégantic	Thetford	x			
Bécancour	Mégantic	Thetford	x			
Noir	Mégantic	Ireland	x			
Trout	Mégantic	Ireland	x			
William	Mégantic	Halifax	x		x	
Caribou	Mégantic	Coleraine	x			
Elgin	Wolfe	Stratford	x			
Aylmer	Wolfe	Stratford	x			

APPENDIX I (continued)

Names of lakes	*County*	*Township*	*Preliminary Detections*	*Systematic Detections*	*Defining Natural Crest*	*Inspections for Navigability*
Coulombe	Wolfe	Garthy	x		x	
Silver	Wolfe	Dudswell	x			x
Bishop	Wolfe	Dudswell	x		x	x
Du Moulin	Pontiac	Dorion	x		x	
Clear	Wolfe	Weedon	x			x
Brome Pond	Brome	Brome	x			
Brome	Brome	Brome	x			
Nick	Brome	Bolton	x			
Étang-Bonne Allée	Brome	Bolton				
Pearlex Pond	Brome	Bolton	x			
Gilbert	Brome	Bolton	x			
Trousers	Brome	Bolton	x		x	
Windsor	Richmond	Windsor	x		x	x
Tomcod	Richmond	Brompton	x			x
La Rouche	Richmond	Brompton	x			
Brais	Richmond	Brompton	x			
Brompton	Richmond	Brompton	x			
Petit Brompton	Richmond	Brompton	x			
Lovering	Stanstead	Magog	x			
Lyster	Stanstead	Barnston	x			
Massawipi	Stanstead	Hatley	x			
D'Argent	Stanstead	Stukely	x			
Stukely	Sherbrooke	Orford	x			
Bowker	Sherbrooke	Orford	x			
Orford	Sherbrooke	Orford	x			
Fraser	Sherbrooke	Orford	x			
Montjoie	Sherbrooke	Orford	x			
Chaînes de lacs	Sherbrooke	Orford	x			
Waterloo	Shefford	Shefford	x			
Roxton Pond	Shefford	Roxton	x			
Saint-Paul	Nicolet	Bécancour	x			x
Sergent	Portneuf	Saint-Raymond	x	x		
Archange	Laviolette	Saint-Thècle	x			x
Vert	Lac-Saint-Jean	Garnier	x			x
Pohénégamook	Kamouraska	Pohénégamook	x			
Grande Fourche	Riv.-du-Loup	Demers	x			
Saint-François	Riv.-du-Loup	Withworth	x		x	
Aigles	Rimouski	Biencourt	x			
Sauvagesses	Témiscouata	Robitaille	x			
Crescence	Kamouraska	Parke	x			
Saint-Hubert	Riv.-du-Loup	Demers	x		x	
Squattecks 2	Témiscouata	Robitaille	x			

APPENDIX II

STATEMENT OF INCOME

From April 1, 1967, to March 31, 1968

(*a*)	Interest	$ 60,298.13
(*b*)	Sundry fees (Hydraulic Service)	2,589.00
(*c*)	Storage dams	471,111.59
(*d*)	Hydraulic power	2,526,198.97
(*e*)	Beach lots	71,936.76
(*f*)	Log-driving dams	182,765.00
(*g*)	Land sales	2,502.00
(*h*)	Income on number of kilowatt-hours electricity produced — P. of Education	2,552,485.09
(*i*)	Quebec Hydroelectric Power Commission contribution (Bill 63)	22,179,172.29
(*j*)	Transmission lines	21,288.23
	Total	$28,070,347.11

STATEMENT OF INCOME

Comparative Table

		1966/67	*1967/68*
(*a*)	Interest	$ 65,207.23	$ 60,298.13
(*b*)	Sundry fees (Hydraulic Service)	5,300.00	2,589.00
(*c*)	Storage dams	353,572.91	471,111.59
(*d*)	Hydraulic power	2,628,501.17	2,526,198.97
(*e*)	Beach lots	69,830.71	71,936.76
(*f*)	Log-driving dams	175,258.70	182,765.00
(*g*)	Land sales	24,414.03	2,502.05
(*h*)	Income on number of kilowatt-hours of electricity produced — P. of Education	2,438,481.40	2,552,485.09
(*i*)	Quebec Hydroelectric Power Commission contribution	21,851,124.56	22,179,172.29
(*j*)	Transmission lines	26,141.76	21,288.23
	Total income	$27,637,842.47	$28,070,347.11

Hydraulic Development Service

On November 1, 1967, officials of the Quebec Department of Natural Resources decided to identify this unit as the Hydraulic Development Service instead of the former Studies and Research Service, as it had been known during the five years of its existence. The adoption of this new designation coincides with the annexation of the Operation of Dams Division and better serves the responsibilities and objectives of the Service such as is shown by the schedule of activities for the fiscal year 1967/68.

PERSONNEL

The addition of the personnel of the Operation of Dams Division (two enginners, two technicians, one office clerk and ten dam operators), the recruitment (two engineers and one technician), and the acquisition of an engineer who had been transferred from another service brought the permanent staff of the Hydraulic Development Service to 33 employees at the close of the fiscal year 1967/68. The staff now consists of 12 engineers, one administrative agent, seven technicians, one office clerk, two stenographers and ten dam operators. Moreover, the Service profited from the services of an engineer from France, engaged on a part-time basis, before he became included within the framework of the France-Québec technical cooperation, and a part-time student from the University of Sherbrooke, who held a position established on a permanent basic for bi-annual periods of four months.

Two engineers are at present attending study terms outside the Service. In September, one of these began a two-year course of studies at the University of Denver, Colorado, for the degree of Doctor of Science. The other engineer left the Service temporarily in mid-December to commence a one-year term of studies at École Nationale d'Administration (E.N.A.) de France.

ACTIVITIES

The schedule of activities for the fiscal period 1967/68 included the pursuit of several studies undertaken formerly and mentioned in the preceding annual reports.

At the request of the Hydraulic Services direction, other projects were started during this period with a view to determining, planning and promoting means for exercising a control of the flow conditions of several rivers for the benefit and protection of the various methods set forth to meet the problem of flooding (with or without the presence of ice), of erosion and of the water supply for domestic, agricultural, and industrial uses. The Service plays a definite role in these spheres and is especially interested in the possibility of bringing about works in many fields and of diversified character for promoting the development and the best use of water resources of the territory.

LONG-TERM PROJECTS

CHAUDIÈRE RIVER, GENERAL PLAN
(Beauce and Frontenac Counties)

Flood control dams on tributaries

The Hydraulic Development Service continued its investigation into aspects relating to the possibility of reducing damages caused by free-water flooding, between Saint-Maxime-de-Scott and Beauceville.

These studies are now terminated and a complete report is ready for print. The report will give authorities all the necessary data for them to make a decision in matters concerning the advisability of constructing one or all three of the reservoir dams, the sites of which have been given particular attention, such as has been mentioned in the report for the preceding fiscal period.

The Service is pleased to point out that the Sartigan dam, which was inaugurated on December 17, 1967, proved its effectiveness during the spring of 1968. Without this dam the riparian municipalities would have had cause to deplore considerable damage due to the last break-up.

Investigations into Bed-load Transport

In order to increase our knowledge concerning the mobility and evolution of the bed of the Chaudière river, especially in the vicinity of the mouth of the principal affluents and in the reaches upstream from Sartigan dam, the Service did granulometric analyses of several samples of sediments taken from typical sections which had been previously surveyed.

At the location of the Drolet ice boom, a comparison between the results of bed soundings done in 1963, 1966, and 1967 made it possible for engineers of the Service to conclude that the sill built immediately downstream from that ice boom was responsible for an appreciable deposition of material up to the end of the winter of 1966/67. The movement of ice, as observed in the spring of 1967, however, appears to have brought downstream the greater part of the deposits accumulated behind the sill since it was built. This inquiry somewhat delayed a decision by the Service as to the advisability of erecting similar sills for retaining and controlling the bed-load transport upstream from Sartigan dam reservoir, either on the Chaudière itself or at the mouth of Linière river, in view of lessening the filling in of the available storage capacity.

The tremendous amount of anchor ice and ice-floes noticed at the foot of Lessard falls on Chaudière river during the preceding winter season has caused the Service to believe that the presence of a submerged sill at that place would only momentarily retard carriage along the bed. Most of the solid particles deposited behind the sill would be dragged along downstream by the passage of ice-floes at break-up.

Considering the force developed by the break-up during the spring of 1968 along Linière river, the Service likewise estimates that the introduction of a submerged sill in the section downstream from this affluent would not be too effective in controlling bed-load transport of the river. Under the circumstances the Service believes it is preferable to study the evolution of the bed in the limits of the reservoir created by the Sartigan dam and to proceed with the draging of its upstream reach once this depositing of material has become a hindrance to the proper functioning of the dam.

Work for Retaining Ice-floes at Beauceville

The results of experiments conducted on a reduced-scale model in the hydraulic laboratory of Université Laval are analysed in a report submitted to the Hydraulic Engineering Service at the beginning of the fiscal term 1967/68. The report explains the basic standards recommended with a view to stabilizing ice accumulations in the basin at the foot of Diable rapids.

It should be nevertheless pointed out that the preparation of the plans and estimates of this project had to be suspended after investigations conducted in the spring of 1968 demonstrated that the Sartigan dam has a predominant effect on the movement of the break-up in the zone of transition and along the middle section of the Chaudière.

If other observations confirm these facts, and, since the Service anticipates being in a position to conjugate the effects of future reservoir-dams on the tributaries along with the effects on the Sartigan dam in its control of the regime of ice-floes, it is possible that the project for the retention of ice at the place mentioned above will be abandoned.

Retaining Wall at Sainte-Marie

Having verified the specification relating to a project of a retaining wall along the right bank of Chaudière river, such as designed by a firm of consulting engineers contracted by the city of Sainte-Marie, the Hydraulic Development Service recommended that the construction of the wall inside the river width should not surpass 35 feet in order to allow a minimum width of 365 feet at the narrowest cross-section.

Another recommendation dealt with the direction of the wall so as to preserve the natural outline of the banks in order thereby to avoid any disturbance of flow conditions. These recommendations are based on water level variations attributed to the wall encroachments that the Service was able to show from the back-water curves already established at this section of the river.

Other Information

As soon as the purpose of the planification of the road network that was drawn up, proportional to the scale of the region of Beauce, by the Traffic Service of the Department of Roads became known, the Hydraulic Development Service

compiled, for the needs of that Service, all the reports published by the Department of Natural Resources on the subject of Chaudière river. The Service took the opportunity to draw up a list of the interventions, completed works and work being carried out, as well as the study projects by the Hydraulic Services within the framework of the Chaudière general plan. Other information was also brought to the attention of the Service of Bridges and to the Projects Service of the Department of Roads, currently preparing the plans and estimates for the construction of bridges across the Chaudière river at Saint-Georges and at Notre-Dame-de-la-Providence, in the county of Beauce.

YAMASKA RIVER
(Eastern Townships)

A collection of the literature, documents, and technical reports which the Service has been able to gather concerning Yamaska river lead to the publication of a document which provides an exact source of information for those interested in the physical and geographic characteristics of the drainage basin of the Yamaska by presenting the hydrologic data and numerous problems arising from the nature and state of this river. This documentation stresses two major problems: first, the relative scarcity of the available water supply that already limits the usual source of drinking water in the interior of the basin; secondly, the poor quality of the water in general that makes it virtually unfit, unless it is subjected to expensive treatment, which cost cannot be met by most of the municipalities of this territory.

Yamaska Sud-Est at Cowansville

After the flooding which damaged certain residential quarters in the City of Cowansville, on April 3, 1967, the Service set out to find means of solving this problem.

In the beginning three avenues of procedure were considered. Erecting of reservoir-dams upstream from Cowansville in order to mitigate the floods; excavation of an auxiliary channel in order to divert to the outside zones of flooding a part of the overflow of floods; and controlling and embanking works in order to protect riparian constructions against the periodic invasion of waters from the river. After a preliminary examination of the technical and economic implications of these alternatives, the Hydraulic Development Service abandoned the first two, which were judged inadequate, and it concentrated on the third procedure while adding to it the revision of the operating conditions of the municipal dam at Cowansville.

At the request of the City of Cowansville, which wished to undertake certain works of its own in the bed of the river during the winter of 1968, the Service supplied the city with certain specifications to be respected, taking into account the back-water curves established previously through mechanographic processes. The influence which all the controlling works would have on lowering the high-water line remains to be definitely ascertained and the height that the retaining walls should have still has to be determined.

Yamaska Nord

Having as an objective the regulating of the flow of this branch of the Yamaska and the increasing of the reserve of drinking water for the City of Granby, which has already received the first installment of $100,000 of the grant amounting to $500,000 made by the Department of Natural Resources for the redevelopment of Boivin lake, the Hydraulic Development Service examined the possibility of building a reservoir-dam. Photo-grammetric plans covering the area of the reservoir at an appropriate scale were requested from the Department of Lands and Forests in order to learn its storage capacity and to determine the other basic data relative to the project. The Service likewise called upon the Hydraulic Engineering Service and that of the Mineral Deposits Service of the Department of Natural Resources in order to conduct a survey of the axis of the dam and to make a preliminary geological study of the foundations of the dam, as well as of the perimeter of the reservoir.

Brome Lake

The operating conditions of the dam which controls the level of the waters of Brome lake were the object of an analysis aimed at establishing working methods for proceeding with the openings of the dam controlled by the City of Bromont in order thus to regulate the discharge flow and, at the same time, maintain a level that would be satisfactory to the majority of those dwelling along the shores of the lakes in the summer season. The Service verified the dimensions of the sluice gates in the dam and some sounding was carried out over a distance of 1,000 feet, which is up to the upstream limit of the outlet of the lake, for the purpose of establishing the back-water curves for flows of 50, 40, 30, 20, and 10 cu. ft. per sec. Conclusions of the study show that a regulated discharge of 30 cu. ft. per sec. corresponds to a fluctuation in level of the order of 2 feet, whereas, for a regulated flow of 50 cu. ft. per sec., this fluctuation would be of the order of 4 feet. Before fixing the operating conditions, the Service awaits the setting up of a system of fact-finding proportionate to the drainage basin of the Yamaska, in order to be sure that these conditions meet the needs of the municipalities concerned.

DU GOUFFRE RIVER
(Charlevoix County)

The general plan introduced during the course of the fiscal year 1966/67 for the purpose of finding a solution to the problems of erosion and flooding caused by Du Gouffre river and some of its tributaries, more particularly between Baie-Saint-Paul and Saint-Urbain, continued to progress during the fiscal period under review. The first stage of this plan consists in an inventory of available information relating to the basin of Du Gouffre river, and it involves four main parts:

1. Study of the characteristics of the basin and of the hydrographic network (brought about by the Hydrographic Service);

2. Study of the characteristics of the river between Saint-Urbain and Baie-Saint-Paul, comprising the identification of the principal zones of erosion and deposition, as well as the granulometric analysis of samples of sediments taken from the river bed and along the banks of the river;

3. The positive and negative aspects of the use of the water, including an inventory of the existing dams;

4. Inventory of works already accomplished by the Department of Natural Resources, its predecessors, and the Federal Government.

After this first stage was completed, a two-volume report totalling 278 pages was published.

The second stage, which consists in the search of economic solutions to the problems of erosion and flooding, was commenced during the fiscal year under review. It includes searching for solutions to the level of the basin, such as the installation of reservoir-dams for controlling floods and regulating the discharge flow, as well as the search for solutions of a local character, such as protection of banks, the straightening of meanders, and the building of sediment barriers.

DU LOUP RIVER
(Kamouraska County)

A report concerning the revision of the project relating to the control of floods in the region of Saint-Alexandre was forwarded to the Comité permanent d'aménagement des ressources (CPAR) in order to reach a basic agreement with the other interested departments and in view of eventually integrating with the Agricultural and Rural Development Act (ARDA) program the projects and works advocated by the Service.

The search for favorable sites for the installation of reservoir-dams in the upper part of the basin resulted in the rejection of this alternative because topographic conditions were unsuitable. The means recommended for controlling flood waters consist in a channel with a retractable dam near it downstream extremity and in the cutting of some meanders downstream from the Saint-Alexandre road bridge. A benefit-cost analysis shows that the carrying out of this project is economically justifiable.

NOUVELLE RIVER
(Bonaventure County)

A hydromorphologic study of the lower section of Nouvelle river was undertaken. The purpose of this study was to increase the Service's knowledge of the gravel rivers, which type of river is well representative of the majority of streams situated in the interior of the Gaspé Peninsula. An inventory of all the data available made it possible to undertake the analysis of certain characteristics of the river and to recommend the installation of three water-

level recorders in the section under observation in order to obtain a broader knowledge of the conditions of flow. Precision levelling in order eventually to produce the longitudinal profile, the choice of transversal sections, and the marking of sediments are some other measures that were taken for following the evolution of this part of the mobile-bottom river.

RIVERS DRAINING INTO JAMES BAY

An examination of the possibility of diversion, toward the south, of rivers draining into James Bay was started by a review of the literature and the technical documentation available within the Department. From the information obtained from Hydro-Québec, the Service more especially directed its attention to the Harricana, the drainage basin of which has been outlined on appropriate maps for determining the height of land with adjacent territories, to establish a preliminary choice among the possible routes of diversion, and to designate the most favorable places to carry out the work of containing these waters. A general program of studies involving the participation of several services of the Department was arranged in order to estimate the cost of a gradual achievement of this project over a period of five years.

STUDIES AND PROJECTS OF LOCAL INTEREST

DAVID CREEK IN CHIBOUGAMAU
(Abitibi County)

Upon the request of the Hydraulic Engineering Service, the Hydraulic Development Service supplied the basic data for the project of the canalization of David creek, which crosses a part of the territory of the City of Chibougamau.

BOURBON RIVER IN PLESSISVILLE
(Mégantic County)

The numerous representations drawn up by the City of Plessisville for the attention of the Department since the autumn of 1965 deal with two objectives: increase in the reserve of water for the city to answer growing needs, in particular in the industrial field; protection of residential and industrial zones periodically affected by flooding caused by the overflow of Bourbon river. Following preliminary studies carried out by the Hydraulic Engineering Service, the Hydraulic Development Service drew up plans on the main features of a reservoir-dam project on this river with a view to controlling the flooding in Plessisville and to maintaining at the same time a reserve of usable water for domestic and industrial purposes. The working out of the project depends on the results of the negotiations undertaken with the municipal representatives, ARDA, and the local industry as to the sharing of financial responsibilities relative to this multi-aspect development.

SAINT-FRANÇOIS RIVER
(Richmond County)

Negotiations with Kruger Pulp and Paper Company Ltée were successfully completed, since they resulted in an agreement on the conditions for the transfer of the Bromptonville dam to the Department of Natural Resources. This transfer was authorized by an Order in Council sanctioned on March 20, 1968. bearing number 738 and pertaining to the purchase of the dam referred to.

Upon the request of the Hydraulic Development Service and on the recommendation of the Hydraulic Engineering Service, the LaSalle Hydraulic Laboratory commenced other tests on the model to ascertain the consequences of a change of position of the sluice gate to be installed in the dam.

According to these experiments, this modification will involve the digging of a channel of about 350 feet long immediately upstream from the dam, opposite the flood sluice gate, and the demolition by the Kruger Co. of two pillars now serving to anchor its boom in the upstream reaches of the dam. The purpose of this last-mentioned requirement is to remove as many obstacles as possible impeding the circulation of ice-floes.

Among the clauses of the transfer contract, mention may be made that the company shall be responsible for the pollution or the obstruction of the flow of water and ice which might arise while using the upstream reaches of the dam for its log-floating operations.

VERTE RIVER
(Rivière-du-Loup County)

The diversion of the waters of Saint-François lake into the basin of Verte river, a project approved by the City of Rivière-du-Loup for the purpose of increasing its source of supply of drinking water, was the object of a detailed examination. According to information obtained by the consulting engineer engaged by the city, this additional source of supply would be sufficient to provide for an eventual supplementary consumption of about eight million gallons of water a day, taking into account the demographic and industrial growth during the course of the next 50 years. On this subject, the Service advanced the opinion that in order to permit the diversion of a part of the waters of Saint-François lake toward the drainage basin of Verte river, the city would have to take the necessary steps to maintain at the outlet of Saint-François lake an average minimum supply established over 15 consecutive days and having a recurring period of five years. In order to respect this condition it would be necessary that the city plan the construction of a dam, which item would increase in an appreciable degree the cost of the project. An interdepartmental committee directed by the Department of Lands and Forests, in which the Hydraulic Development Service participated, studied the numerous implications of various jurisdictions which this project involves. The committee finally recommended that the City of Rivière-du-Loup undertake a study to compare the economic components of other alternatives not yet considered by the city before it adopts a definite option.

OBSERVATIONS OF ICE CONDITIONS IN RIVERS

As in previous years, the Service conducted an observation and appraising campaign of the extent, evolution, and destruction of ice covers on different rivers of Quebec. These arrangements aimed at checking the efficiency and the consequences of projects and work already carried out and at specifying the nature of future interventions designed to protect certain riparian communities confronted with problems arising from ice. During the previous winter season, the Service's program of observations made it possible for the Service to gather information on several streams where jams and frazil accumulation were noted in the proximity of inhabited centers. The rivers mentioned below were observed.

Métis river at Sainte-Angèle, Matane county.

Etchemin river at Saint-Malachie and Saint-Anselme de Dorchester and Saint-Henri in Lévis county.

Chaudière river between Saint-Maxime-de-Scott and Saint-Georges de Beauce and also at the location of a dam situated about five miles upstream from Lake Mégantic.

Famine river (tributary of the Chaudière) in the section skirting the grounds of the Saint-Georges Golf Club.

Bras Saint-Victor (tributary of the Chaudière) at Saint-Éphrem-de-Beauce.

Bourbon river at Plessisville.

Bécancour river in the vicinity of the bridge on Highway N$^{o.}$ 3 in the town of Bécancour.

Saint-François river at Bromptonville, Saint-Nicéphore, Saint-Lucien and Notre-Dame-de-Pierreville.

Châteauguay river between Powerscourt and Huntingdon in Huntingdon county.

Des Prairies river between Laval-des-Rapides and Notre-Dame-des-Prairies.

Mille Iles river near Terrebonne and upstream from the bridge on the Laurentides autoroute.

Assomption river at Assomption.

Sainte-Anne de la Pérade river and Bras du Nord near Saint-Raymond de Portneuf.

In March 1968, some engineers from the Hydraulic Development Service acted as advisors to the personnel of Civil Protection conducting dynamiting operations on the rivers Sud at Montmagny, Chaudière at Saint-Lambert, and Saint-François at Bromptonville in order to burst the jams that caused floods during those rivers' break-up period.

The reports of the observers on the sites of the rivers mentioned above and those who took part in dynamiting operations during the winter and spring of 1968 will be condensed and will later form the contents of a publication that will make it possible to analyse the facts and circumstances relating to the evolution of the regime of ice that has affected these sections of the rivers.

OPERATION OF DAMS HELD BY THE DEPARTMENT

The Division responsible for the operation of dams under jurisdiction of the Department was transferred from the Hydrometry Service to the Hydraulic Development Service at the beginning of November 1967. As in past years, this Division has, as its principal task, the obligation of seeing to the operation and ordinary care of 26 dams for the maintaining of 23 reservoirs distributed in the interior of eight hydrographic basins of Quebec, as indicated on the accompanying synoptic table. By means of these dams the Division regulates the outflow for various ends: storage rendered available for the use of certain hydraulic power stations; control of floods and the regime of ice; extra help for log floating; maintenance of a stable level for the benefit of riparian dwellers who make use of the reservoirs; and increase the discharge rate of flow in order to improve the drainage and add to the beauty of the riparian lands.

It is worth mentioning that, during the fiscal year under review, the number of dams and reservoirs was increased by six following the inauguration, in December 1967, of the Sartigan dam on Chaudière river and the acquisition of five other works which belonged to the Department of Lands and Forests: four of these are located in the dainage basin of Matane river and the other controls the water level of Lake Saint-Joseph in Portneuf county.

Inspections were made at each of the dams in order to verify the condition of the structure and to see whether each of the guardians took care of the dams and the material for which he is responsible in the manner expected of him. In collaboration with the Hydrometric Service, the Hydraulic Development Service continued to install more precise measuring apparatus at various dams. The Division, moreover, has to its credit some particular studies destined to perfect the methods of operation of certain reservoirs and to extend their uses. Among others, some of these advantages are given below.

LAKE SAINT-JOSEPH
(Portneuf County)

Calculation of the discharge flow of the sluice gates of the dam and estimation of the storage volume; analysis of the flood of June 25 and 26, 1967 (at the start of which study it was shown that the openings on the present dam have not sufficient evacuation capacity); interpretation of the results of an inquiry conducted among most of the riverside proprietors in order to come to an agreement as to the level of the lake to be maintained during the summer season.

NORD RIVER

Revision of the storage statistics in use from geodesic figures for most of the reservoirs operated by the Department at the interior of the drainage basins of Nord river; recommendations to the initiators of a project for the construction of access roads to the upstream reaches of the dam of Ludger lake so that this project does not eventually impede the operation of the dam; participation in the program of surveying for ascertaining the dimensions of the Sables and Masson dams.

KÉNOGAMI LAKE
(Chicoutimi County)

Use of the mathematical model of a flood from melting snow in order to estimate the run-off resulting from the seasonal melting within the Territory that is drained toward the Kénogami reservoir; compilation of the records of temperature gathered at the meteorologic stations located in the drainage basin of Kénogami reservoir.

DU LOUP RIVER
(Kamouraska County)

Statistics concerning various floods registered on this river served to set up a mathematical model. This model was constructed for the purpose of lessening floods on Du Loup river. This reduced scale model would eventually make it possible to propose a system for the prevention of floods in order to better the operating conditions of the dam of Morin lake.

DES COMMISSAIRES LAKE
(Lac-Saint-Jean County)

The Division revised the annual amount of assessment that the Alcan company pays to the Department of Natural Resources for the benefits it derives from the impounded water controlled by the dam operated at the outlet of Des Commissaires lake. The annual amount of operating and upkeep expenses of the dam, valued according to the rate of rental for the energy rendered available to the hydro-electric plants of Alcan on the Saguenay river, was suggested as a basis for the new assessment.

CONTRIBUTIONS TO THE HYDRAULIC DOMAIN ADMINISTRATION

DEUX-MONTAGNES LAKE
(Vaudreuil County)

The City of Vaudreuil having requested authorization to proceed with the filling-in of a certain part of the bed of Deux-Montagnes lake in order to build a municipal park, the Operation of Dams Division verified whether this encroachment would hinder operations of other hydraulic works established in the vicinity. The inspection of the sites showed that no inconvenience would result from this project of filling-in as long as the recommendations of the consulting engineers would be wholly applied.

MILLE-ÎLES RIVER
(Terrebonne County)

The study undertaken to ascertain the consequences of constructing an access road under a bridge span of Highway 25 having been completed, the Division drew up the following recommendations: necessary protection of the embankment from the new road; cleaning of the river bed along the edge of the right

Basin	*Stream*	*Reservoir*	*Dam*
Matane	Matane	Price	Price
Matane	Matane	Hammer Mills	Hammer Mills
Matane	Matane	Matane	Gr. Lac Matane
Matane	À la Truite	À la Truite	Lac à la Truite
Chaudière	Chaudière		Sartigan
Saint-François	Saint-François	Saint-François	Allard
Saint-François	Saint-François	Aylmer	Aylmer
Du Loup	Fourchue	Morin	Morin
Du Nord	Aux Mulets	Théodore	Théodore
	Doncaster	Masson	Masson
	Du Nord (trib.)	Des Sables	Des Sables
	Du Nord (trib.)	Manitou	Manitou
	Du Nord (trib.)	Cornu	Cornu
	Du Nord (trib.)	Brûlé	Brûlé
	Du Nord (trib.)	Ludger	Ludger
	Du Nord (trib.)	Papineau	Papineau
	Du Nord (trib.)	Montagne Noire	Montagne Noire
Du Lièvre	Du Lièvre	Rapide des Cèdres	Des Cèdres
	Kiamika	Kiamika	Kiamika
	Mitchinamekus	Mitchinamekus	Barrage Principal
	Ruisseau La Loutre	Mitchinamekus	Broderick
Jacques-Cartier	Aux Pins	Saint-Joseph	Lac Saint-Joseph
	Chicoutimi		Portage des Roches
Saguenay		Kénogami	
	Au Sable		Pibrac Est
			Pibrac Ouest
	Ouiatchouane	Des Commissaires	Des Commissaires

STORAGE RESERVOIRS

Station N°.	*Drainage Basin (sq. mi.)*	*Maximum Retained Level (in feet)*	*Running (in inches)*	*Capacity 10^9 cu. ft.*	*Start of Operations*		*Height of Transport Fall*
021603	656.3	10	*	*	July	1967	—
021606	652.8	*	*	*	July	1967	—
021604	57.0	14	2.1	.27	July	1967	—
021605	13.0	14	3.7	.12	July	1967	—
023439	1,186.0	583	0.05	.14	January	1968	—
030201	465	952	11	12.22	April	1918	215
030202	196	816	8	3.60	October	1940	215
022505	103	631	2.1	0.52	October	1943	220
040109	31	1,201	2	0.12	January	1944	252
040108	13.2	1,106	15.4	0.47	January	1927	452
040107	15.6	1,236	4.4	0.15	October	1944	302
040106	9.4	93	7	0.16	October	1944	302
040105	4.9	93	4.9	0.06	January	1944	302
040104	27.5	1,204	2.6	0.16	January	1944	302
040103	15.4	1,238	4.1	0.14	January	1927	302
040102	11.0	94	1.1	0.03	January	1944	302
040101	5.1	100	19.3	0.23	January	1927	302
040602	2,310	659	4.7	22.13	April	1930	459
040608	280	885	20	13.40	April	1954	481
040609	348	1,255	21	18.62	May	1941	492
040610	348	1,255	21	18.62	—	—	492
050805	82	520.95	3.0	0.57	April	1967	—
061001					October	1923	423
	1,270	539	4	13.57			
					October	1923	380
061601	225	1,082.32	9.3	4.9			

* Studies underway to determine this information.

bank so as to better flow conditions under the bridge adjacent to this bank; and instructing the promoters of the project as to the elevation of the high waters recorded during the past 40 years in the vicinity of the bridge.

OUTAOUAIS RIVER
(Terrasse Vaudreuil)

In regulating the project of a causeway connecting Avel Isle to the 11th Avenue of the municipality of Terrasse Vaudreuil, the Operation of Dams Division made the following recommendations: construction of two passages for water through the causeway in order not to hinder the circulation of water and ice; raising the embankment to an elevation higher than the high-water level registered at that place; adequate protection of the facing of the causeway against waves; and assurance that it will have sufficient stability by seeing that the embanking is given the proper slope.

DES PRAIRIES RIVER
(Montreal)

Having examined the project of constructing a terreplain by the City of Montreal in order to expand the municipal park by using a part of the bed of des Prairies river, the Operation of Dams Division established the limits of permissible fillings. The Division, moreover, sought means that would prevent the filling-in material from being undermined by the current, which action would hinder the flow conditions upstream or cause further pollution by the river, especially if waste were used for filling.

Elevation of the Natural High-water Level of Lakes

Having approved a program to follow in searching for the normal high-water mark of waters of certain lakes, the Division submitted a study plan to the Hydraulic Domain Service. This plan, which shows the steps to be followed in the interpretation and analysis of available data, made it possible, afterward, for that Service to assign a member of its technical staff to this task. Archambault and Kilkenny lakes, in Mégantic county, and Simon lake, in Papineau county, were the object of recommendations as to the adoption of an elevation in order to determine the line of demarcation of public property in relation to private property.

INTERDEPARTMENTAL COLLABORATION

Sainte-Anne-des-Monts River
(Gaspé-Nord County)

Starting with a draft project, proposed by a consulting engineer commissioned by the Department of Tourism, Fish and Game, concerning the development of the Sainte-Anne-des-Monts river for salmon fishing, the Hydraulic Development Service established, at the request of the Waters Branch, a program of

MITCHINAMECUS DAM

Du Lièvre River

MATANE DAM

Matane River

studies shared by the services of the Department of Natural Rsources that are in a position to undertake the preliminary stage and development of each aspect of the project. Once the interested services have made known to the Hydraulic Development Service the contributions which they could make to this result within the scope of their specific budgets, the Service proposed a program of participation by the Department in this plan for development. This plan was afterward submitted for approval by the Department of Tourism, Fish and Game.

Integration of the Recreation Aspect with Reservoir-dam Projects

A few meetings were held between representatives of the Department of Tourism, Fish and Game and members of the Hydraulic Development Service for the purpose of examining the possibility of integrating the recreative aspect with the pre-project stage of reservoir-dams planned for lessening floods.

Legislation on Recreation

In collaboration with a representative of the Department of Tourism, Fish and Game, Donald Guay, an administration officer of the Service, continued making an inventory of the legislation on recreation. A report was distributed on this subject to the interested parties of the two Departments.

Committee for Recreation in Forests

The same administration officer of the Service, Donald Guay, took part in all the meetings held by the committee set up by the Comité permanent d'aménagement des ressources (CPAR). In what concers the activities of this committee, he stressed the point of view of the Department of Natural Resources on questions concerning administration of the hydraulic domain in forested territory and he also collaborated with a crew engaged in preparing a systematic program of territorial studies on open-air recreation.

Subcommittee on Water

An engineer of the Division, Claude Triquet, carried out the duties of secretary during the meetings held by this subcommittee of the permanent council for the development of resources.

Subcommittee on Bridge Scour

Upon the request of the Department of Roads, Bernard Harvey, an engineer of the Service, was made responsible for collaborating in the preparation of a program of studies on the scour at bridge piers. He attended a meeting of that subcommittee of the Canadian Association of Good Roads, which was held at Winnipeg from November 21 to November 23, 1967.

Downstream view

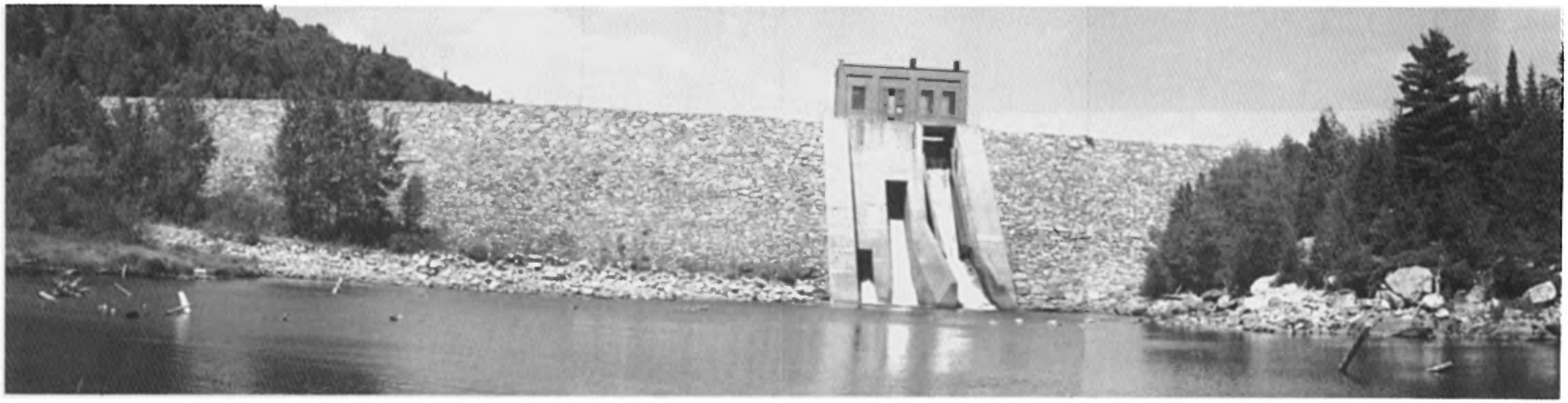
DU LIÈVRE RIVER

RAPIDE DES CEDRES DAM

Notre-Dame du Laus, Papineau county

Upstream view

CHAUDIÈRE RIVER, Beauce county
SARTIGAN DAM AND RESERVOIR May 1968



DE LA LOUTRE (Mitchinamecus) DAM and RESERVOIR

DU LIÈVRE RIVER, Labelle county

KIAMIKA DAM and RESERVOIR

OTHER INFORMATION

Courses on the Economic Aspect of Hydraulic Resources

Engineers of the Hydraulic Development Service assisted at a series of courses given from February 19 to February 23, 1968, at Université Laval, by Professor Edouard Kuiper, on the economic aspect of management of Hydraulic resources.

Hydrology Courses

From August 21 to September 8, 1967, André Marcoux, engineer, assisted at a series of courses on hydrology given by the Université of Guelph, Ontario, under the auspices of the Canadian Committee of the International Hydrological Decade.

International Hydrological Decade

Louise Blais Leroux, engineer, took part at a meeting held in September 18 and 19, 1967, at the Montmorency House, within the scope of activities of the Canadian Committee of the International Hydrological Decade. Groundwater was the subject of the discussions.

International Association of Hydraulic Research

Bernard Mathieu and Claude Triquet, engineers, took part in the International Association of Hydraulic Research (IAHR) seminar of the section interested in ice. This association held its 12th Congress at Fort Collins, in Colorado, from September 11 to 14, 1967.

Congress for a Leisure Policy in Quebec

Donald Guay took part in a congress convoked by the Government of Quebec at the beginning of October 1967 in order to establish a basis for a leisure policy in Quebec. This was an inquiry among specialists in sport, leisure and recreation.

Conference on Regional Development

On October 13 and 14, 1967, Donald Guay was present at conferences held at Montreal University on regional development.

American Society of Civil Engineers

Bernard Harvey, engineer, assisted at the congress of the American Society of Civil Engineers (ASCE) on hydraulic resources. This congress was conducted at New York from October 16 to October 20, 1967.

HYDROMETEOROLOGICAL SERVICES

The Hydrometeorological Services comprises the Meteorological, Hydrometry, and Hydrography services and is responsible for collecting, studying, and supplying basic data on waters within Quebec's territory.

This work involves the observation, compilation, and analysis of a wide range of information and other meteorological phenomena, fluctuations of the level of lakes and rivers, variations in the flow of rivers, and the topography and hydrography of streams in the Province.

Mortimer Hendler, director of the Hydrometeorological Services, R.-C. Pesant, and J. Aumont served several times on the Civil Service Board of Examiners for the purpose of judging the qualifications of candidates for different avenues of employment, for changing one's classification within the Department of Natural Resources, and for expediting advancement.

Mr. Hendler continued to represent the Department on the Hydrology Subcommittee, a group of the National Research Council, interested in geodesy and geophysics, the purposes of which are to encourage, promote, and coordinate the development of hydrology and hydrological research across Canada.

Messrs. Ménard and Hendler attended two meetings of the Great Lakes Commission. This body is made up of representatives from eight riparian American States of the Great Lakes and those from Ontario and the Province of Quebec. The latter group assisted at the meetings as observers only.

Mr. Hendler also attended Symposium No. 6 of the Subcommittee on Hydrology. This symposium was held in Saskatoon and the subject of discussion was "Humidity of the Soil".

Hydrography Service

The Hydrography Service studies sheets of water through surveying in the field and the study of topographic data for the purpose of supplying this information to various governmental units and the general public.

Surveying Division

The personnel of the Surveying Division has the task of seeing to the organization and actual work of surveying. This work is part of a long-term program embracing several years. Occasionally, however, some work is undertaken for a very particular study.

The surveys carried out during the fiscal year 1967/68 may be summarized as follows:

(a) *Surveying of rivers*

A program has been underway for the past several years for determining river profiles along the principal rivers in the northern part of the Province for the purpose of taking an inventory of the hydraulic resources of Quebec's territory. Having already studied the rivers flowing into James, Hudson and Ungava bays, the Service concentrated its survey work during the preceding years on rivers of the lower North Shore.

Some of the contouring is carried out by a temporary personnel, which consists of students and workmen hired especially for this work. A contouring party is made up of an instrument man and two surveyors, all university students in science, as well as a canoe man and a woodcutter. Generally, two parties are grouped together to form a camp, in which case a cook is added. The direction of operations is centralized at the most accessible place, usually an air base. The work itself is assumed by an engineer aided by a technician. These two take the bearings and supervise the work. In 1967, seven parties were spread over a radius of 200 miles around Havre-Saint-Pierre. These comprised 45 persons, of whom 22 were students.

Surveying was carried out along the following rivers:

Petit-Mécatina river	230 miles
Natashquan river	41 miles
Magpie-Ouest river	22 miles
Magpie-Manitou traverse	18 miles
Musquaro river with tie-ins to Olomane and Natashquan rivers	110 miles
Total	421 miles

This work completes the surveying of the principal rivers of the North Shore, from Sept-Îles to Blanc-Sablon. The rivers studied in the course of the preceding years are Sainte-Marguerite, Moisie, Manitou, Magpie, Saint-Jean, Romaine, Nabisipi, Aguanus, Natashquan, Musquaro, Olomane, Petit-Mécatina, Saint-Paul, and Saint-Augustin. Some important tributaries of Moisie, Magpie, and Natashquan rivers have also been studied. With a view to verifying the accuracy of the surveys completed along watercourses, traverses are made between rivers, thus forming a series of loops attached to one another, which procedure enables one to accept or reject the values obtained.

The field work is conducted during the months of June, July and August. At the beginning of September the parties are disbanded and members of the permanent personnel return to the office. During the winter, this personnel is engaged in verifying survey notes, calculating altitudes, and determining the water profiles. These compilations are fed into a computer, which action is possible because of programs set up for the electronic processing of these data. After verification of the summer's work, it will be necessary to do over again some 20 miles of Magpie-Ouest river in order to join the survey lines within the permissible limits.

(b) *Surveying of lakes*

At the beginning of November 1967, the Hydrography Service was given the responsibility of expressing opinions concerning the navigable and floatable condition of lakes and rivers and of determining the natural high-water line. This task was formerly assigned to the Hydraulic Domain Service. Because it is necessary, before giving an opinion, to carry out a survey in the field or to determine certain characteristics by first consulting topographic maps — a task normally accomplished by this Service — it was deemed preferable to transfer these activities to the Hydrography Service.

The compilation of opinions expressed on the navigability of lakes had been commenced and was continued during the winter months by starting with a study of the Department's files. In fact, opinions on navigability have been given for 1,369 lakes as follows:

Opinions expressed after visits to the field	409
Opinions expressed after examination of maps	956
Judgments given from memory	4
Total	1,369

The number of opinions expressed is steadily increasing, as requests concerning navigability are addressed regularly to the Service. A classification of these lakes, termed a dictionary of lakes, already exists and will eventually be published. This dictionary will give for each lake, besides the navigability features, all other available information, such as its location, surface area, altitude, depth, etc.

(c) *Surveys of ice thickness*

Upon the request of the Hydraulic Development Service, which conducts studies on the formation of frazil in rivers, technicians of the Hydrography Service carried out surveys during the winter of 1968 on Etchemin river at Saint-Anselme and Sainte-Claire and on Métis river at Sainte-Angèle. These surveys consisted in measuring the thickness of ice, the thickness of frazil, and the depth of the river bed. The first step was to bore holes into the ice at a determined section.

At every 500 feet along a distance of several miles, similar sections were defined. This survey program will be repeated every winter in the future on different rivers where the formation of frazil causes problems.

(d) *Publications*

During the fiscal term 1967/68, the Hydrography Service published, for the first time, under the form of installments, the results of the surveying of the main river basins of James bay and Hudson bay. So far, 68 sections giving the

location, altitude and description of all the bench-markers installed by the Department of Natural Resources and its predecessors have already been published. A system of numbering of these sections makes it possible to establish any datum line easily and quickly. At the present time, other installments describing bench-markers installed along the rivers of the North Shore are in preparation and will be published as soon as the results of the surveying are definitely known.

Studies Division

Two major activities occupy the personnel of the Studies Division: study of the topographic characteristics of drainage basins and study of the variation of water lever of lakes and rivers.

(a) *Topographic features*

The study of the topographic features consists in gathering basic data relative to the shape and relief of drainage basins and in analysing this information in order to learn the characteristics proper to these basins.

The principal characteristics of basins are the area of basins and sub-basins, sheets of water in forested or in cultivated regions, determination of the hypsometric and isochronic curves, the normal size and altitudes, and calculation of the capacity and slope indexes. Du Gouffre river was made the object of such a study in the summer of 1967.

During the past few years, the Hydrography Service has assumed the task of determining, as accurately as possible, the surface area of all the river basins of the Province. This work was pursued during the summer by students engaged especially for that purpose. The south bank of the St. Lawrence was completed during the year reviewed here and students commenced the study of the tributaries along the north shore of that river. All the basins and sub-basins, from the Outaouais to the Saguenay, have been outlined on maps at the scale of 1:50,000. This region, which represents an area of about 105,000 square miles, has also been measured. A publication giving the results of this work will be prepared and distributed to the public.

At the request of the Hydraulic Domain Service, the Hydrography Service determined the area of about 100 lakes, as well as their drainage basin surface. This work of measuring the area of lakes will be pursued on an ever-increasing scale. This program of studying and measuring will also embrace all the larger lakes of every region.

(b) *Water-level variation*

The purpose of studying water-level variations is to see to the operation and expansion of the network of stations installed for the observation of the changes in water-level of rivers and lakes. The information thus collected is necessary

for the study of the regime of waters and for determining the rights of riparians. The network comprised 88 stations as of March 31, 1967. During the year under review, seven new stations were put into service at the following places: Nouvelle, des Prairies, and Seize-Îles rivers, and des Îles, Jack, and Preston lakes. Moreover, two stations were improved and one was abandoned.

The following table gives the equipment in use at the various stations.

Equipment	*Stations in Operation on March 31, 1967*	*March 31, 1968*
Limnometric scale	51	50
Limnograph	22	27
Perforated tape recorder	1	3
Maxima gauge	11	11
Limnophone	0	1
Without equipment	3	3
Total	88	95

Technicians of the Service see to the installation and proper functioning of these stations and visit them regularly from three to six times a year in order to verify the work of the observers and to keep the recording apparatus in good working condition. The work of verifying the collected data, analysing this information, transferring it to graphs, and, lastly, publishing the facts takes place in the office. During the fiscal year under study, the station at Brompton-ville was equipped with a limnophone for the purpose of detecting floods more easily. This apparatus, by a simple telephone call, gives the present height of the water plane, as well as that attained during the preceding 10 hours. In this manner, one can readily follow the changes in water level at that place.

Some students are hired during the summer months to work in the office. The Service took advantage of their presence to bring up to date data relating to some 100 stations that had been in operation since many years. Thus, during the course of the summer season, the data from 12 stations were revised and this work represented a total of 450 years of limnometric information. These water-level variations were also put on graphs. This revision was carried out for the stations on Métis, Sud, Chaudière, and La Sarre rivers and on Macamic, Abitibi and Brome lakes.

(c) *Publication*

In collaboration with the Hydrometry Service, the hydrologic annual for 1965 was published, as well as the list of stations in operation as of March 31, 1968. Insofar as the Hydrography Service is concerned, the first publication contains a series of tables on water-level variations at certain stations, whereas the second is a record of all the stations where information is available and can be supplied by the Service.

Hydrometry Service

General statement

The work of the Hydrometry Service is to study the regime of surface waters. This work is essential to the rational exploitation of the Province's hydric resources. The Service's activities are orientated mainly to the knowledge of this renewable resource, and this under two forms — quantity and quality.

The network of gauging stations is used to keep the service posted on the seasonal and annual fluctuations of flow of Quebec's streams and to supply the data necessary to the study of regional variability of the stream-flow and flow-level of watercourses in periods of high and low water. To study the quality of surface waters, the Service will draw up a program for the systematic collecting of data in the spring of 1968. During the present fiscal period, efforts of the Service were directed toward recruiting and training personnel, organizing an analysis laboratory, and taking samples from the various watercourses where 20 preliminary "quality" stations were to be set up in 1968.

The knowledge of these two aspects of this resource is motivated, on the one hand, by the present use of water for purposes of consumption, navigation, and leisure and, on the other hand, by the execution of various engineering works related to the development of river basins for multi-technical ends, such as control of floods, construction of bridges, hydroelectric energy production, etc.

Since the reorganization of the internal structure of the Waters Branch, the operation of reservoir dams has been under the direction of the Hydraulic Development Service. The transfer of the 16 persons involved took place on November 2, 1967, and the activities of that group are recorded in the report by that Service.

Given below is a detailed explanation of the work carried out by the Hydrometry Service during the fiscal year 1967/68.

HYDROMETRIC DATA

The Service continued its efforts to conclude the program initiated during the year 1965/66. Without neglecting the program of hydrometric surveys, particular attention was given to the continued development and to the equipment of stations now in operation. Insofar as making use of the hydrometric data was concerned, the work of the Service was directed mainly to the publication of the "Annuaire hydrologique 1965", and to the revision of flow-data from 12 gauging stations, which comprised accumulated information derived from more than 20 years of continuous observation.

In what concerns the operation of the hydrometric network, it may be mentioned that 760 flow measurements were made and 1,805 gauging stations of the present network were visited. Gauging measurements are made at every

station during the year, and these measurements serve to define the height-flow ratio, which is the basis for the daily flow calculation. A certain number of gaugings were carried out to determine the flow of small streams. This information was requested by municipalities and general contractors in connection with the size of diversion conduits or, again, for the use of these streams as a source of supply for drinking water.

Improvements were made to 24 stations already operating. In some cases the station was relocated for any of the following reasons: to obtain a permanent control section, a more sensitive height-flow relation, and better sections for taking gauging measurements of the high water and low water in summer and winter seasons. At several stations, the non-recording gauge was replaced by a recorder (limnograph or perforated tape recorder). Expansion of the network was attended to by installing 24 new stations. Some of these new units will replace those already in existence, in which case the old ones will be eventually abandoned. These new stations were added to the network to ensure a more accurate knowledge of the characteristics of flow of the streams in Quebec. The new stations were located at places determined by the relief of the drainage basins and the density of the network in the different regions.

At the close of the fiscal year 1967/68, the Hydrometry Service had 213 gauging stations in operation. The following table gives the number of stations in service as of March 31 for each of the years indicated, as well as the type of apparatus used to observe the water level.

NETWORK OF GAUGING STATIONS

Operated by the Department of Natural Resources

Type of Equipment	*1965*	*1966*	*1967*	*1968*
Non-recording gauges	60	46	33	18
Limnographs	74	84	88	83
Perforated tape recorders	5	34	68	112
Total	139	164	189	213

The Hydrometric Service continued, for practical reasons, the inspection of eight non-recording stations located in New Quebec and Témiscamingue, but the scrutiny and compilation of this information is still the responsibility of the Hydrography Service.

Up to the present, measurement of the flow of streams under study is made with the use of a paddle-wheel. In Quebec, however, several rivers have a torrential regime that does not always lend itself to the use of paddles for measuring their flow. After several years of experimenting, the general technical section of Électricité de France perfected a method of measurements based on the dilution of a "mother solution" (sodium bichromate) injected into the stream. In May 1967, Henri André, an engineer with the E.D.F., spent some time in Quebec for the purpose of examining the possibilities of applying this system to the rivers of the Province. For most of the rivers visited, flow

conditions are favorable to this process, and it has been suggested that the method be used in 1968. As the first step, Marc Desruisseaux, the engineer responsible for the operation of the network, went to Grenoble in March 1968 in order to become familiar with this flow-measuring technique, and, on his return, put into operation a preliminary program of the technical personnel by employing this method at the gauging stations in Quebec.

In collaboration with the Quebec Water Board, the personnel of the Hydrometry Service prepared a survey program in November 1967 in order to define the mode of diffusion of waters at the confluence of the St. Lawrence and Saint-Maurice rivers. This work, which resulted from a request to the Department of Natural Resources by the City of Trois-Rivières, related to the construction project of a sewer collector, the outlet of which is located in the river upstream from the Saint-Maurice. The task of completing the program was confided to J.-Paul Boucher, an engineer of the Service.

QUALITY OF WATER

Within the scope of the study on the quality of surface waters, Yvon Turcotte, chemical engineer, made two trips to acquire information concerning the methods and instruments in use by American and Canadian organizations, which, for many years, have been pursuing a survey program in this domain. Thus, at the end of April 1967, Mr. Turcotte went to Philadelphia for a period of two weeks and then to Saskatoon, Saskatchewan.

The first sedimentological station was installed on the St. Lawrence at Mercier bridge. The Internal Waters Branch of the Federal Department of Energy, Mines and Resources collaborated in the drawing up of this sampling program by supplying the apparatus necessary for taking water samples.

Since June 1967, ten Quebec rivers were sampled once every two months in order to determine their heavy hydrogen concentration. This sample-collecting program was conducted by the Service and the analysis of the samples was made at Chalk River in the Canadian Atomic Energy Laboratory.

From the summer of 1967, the campaigns of preliminary surveying were carried out on some 15 Quebec streams in order to obtain information on the quality of surface waters from watercourses representing the various territorial regions of the Province. The results obtained will be used by the Service in the choice of rivers on which "quality" stations are to be installed for the systematic collection of data concerning the physiochemical properties of these waters.

In July, Demetre Kougioumoutzakis joined the personnel of this Division with the title of chemist in charge of the laboratory. This laboratory was temporarily set up in "E" Building and will be used for sampling water. Mr. Kougioumoutzakis went to Philadelphia and Harrisburg in December 1967 to visit analysis laboratories and to acquaint himself with the equipment and methods used for determining the physiochemical properties of water and the quantitative and granulometric analyses of the sediments collected in rivers.

At the close of the fiscal year under review here, five permanent stations were installed on the following streams: Yamaska, Saint-François, Chaudière, and Sainte-Anne de la Pérade. Samples of water were taken regularly at these stations. Moreover, a certain number of project stations were put into service in the Chaudière River basin. This information will be used for the realization of projects provided for in the development program which the Department undertook some years ago. At the experimental basin of Montmorency Forest, monthly sample collecting is carried out at the five gauging stations operating in this forested basin.

The personnel at the laboratory completed, during the period from July to March, 1968, 336 analyses, each involving the determination of 17 physio-chemical parameters, as well as 81 sediment concentrations.

STUDIES

The personnel of this group is responsible for studies within the framework of the International Hydrological Decade. It conducted hydrological research and other studies in order to meet the demand for information originating from the various Services of the Department of Natural Resources, and other government and private organizations. Among others one might mention:

1. Revision of the daily flow of Eaton river for the period from 1932 to 1964.
2. As a contribution to the study of the world-wide hydric inventory, estimation of the average flow of the rivers of Quebec having a mean yearly discharge equal to or greater than 400 cubic meters a second. This work also included the monthly assessment of the flow observed at the 25 gauging stations used for this study.
3. Mathematical models for simulating a flood from meltwater and one resulting from heavy precipitation. One application of this research will be the very quick forecasts of the run-off in the event of a flood.
4. Simulate the regularization of flow of the Outaouais in relation to the best use of the total electricity generated at the hydroelectric stations developed along the course of this river.
5. Estimate the high-water and low-water flows and their probability of occurrence for different streams.

INTERNATIONAL HYDROLOGICAL DECADE

The Hydrometry Service continued its work within the scope of this global program of scientific research in hydrology. During the fiscal year 1967/68, the Service was occupied mainly with the scrutiny and analysis of data gathered at the stations being operated for this end and with continuing studies already underway.

A short description of the five projects was presented in the report on the activities of the Department for the fiscal period 1966/67.

PUBLICATIONS AND REPORTS

The Hydrometry Service regularly publishes a hydrological yearbook containing data on the water level and flow of several streams in the Province. Moreover, various reports are prepared during the course of each year for the benefit of interested organizations. These weekly, monthly or yearly reports contain a variety of information.

The hydrological yearbook presents a general description of the drainage basins of the Province and gives the hydrometric information gathered at gauging stations, non-recording stations and dams. On the other hand, the list of non-recording stations shows the number of stations in service, their location in the territory, the years of documentation, the names of the operators, etc.

Two weekly reports and eight monthly reports are prepared and sent to various governmental or private organizations. The transmitted information pertains to the level and flow of certain watercourses of Quebec.

The reader will find at page 3 a list of publications prepared during the fiscal term 1967/68 by the Hydrometry Service in collaboration with the other units of the Hydrometeorological Services.

PERSONNEL

As of March 31, 1968, the personnel of the Hydrometry Service comprised 50 persons, 15 of whom were professionals, 30 were hydric resources technicians or technician helpers, two were workmen and three were employees in charge of administration. During the year reviewed, there were 14 nominations and three transfers. One professional and five technicians left the Service.

During the summer of 1967, nine students were hired for the purpose of helping with projects and work in progress.

In May 1967, Guy Morin, engineer, completed a term of post-graduate studies in France. He was a bursary scholar at the ASTEF and, during this 13-month period, he spent some time at the Électricité de France and at the ORSTOM (Organisme de Recherches Scientifiques et Techniques d'Outre-Mer).

Jacques Déziel, Pierre Desforges, and Raymond Charbonneau, engineers with the Service, attended, for a period of three weeks at Guelph, an initiation course in the principles of hydrology, which was organized by the Canadian National Committee of the International Hydrological Decade. This course was part of an educational program within the scope of scientific research in Hydrology and is considered an activity of the I.H.D. (1965-74).

Jean Houde, chief hydric resources technician, attended an advance training course designed for senior technicians of the Inland Waters Branch of the Federal Department of Energy, Mines and Resources. This course, of three weeks' duration, was held in Manitoba and dealt with the apparatus and methods employed for conducting hydrometric surveys, as well as the work relating to

studying data, making calculations, and analysing the records of daily flow obtained at a gauging station.

Since January 1968, the Service has welcomed a French university postgraduate for a technical term of a 16-month duration organized by the Technical Cooperation Branch of the Department of Intergovernmental Affairs in collaboration with the French General Consulate at Quebec.

The Service hired an engineering student from the University of Sherbrooke for the period from January to April, 1968. The programe of engineering studies at the University of Sherbrooke is such that, after a year of university studies, engineering students follow alternating 4-month periods of theoretical courses and 4-month periods of practical work. The Department of Natural Resources has endorsed this program of professional training and will regularly engage these students who will be assigned to the works and projects that these different services carry out.

On March 15, 1968, M[r]. Desruisseaux, the engineer responsible for the operation of the hydrometric network, went to Grenoble for a period of two months for advance training. At the Électricité de France he became familiar with the method of gauging through dilution and of processes of laboratory analyses. Upon his return, M[r]. Desruisseaux will be in charge of perfecting and of putting into operation the program of instruction for the Service's technicians in hydric resources relating to this technical method of gauging; to this effect, a specialist from the E.D.F. will spend two months in Quebec in order to help out.

MISCELLANY

On several occasions during the fiscal period under review here, Pierre Desforges and Claude Pesant were on the Civil Service Examination Board to judge candidates for employment in the following spheres: engineers, hydric resources technicians, and public works.

Within the framework of the program relating to Franco-Quebec Technical Cooperation, Y. Brunet-Moret from the ORSTOM spent two months with the Hydrometry Service starting in March 1968. His work was mainly concerned with statistical analyses of the flow of various Quebec rivers. Two professionals from the Service took part in this study. Also within the scope of the same program of cooperation, a French delegation stayed in Quebec from October 26 to November 2, 1967, for the purpose of examining the method employed for the organization of the hydrometeorological network and the compilation, transmission and automatic processing of the data related to this network. The four French engineers from the Mission du "secrétariat permanent pour l'étude des problèmes de l'eau" met with representatives of the various activities from most of the Services of the Waters Branch.

The meeting of members from the Hydrology of North America Group, comprising representatives of the United States Geological Survey and of the

Inland Waters Branch of the Federal Department of Energy, Mines and Resources, was held in Quebec on August 10 and 11. All the participants are directly concerned with the collection of hydrometric data on the North American continent. There was an exchange of information relative to the methodology and apparatus used in this domain, as well as to problems bearing on the operation of the gauging stations network. Those attending the meeting visited the hydrometric developments conducted by the Department of Natural Resources in the experimental basin of Montmorency Forest, a project of the International Hydrological Decade pursued by Université Laval.

Henri St-Martin presented a paper in September at the symposium on "Les systèmes d'eau souterraine et d'eau fluviale". The colloquy was held at Montmorency House on September 18 and 19 and was organized by the Canadian National Committee of the I.H.D. M[r]. St-Martin also attended the conference on "Humidity of Soil", which was held at Saskatoon on November 15 and 16.

During the fiscal term reviewed here, the personnel of the Service attended the meetings of various committees having to do with study projects on the development of basins or studies related to the solution of problems of drinking-water supply.

Meteorology Service

Owing to the ever-increasing demand for information on the weather and climate of Quebec, assignments of the Meteorology Service have, of necessity, become more numerous and varied. During the fiscal year 1967/68, the three Divisions making up this Service supplied a field crew, which made it possible to inspect meteorological stations, verify and compile data, and study the many problems brought to the attention of their meteorologists.

Inspection Division

During the year reviewed, the Inspection Division comprised an inspector-in-chief and six technicians; its aim is to maintain in operation the meteorological network. It is therefore necessary to visit stations, put back into working condition those that are occasionally closed, and add new units in regions where climatic information is scarce.

Of the 512 stations now in operation, 380 are *permanent,* that is to say stations under observation throughout the year; 112 are *seasonal,* or stations subject to observation during only a part of the year, which means in the summer season, more specifically during the period of forest-fire protection; and 20 are *automatic stations.* The permanent and seasonal stations are, moreover, classed as *forestry meteorology stations* and total 163 unit. These are the stations from which the observer determines the *forest inflammability index.*

During the fiscal period reviewed here, inspectors from the Service visited 281 stations. They replaced abandoned stations, re-equipped some stations for obtaining new results, and installed four automatic stations in New Quebec. Moreover, they undertook the installation of part of a climatological network in the Sainte-Anne river basin and helped to complete the temporary network of automatic apparatus of the Shickshock mountains. The station map was prepared anew, and the inspection reports were brought up to date and sent to the Meteorological Service of Canada.

Verification and Compilation Division

The Verification and Compilation Division was organized to receive all the regular weekly and monthly station reports. During the period reviewed here, it verified and compiled data pertaining to temperature, precipitation, wind, cloudiness, sunshine, humidity, and evaporation at all the stations making up the Quebec network. A monthly report for each station was prepared and a copy of it sent to the Meteorological Service of Canada. This Division also prepared synopses of pluviographical data and summarized the values deducted from snow courses. The Division also verified the calculations of the forestry inflammability index that is supplied weekly by observers of the forestry meteorological stations. A weekly report of these data was forwarded each week to forest fire rangers responsible for the respective territory of the stations concerned. This same Division received and compiled special information of some 40 observers who took part in a study of the method used at present for evaluating the danger of forest fires. The Verification and Compilation Division was staffed by four technicians and four technician assistants during the fiscal year under review.

Studies and Information Division

The personnel of the Studies and Information Division comprises three meteorologists, three engineers, one physicist, four technicians, and one technician assistant.

This Division answered 290 requests for information, supplied 6,838 monthly climatological reports and prepared more than 2,700 copies of meteorological documents. The personnel of this Division prepared, in view of its publication each month, the *Bulletin Météorologique*, its *Supplément Annual*, the list of meteorological stations, and special compilations of data for the purpose of climatic summaries.

This Division continued the studies undertaken in hydrometeorology, climatology, instrumental meteorology, and agrometeorology. Two of these studies, dealing with the climate of the Province, represent more than two years' work.

A list of reports prepared after studies is given on page 2.

Moreover, the Studies and Information Division continued to publish the *Feuillet Météorologique* destined for observers and the many followers of meteorology. The first group, the observers, by reading this periodical, are made aware of the directives for the observation and utilization of meteorological data. The second group can learn the outlines of applied meteorology. This booklet also contains the observation program of snow-gauging stations and an annual report of the values deducted from snow courses, as well as the various policies established by the Meteorology Service to meet the needs not only of the Department of Natural Resources but also those of other Departments (Agriculture and Colonization; Lands and Forests; Tourism, Fish and Game; Municipal Affairs; and Roads), public utility organizations (Hydro-Québec; associations for forest protection; and forestry exploitation companies), and numerous commercial and industrial firms.

To these activities, one might add administration of the budget, the taking of a perpetual inventory of the meteorological material, and the preparation of the formulary by an administration agent and an office clerk.

During the fiscal term under review here, meteorologists of the Service represented the Minister of Natural Resources at various conferences.

Raymond Perrier, M.A., spent three months in France and England, where he met engineers and meteorologists of those countries.

Jean-Guy Fréchette, M.F., went to western Canada for a month in connection with his studies in forestry hydrology.

G.-Oscar Villeneuve, Ph. D., and *Raymond Perrier*, M.A. attended a meeting in Montreal held jointly by representatives of the Meteorological Service of Canada and those of the Meteorological Service of Quebec.

Luc Bertrand, technician, went to Toronto to assist at a conference on the use of the Fisher and Porter pluviograph.

Michel Ferland and *Raymond Gagnon* spent some time in Toronto: the former to become familiar with various instruments for measuring radiation; the latter to confer with hydrometeorologists of the Meteorological Service of Canada for the purpose of organizing a joint study of the extensive floods of Chaudière and Saint-François rivers.

G.-Oscar Villeneuve, Ph.D., and *Raymond Perrier*, M.A., took part again, during the year 1967/68, in the regular meeting of the advisory committee of representatives from Hydro-Québec, of the Minister of Natural Resources, and of the Minister of Lands and Forests. This meeting was held at Quebec.

G.-Oscar Villeneuve, Ph.D., assisted, for the second consecutive year, at the regular meeting, at Ottawa, of the subcommittee of meteorology of the National Research Council.

Jean-Guy Fréchette, M.F., attended, as a representative of the Meteorology Service, the 16th Canadian Hydrology Symposium, which took place in Saskatoon.

G.-Oscar Villeneuve, Ph.D., and *Michel Ferland*, M.A., attended a meeting of forest rangers responsible for forest protection in Quebec and collaborated to draw up projects of a new policy in forestry meteorology. The meeting was held in November, at Duchesnay, Portneuf county.

In December, *G.-Oscar Villeneuve*, Ph.D., was the speaker at a conference held in Montreal in connection with the Corporation of Agronomists of the Province of Quebec. His talk dealt with agroclimatology.

Moreover, *Dr. Villeneuve* continued, as in preceding years, to take an active part in the Subcommittee on Meteorology and Atmospheric Sciences of the Committee on Geodesy and Geophysics of the National Research Council. This committee held two meetings in Ottawa during the year under review.

Dr. Villeneuve was also asked to join a Forestry Meteorology Committee at Quebec. This committee did not convene yet.

Lastly, *Dr. Villeneuve* was delegated by the Quebec Meteorological Society to attend the Canadian Meteorological Society at its annual congress. He was present at this congress, which was held in June 1967 at Calgary.

This annual report would not be complete if one did not mention the fact that three meteorologists and one engineer of the Meteorology Service are members of the Administration Council of the Meteorological Society of Quebec. In fact, Michel Ferland continued, for another year, his work as secretary-treasurer. Raymond Perrier and Jean-Guy Fréchette became directors, and G.-Oscar Villeneuve, ex-president, remains an observer in the service of the Administration Council, representing the Canadian Society of Meteorology.

NEW QUEBEC BRANCH

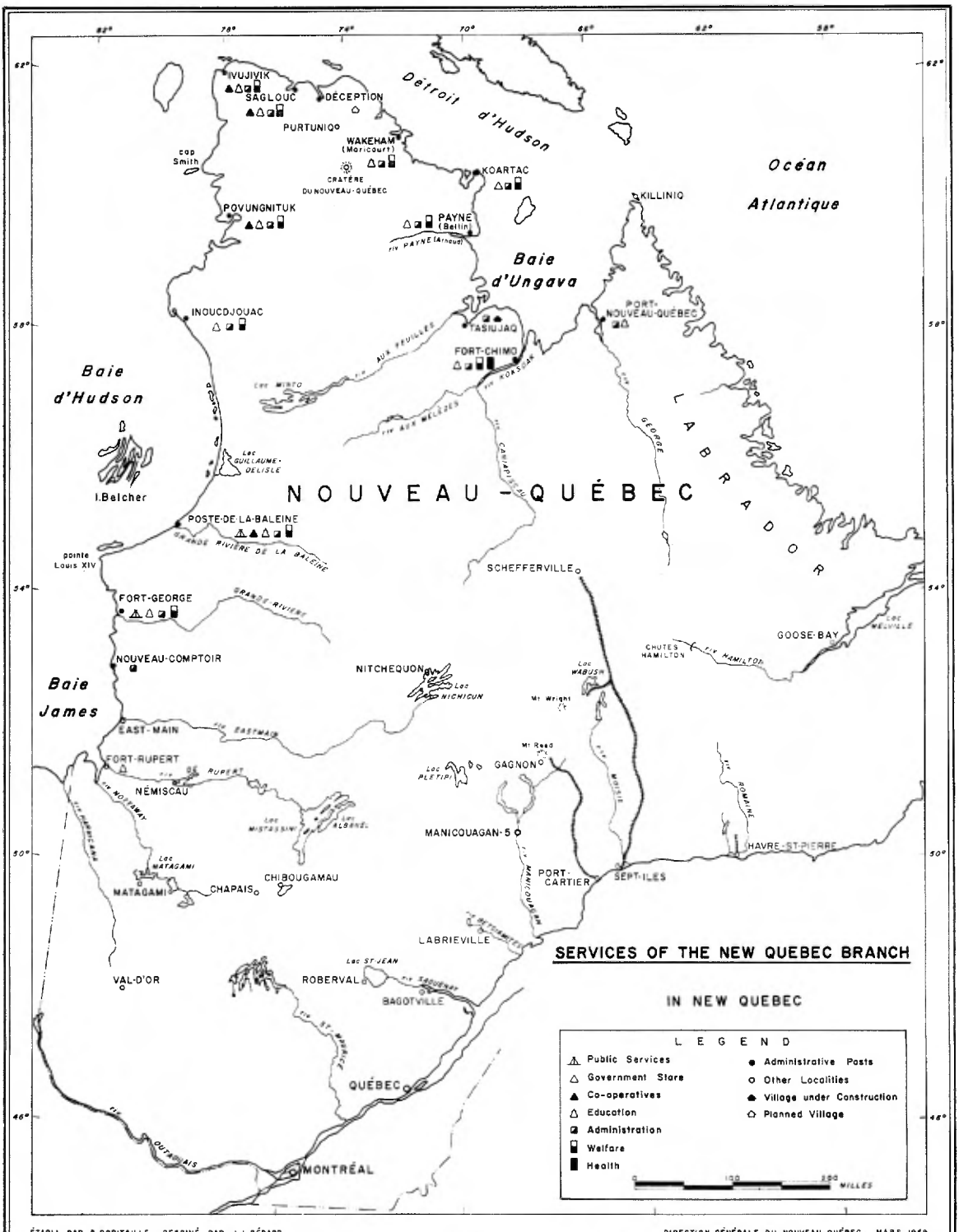
During the fiscal year 1967/68, the New Quebec Branch continued to expand the services of the Government of Quebec in its northern territories. This was done in harmony with the obligations imposed on it by an Order in Council dated April 8, 1963, whereby the Branch was to carry out the administrative functions in the unorganized part of Northern Quebec, except in those spheres coming under the jurisdiction of the Department of Justice and the Department of Lands and Forests.

At the end of March 1968, the New Quebec Branch had a representative or agent in 13 native villages, compared with 10 during the preceding year. There were 12 teachers in these villages against 9 during the previous fiscal periods. Its personnel for the year reviewed here numbered 158. Forty-five of these employees were stationed at the administration office at Quebec and 113 were posted in the villages of New Quebec. To this number could be added some 60 persons charged with maintenance of the airbase and municipal services at Poste-de-la-Baleine on Hudson bay, as well as several employees who are recruited from time to time, especially to meet the demands of construction work in the various villages of the North. Among this personnel are included both full-time and part-time employees. These naturally are aboriginals, that is Esquimos and Indians who are engaged in the work for which they are best adapted and allocated, as the case may be, to the services of administration, education, health, construction and maintenance.

The New Quebec Branch comprises two main units: the Administrative Services and the Technical Services. The first consists of the Supply Service, the Inventory of Equipment Service and the Accounting Service, whereas the second embraces the Research Service, the Engineering Service, the Education Service, and the Health and Social Security Service.

ADMINISTRATION SERVICES

It is the responsibility of the Administrative Services to supply the personnel stationed in New Quebec with the provisions and equipment necessary for carrying out its work and even for the life of the native villages. The Services has likewise the task, consequently, of keeping an inventory of all items belonging to the Department of Natural Resources in northern Quebec and of examining the accounts and expenses of each Service.



ÉTABLI PAR B.ROBITAILLE - DESSINÉ PAR J.-L.BÉDARD

DIRECTION GÉNÉRALE DU NOUVEAU-QUÉBEC, MARS 1969

In every case, the great distances and the difficulties of communication between the northern villages and the Capital on the one hand, and between these villages themselves, on the other hand, create problems which call for specific solutions, that is solutions adapted to very particular conditions. For example, provisions and building material, the total weight of which exceeds 1,200 tons a year, have to be, for economic reasons, transported by boat, as much as possible during the three months of summer navigation, when that is feasible, at least as far as the shores, otherwise to transport into the bays the merchandise destined for the villages which are all situated somewhere along water routes, be it on James bay, Hudson bay, Hudson strait or Ungava bay. A rather short navigation period makes it imperative to ensure, once the orders are prepared, approved and passed, that the merchandise is delivered and unloaded at a convenient time.

Similar reasons of remoteness induced the personnel to devise, during the fiscal year reviewed, a new method of accounting, which was shared both by the Accounting Service at the Quebec administration office and by the villages in the North, in such a way as to follow and control effectively expenses according to fixed budgetary limitations and the credits allocated to each Service. Moreover, the Service sought to define an inventory method which would centralize at Quebec the results of the different inventories kept in the various villages and regions of New Quebec.

However, there was some progress made during the fiscal year reviewed here in the fields of transport and communications. On the one hand, the Government of Quebec undertook the enlargement of the landing strip at Fort-Georges and the surveying of one at Puvungnituk and another at Koartac, whereas the Federal Department of Transport was engaged in building a runway at Inouedjouac. Indeed, the two principal villages, those of Chimo and Poste-de-la-Baleine, are already provided with an airdrome, these being former airbases. However, it appears indispensable that each village possess a landing strip so as to be accessible at all times, including the long period of freeze-up and thaw, especially because of public health needs. For example, it is sometimes necessary to provide help to sick persons of the smallest villages, and to transport these to the Health Center at Chimo or, in serious cases, to hospitals in the South. On the other hand, the Bell Telephone Company of Canada had, during the year under review here, radio-telephone installations at Payne, Port-Nouveau-Québec and Nouveau-Comptoir, so that 13 villages of northern Quebec are now linked to one another and to the South by wireless.

Moreover, the New Quebec Branch had three fires in 1967/68. These fires damaged or razed certain government buildings in the villages of northern Quebec. Thus, a fire completely destroyed a residence being built at Baie-aux-Feuilles on October 5, 1967. Another fire ravaged the government Center of Povungnituk on December 30, 1967 and still another razed a wing of the base at Poste-de-la-Baleine on March 11, 1968. Contrary to the first two places, there was at Poste-de-la-Baleine a fire station and, because of this, complete destruction was prevented. The losses were heaviest in the last two cases insofar as the local services of administration and teaching were concerned.

Government Agencies

During the fiscal year being reviewed, the New Quebec Branch installed a representative or an agent in three new villages of northern Quebec, namely: Port-Nouveau-Québec, Nouveau-Comptoir and Baie-aux-Feuilles. This was done following a well organized plan to extend government agencies to all Esquimo and Indian villages of the North. The Government of Quebec is thus now represented in 13 villages, 10 of which are inhabited exclusively by Esquimos, one by Indians only and two by both groups of aborigines.

The work of the agent from Quebec among the natives requires the execution of complex and difficult tasks. It consists, on the one hand, in inquiring into the needs and wishes of the local population for guiding the Administration Services and, on the other hand, in collaborating with the natives for taking administrative decisions. It is also the responsibility of the government agent to compile the census figures, to make inquiries and to complete the necessary questionnaires for obtaining social allowances and also to supervise the occupation of lands so that no one settles on lands of the State without authorization from the Department of Lands and Forests. The daily work of the Quebec agent requires that he attend to numerous services, from the help which he can give to undertakings by the natives or to local cooperatives to the duties inherent to the job of controller of the post or as radio-telephone operator, which positions he fills for the needs of the village.

Apart from inquiring into the needs and wishes of the aboriginals through the intermediary of its agency proper, the New Quebec Branch facilitates the expression of opinions among the Esquimos by bringing together, once a year for two or three days, delegates from the various Esquimo villages. This makes it possible for them to assemble their ideas before submitting them to the representative having government authority. The last of these meetings took place at Poste-de-la-Baleine on August 23 and 24. Some 40 Esquimos took part, which meant two representatives from each village, and they discussed most of the problems concerning their villages, such as those pertaining to dwellings, electricity and teaching. Having discussed together privately during the first two days, they then submitted their questions and their suggestions to the authorities of the New Quebec Branch.

TECHNICAL SERVICES

Unlike the Administrative Services, which is essentially occupied with internal control, the Technical Services supplies, as its contribution, theoretical and practical knowledge in the immediate exercise of administrative action relating to northern Quebec and the inhabitants collectively. It embraces the Research Documentation Service, the Engineering Service, the Education Service, and the Health and Social Security Service.

Research and Documentation Service

The main function of the Research and Documentation Service is to carry out works and bring together information apt to accelerate administrative decisions for the development of the material and human resources of New Quebec.

To this end, several studies were undertaken or pursued during the fiscal period reviewed by the personnel of the Branch or, at its request, by outside investigators or organizations.

Thus, a geographer from the Research Service carried out, with a collaborator, an inquiry of a geographic nature at Inoucdjouac, during the summer of 1967, in order to study the population and resources of that region. The information thus obtained will be the object of a monograph, just as that which was gathered in past years in the villages of Povungnituk and Ivujivik. During the same period, a similar study was conducted in the village of Payne with the help of government services. To be listed in the same category are the research works which a consultant in anthropology conducted for the New Quebec Branch concerning the structure of Esquimo families in the Ungava region. It is for this purpose that, at the request of the Research Service, the Institut de démographie of Montreal University started, in February 1968, a demographic inquiry into the population of New Quebec for administrative needs, especially in matters concerning social allowances or of student attendance in years to come.

Moreover, the Research Service pursued its inventory of the fauna in New Quebec especially during the summer of 1967, in the tributary rivers of the east bank of James bay. A biologist attached to the Research Service was especially engaged, during the fiscal year reviewed here, in following up a project of transporting muskox in northern Quebec with the consent of the Council for the North West Territories, and for the University of Alaska. Fifteen young ovibos, that is three males and 12 females, were transported on September 3, 1967, from Ellesmere island (North West Territories) and stationed in the former Fort-Chimo site opposite the present village, to be raised and to reproduce. It is hoped that the Esquimos will learn to take care of this herd, which should eventually become part of the economy of the villages through the use, for example, of the abundant wool of these ovibos in the fabrication of clothing.

Upon the joint request of the New Quebec Branch and the Planning Branch, the Research Service obtained, from September 1967 to May 1968, the services of a specialist in territorial development in order to prepare a pilot project for managing the resources of New Quebec. It will then be the work of the personnel of the Branches mentioned above to examine the results of this study together and to judge the feasibility of applying the conclusions therefrom, and at the same time to take into account the basic data and the detail work which is still to be done in the Quebec northland.

It is also the responsibility of the Research Service to give to the personnel destined to the northern villages, initiation courses relating to the northland

The Quebec Government Center of Povungnituk which was completed in April 1966 and destroyed by fire on December 30, 1967.

The compound for the muskox transported to the former site of Fort-Chimo, opposite the present village on the banks of Koksoak river.

and the Esquimo language. These lessons are given especially during the summer to teachers who prepare themselves to go and occupy posts in September among the Esquimos. To this end, two persons from the Research Service have already elaborated a method and a lexicon, which they continue to improve by use, for the rapid study of Esquimo. The Research Service, in fine, has acquired, for the Documentation Service, a large collection of Danish "Meddelelser on Gronland", which is an indispensable instrument for the knowledge of northern regions.

Engineering Service

The New Quebec Branch would not be able to carry out administrative or educative action in the villages of the natives without having the buildings and equipment necessary to the services and to the life itself of the local communities. In this respect, it could be advantageous to rent available space at certain places and indispensable to build in other villages. It is, therefore, the task of the Engineering Service to prepare the plans and estimates, to order the material, to supervise its delivery and to transport it by boat, and, finally, to erect the building on the sites with the help of skilled and un-skilled workmen, both Caucasian and native.

A list of the works accomplished in the various villages of New Quebec in 1967/68 is given below:

at Poste-de-la-Baleine on Hudson bay, transformation of a wing of the buildings of the former airbase into family lodgings for the personnel, and of another wing into a residence for students; preparation of another part to house a secondary school for girls and a classroom for the village at the elementary level;

at Fort Georges on James bay, construction of a garage-school and two houses; extension and enlargement of the landing strip and surveying of another strip, 5,000 feet long and at right-angles to the preceding one;

at Fort-Chimo at the end of Ungava bay, transformation of a former warehouse; construction of a residence pavilion, for the personnel and visitors, and a storage for vehicles;

at Povungnituk on Hudson bay, initial work on construction of a landing strip 3,200 feet long and the installation of a cold storage for village needs;

at Inoucdjouac on Hudson bay, construction of a warehouse, of a house, and of a pavilion consisting of a classroom, a community hall, and a lodging for visitors;

at Baie-aux-Feuilles on Ungava bay, installation of an electrogenerating plant and a cold storage for the needs of the village;

at Wakeham on Hudson strait, addition of two classrooms to the local school;

at Ivujivik in the vicinity of Hudson strait and Hudson bay, installation of a cold storage and an electrogenerator for the needs of the village; construction of a pavilion destined to house two classrooms, a community hall, and community services, such as a laundry, showers, etc.;

at Nouveau-Comptoir on James bay, transformation of the former lodging of the Department of Tourism, Fish and Game into a residence.

The Engineering Service has, moreover, been assigned the task of making the necessary installations for the raising of muskox on the former Fort-Georges site, opposite the present village, on the other side of Koksoac river. It was also occupied with the building of small hothouses at Inouedjouac, Ivujivik and Saglouc where an attempt will be made to cultivate certain vegetables, which at present have to be transported, like all foodstuffs, from the South.

From experience, the Engineering Service tends more and more to build on concrete foundations in New Quebec. Insofar as climate conditions are concerned, the limits of the fiscal period pose problems for the Engineering Service in the carrying out of its activity beyond the 52° of North latitude. This means that, once moneys are approved by the Government, the material is ordered and the transportation of it is arranged during the summer so that it can be used during the same fiscal period. It is, therefore, necessary to prepare and estimate a year in advance the plans and specifications for the needs of construction in northern Quebec, in order to purchase in 1968/69, for example, the material which will be required for construction in 1969/70.

Education Service

One of the main efforts of the New Quebec Branch during the fiscal period under review consisted in extending its education or teaching services throughout the native villages. Hence, new classes were opened at several localities. At Chimo and at Wakeham, for example, the Education Service added a third year to the kindergarten class, to the first and second year which already existed, and, at Ivujivik, it started to make a second year in addition to the kindergarten class and the first year which it took upon itself in the past. Moreover, there is at Payne, Povungnituk, Inouedjouac and Saglouc a first-year class, which has been added since September 1967 to the kindergarten class. On the other hand, a kindergarten class and a first year were opened at Koartac, and a kindergarten class, at Port-Nouveau-Québec. There is also at Fort-Chimo and at Poste-de-la-

Baleine a French school destined for the children of government personnel stationed in these localities. Poste-de-la-Baleine is, in reality, a very peculiar case, since it consists of, in addition to a White community, a group of Esquimos and also one of Indians in about equal numbers. It is for this reason that a first year has been organized in addition to a kindergarten in the Indian language, and a first year in addition to a kindergarten in Esquimo. Mention must also be made that the New Quebec Branch has accepted, at the request of the Department of Education, to take charge, since September 1967, of the teaching of the first and second years in French to the Indians of Fort-Rupert on James bay, that is to say in a locality situated outside the limits of New Quebec.

While assuming the responsibilities of a continuous expansion of the first years of the elementary school where the teacher instructs in the language of the natives, the New Quebec Branch also enlarged, during the course of the fiscal year 1967/68, the scope of the teaching of trades and of household management among the aboriginals. On the one hand, the École des Métiers, opened at Poste-de-la-Baleine in May 1966, brought together, at the beginning of autumn 1967, 70 boys from the various Esquimo and Indian villages and these studied one or the other of the following subjects: mechanics, carpentry, timberwork, electricity, soldering, general preparation, and office work. Two types of students attend this school: some are adults in their thirties, who wish to become apprentices in a trade distinct from the old traditional occupations of hunting and fishing, and the others are especially those of 16 or 17 years, who have an occasion to prolong their primary studies by acquiring a more advanced general knowledge and also that of a trade. The course for the older group lasts two years, and the one for the young is of three years' duration.

The success and the lack of space of the École des Métiers of Poste-de-la-Baleine prompted the New Quebec Branch to open, in September 1967, a branch at Fort-Georges for the teaching of certain trades. Nevertheless, the delays of opening the branch, which were attributable to installation preparations, had very adverse effects on its success, and it was able to recruit only four students.

On the other hand, the New Quebec Branch also opened at Poste-de-la-Baleine, but for the instruction of girls, a corresponding school in domestic arts. As in the case for the boys, this school makes it possible for young native girls to pursue their studies as far as the sixth year, while acquiring a complementary training which will equip them for housekeeping, family and social service or prepare them for the profession of teaching or nursing. Twenty-five girls from various local villages were in attendance at this school from its opening in September 1967. The program of study of the École des arts ménagers, like that of the École des Métiers, also included free courses in French, which subject was popular with the students in 1967/68.

Among the types of instruction available in New Quebec, it would be well to mention the French lessons which certain agents of Quebec accepted to give at the local Federal Government school, such as at Povungnituk, and also the series of lessons in domestic arts which the wife of an agent was able to give to

Second-year classroom at Fort-Chimo in 1967/68

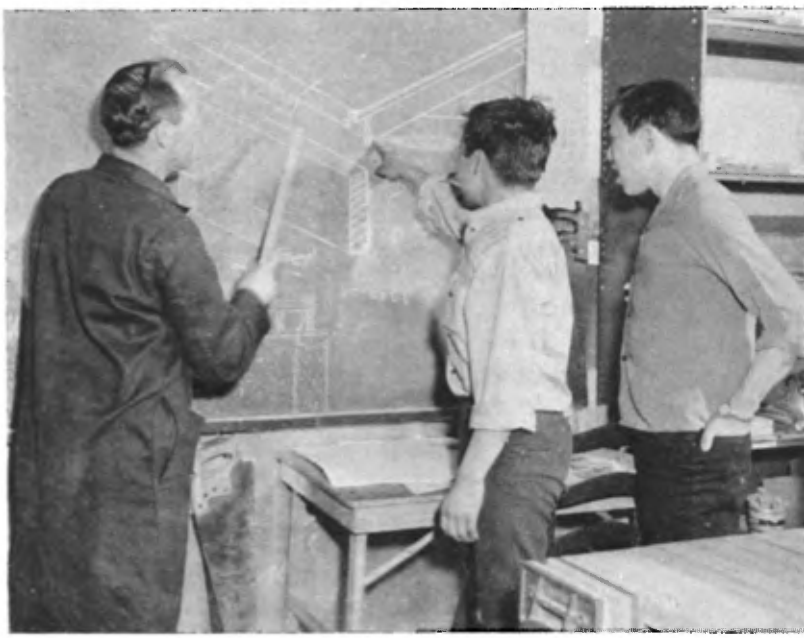
the female natives of the village, such as was the case at Sagloue in the spring of 1967. Moreover, 24 students from the South, attached to the villages of New Quebec during the summer of 1967, took part in this general effort of educative services in Quebec's northland, although under a rather particular form, sometimes by encouraging social activities and taking part in the daily actions of the natives, and, at other times, by organizing games and pastimes in the villages, with the collaboration of the young and even with the adults.

However, in order that this instruction be available in the schools and elsewhere, it requires of those who must teach that, in addition to a knowledge of the native language, they have the ability for adaptation and even for invention. However, in this field, books are completely lacking, except for a series of five volumes prepared and now being revised by the Education Service for teaching Esquimo in the first and second grades. This means that the teachers assigned to the École des Métiers or to the École des arts ménagers of Poste-de-la-Baleine, for example, must, in addition to the task of familiarizing themselves with the native language, prepare their program of studies while striving to adapt their methods and courses to the mentality of the aboriginals from the start.

Hence the New Quebec Branch constantly strives to encourage more and more natives to enter the teaching profession and to work among their own people. To this end, several phases of initiation to teaching were organized in

Sections of the
ÉCOLE DES MÉTIERS
OF
POSTE-DE-LA-BALEINE

Lesson in carpentry



Course in
construction design

Workshop in
light mechanics for
out-board motors
used in
northern Quebec

Four young Esquimos in the first phase of primary education in the offices of the Department of Natural Resources at Quebec in July 1967

1967 for young Esquimos. The first phase was undertaken in the spring at Wakeham, whereas the second was advanced at Quebec and the third at Fort-Chimo in the summer, in such a way as to accustom the natives to elaborate and exercise their training as teachers at the elementary school level.

Health and Social Security Service

The fiscal period reviewed here was also characterized by an extension of the services of health and social security to the natives of northern Quebec. The Health and Social Security Service had on its staff, in addition to the personnel stationed in Quebec, one doctor, five nurses, one laboratory technician, four native nursing aids and two Esquimo interpreters attached to the health center at Fort-Chimo.

The original plan of the Health Service consists in establishing in New Quebec three multi-purpose health centers which will combine curative and preventive medecine, hygienic education and social security in view of serving respectively the Ungava region and the villages of Hudson and James bays. The first among these, the health center of Fort-Chimo, which was opened on March 7, 1967, comprises an out-patient clinic provided with laboratory and radiological services and a section attending to the hospitalization of patients, since September 1, 1967. One can, however, judge the work of this health

center only from the following figures. Its personnel registered, during the fiscal year reviewed here, 252 X-ray examinations, 2,097 laboratory examinations and 3,285 medical visits, of which 2,734 were at the clinic and 551 were house-calls, according to the records of the care given to Esquimo population. From September 1, the date of its opening, to March 31, the hospital section of the health center at Chimo admitted or treated 93 patients, including several sick persons coming from other villages of the Ungava region, that is 16 from Port-Nouveau-Québec, 7 from Baie-aux-Feuilles, 11 from Payne, 8 from Koartak and 7 from Wakeham. On the other hand, 58 patients who were in a state requiring special care were evacuated to the South, transported mainly by airplane provided by the Department of Transport and Communications, so that they could be treated specially at Saint-Sacrement Hospital in Quebec city.

Moreover, the hospital at Chimo now has an administrative council, formed of representatives from the population, since it is a non-profit organization, the letters-patent of which are dated March 1 and empower it to negotiate a hospital insurance contract with the Department of Health. Such a structure should contribute toward establishing the noticeable progress that the Health Service of Fort-Chimo realized in 1967/68 by the spreading of the ever-increasing influence of its personnel among the villages of Ungava. The medical services of Quebec are now replacing, in a friendly manner, those of the Federal Department of Health in this region by assuming not only the practice of curative medecine but also the responsibilities of hygiene, the arrest of tuberculosis and the treatment of chronic cases entrusted to the hospitals in the South.

There remains, however, to extend the health services of Quebec to the regions of Hudson bay and James bay for the benefit of the Esquimo and Indian population there. The New Quebec Branch undertook the building, in 1967/68, of a health center, including a hospital at Fort-Georges, but its project has been, for the present, delayed and taken under further study. Its medical action was limited to sending into this region an ophthalmologist who examined the vision of the natives at Fort-Georges and Poste-de-la-Baleine in March 1968. The results of this visit have led to the sending to Quebec certain patients whose eyes required special treatment.

The Social Security Service is a necessary complement to the Health Service among the natives of New Quebec where insufficient nourishment and lack of hygiene and means of subsistence contribute to the start and spread of illness. In principle, the native population of northern Quebec may profit from the social assistance measures established in Quebec for the people of the South, such as the social welfare allocations distributed as allowances to the aged or help at home, as well as aid to the blind, to invalids, needy mothers, widows, single women over 65 years of age, and also student grants for pupils from 16 and 17 years. Nevertheless, in practice, it is important to adapt these standards and measures as conceived for the population of southern Quebec to the needs of the natives of New Quebec, in such a manner as to take into account their cultural traits and their present socio-economic situation. During

the fiscal period 1967/68, the total sum of $136,633 was distributed to the needy of northern Quebec under the general title of social allowances, that is $10,677 for assistance to the aged, $11,625 for aid to the blind, $5,589 for the sick, $21,179 for aid at home, $7,161 as assistance to widows and single women over 65 years of age, $72,272 for aid to needy mothers, and $8,140 as student aid.

CONCLUSION

In summary, it can be reported that the activity of the New Quebec Branch continued to progress and expand during the fiscal year reviewed here. On the one hand, its Education and Health Services have noticeably extended governmental services in the Quebec North; on the other hand, fires have unfortunately destroyed its installations at Povungnituk and Poste-de-la-Baleine, and plans had to be abandoned because of the lack of coordinated efforts. This was the case of the small Esquimo newspaper "Ajagait" (cup-and-ball) which commenced in June 1967 and ended after its third issue, and an information and documentation bulletin "Courrier du Nord", the publication of which was terminated at the end of its fourth year, in the beginning of 1968.

However, one must realize that, despite these reverses, the Government of Quebec is playing an active role and is resolutely occupied with its northern territory after almost five years of organization. Administrative structures have been established through the intermediary of the New Quebec Branch; plans for future action have been formulated, and the main principles of government policy have been defined. Actually, it is a question of developing the resources of New Quebec for the benefit of its aboriginal population and of the economy of Quebec as a whole, and this is to be done by intensively pursuing this objective with the collaboration of the natives themselves and of the various departments of the Government of Quebec. Thus, in this connection, the New Quebec Branch has spent an annual grant of $80,000 on the cooperatives of New Quebec, through the intermediary of the Cooperative Council of Quebec and of the Federation of Cooperatives of New Quebec, in such a manner as to aid these local institutions to work effectively for the economic progress of native villages. It can be readily understood why the Branch had recourse to the Department of Lands and Forests in order to bring about the surveying of native villages and why it appealed to the technical services of other departments for the purpose of extending government action beyond 52° of North latitude. All this work of planning, building and development of governmental activity would never have materialized were it not for the faith, imagination and devotion of the first director-general of the New Quebec Branch, as stated by Guy Poitras upon his succeeding Eric Gourdeau as head of the Branch at the end of February 1968. It is now up to the new director-general to strengthen these administrative structures and to come forward with plans adapted to hasten the growth of New Quebec. One of these measures might be to continue to promote research work favorable to northern Quebec within the framework of France-Québec collaboration. It is with a view to exploring this idea that

the director of the Research Service organized a mission in France, in March 1968, in company with the director of the Centre d'études nordiques of Laval University and the director of the Centre de recherches arctiques of the École des Hautes Études commerciales of Montreal.

In fine, it is hoped that the people of Quebec develop a growing interest in their northern territories equal to that faith which their ancestors demonstrated in pioneer work along the shores of the St. Lawrence. Why should we not then be inspired, as others are, by this challenge to explore and develop a region which has the dimensions of a country? In fact, people from other lands have made us well aware, especially during the year of the World Fair in Montreal, of the charm which this region of Quebec held for them. Some ventured a visit to one or the other of our northland regions, especially European and American journalists, reporters of Belgian radio and television networks, representatives from the Swiss radio-television, a minister from the Assemblée Nationale française, Jacques Marette, the Commissioner-general from Maroc at the World Fair, Prince Albert of Liège and his wife, Princess Paola. The Study Commission on the integrity of the territory of New Quebec has been able only to attract the attention to New Quebec and to its population by holding consultation meetings at Fort-Chimo from October 2 to 4, 1967, to find out from the inhabitants, and particularly the Esquimos, concerning what were the traditional boundaries of the territory of Ungava bay.

Participation in Other Organizations

Several officers of the New Quebec Branch took part in 1967/68 in the work of outside organizations, to which they contributed their specialized knowledge through courses, studies or writings.

During three weeks of May 1967, the director of Technical Services, Benoît Robitaille, was assigned for the purpose of examining, at the request of the Study Commission on the potential of New Quebec, the relationship between the off-shore islands of New Quebec and the mainland.

The director of Technical Services also gave 30 lectures in July 1967, on the Arctic, within the framework of summer courses at Laval University.

One of the collaborators from the New Quebec Branch, Lionel Beaudoin, took part, as a specialist in government information, in the colloquy organized at the Académie de Québec during the autumn of 1967, by the Syndicats Nationaux and the Bureau du commerce et de l'industrie de l'agglomération de Québec, on the problems of Quebec and its suburbs. On October 12, the following question was treated: "Does the information media of Quebec contribute toward the formation of a great capital, of a metropolis?"

In fine, Benoît Robitaille, director of Technical Services, presented a paper on the use of geomorphologic maps at the colloquy held on geomorphologic cartography within the framework of the ACFAS (l'Association Canadienne-Française pour l'Avancement des Sciences) congress, which took place at Sherbrooke on November 3 and 4, 1967.

PROGRESS OF THE MINING INDUSTRY

Two years ago the value of the mineral production of Quebec attained an all-time high and it was then assumed that this upsurge would continue for a considerable time. During the years of 1967 and 1968, several factors have, however, militated against this advance. Production is at present well above the $700 million mark, but the expected climb to $800 million in 1967 has not been realized.

During 1968, Quebec's mineral production remained stable despite the recovery in the field of economic activity, which normally should have created an increased demand.

The mineral production value of Quebec is now at a level slightly above $730 million. In relation to the other provinces of Canada, this figure takes on a somewhat different significance. Quebec's production decreased 0.4 per cent, whereas the mineral output of Canada as a whole has increased 8 per cent during the same period.

The situation obtaining in Quebec has been the object of serious reflection and the continuous reverses require that studies be directed toward the possibility of its redress. Two factors are mainly responsible for the slow progress in this industry: firstly, the gradual depletion of the deposits and the progressive lowering of their ore tenor and, secondly, a readily noticeable and steady decline, which has continued during several years, in the domain of exploration and prospecting.

Compensating Factors

GASPESIA

At the present time, Gaspé Peninsula seems to present the greatest potential for the revival of copper production for several years. Gaspé Copper Mines, after 15 years of operations, completed its installations of its new Copper Mountain mine and has attained full capacity. This mine alone should be able to compensate the losses sustained in Quebec as a whole in 1967.

The depletion factor, so noticeable in the Rouyn-Noranda region, will be thus offset, and the expansion program planned for the whole peninsula will gradually be completed. One foresees vaguely the exploitation of the Madeleine River mines necessitating an investment of the order of $15 million. The deposits of Terra Nova are being evaluated and construction of access roads to all sections of Mount McGerrigle has commenced.

CHIBOUGAMAU

A great deal of exploratory work followed the discovery of radioactive minerals, and interest in uranium by prospectors has grown considerably.

The development and the process of working asbestos deposits have made great strides in this region, where exploration and a systematic study of the bedrock were undertaken.

The start of operations of the new Icon Sullivan mine in the Mistassini basin will likewise contribute to increased production and favor a renewed interest and activity on the part of prospecting organizations.

One may likewise mention the very extensive development success attained by Opemiska Mines. This company mined three diffrent deposits and has brought its ore reserves up to a point almost equal to the quantities already milled at its plant during the past fifteen years of its operations, and its exploration potential is far from being completed.

NORTHWESTERN QUEBEC

Midrin Mining Co. discovered new showings of copper and nickel mineralization in Baby township, Témiscamingue county. These activities created a certain interest and attracted a goodly number of exploration enterprises, and, farther south, in Campeau township, the development of kyanite deposits (refractory mineral) was commenced.

In the Rouyn-Noranda region, Lac Dufault Company delimited new deposits on its property and commenced the installation of new shafts in order to determine a definite assessment of its potential.

Delbridge continued a program of development, which should lead to an exploitation reasonably soon, and a new deposit, the property of Francoeur Gold Mines, will be put into production by Wasamac.

Intensified Exploration

The first widespread problem which the mining industry must resolve is that of exploration. In general, the activities in this domain in Quebec have now reached a critical point as regards the regular renewal of existing deposits, a state so important that certain mines already have insufficient reserves. It is moreover well known that, since several years, there is a diminution in the tenor of the deposits being mined.

Research

The work of the laboratories of the Department of Natural Resources is at present directed toward extractive metallurgy applied to the development of deposits already delimited in Quebec, the production of which will depend in part on the discovery of new processes.

On the other hand, programs of scientific cooperation are still being negotiated, notably with France, and, of course, contacts with American technology will be likewise intensified.

During the fiscal period 1967/68, the Pilot-Plant undertook 35 new research projects embracing 74 different lots of ore having a total weight of 1,300,280 pounds.

During this same 12-month period, 41 engineering reports dealing with completed studies and projects were presented.

In the laboratory, two projects of special interest were brought to light: studies concerning the concentration of a vanadium-bearing magnetite and work on the concentration of pyrochlore. At the plant, an important pilot project on iron ore from Corgemines Limitée was completed and a second project was commenced which involved the temporary installation of a heavy crusher, necessitated by the study of asbestos ore from McAdam Mining Company. This work warrants the belief that the Department has involved itself in a direct way in the future establishing of two new mining operations in Quebec.

Aeromagnetic Surveys

A new aeromagnetic surveys project, which will extend over a period of 3 years, has been undertaken for the purpose of expanding the mapping of the whole territory of Quebec.

The completed program will require about 255,000 mile-hours of flying and this work is the responsibility of the Mineral Deposits Service of the Department. The project will represent an increase in the cost of works carried out in this field during the fiscal year 1966/67.

SOQUEM

The basic reconnaissance programs conducted during the two previous years have started to show results. On nine mining properties held in whole or in part by SOQUEM, there are promising mineral occurrences, of which some stand a good chance of developing into commercial operations within the ten-year mandate set by the Legislature (13-14, Elizabeth II, Chapter 36).

In Louvicourt township, near Val-d'Or, the company discovered a mineralized body of copper and silver on lands which have been the object of various surveys over the past 25 years.

Excellent relations continue to prevail between SOQUEM and the private sector of the mining industry, of which 15 high-ranking representatives share 21 joint projects. These companies bring to Quebec an important technological and financial contribution and are a good example of the cooperation that can exist between a Crown corporation and private enterprise in the exploration and the development of mineral resources.

SAREP

As already mentioned on the preceding financial report, Hydro-Québec, which held all the exploration licenses in the Gulf of St. Lawrence, concluded an agreement with a private petroleum company (Texaco) for exploring and developing the sedimentary basin of the St. Lawrence.

In this field, Texaco continued its seismic surveys under water, and the results of these studies are such as to reveal the presence of structures of a nature that warrant undertaking drilling operations necessitating substantial sums of money.

MINERAL PRODUCTION OF QUEBEC IN 1966 AND 1967

SUBSTANCES		SUBJECT TO REVISION 1966		ESTIMATED FIGURES 1967	
		Quantity	*Value*	*Quantity*	*Value*
METALLICS					
Bismuth	pounds	650,753	$ 2,603,012	517,460	$ 1,933,343
Cadmium	pounds	304,421	730,610	377,280	1,069,270
Cobalt	pounds	101,000	218,116	30,000	64,800
Columbium	pounds	2,600,000	3,150,000	2,207,000	2,627,000
Copper	pounds	345,434,345	155,100,021	318,175,024	151,355,859
Gold	ounces	944,934	35,725,802 **	837,772	31,625,893
Iron (metal)	tons	355,311	16,895,216	373,400	18,332,344
Iron (ore)	tons	13,817,367 *	128,707,024	14,518,000	135,474,839
Lead	pounds	7,508,276	1,121,736	4,190,678	586,695
Molybdenum	pounds	4,896,309	7,589,279	3,728,298	6,575,733
Nickel	pounds	8,593,400	7,364,544	3,358,400	3,170,330
Selenium	pounds	297,800	1,828,500	517,425	2,328,400
Silver	ounces	5,780,130	8,086,402	4,921,250	8,533,447
Tellurium	pounds	56,900	372,100	61,755	401,400
Titaniferous iron	tons	18,760	142,290	48,000	287,000
Zinc	pounds	580,504,425	87,656,168	485,881,925	70,404,291
TOTAL METALS :			$457,290,820		$434,770,644
NON-METALLICS					
I – Industrial minerals					
Asbestos	tons	1,336,566	$141,559,725	1,260,468	$138,828,849
Feldspar	tons	15,900	397,500	10,555	264,527
Industrial lime	tons	318,342	3,411,306	271,568	3,148,900
Industrial limestone and marble	tons	1,100,000	3,000,000	1,000,000	2,800,000
Lithium	pounds	244,063	258,794	564,977	266,226
Magnesitic dolomite and brucite	tons	——	3,928,158	——	3,441,405
Marl	tons	93,778	164,112	60,000	105,000
Mica	pounds	339,800	14,082	——	——
Natural gas	M. cu. ft.	——	——	61,000	8,000
Ochre and iron oxide	tons	300	14,000	700	28,000
Peat (moss and humus)	tons	110,000	2,500,000	108,000	2,235,000
Quartz and industrial sand	tons	540,000	3,400,000	550,000	3,350,000
Soapstone and talc	tons	15,100	191,100	15,800	229,000
Sulfur	tons	——	1,441,027	——	2,174,750
Titanium (oxide and other titanium products)	tons	395,523	21,615,610	418,670	23,704,420
TOTAL INDUSTRIAL MINERALS :			$181,895,414		$180,584,077
II – Building materials					
Building lime	tons	34,000	$ 357,000	38,000	$ 400,000
Building stone	tons	47,362,626	51,841,068	47,741,204	49,984,475
Cement	tons	2,976,610	49,361,015	2,207,966	41,804,530
Clay products	tons	——	6,600,000	——	7,139,284
Sand and gravel	tons	49,611,123	23,111,231	45,650,000	21,350,000
TOTAL BUILDING MATERIALS :			$131,270,314		$120,678,289
GRAND TOTAL :			$770,456,548		$736,033,010

* In view of the uncertainty as to the location of the boundary between Quebec and Newfoundland, the amount shown may not represent all the iron production of Quebec.

** Value in Canadian funds. According to the international rate which is $20.671834 an ounce troy, the Quebec production is equivalent to $19,533,519 for 1966 and to $17,318,284 for 1967.

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