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REPORT OF THE QUEBEC DEPARTMENT OF NATURAL RESOURCES 1965 / 66

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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, 1966.

Your respectful servant,

DANIEL JOHNSON

Minister of Natural Resources

Quebec, March 1, 1967

HONORABLE DANIEL JOHNSON,
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, 1965, to March 31st, 1966. 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, 1967

LIST OF THE BRANCHES AND SERVICES WITH THE NAMES OF THE CHIEFS

Mines Branch	J.-E. Gilbert
Geological Services	P.-E. Grenier
Geological Exploration Service	R. Bergeron
Mineral Deposits Service	R. Assad
Regional Geological offices:	
Rouyn-Noranda, at Rouyn	J. Sharpe
Val-d'Or—Matagami, at Bourlamaque	M. Latulippe
Chibougamau—Lac Bachelor, at Chibougamau	G. Duquette (Chibougamau)
Eastern Townships, Gaspé and Lake St-Jean, at Quebec	
Gas, Water and Petroleum Service	R. Roy
Cartography Service	A. Blanchette
Mining Services	G. Poitras
Engineering Service (Mines)	G. Paradis
Inspection of Mines Service	Ls-G. Tanguay
District Inspectors at:	
Montreal	M.-O. Lafontaine
Noranda	G. Courtemanche
Thetford	F. Cloutier
Quebec	C. Moscu
Chibougamau	G. Duchesne (Noranda)
Mining Domain Service	J.-Ls Pouliot
District Registrars at:	
Amos	F. Adams
Chibougamau	R.-H. Lefebvre (Chibougamau)
Montreal	R. Richer
Rouyn	R.-H. Théberge
Agent, at Bourlamaque	M. Laforest
Laboratories Services	M. Archambault
Pilot-Plant Services	P.-E. Pelletier
Waters Branch	M. Slivitsky
Assistant Director General	C.-E. Deslauriers
Hydraulic Services	R.-L. Ménard
Engineering Service (Waters)	R. Laganière
Hydraulic Domain Service	L. Thibault
Study and Research Service	B. Mathieu
Hydrological Services	M. Hendler
Hydrological Service	J. Aumont
Hydrometry Service	R.-C. Pesant
Meteorology Service	G.-O. Villeneuve

Planning Branch	A. Marier
Economic Studies Service	J.-M. Bellemarre
New Quebec Branch	E. Gourdeau
Technical Services	B. Robitaille
Administrative Services	E. Bernier
Administration Branch	R. Cormier
Purchasing Service	G. Durand
Archives Service	G. Gauthier (Waters)
	P. Bordeleau (Mines)
Equipment Service	C. R. Staniforth
Secretariate and Scholarships Committee	G. Landreville
Information and Publications Branch	P. Thériault
Legal Service	R. Langevin
	Denys Pouliot
Personnel Service	C.-P. Bélanger
Accounting Service	J.-C. Delaunière

TABLE OF CONTENTS

ADMINISTRATION BRANCH

The Administration Branch includes the following services: Equipment, Purchasing, Archives, and the Secretariate. Its main task, along with seeing to the proper functioning of these four services, is to control the expenses of the Services of the Department.

Also, within the Branch, an Installation and Maintenance division, in consultation with the Department of Public Works, deals with numerous problems related to the installation and maintenance of the various offices of the Department in the Province.

Equipment Service

The Equipment Service sees to the maintenance of the 140 vehicles belonging to the Department.

This Service is also responsible for materiel and equipment for the technical services' programs. The Department has four warehouses, two in Quebec and two in Montreal, where all this stock, valued at more than a million dollars, is catalogued and maintained in good condition.

During the 1965/66 fiscal year, some 60 parties, headed by geologists, hydrologists, and engineers supervising construction contracts for mining roads, used the Equipment Service for their camping material requirements and for the technical instruments needed in their work.

Scholarships

The Department maintained its policy of awarding scholarships in mining and hydraulic sciences.

The Minister appointed a committee of experts in each of these fields to study the applications of the candidates. The committee recommends to him the most deserving applicants, after taking into account academic results and family financial circumstances.

MINES

Eugène Larochelle, Chairman
Rev. Fr. J.-W. Laverdière, Geology Department, Faculty of Science, Laval University.
Henri Gaudefroy, director, Ecole Polytechnique.
Arthur Dubé, director, Department of Mines and Metallurgy, Faculty of Science, Laval University.
J. E. Gill, director, Department of Geology, McGill University
Jacques Lemieux, Faculty of Science, University of Sherbrooke.
Gisèle Landreville, Secretary.

WATERS

Yvon DeGuise, Quebec Hydro Commissioner, Chairman.
Raymond Boucher, director, Department of Civil Engineering, Ecole Polytechnique.
Michel Normandin, Dean of the Faculty of Science, University of Sherbrooke.
Bernard Michel, Department of Civil Engineering, Faculty of Science, Laval University.
Svenn Orvig, Professor of Meteorology, McGill University.
Gisèle Landreville, Secretary.

Scholarships awarded by the Department during the 1965/66 fiscal year amounted to 139 and were awarded to students attending universities as listed below.

Graduate Students :

	Mines	*Waters*
Laval University	2	3
Ecole Polytechnique	2	—
University of Montreal	2	—
McGill University	6	1
University of Toronto	1	—
University of Western Ontario	1	—
McMaster University	1	—
Dalhousie University	1	—
Massachusetts Institute of Technology	2	3
Colorado School of Mines	1	—
University of Illinois	1	—
Purdue University (Indiana)	1	—
University of Toulouse	—	2
University of Grenoble	—	1
Strathclyde University (Scotland)	1	1
	22	11
TOTAL	33	

Undergraduate Students :

	Mines	*Waters*
Laval University	48	15
Ecole Polytechnique	34	—
University of Montreal	2	—
McGill University	7	—
	91	15
TOTAL	106	
GRAND TOTAL	139	

MINES BRANCH

Among the functions entrusted to the Minister of Natural Resources by the Natural Resources Department Act (9-10 Elizabeth II, Chapter 48), the Mines Branch is responsible for the following:

(*a*) Administration of mining rights and mining lands in the Province;
(*b*) Legislation respecting mines;
(*c*) Contribution to the development, operation and uses of Quebec's mineral resources for the benefit of its people.

Administratively speaking, the responsibilities of the Mines Branch are subdivided as follows:

(*a*) Administration of mining lands through issuance, registration and renewal of mining titles, as well as the control of statutory work for holders of mining rights;
(*b*) Supervision of mining operations with the aim of ensuring the safety and comfort of workers and the prevention of water and air pollution;
(*c*) Collection of mining dues;
(*d*) Assistance to the exploration and uses of Quebec's mineral resources through the establishment of scientific and technical services that make geological, geophysical and other studies available to the public and that provide laboratory facilities for purposes of research, sample assaying, and discovery of new ore treatment and marketing processes;
(*e*) Opening of access roads to mineral resources;
(*f*) Establishment of mining villages and towns with the welfare of workers in mind, and control of sales of residential and other lots on mining concessions.

During the 1965/66 fiscal year, three new acts concerning the Quebec mining industry came into effect:

(*a*) The Mining Act (13-14 Elizabeth II, Chapter 34), which came into effect January 1, 1966, concerns the administration of mining lands in general, as well as the assistance given to mining exploration;
(*b*) The Mining Duties Act (13-14 Elizabeth II, Chapter 35), which also came into effect January 1, 1966, replacing the provisions of the former Quebec Mining Act respecting mining duties;
(*c*) The Charter of the Quebec Mining Exploration Company (13-14 Elizabeth II, Chapter 36), which came into effect July 15, 1965, and which incorporated a new company with the Quebec Government as its sole share-holder having as its main objectives to promote a greater participation by the State in the profits resulting from the mining operation in its subsoil and to accelerate mining exploration in Quebec with the hope of facilitating new discoveries.

Revenue collected during the fiscal year 1965/66, under the Mining Act and under the Mining Duties Act, amounted to $11,385,219.69, whereas expenses amounted to approximately $6.75 million of the $13.4 million spent from the Department of Natural Resources' total budget. However, of this $6.75 million some $3.65 million was for capital expenditures on new construction. Of this amount nearly $2 million is recoverable from

the Government of Canada, various mining companies, and mining villages and towns.

The ordinary expenditures were $3.1 million, as against revenues amounting to approximately $11.4 million.

A little more than $2.12 million was allocated to aid mining research, $1.45 million having been spent on Geological Services and about $670,000.00, for laboratories and the pilot-plant.

Construction, repairs, and maintenance of mining roads cost some $3.3 million, of which nearly $3 million may be classified as capital expenditures, with nearly $1.4 million reimbursable to Quebec. The establishment and organization of mining villages cost a little more than $660,000.00, of which approximately $600,000.00 is recoverable in the long run.

On the other hand, administration of the mining domain, supervision of mining operation works, and general administration costs relative to the Services forming the Mines Branch cost a little more than $675,000.00, of which nearly $55,000.00 is recoverable from mining operators.

GEOLOGICAL SERVICES

Paul-E. Grenier, Director, submits the following summary report on the Geological Services for the 1965/66 fiscal year:—

The Geological Services are responsible for studying the geology of the Province and for working on the many diverse problems related thereto. They comprise four entities: the Geological Exploration Service; the Mineral Deposits Service; the Gas, Water and Petroleum Service; and the Cartography Service. The last-mentioned unit also serves other branches of the Department but, as its principal task is related to geological work, it is grouped most logically with the Geological Services.

The activities of each of these four services are given in detail immediately following this summary, through the separate reports of the respective directors.

During the year under review, the present Director was named to head this group of services. This followed the retirement from government employment, effective August 1, 1965, of the previous incumbent, I. W. Jones, who, for more than 36 years, ably and diligently served the Department of Natural Resources and its predecessors. From 1929 to 1938 Dr. Jones carried on field work in which he outlined the geology of much of the interior of Gaspé Peninsula. In 1938, when the Department of Mines was created a separate ministry, its Geology Division split into two units: the Geological Surveys Branch, and the Mineral Deposits Branch. Dr. Jones was named Chief of the former. From that time Dr. Jones' notable talents were applied in the administrative field. In 1957, he was appointed to the directorship of the newly-created Geological Services. It was under his able guidance that the group continued to expand to reach its present maturity.

Dr. Jones is the author of numerous geological reports and maps, as well as many other technical papers. He has served many scientific organizations in a variety of capacities. Throughout the years, his scientific knowledge, wide experience, and wise counsel have benefited all levels of the Department.

During the year, also, H. W. McGerrigle, formerly Chief of the Geological Exploration Service, was appointed a Technical Adviser in the Geological Services. He is engaged mainly in the technical editing of

geological reports and maps, but his duties will not be limited to this field.

Summaries of the results obtained from individual geological surveys and related projects carried out in the 1965 field season appear in the special booklet, S-97, which is accompanied by index map No. 1605-A. This publication is issued so that useful information is made available as soon as possible to prospectors, mining companies, and others interested in the geology of Quebec.

It should be mentioned that, during the year reviewed, a three-year program of aeromagnetic surveys of certain sections of the Province was completed by the publication of the remaining isomagnetic maps. The cost of this program, launched in 1962/63, was shared equally between the Department of Natural Resources and the Federal Department of Mines and Technical Surveys. Additional details of this work appear in the Department's annual reports for the preceding three years.

In September 1965, Michel Houde, geologist in the Gas, Water and Petroleum Service, returned to the Department on completion of a one-year course of study at the "Institut français du Pétrole", in Paris. Here he specialized in geophysics, especially the techniques being applied in the search of hydrocarbons. His trip was made as part of the exchange of scientific personnel between France and Quebec initiated in 1964.

Under the same program, Robert Assad, Director of the Mineral Deposits Service, left on January 4, 1966, for three months of study at the "Commissariat à l'Energie Atomique de France". During that time, he was able to visit the principal installations pertaining to the mining, processing and utilization of radioactive minerals.

Early in March 1966, Raymond Roy, Director of the Gas, Water and Petroleum Service, left for a two-month study tour in France. It is intended that he will become acquainted with the techniques being applied in hydrogeological research in France. Moreover, it is expected he will acquire a complete knowledge of French legislation pertaining to groundwater, and also note the types of problems that may arise from the application of such legislation. Mr. Roy's studies are being carried out with the collaboration of the "Bureau de Recherches Géologiques et Minières" (B.R.G.M.) of France.

During the period January 20—February 10, 1966, Robert Bergeron, Director of the Geological Exploration Service, voyaged to France. The purpose of his trip was twofold—firstly, to try to recruit technical personnel for the Geological Services and also an officer for the Inspection of Mines Service and secondly, under the auspices of ASTEF (Association pour les Stages techniques en France), to make arrangements for the hiring each year of some French students for summer field work on the Department's geological mapping parties.

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 sub-committee on Mineral Deposits, and he also acts as the Department's representative to the body. He is a member of the Associate Committee on Geodesy and Geophysics of the "National Research Council", as well as the Department's representative for the "Canadian Scientific Committee for the Upper Mantle Project". Within "The Canadian Institute of Mining and Metallurgy", he is on the Executive Committee of the Geology Division, and is the Quebec City Branch representative on the Membership Committee.

GEOLOGICAL EXPLORATION SERVICE

Robert Bergeron, Director, reports as follows on the activities of this Service during the 1965/66 fiscal year:—

On March 31, 1966, the professional staff comprised 15 geologists and geological engineers—unfortunately a net decrease of five from the status at the close of the preceding year. During the year, five staff officers resigned— J.A.V. Douglas left to join the Federal Dept. of Mines and Technical Surveys; Guy Valiquette accepted a university teaching post; and F.W. Benoit, Marcel Morin, and T. Hashimoto took positions with companies in the mining industry. A sixth member, J.-Y. Chagnon, was in December transferred to the Mineral Deposits Service of the Department. On the other hand, only two geologists joined the staff—Claude Hubert and Jean Depatie. The Service also includes four technical assistants and clerks, and six secretaries and stenographers.

During the year, also, H.W. McGerrigle, for the past six years the Chief of Service and for the preceding two the Acting Chief, was named Technical Adviser in the Geological Services. For more than 27 years Dr. McGerrigle has been a geologist with this Service. Over a long period he carried on field mapping, chiefly in Gaspé Peninsula, and is the author of many geological reports and maps, as well as sundry other scientific papers. His long-time, valued service to the Department is recognized in this merited, new appointment, which frees him from administrative work to devote his knowledge and talents to a wider range of duties.

The Service had another 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 geological reports and maps giving the findings of their investigations. Such work has, in some instances, led to the finding of mineral deposits of commercial value, and in others has indicated where further investigations 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 in, 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 and cuttings, 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 1965 field program comprised 25 projects, three more than in 1964.

Two parties (led by A.-F. Laurin and E.H. Chown) carried out reconnaissance mapping, compared with one in 1964. Together, they

covered about 12,600 square miles (about 2.1% of Quebec's area), at a scale that will permit the publication of maps at 1 inch = 4 miles.

Another 16 parties did regional geologic mapping, compared with 20 in 1964. They covered, in all, approximately 4,000 square miles (about 0.7% of the Province). These maps will be issued at 1 inch = 1 mile.

Two other parties (headed by P. Lasalle and J.-C. Dubé) mapped the unconsolidated (Quaternary) deposits over areas that total about 1,000 square miles.

Another five field projects were of a miscellaneous nature. They were:—

(*a*) detailed mapping (1" = 500'), by S.T. Ahmedali, of two small areas along the lower north shore of the St. Lawrence that are underlain by anorthosite and associated rocks;

(*b*) research on clays, and associated studies on landslides, begun by J.-Y. Chagnon;

(*c*) a continuing program of drill-core logging, by B. Warren;

(*d*) diverse projects—mostly connected with boreholes and the logging of cores and cuttings—in the St. Lawrence Lowlands, by T.H. Clark;

(*e*) investigations in Gaspé Peninsula, by W.B. Skidmore chiefly detailed studies and fossil collecting in the vicinity of Percé, Gaspé-South county.

Fourteen of the 25 field projects were headed by officers of the permanent staff, and another full-time geologist, T. Hashimoto, assisted A.-F. Laurin in his large-scale mapping program. The other 11 parties were led by geologists employed on a short-term basis, mainly graduate students pursuing research at various universities towards their doctorates. The parties engaged 25 other geologists (including two professors), 50 students, and 75 helpers.

Prof. F.F. Osborne of Université Laval, enlisted for many years on a part-time basis, continued to act in an advisory capacity on various projects.

Two staff geologists, Richard Grenier and M.M. Ritchie, assisted the Director in administrative, editorial, and other duties.

During the field work, the mapping parties of the Service collected systematically, for geochemical analysis, some 3,800 stream-sediment samples from small water courses encountered in their areas. These, along with considerable data on locations and prevailing conditions, have been submitted to the Mineral Deposits Service. They are being analysed by suitable methods for indicative values of certain metals, such as copper, lead, zinc, and molybdenum. It is hoped that this research may eventually help to delineate areas especially favorable for the finding of certain types of base-metal ore deposits.

The geologists also cooperate with the Mineral Deposits Service by examining, and reporting on, various mineral occurrences, prospects, and showings met with during the field work.

In 1965, a preliminary, colored edition of a new map of the geology of the Province was published, at the approximative scale of 1 inch = 60 miles, by the Quebec Department of Industry and Commerce. It accompanies the "Quebec Yearbook, 1964/65", issued by that ministry. This map, prepared by the Cartography Service of the Department of Natural Resources, was based on a larger-scale, manuscript map compiled by Marcel Morin, with assistance from other members of the Geological Exploration Service. The Department is publishing a revised, more detailed edition of the map, at the scale of 1 inch = 20 miles.

An informal geological colloquium was organized in February, with Dr. Dimroth as president. At each fortnightly meeting, two staff members

give summaries of published, but not well known, geological papers or volumes. Each presentation is followed by relevant discussion. These sessions are proving to be of much interest to the officers of the Geological Services.

Several of the Service's officers hold important posts in various scientific bodies. Dr. Bergeron is a member of the board of directors and secretary of the "Centre d'Etudes Nordiques de l'Université Laval". He is also a member of the Education Committee of "The Canadian Institute of Mining and Metallurgy", whereas A.-F. Laurin acts in an equivalent role for the Quebec City branch of that society. P.J. Clarke and P. St-Julien are, respectively, president and treasurer of "La Société Géologique de Québec". W.B. Skidmore is a director of the Quebec City branch of "The Canadian Institute of Mining and Metallurgy". Dr. St-Julien is a member of the subcommittee on Structural Geology of the "National Advisory Committee on Research in the Geological Sciences".

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

Robert Bergeron, with *André Deland* of Sir George Williams University:

"Geology and Mineral Resources of Quebec": Chap. XIV. Mines, Div. 1. in Quebec Yearbook 1964/65 (47th edition), pp. 445-465, published by Quebec Dept. of Industry and Commerce, 1965.

Robert Bergeron

"Geology and Mineral Resources of the Labrador Trough": paper presented to the New York Academy of Sciences (Section of Geological Sciences), at New York, May 3, 1965—also published in Trans., N.Y. Acad. Sci., Ser. II. Vol. 27, No. 8, June 1965.
"Aspects physiques du Nouveau-Québec": No. 1 of a series of 15 public lectures on the organization of New Quebec, given under the auspices of the Centre d'Etudes Nordiques de l'Université Laval, at Quebec, January 17, 1966.

J.-Y. Chagnon

"Les Glissements de Terrain": paper presented to the 33rd Congress of l'Association Canadienne-Française pour l'Avancement des Sciences, Sec. 18, at Montreal, November 6, 1965.

E.H. Chown, W.B. Skidmore, et al.

Panelists for "Careers in Geology, Mining and Metallurgy" at Forum on Career Opportunities, for senior students of Quebec High School, at Quebec, March 9, 1966.

P.J. Clarke

"Structural Control of the Mount Wright—Mount Reed Iron Deposits": paper presented to the Lake Superior Institute on Geology, at Minneapolis, Minn., May 6, 1965.

Erich Dimroth

"A Structural Cross-section through the Central Labrador Trough": lecture to the Adams Club, McGill University, at Montreal, February 3, 1966.

Yvon Globensky

"Les Microfossiles et leur Utilité": paper presented to the 33rd Congress of l'Association Canadienne-Française pour l'Avancement des Sciences, Sec. 18, at Montreal, November 6, 1965.

Claude Hubert

"Stratigraphy and Sedimentation of the Quebec Complex in the L'Islet—Kamouraska Area, Quebec": lecture to the Adams Club, McGill University, at Montreal, April 1965.

Claude Hubert, with *Colin A. Stearn* of McGill University:

"Silurian Stromatoporoids of the Matapedia—Temiscouata Area, Quebec": paper published in Can. Jour. Earth Sci., Vol. 3, No. 1, February 1966.

A.-F. Laurin

"Commentaires sur la recherche géologique effectuée par le Ministère des Richesses Naturelles, et sur les publications géologiques": talk to Université Laval graduating class on surveying, at Quebec, February 16, 1966.

"Outline of the organization of the Quebec Dept. of Natural Resources, and summary of the proposed 1966 field program of the Geological Services": talk to the Dept. of Geology, McMaster University, at Hamilton, February 23, 1966.

List of Geological Field Projects — 1965

Following is a list of the 1965 field projects, including the title of each and the name of the party chief. Summaries of each project are given in special booklet No. S-97, which is accompanied by index map No. 1605-A.

Areal Mapping Projects

1.	Dunphy Lake Area, New Quebec	Erich Dimroth *
2.	Sakami Lake Area, New Quebec	J.P. Mills
3.	Benoit—Ruette Area, Abitibi-East County	J.H. Remick *
4.	Julien—Lantagnac Area, Abitibi Territory and Abitibi-East County	J.A. MacIntosh * #
5.	Mistassini River Area, Mistassini and Abitibi Territories, Roberval and Abitibi-East Counties (1" = 4 mi. mapping)	A.-F. Laurin *
6.	Savane River Area, Mistassini Territory, Roberval and Chicoutimi Counties (1" = 4 mi. mapping)	E.H. Chown *
7*a*	Tétépisca Lake Area (East Half), Saguenay County	J.G. Murtaugh
7*b*	Mont de Babel Area (West Half), Saguenay County	J.G. Murtaugh
8.	Gagnon Area, Saguenay County	P.J. Clarke *
9.	Piscatosin Lake Area, Labelle and Montcalm Counties	R.S. Jacoby
10.	Provost Area, Joliette, Berthier, and Maskinongé Counties	Kees Schryver
11.	Montauban Area, Portneuf, Champlain and Laviolette Counties	D.R. Pyke
12.	Arvida Area, Jonquière-Kénogami and Chicoutimi Counties—(Quaternary geology)	Pierre Lasalle
13.	L'Anse St-Jean Area (East Half), Chicoutimi and Charlevoix Counties	Jehan Rondot *
14.	Têtu Area, Duplessis County	Jean Depatie *
15.	La Tabatière Area, Duplessis County	Raymond Davies

16.	Drummondville Area (West Half), Drummond, Arthabaska, Nicolet, and Yamaska Counties	Yvon Globensky *
17.	Disraeli Area (East Half), Frontenac, Wolfe, and Mégantic Counties	Pierre St-Julien *
18.	Lyster Area, Mégantic, Lotbinière, Nicolet, and Arthabaska Counties—(Quaternary geology)	J.-C. Dubé
19.	Rosaire Area (West Half), Montmagny, L'Islet, and Bellechasse Counties	Claude Hubert *
20.	St-Fabien Area, Rimouski County	Jean Lajoie, Jacques Béland, and G. Archambault

Miscellaneous Projects

A.	Sept-Iles and Rivière-Pentecôte Anorthosites	S.T. Ahmedali
B.	Clays and Landslides	J.-Y. Chagnon * #
C.	Drill-core Logging	Bertrand Warren *
D.	St. Lawrence Lowlands	T.H. Clark
E.	Gaspé Peninsula	W.B. Skidmore *

MINERAL DEPOSITS SERVICE

The Mineral Deposits Service collects as much information as possible on metallic showings and deposits, on the operation of industrial minerals and on peat-bogs. J.R. Assad, director of the Service, reports as follows on the activities of his service during the fiscal year 1965/66.

The responsibilities of the Service are handled through the offices of resident geologists and the main office in Quebec. During 1965/66 the personnel comprised 18 engineers and geologists, one agronomist, and 33 technicians, clerks and stenographers. These employees were stationed at the offices of resident geologists in Rouyn (4), Val-d'Or (4), Chibougamau (3) and at the main office in Quebec (41). Three geologists, L. Kish, J.A. MacIntosh and C. Gélinas joined the staff of the Service during the year, whereas one, R.-A. Marleau, resigned.

The personnel of the main office in Quebec deals with the planning and supervision of the annual geological mapping and peat-bogs inventory programs, the editing of technical reports, the filing of technical documents, geological and geochemical research and the studying of problems submitted to the Service. Its work entails a great deal of correspondence. The office has three specialized divisions: the Technical Archives Division, the Industrial Minerals Division, and the Peat-bogs Division.

There are two sections in the *Technical Archives Division:* a confidential section containing reports of assessment work submitted by mining companies, reports of visits to mining properties by members of the Department, and other miscellaneous documents, and a public section containing files transferred from the confidential section after the claims on which the work was done have expired.

During the 1965/66 fiscal year, the confidential section received 1,453 reports and 2,108 maps, a total of 3,561 new documents. During the same period, 784 files containing 2,268 documents were transferred to the public section. Photocopies of 14,154 pages of reports and of 725 maps were made on request from mining companies and individuals interested in exploration.

* Indicates full-time staff officer.
\# Transferred to Mineral Deposits Service.

The compilation of index maps showing the areas covered by documents on file was continued during the year. In addition to keeping existing maps up to date, 100 new maps were completed, bringing the total to 347. It should be noted that each map covers one township and is accompanied by a booklet listing and describing the documents indicated on each map. In all, 1,374 copies of these maps were distributed during the year. A supplement was also produced in order to bring up to date the map showing the locations for which aerial geophysical survey maps were submitted by exploration companies. These maps were made public after they had been kept in the confidential section for six months. Approximately 429 visitors consulted files in the Technical Archives during the year.

During the fiscal year, the *Industrial Minerals and Building Materials Division* employed four engineers and geologists, who were assigned to establish and maintain contacts with producers and to advise them technically, to compile a list of worked and workable locations in order to keep an up-to-date inventory, to answer numerous requests for information and, finally, to serve as liaison officers between producers and consumers. It should also be noted that industrial minerals and building materials usually amount to more than one half of the total production of the Quebec mining industry. Workable sources in the Province contain at least 25 different products.

The Division acquired, during the year, a geotechnic section. The main and immediate aim of this section is to study certain unstable clayey lands which have caused disastrous landslides in the past and are apt to do so again in the future.

The Division also continued its study of mineral water springs in the Province. These springs have already been the topic of a preliminary report (publication S-85) written by R. Paquet. Four springs were especially studied during the year by R. Paquet and by D. Kougioumoutzakis of the Laboratories Services. The latter conducted an intensive chemical analysis of these springs in the field, as well as in the laboratory.

The *Peat-bogs Division* comprises one agronomist, two technicians, one clerk, and one stenographer. It looks after all problems related to peat-bogs, among others that of the inventory, which includes preliminary investigations, more detailed surveys, and ecologic surveys. During the fiscal year, the Division did the following studies and experiments :

1. Drainage surveys of 30 peat-bogs mostly located on the St-Lawrence South Shore. These surveys were carried out by D. Tanguay.
2. Topographic surveys and sampling of six peat-bogs by three parties under the direction of A. Tremblay. The surveys were carried out at locations and by persons described as follows : Saint-Henri de Lévis, Lévis county — M. Gagnon; Les Escoumins, Saguenay county — M. Gagnon and A. Hotte; Chute-aux-Outardes, Saguenay county — A. Hotte; Anse-du-Bon-Désir, Saguenay county — M. Gagnon; Bagotville, Chicoutimi county — M. Gagnon; Saint-Ambroise, Chicoutimi county — M. Gagnon. A survey, based on methods which were being used in other countries and which may well serve as a pattern for future surveys, was carried out by A. Simard, head of the Division, on the Villeroy peat-bog, Lotbinière county.
3. Reconnaissance investigations, at Saint-Janvier and at Senneterre in Abitibi-East county and in the area of Sept-Iles, by A. Tremblay.
4. Ecology and research on the water-absorption possibilities of peat-bogs. This work, under the direction of A. Simard, was completed by R. Gauthier on the following peat-bogs : Lambert

peat-bog, Rivière-Ouelle; Plourde peat-bog, Rivière-du-Loup; Anctil peat-bog, Saint-Arsène; Reid peat-bog, Pointe-au-Père; Roy peat-bog, Saint-Ulric.

5. Studies and joint programs under the direction of A. Simard :
   (*a*) Study of the effects of natural peat and treated peat (humus) as mineral soils additives. This study, which began in August 1964, is carried out with the cooperation of the Department of Agriculture and Colonization on the sandy soils of the Research Center at Les Buissons, Saguenay county.
   (*b*) Comparative study of peat litter and straw litter. This study, which began in November 1964, is carried out at the Provincial Farm-School in Deschambault, Portneuf county. The study includes two different experiments : the systematic use of two types of litter under animals subjected to different methods of hibernation, and the spreading of the resulting stable-litter on the field in order to compare their respective yield in hay and potatoes.
   (*c*) Comparative study of natural and processed peat as mulch in orchards. This study began in November 1964 at the Royer orchard in Saint-Pacôme, Kamouraska county.
   (*d*) Research into the practical and economic aspects of the manufacturing process of peat briquettes and tiles for horticultural purposes. This research program, which began in January 1965, is now conducted by Laval University's Faculty of Agronomy specialists. They conduct tests geared to the simplification of agricultural planting and the demonstration of the superiority of briquettes and tiles locally manufactured over imported peat pots.
   (*e*) Manufacturing tests of peat-mould for the Quebec market. These tests are conducted in cooperation with a private commercial concern which foresees the storage of 2,000 bags before the end of 1966.
   (*f*) Continuation of a research program on titration methods of humic acid in peat and on the mechanical separation methods of peat components with the aim of producing carbon for industrial uses. This program is conducted in cooperation with Professor Georges Pagé of the Montreal Institute of Technology.
   (*g*) Cooperation with the Department of Industry and Commerce with the aim of grouping together peat-bog operators in order to improve the profit-earning capacity of the industry.
   (*h*) Cooperation with ARDA and with soil specialists from the Quebec Department of Agriculture in order to study the possibility of including the peat-bogs inventory in the Canadian lands inventory. A report on this question is to be submitted to CPAR (Comité d'aménagement des Ressources) by the heads of the Departments concerned.

Advertising the advantages of peat was continued for a second straight year; the advantages of peat as litter and as a soil additive were made available to visitors at the Provincial Exhibition in Quebec City. Mr. Simard was heard twice on the CBC network explaining the qualities of peat as litter, additive and arable land.

In July 1965, Mr. Simard travelled to Newfoundland at the invitation of its Department of Mines, Resources and Agriculture. He visited sites

where, for the last eight years, agricultural experiments on peat-bogs have been conducted. About a hundred slides are now available for publicity purposes, agronomists and interested groups. A report on this trip was published in the magazine, "Agriculture", Vol. 23, No. 1, March 1966.

As in previous years, the Department gave grants for the drainage of peat-bogs. These grants, amounting to $20,000.00, were distributed among 23 operators.

Along with work carried out by the Technical Archives, Industrial Minerals, and Peat-bogs divisions, members of the Quebec Office conducted or supervised geological work by seven parties. Five of them mapped in detail the surface geology of mining districts. One conducted applied research by studying the contents of heavy minerals in creek sediments of Holland and Lemieux townships, Gaspé-North county, whereas another visited the deserted village of Val-Jalbert, Roberval county, in order to gather the necessary information for the publication of a geological booklet that will be available to tourists. The personnel responsible for geological work comprised 13 geologists (five of whom are full-time Department employees), 14 student helpers and about ten laborers.

The following is a list of the geological field projects carried out in 1965. The numbers on this list correspond to those appearing on Map 1605-A.

21 — Otelnuk lake, New Quebec	L. Kish*
22 — NW. McKenzie, Abitibi-East county	G. Duquette* A. Mathieu*
23 — NW. Poirier, Abitibi-East county	R. Kelly*
24 — Mount Richardson, Gaspé-North county	P. Girard
25 — Lesseps Creek, Gaspé-North county	J.-L. Robert*
26 — Holland and Lemieux townships, Gaspé-North county	W. Sims
27 — Val-Jalbert, Roberval county	R. Sabourin

All geological surveys, whether they are conducted by the Mineral Deposits Service or by the Geological Exploration Service, are accompanied by samples taken from creek sediments for geochemical purposes. The samples, numbering approximately 9,000 for the year under review, are sent to the Service where G. Boiteau classifies them and has them assayed for copper, zinc, lead, and other elements, by the Department's laboratories.

Courses in prospecting are offered to the public under the sponsorship of the Service's Quebec City personnel. An elementary course in prospecting was given this year at Sainte-Anne-des-Monts, Gaspé-North county. Advanced courses, of a duration of six weeks, were given during the year at Laval University in Quebec and at "l'Ecole Polytechnique" in Montreal.

Practical courses in geology were given by Raymond Paquet, engineer with the Mineral Deposits Service, at the Jeunes Biologistes summer camp, at Port-au-Saumon, Charlevoix county.

As regards basic documents, work was continued on the publication of an annotated bibliography and of colored maps on the metallic mineralization of the Rouyn, Val-d'Or, Matagami and Chibougamau areas. Research and the compiling of information for the preparation of the metallogenic map of Quebec, which is part of a world mosaic now in preparation, were continued.

As far as publishing is concerned, the following reports and maps have received the attention of J. Dugas and of R. Gagnon :

* Denotes a full-time staff member

Geology and Sulfur Deposits of the Matagami Area (Final Report by J. I. Sharpe)
Geology of Louvicourt Township (Final Report by J. I. Sharpe)
Geology of the Orford-Sherbrooke Area (Compilation map by P. St-Julien)
Geology of NW. Quarter of McKenzie Township (Preliminary Report by G. Duquette and A. Mathieu)
Geology of NE. Quarter of Roy Township (Preliminary Report by A. Mathieu)
Mount Vallières-de-St-Réal Area (Preliminary Report by J.-L. Robert)
Metallic Mineralization in the Rouyn, Matagami, Val-d'Or and Chibougamau Areas (Bibliography and map compiled by G. Duquette, J. Dugas, and M. Latulippe).

Members of the Service also received visitors and answered letters and telephone calls from an ever-increasing number of persons inquiring about various aspects of the mining industry. Drill-core logging was also done on core from some of the holes drilled by the Department of Agriculture and Colonization. Research was conducted regarding problems relating to the revocation of mining rights on certain lands and visits were made to places where indications of mineralizations warranted their inspection by a geologist.

The *regional offices* carry out an essential part of the works of the Service. Each office is staffed by a resident geologist and, usually, an assistant. Each resident geologist must be familiarized with the mining operations and the mining development taking place within his district, collect and compare the geological information, and act as a consultant for mining companies and prospectors. He must also visit claims and other mining lands and prepare reports on their exploration and development. Finally, his duties provide that he oversee the mapping, on a detailed scale, of the geology of his district. In order to help him carry out his duties, his office is provided with a collection, as complete as possible, of reports, maps and other documents related to the geology and the mining development and work of his district.

G. Duquette, resident geologist in the Chibougamau district, visited 17 mining properties and wrote nine visit reports. In the Val-d'Or district, M. Latulippe visited 42 mining properties and wrote 15 reports. R. Y. Lamarche, assistant to Mr. Latulippe since February 15, 1965, made nine visits and wrote two reports. In Rouyn, John I. Sharpe made 25 visits and wrote 10 reports. Each of these offices was visited by some 200 persons seeking information.

Among the contributions of the Service to scientific and industrial meetings, the following must be mentioned :

"Lithology and Stratigraphy in Relation to Mineralization in Central Gaspé, Quebec", and "General Geology and Asbestos Mineralization in the Chibougamau District".

These papers were presented by J.-L. Robert and G. Duquette respectively, at the Prospectors and Developers Association Meeting in Toronto, in March 1966.

GAS, WATER AND PETROLEUM SERVICE

The Service, under the supervision of its director, Raymond Roy, is responsible for the conducting of hydrogeologic surveys upon requests by municipalities seeking subterranean water, and for the supervision of drilling work carried out by private concerns searching for hydrocarbons.

Hydrogeology Division

Numerous municipal councils and public bodies or services seek a supply of subterranean water rather than surface water, as the supply from surface, in most instances, involves costly treatment. The Division answers such requests by conducting hydrogeologic surveys in the field to locate one or more favorable water-bearing formations. The method used consists of drilling holes, obtaining by means of electrical core-logging a diagram of the formations crossed, conducting a seismic survey of the area under study and, finally, conducting pumping tests to evaluate the aquifer potential of these formations.

A seismic apparatus of the FS-3 type was acquired by the Division during the fiscal year under review, thus enabling a more effective and rational use of its rotary drill. This apparatus helps to determine the nature and extent of the overburden.

In 1965/66, Raymond Roy, Claude Grenier, Raynald Dessureault, J.-J. Tremblay, Claude René, and Georges Simard concentrated their research work on a total of 67 hydrogeologic surveys in 35 municipalities of the Province.

As for area research, the study of the Eaton River basin, an area covering 250 square miles and located between longitudes 71°10' and 71°45', and latitudes 45°10' and 45°30', was intensified. One party, headed by J.-J. Tremblay and directed by J.-N. Grant, conducted a seismic survey and mapped the various rocks in four sub-basins. From this preliminary study, it appears that one of the most important aquiferous formations is the rock in place except for a few lateral moraines and a few alluvial plains. A geochemical survey of underground waters in this area, as well as in the Beloeil area, was also continued.

A second project, under the direction of Claude Grenier, was undertaken by Claude René and Georges Simard, who began a special study of the Aylmer and St-François Lakes area, located between longitudes 71°00' and 71°30', and latitudes 45°45' and 46°00'. It is believed that part of the Lake St-François water flows into Lake Aylmer through an ancient channel, now buried. The study should end in 1967.

Natural Gas and Petroleum Division

In the field of hydrocarbons, private concerns are searching for natural gas and petroleum in the Province. Thus, nine companies drilled wells in Gaspé peninsula, three on Anticosti island and 59 in the St-Lawrence lowlands, of which 49 did not go beyond a depth of 500 feet. Finally, two companies conducted seismic surveys in the St-Lawrence lowlands and two others undertook a summary study of the geology of the Gaspé peninsula.

Paul Simard and Michel Houde, attached to this Division, followed closely all the work being undertaken in the search of petroleum and natural gas. Their work consisted in gathering as much geological information as possible, in measuring the pressure and output of important occurrences of natural gas, and in taking samples of natural gas, petroleum and water coming from drilled wells for assaying purposes. They scrutinized rock samples taken from the drilled wells. In this work they were assisted by a geologist hired on a part-time basis. They mapped and indexed details of drilling work and tried to evaluate the importance of existing oil-bearing and gas-bearing sheets. Another task was to investigate reports of natural gas and petroleum discoveries on private lands.

Finally, it should be mentioned that the staff of the Division continued working on the preparation of new regulations concerning the exploration and operation of natural gas and petroleum.

CARTOGRAPHY SERVICE

Headed by A. Blanchette and his assistant, Gérard Côté, this Service, which comprises three divisions, employed, on April 1, 1966, 16 draughtsmen, one technician, one secretary, and one messenger—a total staff of 21.

The Cartography Service is essentially responsible for the drawing of various maps, diagrams and plans needed by the several services of the Department. Its principal work consists in: (1) the preparation of base maps needed by geological field parties; (2) keeping mining claim maps up to date and (3) tracing maps which accompany publications, particularly those of a geological nature.

Thus the Service must prepare base maps on tracings, with topographic data gathered from aerial photographs or other sources. These are used by field parties on geological surveys. Moreover, the Service keeps two series of maps on tracings (scale of ½ mile to an inch) up to date, one of them showing the location of mining claims and mining properties. The number of maps of the latter is 620, and 34,616 new claims were shown on the 1,459 maps of the first series. In all, 18,078 copies of these maps were made to answer requests.

However, the most important task of the Cartography Service consists in preparing the maps which accompany all geological reports, and the supervision of their printing by the lithographer. These maps illustrate the geology studied in the field, and show the topography, township boundaries and location of mining properties. There are two series of the maps and these accompany the preliminary and final reports respectively.

The preliminary maps are printed in black, green, red, and blue lines, whereas the final maps, completed after more detailed studies to show a more definite geological interpretation of an area, are drawn so that the maps may be printed in several solid colors.

The 25 preliminary geological maps published during the year related to the following areas:

No. 1565 — Sherbrooke North area
No. 1566 — Sherbrooke South area
No. 1576 — Otelnuk Lake area
No. 1580 — Tchitogama Lake area
No. 1581 — Cook-D'Audhebourg area
No. 1582 — Tétépisca Lake area
No. 1583 — Des Silicates Lake area
No. 1584 — Mount Hog's Back area
No. 1585 — Hart-Jaune River Headwaters area
No. 1586 — East Péribonca River area
No. 1587 — Legendre area
No. 1588 — Cramoisy Lake area
No. 1590 — Membré-Chalifoux area
No. 1593 — La Malbaie area
No. 1594 — Baie des Moutons area
No. 1595 — Montauban-Colbert area
No. 1597 — Hébertville area
No. 1598 — Tuk River area
No. 1599 — Mount Vallières-de-St-Réal area
No. 1601 — Pambrun Lake area
No. 1602 — Chown Lake area
No. 1603 — Matonipi River area
No. 1604 — Houde-Masson area
No. 1605 — Geological field parties, 1965

No. 1606 — Mining developments north of the 50th parallel (New Quebec)

The 21 colored maps, including detailed geological maps, published during the year were:

No. 1471 — Lac aux Feuilles area
No. 1472 — Bérard Lake area
No. 1473 — Gérido Lake area
No. 1481 — Gastonguay-Mourier area
No. 1488 — Honorat-Reboul area
No. 1495 — Bristol-Masham area
No. 1499 — Thévenet Lake area
No. 1513 — Béthoulat Lake area
No. 1514 — Toco-Témiscamie area
No. 1534 — Northeast quarter of Montbray township
No. 1535 — Southeast quarter of Montbray township
No. 1536 — Southeast quarter of Barraute township
No. 1538 — Causapscal area
No. 1554 — Inussuaq—Pointe Normand area
No. 1569 — Châteauguay area
No. 1571 — Takwa River area
No. 1572 — Frotet and Troilus Lakes area
No. 1573 — Duquet-McOuat area
No. 1574 — Northwest quarter of Holland township
No. 1575 — Gouin Reservoir area
No. 1596 — Hydraulic installations of Quebec

Moreover, the Cartography Service prepared 44 plans for the Gas, Water and Petroleum Service, and 91 other diagrams or plans, either to illustrate publications or to be used within the Department. Finally, the layout division of the Service prepared 595 forms, graphs, and vignettes for the covers of reports. This work was done at the request of the Information and Publications Branch.

MINING SERVICES

The Mining Services are responsible for the application of the Quebec Mining Act in what concerns:

1. The granting of mining titles on Crown lands through issuance, as the case may be, of registration of mining claims, development licenses or special permits; the sale or rent of lands for mining operation purposes; and the ascertaining whether the holders of mining rights fulfill the obligations set down by the titles they hold.
2. The collection of mining dues.
3. Inspections to ensure that working conditions in mines, quarries, and mills conform to the Quebec Mining Act and regulations regarding the safety and health of workers in mines.
4. The preparation and execution of engineering works necessary to the opening of new mining districts or new mining installations, including the construction of mining access roads, the establishment of mining villages, etc.

The Mining Services comprise three administrative services, namely:

(*a*) Mining Domain Service
(*b*) Inspection of Mines Service
(*c*) Engineering Service (mines)

MINING DOMAIN SERVICE

The Mining Domain Service was established at the beginning of the 1965/66 fiscal year through the amalgamation of the former Mining Operations and Mining Titles Services. It is responsible for granting mining titles on Crown lands and it sees that holders of these titles fulfill their obligations. It also studies requests addressed to the Department for mining concessions or leases for mining operation purposes, investigates exploration and development work reports, receives and compiles statistical reports sent each year by the operators, and supervises the application of the "Unwrought Metal Sales Act". It is also responsible for the collection of mining dues.

The administrative tasks of the Mining Domain Service are carried out by the Mining Titles Division, the Mining Operations and Obligations Control Division, and the Mining Duties Taxation Division.

Mining Titles Division

Under Sections 12, 45, 195, 62, 68, 38, 136, 189, 210, 270, 89, 113, 117, and 160 of the new Mining Act (13-14 Elizabeth II, Chapter 34), in effect since January 1, 1966, the Mining Titles Division issues prospectors' licenses; records claims and transfers of mining rights; issues and renews development licenses, exploration licenses, mining leases, mining concessions, letters patent, and operating leases. The Division also sees that holders of mining titles abide by the prescriptions of the Quebec Mining Act and fulfill the obligations laid down by their titles.

It should be mentioned that the district offices of Quebec, Amos, Rouyn, Chibougamau, Bourlamaque, and Montreal issue prospectors' licenses, collect the fees for the issuance of various mining titles and for the registration of transfers of mining rights, and answer various requests for information. All these district offices, except those in Montreal and Bourlamaque, register mining claims in their respective districts. On the other hand, agents in Hull, Ville-Marie, and Campbell's Bay issue prospectors' licenses. Finally, the Quebec office is the only one responsible for the registration of transfers of mining rights, the issuance of development licenses, exploration licenses, special permits, exploration permits, mining leases, operating leases, the sale of mining concessions, and the preparation and recommendation for the granting of letters patent.

The Mining Titles Division sold, during the fiscal year under review, 7,732 miners' certificates and 2,835 prospectors' licenses; acknowledged and registered 34,616 claims; and issued or renewed 7,742 development licenses. Pursuant to the prescriptions of Sections 75 and 79 of the former Quebec Mining Act and of Sections 62 and 68 of the new Mining Act, claimholders sent in documents supporting declarations certifying that they had carried out development work that was equivalent to a total of 8,609,807 hours.

Moreover, the Mining Titles Division registered, pursuant to Section 34 of the former Quebec Mining Act and Section 195 of the new Mining Act, a total of 2,368 transfers of mining rights, and, on the recommendation of the director of Mining Services, 10 mining concessions were sold, of which seven were sold under Section 40 of the former Quebec Mining Act and three under Section 113 of the new Mining Act. Moreover, the Lieutenant-Governor in Council, pursuant to Section 228 of the former Quebec Mining Act, authorized the issuance of three mineral exploration licenses for combustible natural gas, mineral oil or naphtha:

(*a*) The first one covering an area of 60,000 acres in the St-Lawrence valley;
(*b*) The second one covering an area of 48,200 square miles in the bed of the St. Lawrence river and of the Gulf of St. Lawrence;
(*c*) The third one covering an area of 544,000 acres in the electoral districts of Rimouski, Matane, and Matapédia.

The Lieutenant-Governor in Council, pursuant to Section 51-b of the former Quebec Mining Act, also authorized the issuance of three special exploration permits for minerals other than gold and silver:

(*a*) The first one in Garthby township, electoral district of Wolfe;
(*b*) The second one in Ascot township, electoral district of Sherbrooke;
(*c*) The third one in Bolton township, electoral district of Brome.

Finally, it should be mentioned that four requests for withdrawal from staking were approved by the Lieutenant-Governor in Council during the year, pursuant to Section 227 of the former Quebec Mining Act. These requests concerned the following areas:

1. A parcel of land located in the Hall River area in Arnaud township, electoral district of Duplessis;
2. Four parcels of land located in Saint-Castin, Hauteville, Malapart and Bergeron townships, electoral district of Saguenay;
3. Three parcels of land located in Dionne, Chabot and Painchaud townships, electoral districts of L'Islet and Kamouraska;
4. Petite Basque island, Letellier township, electoral district of Duplessis, along with a 2,000-foot-wide bed around the island in the Gulf of St. Lawrence.

Mining Operations and Obligations Control Division

This Division is responsible for studying requests submitted to the Department of Natural Resources concerning the location of mining installations and tailing sites, pursuant to Sections 13(2), 37, 110, 123, and 127 of the former Quebec Mining Act, and to Sections 99 and 243 of the new Mining Act (13-14 Elizabeth II, Chapter 34), in effect since January 1, 1966.

Under the provisions of Section 37 of the Quebec Mining Act, 11 mining companies now rent, under lease and in accordance with the conditions prescribed by Order in Council, Crown lands for the purpose of depositing waste and tailings, and another company operates a sand and gravel deposit. Moreover, a company rents a pipeline right of way on a stretch of land. The Department also rents to an operator, pursuant to Section 127 of the former Quebec Mining Act, a stretch of land for the installation and operation of a telpher railway.

Under the provisions of Section 13(2) of the Quebec Mining Act, the Lieutenant-Governor in Council approved the site of a ground to receive the Gaspé Copper Mines Limited overburden, in Holland township, and the enlargement of a ground to receive waste material from the operations of Opemiska Copper Mines (Quebec) Limited, in Lévy township. Moreover, under Section 37 of the former Quebec Mining Act, the Lieutenant-Governor in Council granted under lease to Gaspé Copper Mines Limited, a pipeline right of way on a stretch of land, for the transportation of waste coming from its smelter.

In another connection, pursuant to the provisions of Section 123 of the former Quebec Mining Act, the Minister approved sites for waste grounds on the lands of Anglo American Molybdenite Mining Corporation in Preissac township, of Flintkote Mines Limited in Thetford township, of Wasamac Mines Limited in Beauchastel township, and of Lake Dufault

Mines Limited in Dufresnoy township, as well as the enlargement of the Preissac Molybdenite Mines Limited waste ground in Preissac township.

During the course of four (4) inspection trips, an engineer visited a certain number of operating or abandoned mines and collected samples for the purpose of studying the influence of effluents flowing from mine waste dumps into nearby hydrographic basins.

It should also be mentioned that, since January 1, 1966, date of the coming into force of the new Mining Act (13-14 Elizabeth II, Chapter 34), the Department of Natural Resources is responsible for the disposal, under the conditions determined by regulation, of the right of working sand and gravel deposits. Any request sent to the Department is studied by the Mining Operations and Obligations Control Division in cooperation with the Soils and Materials Division of the Department of Roads. If it is not against public interest, the permit requested is issued.

The Mining Operations and Obligations Control Division is also responsible for scrutinizing exploration and development work reports, along with geological, geophysical, geochemical, and metallurgical studies which are submitted to the Department by holders of mining rights in compliance with Divisions VIII and IX of the Quebec Mining Act.

During the fiscal year under review, an engineer approved 263 geophysical studies and maps, of which 12 were airborne, 74 geological and geochemical studies and maps, 308 diamond drilling work reports and 14 metallurgical studies as well as the enclosed vouchers. On the other hand, the same engineer studied 12 reports which had been submitted in support of requests for mining concessions in compliance with the requirements of Section 45 of the former Quebec Mining Act or of Division XI of the new Mining Act.

As in previous years, the Department of Natural Resources answered requests for information relating to reports which mining companies must submit in order to comply with the regulations of the Quebec Securities Act (3-4 Elizabeth II, Chapter 11, and its amendments) for the issuance or the renewal of their registration as brokers. During the year, the Quebec Securities Commission approached the Department of Natural Resources for information concerning 121 mining companies whose reports were submitted.

Statistics regarding the mining industry have been gathered and compiled since the beginning of 1963 by the Quebec Bureau of Statistics. The Bureau supplies the Department with a copy of all the reports it receives. Moreover, it is expected to supply all the compilations needed by the Department.

During the fiscal year, the Division kept up to date, in compliance with Section 250 of the Quebec Mining Act, a list of operators of mines and quarries in the Province. It has, from time to time, sent this list to the Bureau of statistics so that the latter could dispatch to the operators, questionnaires related to the preparation of its annual statistical report.

The Division also ascertained whether the reports that it received contained all the required information and had those that were incomplete or erroneous completed or revised. It also cooperated in the compilation of part of the data gathered.

Finally, it carried out special compilations for Department use or for answering requests concerning information from the public.

Mining Duties Taxation Division

Sixty-three operators produced ore in reasonable commercial quantities during the fiscal year reviewed here. Mining duties were payable by 50 of them, in the amount of $9,976,966.60. The remaining 13 were

not taxable, owing to losses encountered or to profits that were less than the $10,000.00 basic exemption.

Moreover, it must be emphasized that the application of the transitional provisions of the new Mining Duties Act has resulted in the receipt of $145,500.01 in the form of duties paid in advance.

Some 365 holders of mining concessions were subjected to an annual tax of ten cents per acre. However, 184 were exempted from this tax following the carrying out of mining work. The holders of concessions not exempted paid the sum of $4,958.47 during the fiscal year.

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 Quebec Mining Act. This involves regular inspections of mines, open-pit operations, and quarries, including the inspection of electrical and mechanical installations and smelters; testing the cleanliness of air in mining operations; investigating accidents or other occurrences which may affect the lives of workers in the mining industry; and directing the annual mines rescue program.

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, in 1965/66, to carry out 314 inspections of mines and quarries. These inspections, conducted during working hours, allowed the engineers to examine working conditions and work in progress and to verify whether the safety regulations were being well observed as to the disposition of working premises, the condition of machines, and the protection of workers.

Moreover, the engineers conducted inquiries into 11 fatal accidents involving 12 victims and investigated other unusual events, following which reports were published.

For their part, electrical engineers of the Service conducted 144 inspections of electrical installations, verifying whether these conformed to regulations of the Quebec Mining Act. They examined detailed plans of new electrical installations or modifications to existing ones that had been submitted to the Department for approval.

The Department is also responsible for the approval and inspection of mechanical installations, such as mine hoists, compressors, etc. The Mechanical Installations Division of the Inspection of Mines Service supervises the installation of all new hoists and other types of heavy equipment in mines and quarries and conducts periodic verifications to assure that the equipment conforms to safety regulations and that its maintenance is satisfactory.

During the year under review, 60 special inspections of hoisting equipment were carried out. Also, a number of mines and quarries were visited in order to investigate mechanical accidents or to discuss various specific problems. The Division received 260 hoist-cable registration reports, 379 rope-breaking test reports, 226 steam-boiler inspection reports, and 308 medical certificates on hoist operators. The study of these documents permits the engineers to exercise a strict control on all hoist-cables and boilers used in mines and quarries.

For several years now, some mines have voluntarily adopted the electromagnetic method of cable testing. During the 1965/66 fiscal year, 213 tests of this type were carried out.

During the year reviewed, electronic instruments (oscillograph and remote-control decelerometer) were used for detailed analysis of the working of hoist brakes in mines. This work has revealed a number of interesting braking-device characteristics, and it is hoped that continual use of this equipment will enable the making of modifications to these devices so as to increase the safety of their operation.

Air cleanliness is an indispensable condition to the health of miners. Because of this, engineers of the Service regularly control the ventilation and the dust in mining operations. They conducted 75 control inspections and 772 microscopic analyses of air samples that contained dust in order to determine the degree of dust saturation in various places of work.

Order in Council No. 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 Commission, hold a medical certificate renewable each year. The Inspection of Mines Service thus received 16,434 radiographic examination certificates submitted by miners in the course of the year under review.

Finally, it is the common practice that miners, chosen by aptitude, be trained in rescue and first-aid work in all important mines. The mining companies pay the cost of the courses or exercises, which are organized and directed by the Inspection of Mines Service. During the year reviewed, 32 mines benefited from these exercises, which have trained, since 1948, 1,445 first-aid men, of whom 330 are, at the present time, 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 in Noranda, in May 1965, between the eight finalists of the original 23 teams that had taken part in the preliminary competitions. The Barnat Mines Limited team won the trophy.

ENGINEERING SERVICE (MINES)

The Engineering Service (Mines) is responsible for the preparation, execution, and supervision of various engineering works to permit and facilitate the discovery, development, and operation of the mineral deposits of the Province.

The principal activities of the Service are the construction of access roads to promising mining areas and of mining roads to known and eventually profitable deposits, the creation and establishment of mining villages on Crown lands, and the administration of municipal funds destined to facilitate expansion projects of mining towns and villages already in existence.

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

Mining Roads Division

In 1965/66, the Department of Natural Resources allocated $4,137,000.00 of its budget for the construction of access roads to resources. Owing to certain difficulties encountered in the course of the execution of the work, the amount spent did not exceed $2,995,531.95.

The Federal-Provincial agreement concerning the construction of access roads to resources had to be extended for one more year in order to recover the total amount estimated for this program, which, according to the October 18, 1960, agreement, was $7,500,000.00.

I. WORKS CARRIED OUT WITH THE FINANCIAL COOPERATION OF THE FEDERAL GOVERNMENT FOLLOWING THE OCTOBER 18, 1960, FEDERAL-PROVINCIAL AGREEMENT.

A. Chapais-Senneterre Road

Bridge on Renault river—The construction of this bridge, which began during the 1964/65 fiscal year, ended in 1965/66 and cost $84,666.17. It should be recalled that the original plans had to be set aside because of ground conditions. New plans were drawn up making it possible to complete successfully the construction of this 238-foot bridge with a 24-foot-wide carriage lane.

B. Waconichi Lake — Albanel Lake Road

As in the previous year, a major part of the budget ($1,925,723.04) was spent on the continuation of construction of this road and on the start of construction of seven permanent bridges between Miles 6 and 61. Finally, plans and specifications for the two bridges remaining along the whole distance were submitted to the Department for approval.

1. 2nd section — Miles 22 to 50 — The spreading of crushed gravel and the installation of guide-rails completed work on this section.
2. 3rd section — Miles 50 to 80 — Having been 75 per cent completed last year, this section was virtually finished during the year 1965/66. Earthwork and gravelling were continued at such a pace that, at the end of the year, only the spreading of crushed gravel and the installation of guide-rails remained to be completed.
3. 4th section — Miles 80 to 92 — A contract for the construction of this section of the road, which was awarded in March 1965, was 85 per cent completed by the end of the fiscal year leaving, as in the case of the third section, only the spreading of crushed gravel and the erection of guide-rails for completion.
4. 5th section — Miles 92 to 97 — Mile 92 is the point where Témiscamie river (whose width at this point is approximately 500 feet) crosses the road. In order to benefit from the possibility of building a temporary ice-bridge there, the Department awarded, in early February, a contract for the opening of this section which gives access to Lake Albanel. Previously, necessary steps had been taken for the purchase of a Bailey bridge which would be set up on the river in order to ensure a permanent link between the two banks. As the bridge could not be completed at the set date, and as it was impossible to build a traffic lane on the ice, the water-flow being too heavy, the contractor built temporary bridges of wood so as to be able to start construction of this section. About 25 per cent of the work was completed.
5. Seven permanent bridges, all having the same characteristics, were constructed, i.e. all are built entirely with reinforced concrete, have a 41-foot width, but have lengths ranging from 91 feet for the longest to 53 feet for the shortest.
   The percentage of the work completed for each of these bridges is as follows:

Bridge on Bordeleau river	Mile	6	35%
" " Bignell river	"	18	55%
" " La Perche river	"	30	95%

"	" Révélation Sud	"	49	95%
"	" Révélation Nord	"	49	95%
"	" (non-designated)	"	53	95%
"	" (non-designated)	"	6	95%
6. Bridge on	Métawishish river	"	86	
"	" Témiscamie river	"	92	

Plans and specifications for these two bridges were completed by consulting engineers and were approved by the Department.

II. WORKS CARRIED OUT WITH THE COOPERATION OF MINING COMPANIES.

A. Road leading to Mines de Poirier Inc.—Joutel Township—length: 13 miles.

1. During the year 1965/66, $273,891.43 was invested for the widening of an eight-mile section of this road east of Harricana river. The work consisted in enlarging to 36 feet the roadway which had been built with a 20-foot width. Part of the invested amount also served for the construction of two culverts made up of semi-circular steel plates resting on concrete foundations. Finally, some work was carried out on the five-mile section located west of the river.
2. Bridge on Harricana river—Because of the growing importance of developments in the Joutel Township area, it became urgent to build a bridge on this river to link the two aforementioned road sections which connect to the main Amos-Matagami highway. Work started in April, 1965, and it was possible to open this bridge to traffic in December, though it was not entirely completed. It is a three-lane bridge with a 24-foot-wide carriage lane and a total length of 426 feet. The abutments and pillars are built with concrete as is its apron, which supports A-242-type steel beams. This steel does not require painting, an important advantage in this remote and cold area.

   The Department spent, during the year reviewed, the sum of $427,431.95 for the construction of this bridge.

B. Access road to the Quebec Clay Mining orebody in Château-Richer

This road was built by the company and by the Department of Natural Resources, which, following favorable reports issued by the Department of Industry and Commerce, agreed to pay to the said company $35,000.00, i.e. approximately 50 per cent of construction costs.

C. Access road to the Chimo Gold Mines property in Vauquelin township

In order to facilitate the reopening of this mine, the Department gave the company a contribution of $17,369.66, which sum represented 40 per cent of the cost of repairs to part of this seven-mile-long access road.

D. Access road to the Camflo Mattagami Mines Ltd. property in Malartic township.

The Department also paid to this company $20,600.00, which was equivalent to 40 per cent of construction costs of its approximately two-mile-long access road.

E. Access road to the McAdam Mines Ltd. property in McCorkill township

An amount of $5,773.49 was spent for surveying and laying out this road.

III. WORKS ENTIRELY PAID BY THE PROVINCE.

Chapais-Senneterre Road

This Department completed, during the year under review, repairs to a 20-mile section of this road, from Desmaraisville to Miquelon. This work was carried out under government supervision and its value amounted to $205,076.23.

Maintenance of Mine Roads

As was the case during previous years, the Department had to take the necessary measures to ensure the maintenance of the following main mine roads:

Road to Joutel township	length	13 miles
" " Lake Albanel	"	50 "
Chapais-Senneterre road	"	95 "
Road in the Chibougamau vicinity	"	31 "

These works were carried out under government supervision, that is, under the supervision of the Engineering Service (Mines) personnel. Their total costs amounted to $287,373.87. All questions relating to the maintenance of mine roads have been studied by the subcommittee for roads, whose recommendations, approved by the Comité permanent pour l'aménagement des Ressources, enabled the Mining Services to open talks with the authorities of the Department of Roads so that the maintenance of mining roads be carried out by that Department in 1967/68.

Mining Villages Division

The purpose of this Division of the Engineering Service (Mines) is to ensure that persons settling in a mining center acquire well deliminated sites, grouped in villages conceived according to the best rules of town-planning, where municipal, educational, and cultural services are or can be advantageously established.

These towns and villages are built either on Crown lands or on mining concessions but, in both cases, the Department looks to the good use of the lands by approving, after a study of the present and future needs of each village, all new subdivisions of lands into building lots. These powers are conferred on the Department by Sections 130 and 133 of the Mining Act, 14 Elizabeth II, 1965.

The sums collected by the Department at the time of the ceding of lands in mining towns and villages built on Crown lands are used as follows:

For each lot, the Department

(*a*) retains and pays to the consolidated funds of the Province an amount representing $0.01 per square foot of the said lot's area;

(*b*) deposits the balance with the Minister of Finance in order to constitute a special fund, designated as "Municipal Fund", which serves to pay the costs for transfer, the establishment of the village, the opening of streets, and the construction of public utility works, along with all other necessary expenses incidental to the building of the village.

For some time, the Mining Villages Division has sought to standardize, in the manner described below, the division of sums collected by the ceding of lots in villages and towns situated on mining concessions:

(*a*) For each lot, the holder of the mining concession pays to the consolidated funds of the Province an amount representing $0.01 per square foot of area.

(*b*) After the deduction of dues payable to the consolidated fund, the mining company remits to the Department of Natural Resources, to be deposited in the municipal funds, an amount representing seventy per cent (70%) of the balance of the transfer price of each site. The remaining thirty per cent (30%) is retained by the mining company in compensation for division into lots, surveying, and legal and administrative costs involved in the transfer of the sites.

For the fiscal year ending March 31, 1966, a total amount of $177,132.66 was paid to the municipal funds of the mining towns and villages. Sales of lands decreased by $59,780.31, in comparison with those of the preceding fiscal year.

Deeds of Sale and Letters Patent :

Section 221 of the new Mining Act (13-14 Elizabeth II, Chapter 34, 1965) gives the holder of an underground mining concession the right to expropriate the lands of those who hold surface rights where they wish to carry out works.

The fear of not being able to expropriate surface rights which they might need in the future having disappeared, the holders of mining concessions may now, through the directives of the Department of Natural Resources, transfer building lots by way of pure and simple sale deeds.

So as not to hamper mining development, the Department of Natural Resources has ceded until 1966 building lots in mining villages located on Crown lands by way of emphyteutic leases also containing recovery rights after a certain number of years.

The right to expropriate having now been given to mining companies, the Department of Natural Resources initiated a change in the method of transferring building lots on lands over which it has jurisdiction. Any person wishing to build will, in the future, be able to obtain an option which will be followed by letters patent giving him clear titles to the land of his choice and will thus facilitate the financing of his project.

Holders of emphyteutic leases also have the right to obtain letters patent on request to the Department of Natural Resources.

(See appendixes giving sale of lots and list of mining companies.)

Appendix I gives the number of lots sold in various mining villages during the fiscal year 1965/66. Also, a financial statement of the municipal funds of the municipalities concerned is shown.

Appendix II shows a list of mining companies authorized to sell lands situated within the limits of certain mining villages.

Equipping works on the new Joutel mining village site progressed at a lively pace during the 1965 summer season in spite of rainy weather.

The deforestation and grubbing up of approximately fifty (50) acres carried out during the 1964/65 winter enabled authorities to award an initial contract for the construction of sewers, waterworks, and streets. When work was suspended in December 1965, approximately 20 per cent of the excavation work was still to be completed, along with the gravelling of streets and the building of concrete sidewalks.

The preparation of subdivision plans has enabled Les Mines de Poirier Inc. to proceed with the construction of thirty-five (35) one-family houses and three buildings containing about 30 apartments.

Drinking water was supplied to the occupants of these new dwellings through the setting up of a temporary hydrant and filtration plant.

In order to facilitate the continuation of development in the village of Joutel, deforestation and grubbing up works on an additional fifty (50) acres were also carried out during the fiscal year.

The total cost of the Joutel municipal works and expenses incurred in carrying them out during the 1965/66 fiscal year amounted to $616,639.98.

The completion and final payment of the latest works financed by the Department of Natural Resources in Matagami necessitated expenditures of $43,425.41. The bulk of this amount covered the payment of sewers and waterworks and the balance due for consulting engineers' fees.

Order in Council No. 1225 of June 21, 1965, authorized the Minister of Natural Resources to sell to the Municipal Corporation of the town of Matagami all streets, lanes, municipal parks and playgrounds, the sewer system of used waters including the purifying plant and waterworks system, taking in the pumping and filtration plant, along with related works. This sale was authorized under the condition that the Municipal Corporation of Matagami pay to the Department of Natural Resources the sum of $1,400,000.00 payable according to terms set forth in the Order in Council.

The cadastration of new subdivisions in the mining towns of Val-d'Or, Chibougamau, Schefferville, and Rouyn cost $3,000.00.

Expenditures of the Department for mining villages and towns as a whole amounted to $663,066.19 during the 1965/66 fiscal year.

APPENDIX I

SALE OF LOTS IN VARIOUS MINING VILLAGES

April 1, 1965 — March 31, 1966

MUNICIPALITY	LOTS SOLD		AMOUNTS PAID		Balance of municipal fund, March 31, 1966	Amounts remitted by the Department of Natural Resources for municipal works
	Residential	Commercial	Consolidated fund	Municipal fund		
Crown lands						
CADILLAC	1	Nil	$ 36.00	$ 352.33	$ 532.26	— — —
CHIBOUGAMAU	14	1	686.75	26,037.74	45,235.74	$ 7,600.00
JOUTEL	NEW VILLAGE		— — —	— — —	— — —	— — —
MATAGAMI	2	1	693.85	71,366.75	57,694.85	301,000.00
Mining Concessions						
BELLETERRE	Nil	Nil	Nil	Nil	10.00	— — —
BOURLAMAQUE	2	0	151.60	4,212.70	5,368.29	— — —
CHAPAIS	4	Nil	351.14	8,836.99	13,966.01	10,436.80
MALARTIC	8	2	1,382.65	11,707.21	1,176.60	11,000.00
MURDOCHVILLE	Nil	Nil	Nil	Nil	187.56	— — —
Crown lands and mining concessions						
ROUYN	4	0	163.07	1,656.93	3,174.11	12,010.00
SCHEFFERVILLE	Nil	Nil	Nil	133.34	39,226.71	— — —
VAL-D'OR	66	0	5,649.96	52,828.67	18,944.91	46,179.18
TOTALS	101	4	$9,079.38	*$177,132.66	$181,517.04	$388,225.98

* This total includes payments due on lots sold during the preceding years.

APPENDIX II

List of mining companies that are authorized to cede lands situated on mining concessions

Mining villages	*Authorized holders of mining concessions*
BELLETERRE	Lorraine Mining Co. Ltd.
BOURLAMAQUE	Lamaque Mining Co. Ltd. Sigma Mines (Quebec) Ltd.
CHAPAIS	Opemiska Copper Mines (Quebec) Ltd.
MALARTIC	Barnat Mines Ltd. Canadian Malartic Gold Mines Ltd. East Malartic Mines Ltd.
MURDOCHVILLE	Gaspé Copper Mines Ltd.
ROUYN (part)	Glencona Exploration Mining Ltd.
SCHEFFERVILLE (part)	Iron Ore Company of Canada
VAL-D'OR (part)	New Harricana Mines Ltd. Sigma Mines (Quebec) Ltd. Gamma Mines (Quebec) Ltd.

LABORATORIES SERVICES

The Laboratories Services, which comprise a group of scientific services, peculiar to the Quebec Government, bring together under the same management research laboratories along with laboratories for studies and analyses. These laboratories are in Quebec, except a routine chemical analysis laboratory at Ecole Polytechnique in Montreal.

The research laboratories were instituted under a law passed in 1949. Their general functions are to carry out all types of research with the view of promoting the better use of the Province's mineral resources.

The laboratories for studies and analyses are available to all interested parties — governmental services, mining companies, and individuals — for the purpose of identifying, analysing, and studying the mineral substances of the Province.

The following table summarizes the activities of the laboratories for analyses and studies:

Samples received	23,129
Routine analyses	61,396
Special analyses (either highly accurate or highly complex)	3,822
Research analyses	3,698
Mineralogical and petrographic determinations	10,686
Determinations by X-ray diffraction	2,716
Radioactivity	91
TOTAL ANALYSES AND DETERMINATIONS	78,587

The laboratories comprise four services: chemistry, physics, mineralogy-petrography, and metallurgy.

CHEMISTRY SERVICE

The personnel of the Chemistry Service is composed of eight chemical engineers and chemists, nine technicians, one laboratory assistant and three laboratory staff workers.

It comprises the following divisions: geochemical analyses, routine and special analyses, water, gas and petroleum analyses, instrumental analyses in which flame photometry, spectrophometry, and, finally, pyroanalysis are primarily involved.

During the fiscal year under review, 42,797 analyses and studies were made, 30 per cent of them in duplicate. These analyses are divided as follows.

Routine analyses	36,209
Highly accurate or highly complex analyses	3,822
Research analyses	2,766

Among the special analyses, the following should be mentioned: 113 complete alumino-silicate analyses, 28 of them on rocks, 51 complete water analyses, and eight complete gas analyses.

The personnel of the Chemistry Service paid special attention to the preparation and development of new methods of analysis. Especially worthy of mention are: the use of a resin for the separation of interference cations in the quantitative analysis of fluorine by uranium nitrate; the quantitative analysis of extremely low-grade (0.01% to 0.001%) sodium quantities in Al-Si compounds; the quantitative analysis of caesium in pollucite with flame photometry; and, finally, the quantitative analysis of lime in rocks with flame photometry, by eliminating the interferences with lanthanum salt. All these works have produced satisfactory results.

PHYSICS SERVICE

During the 1965/66 fiscal year, the personnel of the physics laboratories carried out 20,830 analyses and studies, which may be classified as follows:

Emission spectrography	14,967
X-ray spectrography	3,056
X-ray diffraction	2,716
Radioactivity	91

Of these, 10,951 were quantitative analyses, 2,110 were done within the framework of research undertaken by the laboratories, and 323 were done for the Department of Health.

The personnel attended to the improvement of existing analysis methods and the development of new ones. In X-ray fluorescence, fundamental research was continued on the calculations of the effects of matrix in homogeneous and heterogeneous samples. The latter research was the subject of a scientific paper, which was presented at a symposium in New York.

The laboratory cooperates with the organization of the XIIIth International Conference of Spectrography, which will take place in Ottawa in 1967, through the intermediary of one of its members who acts as president of a committee that is responsible for the translation of papers and the setting-up of a team of interpreters.

MINERALOGY AND PETROGRAPHY SERVICE

The functions of this Service are the following: 1) to identify and prepare reports on the mineral substances sent to the Service; 2) to direct to the appropriate laboratory the samples sent for analysis; 3) to supply technical information and collaborate with research work; and 4) to prepare rock and mineral collections for educational purposes.

The main activities of the Service for the year 1964/65 are summarized below:

Mineral determinations	10,686
Letters and reports edited	521
Thin plates and polished sections prepared	118
Mineral collections:	
Regular	0
Small chips	800
Rock collections	
Regular	0
Small chips	800

As a substantial quantity of regular collections remains in stock owing to a decrease in demand, their preparation was suspended until exhaustion of stock. The regular collections are sold for $5.00 and the collections in small chips are priced at a nominal $1.00 in order to promote initial knowledge of the rocks and minerals in Quebec.

Because of a temporary reduction in the Service's technical personnel, its contribution to research projects mainly took the form of consultations and mineral determinations.

METALLURGY SERVICE

This Service was very active during the fiscal year.

Three of its research workers visited Osisko lake and the vicinity in order to study ways to recuperate the lake which is so polluted that it is completely useless to the adjacent cities of Noranda and Rouyn.

Also during the year, one of the Service's metallurgists went to Schefferville to discuss, with officials of the Iron Ore Company, steps needed to beneficiate part of its iron ore deposits now set aside because they cannot be mined economically.

Moreover, three of the Services' metallurgists went to Barraute to study the recent installations of Quebec Lithium Corporation; they carried out a survey of the conditions under which this company uses the patented process which was put at its disposal for the production of lithium carbonate, and they made recommendations with a view to modifying the operations' rheogram in order to lower production costs.

The main activities of the Service were concentrated on the following research subjects :

Project No.	*Subject and Work Accomplished*
148	Research in order to commercialize the chemical decomposition products of spodumen was continued; a method of manufacturing a by-product that is in great demand on the market and that will lower appreciably the cost of extracting lithium, was discovered. A study of the process used by Quebec Lithium Corporation and perfected in the Service's laboratories was presented by Maurice Archambault, Charles A. Olivier and

André Beauchemin at the Annual Conference of Metallurgists at Carleton University in August, 1965. The paper was entitled "A Unique Process for Extracting Lithium".

152 Research on the beneficiation of the low-grade deposits of Schefferville for the Iron Ore Company of Canada were continued. In order to concentrate them efficiently by the flotation process, the relative selectivities of new collector agents and the efficiency of various lowerings were established. Flocculences which would enable recycling to the flotation circuit water from iron concentrate thickeners were also studied. Research work was started to determine the surface properties and the zeta potential of the constituants of certain iron ore deposits and subsequently to establish the correlation between the properties and their aptitude towards flotation.

153 Experiments made on asbestos waste in the Eastern Townships with a view to discovering a process that would beneficiate them were pursued.

154 Charles E. Beaulieu and Jean-Jules Panneton defined the conditions required for the transformation of the Schefferville "yellow ore" iron oxides into solid MAGHEMITE-MAGNETITE solutions.

They also studied the influence of such factors as the percentage in CO/CO_2 of gas reducers, the granulometry of ore, and the duration and temperature of reaction.

Charles E. Beaulieu and Jean-Jules Panneton presented a paper on this work at the ACFAS Convention which took place in Montreal in November 1965.

Dr. Beaulieu, who conceived and perfected an extracting process based on the above-mentioned transformations, has registered patent petitions in the following five countries : Canada, Germany, United States, England and France.

155 A way to produce ferrocolumbium directly from Oka pyrochlorine is being sought. Moreover, by using pyrochlorine concentrates, attempts were made to obtain an autoreducer mixture that would make it possible to ally directly columbium to steel.

Patents

Following is a list of processes which have been invented to date at the Laboratories Services and for which patents have been granted or are pending :

PATENTS GRANTED OR PENDING

(country and number)

Processes	Canada	France	Great Britain	United States	Germany	Belgium
1. Low-temperature pyrometallurgical extraction of lithium by means of pyrite sulfureted by-products. Inventors: Maurice Archambault, C. A. Olivier, and J. U. MacEwan.	592,353	1,183,727	850,480	2,923,600	1,064,935	560,581
2. High-temperature pyrometallurgical extraction of lithium by means of pyrite sulfureted by-products. Inventor: J. U. Mac Ewan.	601,441	—	—	—	—	—
3. Cyclic and continuous process for the production of lithium sulfate and carbonate. Inventors: Maurice Archambault, C. A. Olivier, and J. U. MacEwan.	640,645	1,246,235	876,580	3,017,243	1,118,766	—
4. Pyrometallurgical process for the purification of lithium carbonate. Inventors: Maurice Archambault, C. A. Olivier, and J. U. MacEwan.	—	—	—	—	1,145,595	—
5. Lithium sulfate production from non-decrepitated ores. Inventor: J. U. MacEwan.	601,498	—	—	2,972,517	—	—
6. Lithium carbonate direct hydrotermal production. Inventor: Maurice Archambault.	643,843	1,287,607	934,447	3,112,171	pending	599,725
7. Lithium carbonate hydrothermal production with concomitant regeneration of reagents. Inventor: Maurice Archambault.	700,295	1,290,185	935,217	3,131,022	pending	599,726
8. Hydrothermal production of lithium fluoride and other salts. Inventors: Maurice Archambault, C.A. Olivier, J.J. Panneton and Paul Fortier.	pending	1,313,352	1,002,410	3,112,172	pending	611,066

PATENTS GRANTED OR PENDING (Cont'd.)

Processes	Canada	France	Great Britain	United States	Germany	Belgium
9. Lithium borate direct hydrothermal production, inventors: Maurice Archambault and C.A. Olivier.	670,745	1,321,443	986,935	3,112,168	1,172,653	612,410
10. Lithium carbonate production by means of sodium and ammonium compounds in a liquid state. Inventors: Maurice Archambault, C.A. Olivier, H.P. Lemay and Michel Savard.	700,310	1,313,413	972,142	3,112,170	pending	612,663
11. Separator according to the form of particles and the processes for freeing asbestos from dust. Inventor: Ls.-Ph. Bonneau.	628,028	1,216,294	848,164	2,910,178	—	571,021
12. Production of nickel and magnesia sulfates by the treatment of silicates in a liquid state. Inventors: Maurice Archambault, C.A. Olivier, and J.U. MacEwan.	—	—	849,364	—	—	—
13. Extraction of lithium salts and by-products. Inventor: Maurice Archambault.	711,662	1,365,594	pending	pending	pending	—
14. Hydrothermic treatment of lithium-bearing silicates with sodium carbonate, with the view of producing a mixture of lithium carbonate and sodium alumino-silicate from which lithium hydrosoluble compounds are directly obtained. Inventors: Maurice Archambault and C.A. Olivier.	705,817	1,365,352	pending	pending	—	627,542
15. Carbonating roasting of lithium ores. Inventors: Maurice Archambault and C.A. Olivier.*	pending	1,415,820	pending	pending	pending	—
16. Pyrometallurgical treatment of iron ores. Inventor: C. E. Beaulieu.	pending	pending	pending	pending	pending	—

N.B. * Patents for process number 15 are also pending in Brazil and Japan.

It is widely held that the Laboratories Services' most important achievements are the discovery, perfectionment and patenting of industrial processes which are of direct interest to the technological and economical advancement of Quebec. These achievements will, in a short time, yield abundantly. The Province of Quebec needs industrialization, and new processes are bound to bring it to the forefront. However, in order to attain this goal the number of scientific workers must be increased and, insofar as possible, scientists of the highest caliber must be selected, if an abundant and prompt harvest of prosperous industries is to materialize.

Publications of the Laboratories Services

1. "A Unique Process for Lithium Extraction", by Maurice Archambault, Charles A. Olivier, and André Beauchemin, presented at the Conference of Metallurgists, August 30, 1965, at Carleton University.
2. "X-Ray Fluorescence Spectometry : The Interelement Effect in Polyphase Specimens", by Fernand Claisse, presented to the Eastern Analytical Symposium, November 17, 1965, at New York, and published by the Department.
3. "Solution solide ferrosoferrique", by Charles E. Beaulieu and Jean-Jules Panneton, presented to the ACFAS Congress, November 5, 6 and 7, 1965, in Montreal.

PILOT-PLANT SERVICES

During the sixth year of operations the Pilot-Plant Services lost its devoted director, the late Dr. Paul E. Pelletier. Since the beginning of May, 1965, the interim direction has been entrusted to Jean-Paul Bolduc, engineer, who, until then, had been superintendent of works at this center in extractive metallurgy.

During the same period, an analysis of the working methods led to a certain revision. The personnel was re-organized to augment general efficiency. Thus, in August 1965, the asbestos fiber control laboratory, located in Thetford Mines, was integrated with the Quebec plants.

The 1965/66 fiscal year saw many projects brought to a successful completion. In fact, 37 new projects were studied, and thereby set a record in the history of the Services. The pilot-plant received 333,945 pounds of ore divided into 80 separate lots. Though the weight of arrivals decreased notably compared with those of the year 1964/65, it nevertheless remains true that the amount of work done has increased notably.

Table I indicates, in alphabetical order, the names of shippers and, for each of them, the weight of the samples as well as the nature of the ore submitted for metallurgical study.

TABLE I

Shipper	Number of lots	Weight in lbs.	Nature of Ore
Anglo American Molybdenite Corp.	1	85	molybdenite
Assad, Dr. R. (D.N.R.)	1	359	sands
Aylmer Mines Ltd.	3	1,756	asbestos
Bédard, M.L.	2	190	molybdenite

TABLE I (Concluded)

Shipper	Number of lots	Weight in lbs.	Nature of Ore
Bersimis Mining	1	136	ilmenite, magnetite, apatite
Canadian Exploration Ltd.	1	140	asbestos
Carrière Varennes Ltée	1	675	feldspar
Campbell Chibougamau Mines Ltd.	7	5,676	magnetite
Continental Coppers Mines Ltd.	1	136	asbestos
Corgemines Ltée	1	319	ilmenite
Dauphin Iron Mines Ltd.	1	550	gold
Duncan R. Derry Ltd.	1	218	asbestos
Equity Exploration	1	80	gold
Farago, Jack	1	460	granite
General Engineering Co.	1	1,969	asbestos
Gosselin, Ls. Phil.	2	674	sands
Grenier, Dr. P.E. (D.N.R.)	1	109	sands
Laboratoires d'inspection et d'essais, inc.	2	646	aggregates
Lacombe, M. Pierre, ing.	2	9,280	graphite
Laviolette Mining and Met. Corp.	1	1,820	mica
Lee, Mr. A.C. (Ghislau Mining Co.)	2	201,606	gold, silver, copper, lead, zinc
Les Granits de Québec Inc.	1	11,042	granite
Lynn MacLeod Engineering Co.	1	2,070	asbestos
McAdam Mining Corp. Ltd.	8	8,882	asbestos
Muscocho Exploration Ltd.	12	900	magnetite
National Asbestos Corp.	3	3,680	asbestos
Nicolet Industries Ltd.	1	94	asbestos
Noiseux, M.M. (Department of Roads laboratories)	3	19,176	heavy aggregates
Northern Exploration Ltd.	1	160	copper, lead, zinc
Ouellet & Castonguay Exploration (Compagnie Minière Péribonka)	1	590	sands
Quebec Cartier Mining Co.	1	300	hematite, magnetite
Quebec Clay Mining Corp.	1	9,914	kaolin, feldspar
Quebec Iron Foundries Ltd.	4	50,038	magnetite, granite, quartz, dolomite
Simard, M.A. (D.N.R.)	7	98	peat moss
Taché Lake Mines Ltd.	1	42	gold, silver, copper, lead, zinc
Terra Nova Exploration Ltd.	1	74	magnetite, ilmenite, apatite
Total	80	333,945	

Project 524-R concerns the study of molybdenite concentration in the presence of talc and hydrocarbons; this is a research project proper to the pilot-plant.

Table II gives the number of projects classified according to the nature of the samples received.

TABLE II

Nature of Ore	*Number of Projects*
Iron and titanium	10
Asbestos	9
Metallic sulfides (including gold and silver)	7
Others	11
Total	37

When one takes into account the small number of scientists working at the pilot-plant, it becomes evident that the work done during the year was excellent. All in all, 36 engineering reports were submitted.

An innovation of the Pilot-Plant Services was the undertaking of its first research project, which took place at the end of the year 1965/66.

The recruiting of scientific personnel continues to be a constant preoccupation of the Services.

WATERS BRANCH

HYDRAULIC SERVICES

The authorities of Hydraulic Services are in charge of administering the rights of the Crown on major lakes and streams, of enforcing the Act Respecting the Use of Watercourses, and of ensuring the realization of all works on projects that may be conducive to the conservation, development and use of hydraulic resources.

A complete account of the activities of each of the three Services making up this body follows.

ENGINEERING SERVICE (Waters)

During the 1965/66 fiscal year, the name of the Hydraulic Works Services was changed to the Engineering Service. Such as was the case last year, this Service comprises four divisions. The activities and accomplishments of this Service during the year are described below:

Remedial Works Division

Personnel:

The Remedial Works Division was staffed during the 1965/66 fiscal year by: an engineer as division head, six other engineers, two technical officers, three technicians, and a construction clerk.

Activities:

As in the past, the standards and directives dealing with water works developed by the Department have been rigorously followed by the Engineering Service.

During the 1965/66 fiscal year, the major part of the field program, as well as an important part of the budget, was devoted to the pursuit of remedial works connected with the Chaudière project.

It should also be mentioned that, during the fiscal year under review, this Division's projects were planned and carried out after they had been submitted to CPAR for study and approval. This was done with a view to integrating part of them within the ARDA program.

Achievements:

The program carried out by the Remedial Works Division during the 1965/66 fiscal year includes 30 projects costing $613,579.05; eight of these were carried out within the framework of the Chaudière overall project at a cost of $359,562.57. A sum of $40,000 should be added to the latter amount since it served to pay land expropriation costs in the parish of Saint-François-de-Beauce.

A summary of each of the 30 projects which were completed during the 1965/66 fiscal year, as well as a table (No. 1) summarizing the cost of the work carried out, is given below.

Moreover, the Engineering Service contributed $42,235.37 for the cost of research on two small-scale models. This research, which began during the present fiscal year, was undertaken with the cooperation of the Study and Research Service of the Department, by Laval University and by the Lasalle Hydraulic Laboratory, and will be completed during 1966/67. The setting up of these models was undertaken with the purpose of studying, prior to the commencement of construction work, of a pier to be built on Chaudière river at Rapide-du-Diable and a section of Saint-François at Bromptonville in order to prevent floods.

The Division also studied 85 requests for remedial work that were submitted by various municipalities in the Province. The recommendations of the Division, after it had studied each request, may be classified as follows:

Sixty requests were rejected after inspection and study, since they did not meet the standards set by the Department justifying intervention;

Eight requests are still pending until additional information required to make a final decision is obtained;

Three requests were acted upon during the present fiscal year due to the fact that they concerned the Public Domain and also due to the fact that it was urgent that the work be done immediately;

Eleven requests have been recommended for the carrying out of work during the next fiscal year;

Finally, on three occasions, the Service authorized certain municipalities to carry out works.

List of remedial works carried out in 1965/66

Beauce County

1. *Chaudière River:* lots 48 to 62, Range I NE., and lots 1503 to 1509, Range I SW., Saint-François parish:
   Correcting of the discharge section of Chaudière river for a distance of 3,000 feet;
   Closing of the secondary arm located at the head of an island situated in this sector, by the construction of a dike protected by a stone facing along a length of 2,000 feet.
2. *Chaudière River:* lots 74 to 80, Range I NE., and lots 1509 to 1513, Range I SW., Saint-François parish:
   Correcting of the discharge section of Chaudière river along a length of 1,380 feet;
   Closing of the secondary arm located at the head of the island situated in this sector, by the construction of a dike protected by a stone facing along a length of 500 feet.
3. *Chaudière River:* lots 84 to 92, Range I NE., and lots 1516 to 1521, Range I SW., Saint-François parish:
   Correcting of the discharge section of Chaudière river along a length of 1,400 feet;
   Closing of the secondary arm located at the head of the island situated in this sector, by the construction of a dike protected by a stone facing along a length of 650 feet.
4. *Chaudière River:* lot 509, Range I NE., and lots 1476 and 1477, Range I SW., Saint-François parish:
   Correcting of the discharge section of Chaudière river along a length of 1,200 feet;

Closing of the secondary arm located at the head of the island situated in this sector, by the construction of a dike protected by a stone facing along a length of 368 feet.

5. *Morency River:* lots 767 to 769, Range I NE., l'Enfant-Jésus parish:
Excavation of a gravel pit located in Chaudière river so as to direct the course of this tributary in the same direction as that of the Chaudière in order to reduce the formation of deposits produced by this tributary;
Construction of a stone facing near the mouth of Morency river in order to protect its left bank;
These works began during the 1965/66 fiscal year but will be completed during the next fiscal year.

6. *Chaudière and Fermes Rivers:* lots 106 to 109, Range I SW., Saint-Joseph parish:
Cleaning of the Chaudière river bed for a distance of 950 feet;
Deposition of materials excavated from the bed on the left bank of Chaudière river;
Construction of a 700-foot-long stone facing on the left bank and a 175-foot-long stone facing on the right bank, at the mouth of Fermes river;
These works began during the 1964/65 fiscal year and were completed during the 1965/66 fiscal year.

7. *Chaudière River:* lot 34, Range I NE., Saint-François parish:
Blasting of a 350-foot-long rock outcrop;
Recuperation of the blasted rock to protect the right bank immediately downstream from this sector.
These works began during the 1964/65 fiscal year and were completed during the 1965/66 fiscal year.

8. *Chaudière River:* lots 36 to 48, Range I NE., Saint-François parish:
Cleaning of rock outcrops in the bed along a length of 1,950 feet;
Transportation of excavated material on the right bank of the river and construction of a stone facing of the same length in order to protect the embankment starting from the right bank in this sector;
Seeding of the top of this bank so as to make it more stable.

Bonaventure County

9. *Nouvelle River:* lots 20 and 21-A, lots 12 to 18, SE. Range, lots 2-B to 40-D, lots 7 to 12, SW. Range, Nouvelle parish:
Construction of a 646-foot-long gabion wall upstream from the bridge on Highway 6;
Construction of a dike protected by a rock covering along a distance of 600 feet downstream from this bridge.

10. *Caplan River:* lot 268, Range I, New-Richmond township:
Repairs to the gabion wall built in 1962.

Champlain County

11. *Batiscan River:* Sainte-Geneviève-de-Batiscan parish:
Correction of the bank by the construction of a 450-foot-long embankment immediately upstream from the bridge, on the right bank;
Protection of this embankment with rock covering.

Charlevoix County

12. *Noire River:* lots 24-E and 24-F, Range I, Callière township, Saint-Siméon parish:
Correction of the discharge section of Noire river along 420 feet by blasting rock outcrops.

Dorchester County

13. *Chaudière River:* lots 744 to 746, Saint-Maxime-de-Scott municipality:
Correction of the right bank for a length of 1,000 feet;
Construction of a stone facing of the same distance;
Sodding and planting of trees along the same distance.

Frontenac County

14. *Chaudière River:* Saint-Ludger municipality:
Removal of accumulated waste upstream from the Drolet pier built in 1963/64.

Gaspé-North County

15. *Gulf of St. Lawrence:* lot 398-7, Range IW., Fox township, Saint-Maurice-de-l'Echourie municipality :
Construction of a concrete retaining wall along a length of 150 feet as an extension of the wall built in 1963.

Gaspé-South County

16. *York River:* lots 20 and 21, Range I, and lots 8 to 14, York River Range, York township, Gaspé-South county:
Construction of a retaining wall for a distance of 1,600 feet on the left bank of York river.
This work is not yet completed since the cleaning of the river bed in this sector remains to be done in the 1966/67 fiscal year.

Iles-de-la-Madeleine County

17. *Gulf of St. Lawrence:* lot 21 in the Etang-du-Nord municipality:
Construction of a retaining wall with rockfilled coffers. This work was not completed by the end of the fiscal year; it will however be finished in the autumn of 1966.

Kamouraska County

18. *Ouelle River:* lots 223 and 426, Rivière-Ouelle parish:
Repair of a retaining wall built in 1962.

Matane County

19. *Cherbourg Creek* : lot 37, Ranges VI and VII, Saint-Thomas-de-Cherbourg municipality:
Redefinition of the river bed and construction of a retaining wall.
20. *St. Lawrence River:* St. Lawrence River bank sector located between Caouette and Bernier streets in the town of Matane;
Repair of an access road to the works carried out in 1964.

Mégantic County

21. *Bécancour River:* sectors of Bécancour river located within the limits of the city of Thetford Mines:

Construction of masonry walls in various locations and repairs to the masonry walls already built.
This work began during the 1964/65 fiscal year and will be completed by next year.

Portneuf County

22. *Jacot Creek:* lot 156, 3rd concession SW., Saint-Léonard parish: Portneuf county:
Cleaning of the bed of the creek in this sector.

Maskinongé County

23. *Petite Rivière-du-Loup:* lot 675, NW. concession of the Grande Rivière-du-Loup in the town of Louiseville:
Cleaning of the river bed and construction of a retaining wall with piles for a distance of 100 feet.

Rivière-du-Loup County

24. *Verte River:* lot 241, Range I, Ile Verte seigniory, Rivière Verte:
Blasting of a rock outcrop and construction on the right bank of the river of an embankment protected by stone bedding for a distance of approximately 300 feet.

Roberval County

25. *Ouiatchouaniche River:* lots P-2-3 to P-8, Town of Roberval:
Construction of a masonry retaining wall having a length of 500 feet.

Saguenay County

26. *Gulf of St. Lawrence:* lots 10 to 17, 19, 20, 22, 23, 24, 27 and 28, Godbout village:
Construction of a gravel embankment and protection of this embankment with rock covering, for a total length of 3,700 feet divided into various sectors.
27. *St. Lawrence River:* lots 8 to 15-G, Range I, Escoumins parish:
Correction of the bank with gravel and protection of the bank with rock covering for 1,000 linear feet along the bank of the river. This work will be completed during the 1966/67 fiscal year.

Saint-Maurice County

28. *Petite-Yamachiche River:*
Construction of a gabion retaining wall on the right bank of Petite-Yamachiche river along Guérin Lajoie street in Yamachiche village.

Sherbrooke County

29. *Saumon River:* lots 7A, 7B, 7D, Range IV, Ascot township:
Correction of the left bank of Saumon river and protection of this bank with rock covering along a distance of 800 feet.

Vaudreuil County

30. *Brûlée River:* lot 308, South concession of Graisse river, Sainte-Madeleine-de-Rigaud parish:
Cleaning of the river bed and construction of a gabion retaining wall on the right bank along a length of 100 feet.

Dams Division

Personnel:

The activities of the Dams Division were slightly modified during the fiscal year under review. The staff still comprises an engineer in charge of the Division, two other engineers, and a technician.

Activities:

During the 1965/66 fiscal year, the Division's field activity declined notably with the transfer of several reservoir-dams on the Saint-Maurice and Gatineau rivers to Hydro-Québec, on July 1, 1965. A number of repair works to some of these dams was expected but this decline in activities was largely compensated by the study of several dam projects for the Department, as well as for various municipalities.

Achievements:

The work program carried out by the Dams Division during the 1965/66 fiscal year consisted in the completion of eight projects, distributed as follows:

A. MAINTENANCE AND REPAIR OF DAMS OWNED BY THE DEPARTMENT

Sable River:

1. Restoration of log slide and reparation of the upper part of the Pibrac-East dam. The project called for the removal of disintegrated concrete and its replacement. For this work, an 'epoxy' adhesive was used for the patching.
2. The sewer pipe which served to direct the waste waters of the two houses of the caretakers was repaired and extended to Sable river.
3. Correcting the curves of the access road leading to the caretakers' houses. Part of this work was undertaken last year, and will be completed to ensure safety.
4. The stop-logs of the two dikes built between the Pibrac-East and Pibrac-West dams were replaced. Before they were set up, these stop-logs were treated with creosote to prolong their duration.

Chicoutimi River:

During the fiscal year under review, the registers at Moncouche, Foin, and Lapointe lakes were repaired. This work was carried out at the request of the Exploitation Division.

Loup River:

Complement of repair and maintenance of the dam at Morin lake. The work was suspended with the advent of the winter season.

Saint-François River:

1. Restoration and waterproofing of the front section of the Allard dam. This work was carried out under contract after public tenders had been issued. It consisted in the construction of an 8-inch-thick slab at the front section of the dam. Moreover, a waterproof membrane was applied to the old surface before pouring the new concrete. This work could not be completed, owing to the rising of waters last spring, but it will be done during the next fiscal year.
2. During the fiscal year under review, sand-blasting and painting of the Aylmer dam stop-logs hoisting apparatus was continued.

Table 2 summarizes the cost of maintenance and repair for each of these projects.

B. CAPITAL EXPENDITURES:

Sable River:

Installation of a metallic fence to mark the boundaries of the Department's properties and to limit access at the Pibrac-East and Pibrac-West dams.

Nord River:

Installation of a metallic fence to limit the access to the Masson Lake dam.

Table 3 summarizes the cost of these undertakings.

C. CONTRIBUTIONS OF THE DEPARTMENT:

During the year under review the Division did not complete any work under this heading.

However, several projects were studied and scheduled for the next fiscal year.

Among those projects for which study was completed, the most important was the planning of a dam which will serve for the retention of ice as well as for the control of flood waters on Chaudière river at Jersey Mills.

Construction on this project is scheduled to start next spring and the work will be carried out under contract after public tenders have been submitted.

Other important projects include the reconstruction of the Lac-des-Neiges dam in Laurentides Park and the repair of dam No. 1 on Chaudière river in Spalding township.

Here, as was the practice with remedial work, local labor was used during construction, whenever possible. The engineer in charge of this work applied to the regional Provincial Employment Office in order to obtain a list of persons available in the region.

All this manpower was paid according to the recommendations of the Department of Labor of the Province of Quebec and in conformity with the Fair Wages Scale for the various zones of the Province.

Topometry Division

Personnel:

The staff of the Topometry Division comprised, during the fiscal year, a land-surveyor as head of the Division, a technical officer, and six technicians. During the summer of 1965, it also had at its disposition ten students who, under the direct supervision of the technicians, helped with the surveying.

Activities:

The Topometry Division carries out the topographic surveys required by the Engineering Service (Waters) and also works in close cooperation with the Study and Research Service and with the Hydraulic Domain Service.

Surveys:

During the 1965/66 fiscal year, the Topometry Division completed 46 topographic surveys, 15 of which served or will serve to develop

projects related to the Chaudière over-all project. The other surveys were performed in various parts of the Province.

Table 4 shows the locations and costs of surveys made by this Division.

Costs Division

This Division is made up of an engineer and a clerk. On different occasions during the year, the engineer in charge took part in the inspection and supervision of projects done by the Remedial Works Division and by the Dams Division.

The function of this Division, as in previous years, is to collect, compile and analyse all available information in order to develop a file concerning unit costs for the work carried out by the Engineering Service.

TABLE No. 1 — REMEDIAL WORKS CARRIED OUT DURING THE 1965/66 FISCAL YEAR

County	River	Municipality	Type of Work	Cost
Beauce	Chaudière	Saint-François (Charlemagne Bernard Island)	Correcting of bed and protection of banks	$ 90,660.08
Beauce	Chaudière	Saint-François (Grondin Island)	Correcting of bed and protection of banks	21,327.79
Beauce	Chaudière	Saint-François (Louis Roy Island)	Correcting of bed and protection of banks	69,000.49
Beauce	Chaudière	Saint-François (Joseph Bernard Island)	Correcting of bed and protection of banks	48,398.11
Beauce	Morency	L'Enfant-Jésus Parish	Correcting of bed and protection of banks	986.10
Beauce	Chaudière Mouth of Fermes River	Saint-Joseph	Correcting of bed and protection of banks	15,000.00
Beauce	Chaudière	Saint-François Parish	Blasting of a rock outcrop	4,375.54
Beauce	Chaudière	Saint-François Parish	Correcting of bed and protection of banks	69,797.28
Bonaventure	Nouvelle	Nouvelle	Protection of bank	1,444.13
Bonaventure	Caplan	Caplan	Repair of a gabion wall	2,101.77
Champlain	Batiscan	Sainte-Geneviève-de-Batiscan	Retaining wall	13,413.52
Charlevoix	Noire	Saint-Siméon	Correcting of bed	29,984.10
Dorchester	Chaudière	Saint-Maxime-de-Scott	Retaining wall	39,666.40
Frontenac	Chaudière	Saint-Ludger	Repair to the pier built in 1963/64	350.78
Gaspé-North	Gulf of St. Lawrence	Saint-Maurice-de-l'Echourie	Retaining wall	7,643.05

TABLE No. 1 — REMEDIAL WORKS CARRIED OUT DURING THE 1965/66 FISCAL YEAR (Concluded)

County	River	Municipality	Type of Work	Cost
Gaspé-South	York	Sydenham	Correcting of bed and protection of banks	$ 12,967.08
Iles-de-la-Madeleine	Gulf of St. Lawrence	Etang-du-Nord	Retaining wall	2,002.31
Kamouraska	Ouelle	Rivière Ouelle	Repair to a retaining wall	878.06
Maskinongé	Little Loup	Louiseville	Retaining wall	4,190.90
Matane	Cherbourg	Saint-Thomas-de-Cherbourg	Redefinition of bed and construction of retaining wall	1,045.75
Matane	St. Lawrence River	Matane	Repair to an access road	94.27
Mégantic	Bécancour	Thetford Mines	Masonry retaining wall	77,321.90
Portneuf	Jacot	Saint-Léonard	Cleaning of bed	629.26
Rivière-du-Loup	Verte	Isle Verte	Correcting of bed and retaining wall	23,547.90
Roberval	Ouiatchouaniche	Roberval	Masonry retaining wall	10,527.02
Saguenay	Gulf of St. Lawrence	Godbout	Retaining wall	40,795.32
Saguenay	St. Lawrence	Les Escoumins	Retaining wall	16,035.14
Saint-Maurice	Little Yamachiche	Yamachiche	Gabion retaining wall	960.00
Sherbrooke	Saumon	Ascot	Retaining wall	6,208.57
Vaudreuil	Brûlée	Sainte-Madeleine-de-Rigaud	Retaining wall	2,226.43
			TOTAL	$613,579.05

TABLE No. 2 — DAMS DIVISION

Maintenance and repair work on dams owned by the Department, 1965/66

County	River	Dam	Description of Work	Cost
Chicoutimi	Chicoutimi	Moncouche, Au Foin, Lapointe	Repair of the limnimetric scales	$ 420.90
Jonquière	Sable	Pibrac East	Repair to concrete of log slide and of the upper face of the dam	5,578.85
Jonquière	Sable	Pibrac West	Repair of sewer pipe serving the two houses of the caretakers	362.20
Jonquière	Sable	Pibrac West	Correction of the access road	835.15
Jonquière	Sable	Pibrac East and West	Replacement of stop-logs of the openings of the two dikes	962.18
Kamouraska	Loup	Morin	Maintenance and repair work on dam	43,875.82
Mégantic	Saint-François	Allard	Repair and waterproofing of the front face of the dam	106,678.08
Wolfe	Saint-François	Aylmer	Sand and painting of the stop-logs hoisting apparatus	3,849.59
			TOTAL	$162,562.77

TABLE No. 3 — DAMS DIVISION

Capital expenditures, 1965/66

County	River	Dam	Description of Work	Cost
Jonquière	Sable	Pibrac	Installation of a metallic fence to mark the boundaries of the Department's properties	$3,285.41
Terrebonne	Nord	Masson	Installation of a metallic fence to limit access to the dam	1,244.63
			TOTAL	$4,530.04

TABLE No. 4 — SURVEY WORK CARRIED OUT DURING THE FISCAL YEAR, 1965/66

County	River	Location	Cost
Asbestos	Richmond Lake	Asbestos	$ 44.85
Beauce	Nadeau-Lessard	Valley Junction	2,878.38
Beauce	Morency	Valley Junction	204.70
Beauce	Plante	Beauceville	1,261.76
Beauce	Chaudière	Beauceville	2,559.24
Beauce	Diable	Beauceville	3,750.29
Beauce	Cliche	Saint-Joseph	722.00
Beauce	Fermes	Saint-Joseph	383.70
Beauce	Plaines	Saint-Joseph	264.40
Beauce	Famine	Saint-Georges	377.75
Beauce	Bras	Saint-Victor	9,451.19
Beauce	Chaudière	Beauceville	1,138.34
Beauce	Chaudière	(general)	774.49
Beauce	Chaudière	Saint-Georges (axis)	5,513.80
Beauce	Chaudière	St-Georges (up-stream of axis)	7,747.00
Berthier	Deligny Lake	Saint-Charles-de-Mandeville	9.25
Châteauguay	Châteauguay	Châteauguay-Centre	144.64
Châteauguay	Châteauguay	Ormstown	76.93
Chicoutimi	Moulin	Chicoutimi	424.07
Charlevoix	Mares	Baie-Saint-Paul	875.83
Deux-Montagnes	Lac Deux-Montagnes	Oka	92.50
Dorchester	Famine	Morisette Station	4,101.18
Frontenac	Chaudière	Saint-Samuel	358.40
Gaspé-South	Malbaie	Barachois	622.55
Gaspé-South	Darmouth	Cortéréal	1,179.73
Matane	St. Lawrence	Matane	13.60
Matane	Matane	Ruisseau Gagnon	489.40
Matane	Matane	Grand Détour	678.40
Matane	Mitis	Sainte-Angèle-de-Mérici	267.20
Montmorency	Sainte-Anne	Sainte-Anne-de-Beaupré	126.79
Mégantic	Bécancour	Thetford Mines	121.94
Mégantic	Blanche	Saint-Ferdinand	335.05
Mégantic	Saint-François	Disraeli	239.13
Matapédia	Humqui	Amqui	1,181.38
Montcalm	Archambault Lake	Saint-Donat	874.07
Quebec	Neiges Lake	Quebec	248.14
Richmond	Saint-François	Brompton	163.25
Rivière-du-Loup	Verte	Isle Verte	389.50
Saguenay	St. Lawrence	Ruisseau Vert	981.51
Sherbrooke	Saumon	Huntingville	1,078.75
Saint-Maurice	Souris Lake	Shawinigan	325.46
Terrebonne	Achigan Lake	Saint-Hippolyte	700.11
Vaudreuil	Brûlée	Rigaud	16.50
Wolfe	Morasse	Notre-Dame-de-Ham	234.20
Wolfe	Weedon Lake	Weedon	239.08
Jacques-Cartier	St. Lawrence	Verdun	29.35
		Total	$53,689.78

HYDRAULIC DOMAIN SERVICE

The Hydraulic Domain Service is mainly responsible 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 line rights of way, sub-stations, log flumes, and waterworks.

Finally, the Hydraulic Domain Service issues, in the absence of judicial decisions, administrative opinions concerning whether or not certain lakes and rivers in Quebec are to be considered navigable and floatable. These opinions guide the administration of the Department of Natural Resources, as well as other Departments, in the establishment of the rights of the Province on its streams.

Appendix VII of this report gives comparative statements of revenue for the fiscal year 1965/66 and for the fiscal year 1964/65.

A. Main activities of the Service pertaining to the administration of the Water-courses Act.

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

Leases issued under Division I cover all uses of Crown properties on water not covered by Division III and subsequent divisions of this Act.

The Department's conservation policy, which is to keep in the public domain as much as possible the ownership of the bed and shores of streams or lakes of this Province, was continued. Leases granted for beach and deep-water lots are valid for short or long periods, depending on the importance of the works which are to be conducted on them.

The Hydraulic Domain Service administers 876 leases under Division I, of which 111 were granted during the fiscal year reviewed here.

Appendix IV gives a list of Orders in Council concerning either concessions by letters patent, leases of mainland and beach lots, or leases on greater areas than those permitted by the general Orders in Council.

Moreover, fifteen (15) Orders in Council authorizing 30 transfers of administration and control to various Federal Government bodies for the establishment of wharves, fishing harbors and other projects in the public interest were sanctioned.

Appendix I gives a list of the Orders in Council authorizing transfers to the Federal Government.

Revenue from the administration of all leases of this nature issued by the Hydraulic Domain Service amounted to $100, 542.66 during the fiscal year under review compared with $31,027.88 during the preceding 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 year under review, five (5) Orders in Council authorizing plans and estimates and hydraulic power leases, as well as renewal of existing leases, were sanctioned by the Executive Council.

Appendix II gives the list of these Orders in Council.

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 set up the controls and make the verifications needed to evaluate this rent.

During the year, the Department's engineers made on site verifications of the production of 27 power plants. These verifications, in some cases, covered a span of several years. During the course of these visits, the Department's engineers also make controls and verifications necessary in order to determine the additional dues payable by holders of hydraulic power sites 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, revenue from the leasing of hydraulic power sites owned by the Crown reached $2,203,137.06 and revenue arising from the Act to ensure Progress of Education amounted to $2,500,936.32.

During the previous fiscal year, revenue from these sources was $2,351,070.03 and $2,367,453.72 respectively.

Since January 1, 1964, all rental fees and royalties payable by Hydro-Quebec were replaced by a single royalty amounting to $0.50 per thousand K.W.H. produced. Under this arrangement, Hydro-Quebec paid, in 1965/66, a total amount of $19,547,903.16, compared with $19,213,832.89 during the preceding fiscal year.

(c) Under Division IV of the Water-courses Act, hydraulic power producers may, under certain conditions, expropriate land necessary for their power plant and related construction needs, such as roads, power transmission lines, sub-stations, etc., subject to prior approval by the Lieutenant-Governor in Council. During the year, five petitions for permission to expropriate were submitted to the Hydraulic Domain Service and resulted in recommendations that were confirmed by Order in Council No. 715, dated April 6, and noted in Appendix II.

(d) Division VI 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 their maintenance.

At the end of the preceding fiscal year and at the beginning of the 1965/66 fiscal year, new administrative procedures along with a census of all such works have enabled the Department to make a list of all the dams maintained by log-driving companies on the streams of the Province without the proper authorizations. At the end of the fiscal year, the legalizing log-driving dams had been practically completed and a program in order to legalize log-boom works was established.

During the year, 37 Orders in Council approved by the Executive Council authorized the approval of plans and specifications, and the rental of lands needed for the maintenance of 113 log-driving dams. Moreover, 14 leases were renewed.

The list of these Orders in Council appears in Appendix 3.

Revenue from leases issued under this Division of the Water-courses Act amounted to $533,980.81, compared with $291,824.61 during 1964/65. The increase is explained by the greater number of leases presently in force and also by the fact that some

arrears in rental owed to the Department for the use of these works in the past were collected during the year.

(*e*) 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 waterworks.

As most of the leases issued under Division VII provide for, in addition to the fixed rental, the payment of a royalty based on production, the Department's engineers make the necessary verifications and controls to determine the amount of this royalty.

Moreover, these engineers supervise the amount of royalties paid by the various companies concerned on profits resulting from the use of storage dams built and maintained by the Department.

All in all, revenue during the year from storage dam profits, whether maintained by the Department or by private concerns, amounted to $729,431.59, compared with $468,893.59 in the preceding year.

(*f*) As in the previous year, the Department intensified, as much as possible, its supervision relative to the conservation and protection of Crown property.

The engineers and inspectors assigned to the Protection Division made 487 inspections principally for the following reasons: complaints, encroachments, unauthorized use of public property, location of protective walls, verification of works, and establishment of yacht clubs and marinas.

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 Crown lands for waterworks, log-flumes and other projects connected with the hydroelectric industry.

During the 1965/66 fiscal year, six requests were made.

The Hydraulic Power Division concluded studies started last year and has consequently issued 29 new leases.

Moreover, because of arrears amounting to approximately $1,100,000.00 due for past use of Crown lands for electrical energy transmission lines, Hydro-Quebec and the Department concluded an agreement by which the Hydroelectric Commission agrees to conduct in the future the operation, upkeep and maintenance of various dams in compensation for non-payment of the aforesaid amount.

This agreement was the object of Order in Council No. 1126 of June 8, 1965.

Revenue from these rentals amounted to $42,075.08, compared with $115,163.99 during the preceding year. The decrease was due to the replacement of the rental fees and royalties to be paid by Hydro-Quebec by the fixed royalty mentioned above and by the forthcoming completion of the legalization of all rights of way.

(*b*) As mentioned earlier in this report, the Hydraulic Domain Service issues, in the absence of court decisions, certain opinions as administrative guidance to the Department and other Departments concerning the character of navigability of lakes and rivers of this Province.

During the year, 40 such opinions were issued and studies and special surveys were made on 16 lakes by engineers and technicians of the Service in order to prepare these opinions.

Actually, this work is not done on a sufficiently large scale and it is intended that it should be intensified until a complete inventory of all streams and sheets of water belonging to the Crown is made.

However, because of the lack of personnel at the disposition of the Service the undertaking of this work is not possible.

Appendix VI contains the list of lakes on which surveys were conducted in 1965/66.

The Service has completed the compilation of all opinions issued to date concerning the navigability of the various Quebec water-courses.

This compilation will, without doubt, prove helpful to many government services.

(*c*) In addition to the requests for the establishment of dams whose construction 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 Service may intervene only if the construction of these dams affects parts of watercourses 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 legislation will be passed in order to permit the Service to exercise a closer surveillance on such works which could, in certain cases, constitute a real danger.

During the 1965/66 fiscal year, 120 requests were sent to the Service for the construction and the maintenance of dams of a nature other than that foreseen by the Water-courses Act.

Appendix V gives a list of the various Orders in Council passed by the Lieutenant-Governor in Council.

Moreover, a general census of hunting and fishing clubs was carried out in the previous fiscal year, revealing the existence of 725 dams that were used and maintained by sporting organizations. These dams had been built either by the clubs themselves or had been repaired by them after being abandoned by companies that had maintained the dams for forestry operations. Since the beginning of 1965/66 fiscal year, the Service has assumed the task of legalizing these works.

Order in Council No. 568 of March 23, 1965, authorized the Hydraulic Domain Service to issue leases for such purposes.

Presently, 51 dams have thus been legalized and it is anticipated that 480 leases will be issued for the maintenance of these dams. The other dams will eventually be demolished.

APPENDIX I

Number and date of Order in Council	*Number of transfers*	*Watercourse*	*Location*	*Work done*
882, May 4, 1965	1	Gulf of St-Lawrence	Biron island	Harbor installation
883, May 4, 1965	5	Gulf of St-Lawrence	Pabos	Warping
		Richelieu river	Lacolle	Wharf
		St-Lawrence river	Pabos	Wharf
		Gulf of St-Lawrence	Havre Aubert	Wharf
		Gulf of St-Lawrence	Amherst island	Wharf
954, May 11, 1965	1	Lake St-John	Garnier township	Wharf
1121, June 8, 1965	1	Lac 16 Iles	Montcalm township	Wharf
1122, June 8, 1965	1	Simon lake	Vauquelin township	Unloading dock
1186, June 15, 1965	1	St-Lawrence river	Trois-Rivières	Alignment light
1226, June 21, 1965	1	St-Lawrence river	Trois-Rivières	Alignment light
1800, September 15, 1965	3	St-Lawrence river	Ste-Anne-des-Monts	Wharf
		St-Lawrence river	Grande Grève Gaspé	Wharf
		Turgeon lake	Lavergne township, Amos	Wharf
1801, September 15, 1965	1	Robertson lake	Privat township Abitibi-West	Wharf
2206, November 10, 1965	1	Macamic lake	Macamic village	Wharf

APPENDIX I (Concluded)

Number and date of Order in Council	*Number of transfers*	*Watercourse*	*Location*	*Work done*
2382, December 7, 1965	1	St-Lawrence river	St-Sulpice	Breakwater
139, January 26, 1966	3	Quévillon lake	Quévillon township	Wharf
		Figuery lake	Figuery township	Wharf
		Castagnier lake	La Morandière township	Wharf
171, February 1, 1966	4	Chicobi lake	Guyenne township	Wharf
		Tibériade lake	Turgis township	Wharf
		Mance lake	La Sarre township	Wharf
		Louvicourt river	Pascalis township	Wharf
414, May 11, 1966	1	Grand Lac du Cerf	Dudley township	Wharf
501, March 22, 1966	5	Des Iles creek	Bouthillier township	Wharf
		Grand L. Nomininge	Loranger township	Wharf
		Lac des Journalistes	Pope township	Wharf
		St-Lawrence river	La Malbaie	Wharf
		St-Lawrence river	Les Eboulements	Breakwater
15 Orders in Council	30 transfers			

APPENDIX II

LIST OF ORDERS IN COUNCIL

1. Approving petitions for expropriation of land needed for electrical energy transmission lines.
2. Approval of plans and specifications for hydraulic power harnessing.
3. Transfers.
4. Changes made to previous Orders in Council.
   - — Order in Council No. 715, April 6, 1965, concerning the petition by the Quebec Power Company for the expropriation of certain lands needed for the relocation and the reconstruction of an electrical energy transmission line between terminal sub-station of the Shawinigan Company situated in Quebec City and the electrical sub-station situated west of Doyer street, in Beauport. Number of petitions concerned (5).
   - — Order in Council No. 876, May 4, 1965, concerning the transfer, to the Quebec Hydroelectric Commission, of a dam once used for log-driving, located on Deverick creek, Champlain township, and of the rights and lands belonging to the Crown needed for the upkeep of this dam.
   - — Order in Council No. 950, May 11, 1965, concerning a change to Order in Council No. 860, of April 29, 1964, regarding new agreements between the Department of Natural Resources and persons to be compensated as the result of the correcting of the St. Francis River channel.
     Increase from 1140 HP-year to 2149 HP-year.
   - — Order in Council No. 1120, June 8, 1965, concerning new assessment dues to be paid by those to be compensated as the result of the correcting of the Rivière du Nord channel.
     The annual contribution will be changed from $9.20 per HP-year to $9.65 per HP-year.
   - — Order in Council No. 1126, June 8, 1965, concerning the transfer to Hydro-Quebec of the administration and control of certain dams, reservoirs, diversion works, and related works.
   - — Order in Council No. 1508, August 3, 1965, concerning a change to Order in Council No. 2132, of November 11, 1964, regarding the repayment of expenses brought on to the Electricity and Gas Board by the application of the Public Security Act.
   - — Order in Council No. 1509, August 3, 1965, concerning certain lands to be added to those leased to the Hydro Electric Power Commission of Ontario for the maintenance and the operation of its dam at the "Cave et Fourneaux" site on Ottawa river.
   - — Order in Council No. 1510, August 3, 1965, concerning certain lands to be added to those leased to the Hydro Electric Power Commission of Ontario for the maintenance and the operation of its dam at the "Les Chenaux" site on Ottawa river.
   - — Order in Council No. 1511, August 3, 1965, concerning a request for the approval of plans, estimates, and specifications regarding the work needed for the increase of the power generated at the McCormick plant on Manicouagan river.
   - — Order in Council No. 1563, August 11, 1965, concerning the leasing to Dent Lumber Limited of certain hydraulic forces on Camatose river.
   - — Order in Council No. 1909, September 29, 1965, concerning a reduction of arrears due by the Canadian International Paper Company of Canada for its use in the past of the rights of the

Government of Quebec that it needed for an electrical energy transmission line between Ecumeuses falls and Cooper lake.

— Order in Council No. 2030, October 14, 1965, concerning Trans-Canada Pipe Lines Limited's needs to expropriate a servitude of passage for the construction of a pipeline between the City of Candiac and the State of Vermont in the United States.

— Order in Council No. 2119, October 27, 1965, concerning a change to be made to Orders in Council Nos. 1909 and 1510 of August 3, 1965, regarding certain lands to be added to those leased to The Hydro Electric Power Commission of Ontario for the maintenance and operation of its dams at the "Les Chenaux" and "Cave et Fourneaux" sites on Ottawa river.

— Order in Council No. 2120, October 27, 1965, concerning a change to Order in Council No. 369 of February 25, 1965, authorizing the Minister of Natural Resources to lease land to be partially flooded by the Hydro-Quebec dam at Manicouagan 2, the said land being located in an unsubdivided part of Eudes township, Saguenay county, and serving for the installation of a marine base needed for wood towing on the artificial lake created by the dam.

— Order in Council No. 2162, November 3, 1965, concerning the striking out of rental and royalty arrears owed to the Government of Quebec by the Town of Mégantic under an Act concerning the municipalization of electrical energy by that town (14-15 Geo. VI, Chapter 30).

— Order in Council No. 58, January 13, 1966, concerning the transfer of rights held by Richmond Pulp and Paper Co. of Canada Ltd. on hydraulic power of the Brompton site on St. Francis river to Kruger Pulp and Paper Company Ltd.

— Order in Council No. 170, February 1, 1966, concerning a request by J.A. Bois for the rental of hydraulic power on Noire river, in an unsubdivided part of Chauveau township, Charlevoix county.

— Order in Council No. 278, February 17, 1966, concerning a change in Orders in Council Nos. 1509 and 1510, of August 3, 1965, and the repeal of Order in Council No. 2119, of October 27, 1965.

— Order in Council No. 416, of March 11, 1965, concerning lands to be added to those leased to The Hydro Electric Power Commission of Ontario, for the maintenance and operation of "Les Joachims" dam on Ottawa river.

APPENDIX III

List of Orders in Council authorizing the approval of plans and specifications, and the rental of lands needed for the construction, maintenance, and operation of log-driving dams deemed useful to timber companies for their log-driving operations — Fiscal year 1965/66.

— Order in Council No. 798, April 23, 1965, concerning a request by Dominion Tar and Chemical Company Ltd. for the construction, maintenance, and operation of two (2) dams to facilitate log-driving.

— Order in Council No. 799, April 23, 1965, concerning a request by Quebec North Shore Paper Company, for the construction, maintenance, and operation of three (3) dams to facilitate log-driving.

— Order in Council No. 878, May 4, 1965, concerning a request by Dominion Tar and Chemical Company Ltd., for the construction, maintenance, and operation of eight (8) dams to facilitate log-driving.
— Order in Council No. 879, May 4, 1965, concerning a request by Canadian International Paper Company, for the construction, maintenance, and operation of three (3) dams to facilitate log-driving.
— Order in Council No. 880, May 4, 1965, concerning a request by Price Company Ltd., for the construction, maintenance, and operation of seven (7) dams to facilitate log-driving.
— Order in Council No. 952, of May 11, 1965, concerning a request by Consolidated Paper Corporation Ltd., for the construction, maintenance, and operation of four (4) dams to facilitate log-driving.
— Order in Council No. 953, May 11, 1965, concerning a request by Murdock & Murdock Company Ltd., for the construction, maintenance, and operation of two (2) dams to facilitate log-driving.
— Order in Council No. 955, May 11, 1965, concerning a request by Price Company Ltd., for the construction, maintenance, and operation of one (1) dam to facilitate log-driving.
— Order in Council No. 1016, May 18, 1965, concerning a request by Coulonge and Crow River Boom Company Ltd. for the construction, maintenance, and operation of eight (8) dams to facilitate log-driving.
— Order in Council No. 1337, July 12, 1965, concerning a request by Anglo Canadian Pulp and Paper Mills Ltd., for the construction, maintenance, and operation of seven (7) dams to facilitate log-driving.
— Order in Council No. 1338, July 12, 1965, concerning a request by Canadian International Paper Company Ltd., for the construction, maintenance, and operation of nine (9) dams to facilitate log-driving.
— Order in Council No. 1339, July 12, 1965, concerning a request by E.B. Eddy Company Ltd., for the construction, maintenance, and operation of nine (9) dams to facilitate log-driving.
— Order in Council No. 1340, July 12, 1965, concerning a request by Gillies Bros. & Company Ltd., for the construction, maintenance, and operation of six (6) dams to facilitate log-driving.
— Order in Council No. 1343, July 12, 1965, concerning a request by St-Regis Paper Company (Canada) Ltd., for the construction, maintenance, and operation of three (3) dams to facilitate log-driving.
— Order in Council No. 1344, July 12, 1965, concerning a request by St-Regis Paper Company (Canada) Ltd., for the construction, maintenance, and operation of two (2) dams to facilitate log-driving.
— Order in Council No. 1507, August 3, 1965, concerning a request by Anglo Canadian Pulp and Paper Mills Ltd., for the construction, maintenance, and operation of three (3) dams to facilitate log-driving.
— Order in Council No. 1564, August 11, 1965, concerning a request by Dominion Tar and Chemical Company Ltd., for the construction, maintenance, and operation of two (2) dams to facilitate log-driving.

— Order in Council No. 1799, September 15, 1965, concerning a request by Canadian International Paper Company, for the construction, maintenance, and operation of two (2) dams to facilitate log-driving.
— Order in Council No. 2033, October 14, 1965, concerning a request by Price Company Ltd., for the construction, maintenance, and operation of six (6) dams to facilitate log-driving.
— Order in Council No. 2034, October 14, 1965, concerning a request by Domtar Company Ltd. for the construction, maintenance, and operation of one (1) dam to facilitate log-driving.
— Order in Council No. 2035, October 14, 1965, concerning a request by Canadian International Paper Company, for the construction, maintenance, and operation of one (1) dam to facilitate log-driving.
— Order in Council No. 2036, October 14, 1965, concerning a request by Quebec North Shore Paper Company, for the construction, maintenance, and operation of one (1) dam to facilitate log-driving.
— Order in Council No. 2118, October 27, 1965, concerning a request by Donohue Company Ltd., for the construction, maintenance, and operation of three (3) dams to facilitate log-driving.
— Order in Council No. 2164, November 3, 1965, concerning a change in Order in Council No. 221, February 13, 1962, regarding a request by Consolidated Paper Corporation Ltd., for the construction, maintenance, and operation of three (3) dams to facilitate log-driving.
— Order in Council No. 2301, November 24, 1965, concerning a request by St-Regis Paper Company (Canada) Ltd., for the construction, maintenance, and operation of one (1) dam to facilitate log-driving.
— Order in Council No. 2381, December 7, 1965, concerning a request by Canadian International Paper Company, for the construction, maintenance, and operation of one (1) dam to facilitate log-driving.
— Order in Council No. 2429, December 15, 1965, concerning a request by Domtar Company Limited, for the construction, maintenance, and operation of one (1) dam to facilitate log-driving.
— Order in Council No. 2430, December 15, 1965, concerning a request by Price Company Ltd., for the construction, maintenance, and operation of two (2) dams to facilitate log-driving.
— Order in Council No. 2507, December 29, 1965, concerning a request by Domtar Company Limited, for the construction, maintenance, and operation of one (1) dam to facilitate log-driving.
— Order in Council No. 81, January 19, 1966, concerning a request by Anglo Canadian Pulp and Paper Mills Ltd., for the construction, maintenance, and operation of one (1) dam to facilitate log-driving.
— Order in Council No. 136, January 26, 1966, concerning a request by Murdock & Murdock Company Ltd., for the construction, maintenance, and operation of one (1) dam to facilitate log-driving.
— Order in Council No. 137, January 26, 1966, concerning a request by Price Company Ltd., for the construction, maintenance, and operation of one (1) dam to facilitate log-driving.

— Order in Council No. 226, February 8, 1966, concerning a request by Canadian International Paper Company, for the construction, maintenance, and operation of one (1) dam to facilitate log-driving.
— Order in Council No. 258, February 15, 1966, concerning a request by Domtar Company Limited, for the construction, maintenance, and operation of one (1) dam to facilitate log-driving.
— Order in Council No. 318, February 23, 1966, concerning a request by Domtar Company Ltd., for the construction, maintenance, and operation of one (1) dam to facilitate log-driving.
— Order in Council No. 412, March 11, 1966, concerning a request by Canadian International Paper Company, for the construction, maintenance, and operation of five (5) dams to facilitate log-driving.
— Order in Council No. 502, March 22, 1966, concerning a request by Murdock & Murdock Company Ltd., for the construction, maintenance, and operation of one (1) dam to facilitate log-driving.

APPENDIX IV

List of Orders in Council authorizing the granting by letters patent, and the rental of mainland and beach lots whose areas are greater than that permitted by the general Orders in Council.

— Order in Council No. 697, April 2, 1965, concerning the granting by letters patent of a beach and deep-water lot forming part of Des Sables Lake bed, parish of Sainte-Agathe-des-Monts, Terrebonne county.
— Order in Council No. 712, April 2, 1965, concerning the rental to Saguenay Terminals Company Limited of two (2) beach and deep-water lots forming part of the Ha! Ha! Bay bed.
— Order in Council No. 713, April 6, 1965, concerning the rental to the Town of Chandler of a beach and deep-water lot forming part of Grand Pabos Bay bed, for the construction of a golf course.
— Order in Council No. 881, May 4, 1965, concerning the granting, to the succession of Léopold Lamarre, of letters patent for beach and deep-water lot No. 1-4 forming part of Lake Saint-Louis of the official cadastre of the parish of Pointe-Claire, registry district of Montreal.
— Order in Council No. 1184, June 15, 1965, concerning the granting by letters patent, of certain retrieved lands on Des Prairies river, within in the city limits of Montreal North.
— Order in Council No. 1341, July 12, 1965, concerning a request by New Brunswick International Paper Company, for the rental of a beach and deep-water lot located at the mouth of Nouvelle river, Nouvelle township, Bonaventure county.
— Order in Council No. 1342, July 12, 1965, concerning a request by New Brunswick International Paper Company for the rental of a beach and deep-water lot located at the mouth of Escuminac river, Nouvelle township, Bonaventure county.
— Order in Council No. 1345, July 12, 1965, concerning the rental of two (2) beach and deep-water lots and two (2) mainland lots contiguous to them at Des Rapides lake, to Northern Wings Ltd. and Quebec Labrador Airways Limited.

— Order in Council No. 1346, July 12, 1965, concerning the rental of a beach and deep-water lot and a mainland lot contiguous to it, at Squaw lake, New Quebec territory.
— Order in Council No. 1379, July 12, 1965, concerning changes to a lease between the Government of Quebec and the City of Shawinigan.
— Order in Council No. 80, January 19, 1966, concerning the granting by letters patent of a beach and deep-water lot in the bed of Lake Saint-Louis, in front of Pointe-Claire parish.
— Order in Council No. 112, January 19, 1966, concerning the rental to Bunge Corporation of a beach and deep-water lot forming part of St-Lawrence river bed, in front of the City of Sept-Iles.
— Order in Council No. 579, March 29, 1966, concerning a request by Murdock & Murdock Company Ltd., for the rental of a beach and deep-water lot located on Ouasiemska river, in Girard Beaudet townships, Roberval county.

APPENDIX V

List of Orders in Council concerning the rental of lands needed for the construction of dams for waterwork purposes and for the operation of dams for sporting purposes.

— Order in Council No. 956, May 11, 1965, concerning the rental of rights and lands needed for the maintenance and operation of a dam for sporting purposes.
— Order in Council No. 1565, August 11, 1965, concerning a request by the town of Murdochville for the maintenance and operation of a storage dam at the outlet of Porphyry lake, located on Block 15, Holland township, Gaspé-North county.
— Order in Council No. 2117, October 27, 1965, concerning the rental to the "Club de Chasse et de Pêche Labbé Inc." of rights and lands needed for the maintenance and operation of a dam for sporting purposes.
— Order in Council No. 2248, November 17, 1965, concerning the rental to the Municipal Corporation of Saint-Eugène, Roberval county of the right to use Cristal lake and a contiguous three-chain-wide stretch of land.
— Order in Council No. 2351, December 1, 1965, concerning the rental to the Donnacona Hunting and Fishing Club of rights and lands needed for the maintenance and operation of a dam for sporting purposes.
— Order in Council No. 2352, December 1, 1965, concerning the rental to the Masketsy Hunting and Fishing Club of rights and lands needed for the maintenance and operation of a dam for sporting purposes.
— Order in Council No. 2380, December 7, 1965, concerning the rental to the Masketsy Hunting and Fishing Club of rights and lands for the maintenance and operation of a dam for sporting purposes.
— Order in Council No. 65, January 13, 1966, concerning a request by the Municipal Corporation of the Latulipe and Gaboury United Townships, regarding the use of Sans Nom lake, located on lots 38 and 39, Range VIII, Latulipe township, for waterwork purposes.

— Order in Council No. 344, March 1, 1966, concerning a request by the Quebec North Shore Paper Company, regarding the construction, operation and maintenance of two dams, with a view to forming a water reservoir, for aqueduct purposes.

APPENDIX VI

List of lakes that required a local survey prior to the issuance of an opinion—Fiscal year 1965/66.

Pembina river, located in Grandison township, Terrebonne county.
Waterloo lake, located in the town of Waterloo, Shefford county.
Saint-François d'Assise lake, located in Montigny township, Labelle county.
Rousselot lake, located in Laverlochère township, Témiscamingue county.
Deligny lake, located in the Lanaudière seigniory, Berthier county.
Talon lake (des Vases), located in Rolette township, Montmagny county.
Lady lake, located in Mulgrave township, Papineau county.
Sans Nom lake, located in Vasson township, Abitibi-East county.
Grignon lake, located in Beresford township, Terrebonne county.
Morigeau lake, located in Ashburton township, Montmagny county.
Dorus lake, located in Mousseau township, Labelle county.
Fauburn lake, located in Dorion township, Pontiac county.
Trois Milles lake, located in Whitton township, Frontenac county.
Corbeau lake, located in Brandon township, Berthier county.
Proctor lake, located in Montcalm township, Argenteuil county.
Sainte-Marie lake, located in Sainte-Agnès parish, Charlevoix county.

APPENDIX VII

HYDRAULIC DOMAIN SERVICE
STATEMENT OF INCOME

		Comparative Table	
		1964/65	1965/66
(*a*)	Interest	$ 53,367.58	$ 72,398.12
(*b*)	Sundry fees (Hydraulic Service)	12,420.00	19,894.75
(*c*)	Storage dams	468,893.59	729,431.59
(*d*)	Hydraulic power	2,351,070.03	2,203,137.06
(*e*)	Beach lots	31,027.88	100,542.66
(*f*)	Log-driving dams	291,824.61	533,980.81
(*g*)	Land sales	152.00	7,315.58
(h)	Income on number of kilowatt-hours of electricity produced — P.E.	2,367,453.72	2,500,936.32
(*i*)	Quebec Hydroelectric Power Commission contribution	19,213,832.89	19,547,903.16
(*j*)	Transmission lines	115,163.09	42,075.08
	Total Income	$24,905,205.39	$25,757,615.13

STUDY AND RESEARCH SERVICE

Established in 1962, the Study and Research Service expanded noticeably during the fiscal year of 1965/66. Its main task gained importance during the year, particularly by completing long-term studies within the framework of other Services of the Hydraulic Services. Its contributions have therefore enabled the two other administrative units of the Hydraulic Services to accelerate the pace of their current business.

The Service continued to draw up plans destined to improve the course of some rivers of the Province and cooperated in the preparation and in the perfecting of other work projects related to the control of the flow of certain watercourses in order to protect urban as well as rural centers against the inrush of water. It has also participated in the settlement of various technical questions relating to the administration of the hydraulic domain.

Personnel:

The technical staff of the Service increased and, at the end of the fiscal year under review, the personnel comprised four (4) engineers and five (5) technicians, compared with that of three (3) engineers and three (3) technicians during the preceding fiscal year. Moreover, two (2) students were hired during the summer of 1965 to assist the technicians in the compilation and charting of the various results obtained from studies carried out by engineers.

Achievements:

In retrospect, the Service's activities during the 1965/66 fiscal year reveal an appreciable increase in comparison with those of the preceding fiscal year. The list includes a good number of accomplishments, the main ones being:

A. LONG-TERM PROJECTS:

Chaudière Over-All Project
(Beauce County)

Ice-bearing floods:

In connection with studies relating to the control of ice-bearing floods on Chaudière river, the Study and Research Service published a report comprising an analysis of the cryological observations compiled during the preceding years, along with a description of the works and construction proposed. Comparative figures of the estimated costs of the proposed solutions and the evaluation of the damages caused by this type of flood are also given in that publication.

Jersey Mills Dam

Among the solutions proposed to control the regime of ice-floes on the Chaudière, the future dam at Jersey Mills, immediately upstream from Saint-Georges, represents the main work project. The Study and Research Service's contribution in connection with the conception of this project was to determine the basic elements involved after available hydrometric data were interpreted and the dam's stability was calculated with particular attention to the thrust from ice that the dam will have to endure.

Breakwater at Beauceville

In order to specify standards for the construction of a future breakwater at the foot of Diable rapids, immediately upstream from Beauceville, one of the Service's engineers was assigned to build a small model at the hydraulic laboratory of the Civil Engineering Department of Laval University. Operation of this model was confided to a Service technician. It reproduced on a small scale the section of the river where the above-mentioned construction, a key element of the Chaudière over-all project, will be built. This laboratory installation will enable the Service to analyse and forecast accurately the consequences of the changes that are to be made to the prototype. By putting this project, which is to be carried out by the Engineering Service during 1967, into concrete form, the Service is endeavoring to accentuate the retention of ice in a place where major accumulations permitting the normal clearance of the downstream sections had been observed several times. The effects of this project will combine with the ice retention anticipated by the putting into operation the Jersey Mills dam and with the breaking up facilities already improved by the dredging carried out downstream from Beauceville.

Floods along free water:

The section mainly affected by the swelling waters of the Chaudière is that of the "still waters" located between Saint-Maxime-de-Scott and the foot of Diable rapids, immediately upstream from Beauceville. In order to know the extent to which it will be necessary to lower the level of the sheet of water so as to halt the invasion of water into urban and rural properties of the area, whirlpool graphs were established for different flows all along the section concerned. The Service also started a study of storage possibilities on the main tributaries, such as Famine and Loup rivers with a view to regulating the flow and at the same time reducing the swelling. The choice of sites among those suitable for the construction of dams capable of storing a sufficient amount of water remains to be made. Moreover, this choice will be influenced by the results of a feasibility study with special emphasis on comparative costs of the adopted projects after evaluation of previous damages caused by floods along free water sections and of the benefits expected from the completion of the preconceived works.

Protection by means of vegetation:

Most of the bank segments reshaped as a result of dredging carried out at various locations between Saint-Maxime-de-Scott and Beauceville were protected at the base by rock covering, whereas, in some sectors, the upper part of the new banks were consolidated by means of shrubby and herbaceous vegetation. During the summer and fall of 1966, one of the Service's technicians prepared a program of work and later supervised the stabilization and embellishing work completed along a total distance of 10,600 feet.

Plantes River:

The Plantes river, a tributary of the Chaudière in Saint-François parish, was the subject of a study conducted by this Service, which submitted plans for a dredging project along a 2,000-foot section located between the railroad bridge and the mouth of the Plantes, to the Agricultural Hydraulic Service of the Department of Agriculture and Colonization. The Study and Research Service was consulted in this case so that the planning of this dredging enters within the framework of the Chaudière over-all project and that the correction of part of this tributary's bed does not eventually cause the formation of shoals in Chaudière river.

Châteauguay River
(Châteauguay and Huntingdon Counties)

Representations were made to the Department by the Châteauguay River Planning Committee, which is made up of riverside municipalities in the above-mentioned counties, and a firm of consulting engineers hired by these corporations has obtained from this Service technical information compiled specifically with a view to improving this watercourse.

This documentation contained, among other things, an account of the observations compiled during the winter of 1965/66 in the vicinity of the Châteauguay river's mouth where costly ice-jams had occurred during the preceding spring.

At the end of the fiscal year under review, the Châteauguay River Planning Committee, through its consulting engineers, submitted to A.R.D.A. a proposition for a two-year study project estimated to cost $90,000.

This Service intends to continue its observations during the winter season of 1966/67 and anticipates entering into communication with the St. Lawrence Seaway Administration in order to obtain information cencerning the advance of ice in this sector since the installation of the channel in the Seaway.

Sainte-Anne River
(Portneuf County)

In the last few years, the consulting engineering firm of Cartier and Leclerc of Montreal has conducted, at the Department's request, a hydrological survey of the Sainte-Anne River drainage basin in order to determine the factors creating floods at Saint-Raymond and subsequently to present recommendations as to the measures to be taken to improve the situation. The town of Saint-Raymond has often suffered in the past from major damages caused by the inrush of water and ice, and a historical study covering the 1893-1957 period was undertaken in order to establish the interval of recurrence of such floods.

One of the reports prepared by Cartier and Leclerc and submitted in January 1966 treats of the storage possibilities on the Sainte-Anne river upstream from Saint-Raymond and on the Bras-du-Nord, its main tributary. From the characteristics submitted for each dam site studied, this Service has tried to establish an order of growth of the cost of the over-all works necessary for the control of the flooding. The exact influence of the reservoir dams on the flooding hydrograph at Saint-Raymond remains to be evaluated.

During the winter of 1965/66, ice-cover samples were taken by technicians of the Service in sectors susceptible to the formation of ice-jams in order to complete the data already gathered on the ground during the preceding years. These tests mainly serve to specify the amount of accumulated ice in the minor bed. Several inspections were also carried out during the spring of 1966 to observe the break-up. On Sainte-Anne river, as on the majority of the St. Lawrence tributaries, the weather that prevailed during that period favored a somewhat slow melting of the level bed on the basin and this factor along with a progressive descent of the ice did not leave any ice-jams in the critical sections.

Saint-François River
(Richmond County)

The Department assigned the Lasalle Hydraulic Laboratory to study a small-scale model in order to determine the most economical solution that would restrict to an acceptable maximum limit the possible height-

ening of the water level resulting from ice accumulations passing or coming to rest in the head-bay of the dam operated by Kruger Pulp at Brompton-ville. These laboratory experiments also aim at specifying the exact nature of works and constructions that the Department will be called upon to undertake in order to control the ice flow, so as to protect adequately the territory of the town of Bromptonville and the riparian farms located between this municipality and Sherbrooke against floods during the break-up period.

Built with reinforced concrete at the scale of 1/72nd and without distortion, this model reproduces on a small scale a section of the river over a length of 6,300 feet and an average width of 1,000 feet.

The Study and Research Service provided all the information required for the construction and operation of the model. It also assisted in the establishment of a testing program and it periodically follows the progress of this research. As soon as a definite solution is proposed, this Service will supply the Engineering Service (Waters) with all the necessary elements for the planning of a project to be undertaken at the end of 1966 or at the beginning of 1967.

B. STUDIES CARRIED OUT FOR OTHER ADMINISTRATIVE UNITS:

FOR THE WATERS BRANCH :

Saint-Jean River
(Kamouraska and L'Islet Counties)

Plans for the installations of a reservoir-dam at the Dickey site on Saint-Jean river show that prominent sheets of water will be formed as a result of the raising of the Saint-Roch, Noire, and Eau Claire river levels in the above-mentioned counties. A preliminary study was carried out by this Service to explore the possibilities of establishing, around this surface of water, a provincial park for tourist and recreational purposes. A report to this effect was presented to the Quebec representative on the International Committee in charge of analysing the consequences resulting from the completion of this project.

FOR THE HYDRAULIC DOMAIN SERVICE:

Moulin River
(Chicoutimi County)

Following a request made by the town of Rivière-du-Moulin concerning the recovery of land forming part of the river bed, near the mouth of Moulin river, this Service found that reducing the flowing section in this place would not disturb the river's normal hydraulic regime. So as to stabilize the permitted limit of filling, the Service submitted to the town a proposed project that provided for the construction of a raised strip of ground protected by a retaining wall and the placing of two watermains to drain water from a small creek. The carrying out of this project will enable the town eventually to install there a public park with a beach and to build a purification plant.

Des Prairies River
(Laval County)

Most of the property owners along the banks of Des Prairies river have encroached on the bed of this domanial river. The grounds for these illegal encroachments on the foreshore were varied: the enlargement

of the riparian property; the filling up of the shore in order to eliminate the disagreeable odors caused by the periodical lowering of the water level; installation of small works to facilitate the docking of pleasure boats, etc. The reasons given to justify these encroachments are nevertheless generally justifiable.

In order to legalize all these encroachments, the Hydraulic Domain Service has proposed the ceding of the lands recovered from the river bed for a nominal price, upon the condition that the riparian owners erect a retaining wall at the extremity of this fill. This demand from the Department serves two purposes: to put a stop to these encroachments, which are liable to cause a lack of balance in the normal hydraulic running of the river and consequently provoke erosion and flooding problems, and to facilitate a rational planning of this river's banks.

On January 18, 1964, and June 15, 1965, Orders in Council authorized the Department to undertake work on that part of Des Prairies river within the limits of the town of Montreal North from the eastern limit of this town to Hénault Avenue. This first phase of the whole project was mainly carried out by the Study and Research Service, which at the end of the 1965/66 fiscal year made way for the following stages: consultations with riparian owners, these talks being 90 per cent completed; the signing of promises of sale by 72 per cent of the owners; and the issuance of letters patent to 8 per cent of the owners.

The second phase of the project will be undertaken during the next fiscal year with the active cooperation of the municipality of Montreal North, which, according to an agreement with the department, ought to ensure the cost of surveying and plans for the section of Des Prairies river between Hénault Avenue and the western limit of this town.

It should be mentioned that this initiative represents a pilot project that will serve to test a procedure to be used for the settlement of identical encroachments encountered along other watercourses of the Province. It may be said that this experiment, even if it is not completed, is conclusive and constitutes the best element of solution to settle in a satisfactory way this serious problem.

Archambault Lake
(Montcalm County)

The analysis of the influence of an artificial sill, erected at the outlet of Tile lake, on the high water level of Archambault lake, has enabled the Service to establish general theoretical standards applicable to the variations caused by this type of obstacle. Once this experimental work had been completed, the Service applied the results to illustrate that the average heightening of the high water level of Archambault lake produced by the sill was 5.78 feet. The obstacle in question is situated on lot 35, Range III, Lussier township.

Achigan Lake
(Terrebonne County)

The natural section of the lake's outlet is narrowed by the remains of an old dam and the Service investigated, according to its theoretical criteria, the consequences of the reduction of this section. The readings resulting from limnimetric scales installed 4 years ago have served to estimate the average level of the lake in its present state, and it was concluded that this narrowing heightens the average level of the high waters by approximately 0.33 feet, starting from lots 22-A and 23-A, Range VIII, Kilkenny township.

Souris Lake
(Saint-Maurice County)

This lake's outlet is controlled by two artificial sills situated in front of lot 6, Range XI, Caxton township. Results from observations revealed that these two controls heighten the level of high waters by 3.85 feet.

Two Mountains Lake
(Two Mountains County)

A general type problem was submitted to the Service regarding the influence of certain piers built along a few lakes and rivers on the flow and on the sandbanking of beaches surrounding these works. To prepare a study of this problem, the Service adopted as a prototype a pier situated in front of part of lot 17, Côte-Sainte-Philomène, in l'Annonciation d'Oka parish. After collecting several samples at that location and after these had been analysed by the Pilot-Plant, the Service attempted to establish certain general standards relating to the opening of water passes. This work was done by taking into account construction methods, hydraulic conditions (flow, maximum difference between the high water and low water levels, ice circulation, etc.), and meteorological conditions (course of prevailing winds).

The Service intends to follow, with the direct cooperation of the Hydraulic Domain Service, the evolution of the bed in the vicinity of a pier to be built on the same lake according to set standards. The planned observations will make it possible to improve and to test the value of these standards entered in a report that also contains several recommendations made by this Service and pertaining to matters of works in watercourses. The purpose of this report is to supply the Hydraulic Domain Service with valid criteria which will serve as reference before the issuance of permits on Crown lands.

Mapping

The Service elaborated on a method and plan of work in order to represent graphically the tenure of Quebec's waters following an experimental study outlined at the level of a township situated in the Hull area. The continuation of this study depends on the hiring of a technician who will be specifically assigned to this task for a period of about three years. In this matter the Service, also participated in the editing of an information booklet entitled "A qui appartient le lit des rivières et les lacs du Québec?" Several copies of this booklet have been distributed to those interested in this question.

FOR THE ENGINEERING SERVICE (Waters) :

Humqui River
(Matapédia County)

At the beginning of 1965, the town of Amqui, in Matapédia county, acquired a vacant parcel of land bordering Humqui river, near its confluence with Matapédia river, in order to open a park and to build a Cultural Activity Center, part of the Canadian Confederation Centennial Program. However, the adequate use of land needed necessitated the diversion of part of Humqui river and, for that purpose the engineering firm of Mé-

nard and Marsan of Rimouski prepared a dredging project and submitted it to the Study and Research Service for examination.

The study carried out by the Service has shown that one of the main consequences of pursuing the proposed dredging project would be a considerable increase of the slope of the river bed in the section considered. Such an increase in dip would necessarily result in greater speed of flow, which would then accelerate, particularly at the entrance of the dredged section, the regressive underwashing of the new bed and the erosion of the banks upstream. In order to prevent a hydraulic unbalance in the whole sector between the mouth of Humqui river and lot 54-A-3 of Range IV, in Amqui township, the Study and Research Service made the following recommendations: i) Ease the dredging curve and construct three immersed sills having a height of 3 feet and spaced 1,750 feet from each other in order to reduce the slope and to stabilize the new bed; ii) Construct foundations under the covering of the banks resulting from dredging, in order to prevent underwashing from rapidly undermining this protection and thus affect its stability; iii) Protect the banks upstream from the dredging where there is a meander in full evolution favoring the formation of islands. The purpose of this precaution is to impound the flow in a degenerated segment where there is a danger of the river's changing its course during a swelling.

The dredging and the construction of the downstream sill were undertaken by the town of Amqui during the present fiscal year, and the Engineering Service (Waters) is to complete this project during the fiscal year of 1966/67.

FOR THE ENGINEERING SERVICE (Mining) :

Chibougamau Lake
(Abitibi-East County)

A preliminary plan for the diversion by Queylus bay of the waters of Chibougamau lake was prepared. For this diversion, the dredging of a canal between Queylus bay and Merrill lake, as well as the installation of a sill to control the upstream level, was recommended. The purpose of this arrangement is to lessen the output of water flowing by Doré lake and thereby to reduce the difference in level caused by the narrowing of a culvert of the road linking Merrill island to the mainland.

C. COLLABORATION WITH DEPARTMENTAL AND INTERDEPARTMENTAL COMMITTEES:

Policy Concerning Waters

One staff member took part regularly at meetings of the Committee formed by the Planning Branch of the Department in order to establish the foundations of a policy concerning waters that will eventually lead to the drafting of legislation destined to change present policies on watercourses. The representative wrote reports on the meetings held by this committee.

Tourist Planning Committee

The director of Hydraulic Services actively representing the Department at this body has often delegated a staff member to take part at meetings of this committee. It was after representations made by this

delegate that the Committee set up a working team assigned to recommend standards relating to recreational and tourist planning. For this reason, and with the approval of the authorities of the Department, a basic documentation giving the Service's point of view in relation to this matter was presented.

Conference : "Pollution and Our Environment"

Within the scope of the preparatory work for this Conference, at the end of October 1966, the Service presented a document indicating the interests of the Quebec delegates in connection with the topics to be discussed at the meetings. This collaboration will be continued as the result of requests to summarize reference papers concerning the above-mentioned subject.

Information

A text describing the role of specialized personnel within the various Services of the Waters Branch was prepared. This was the contribution of the Service's representative to a committee formed to publish an information booklet destined for the eventual recruiting of university graduates for the needs of the Department.

D. MISCELLANEOUS ACTIVITIES:

Sedimentology Campaign

The first part of the established program included the study of the turbidity of Chaudière river in order to find a solution to the problems caused by an intensive deposition of sediments accumulating mainly at the confluence of its most important tributaries. For this purpose, two series of samples were collected along Chaudière river and then analysed in the Service's rudimentary laboratory. Representative samplings in the bed of Nouvelle river in Gaspé-North county were collected in order to disclose the bottom haulage caused by the swelling of these two streams. Eventually, works related to this campaign will come under the Hydrometry Service of the Department, the activities of which are more related to this type of experimenting.

Grant to Laval University

Following recommendations made by the Service, the Department awarded the Civil Engineering Department of Laval University a grant of $6,200 for the testing by way of experiment of a process for stabilizing banks constitued by crumbly and low-density materials. This method of protection may be identified with the installation of a wood-lath carpet of the snow-fence type which would promote the development of dense vegetation. The bibliographical and theoretical part of this experimenting was carried out during the 1965/66 fiscal year by a student from the Graduate School of Laval University who has produced a report entitled "Méthodes de protection des berges". Meanwhile, the construction of the model, along with its calibration, was started and the Service is expected to follow the progress of experiments to be carried out in 1966 and 1967.

Laboratory Experiments

An engineer of the Service presented a thesis to the Graduate School of Laval University entitled "Etudes cryologiques sur les phénomènes de débâcle en rivières". This work reports the results of experiments carried out during the 1965/66 fiscal year at the laboratory of the university's Civil Engineering Department. This research work, which was encouraged by the Department, aims especially at determining the nature of works apt to resorb floods caused by ice-jams in rivers.

Eastern Snow Conference

Another member of the engineering staff participated at the annual meeting of this organization which was held in Hartford, Connecticut, February 9 to 11, 1966, where he presented a paper entitled "Ice Cover Progression in the Chaudière River".

HYDROLOGICAL SERVICES

The Hydrological Services, through their Meteorology, Hydrometry, and Hydrography Services, are responsible for collecting, studying, and supplying the fundamental data on Quebec's waters.

This work is based on the observation, compilation, and analysis of an extensive range of data on precipitation and other meteorological factors, variations in the level of lakes and rivers, variations in the flow of rivers, and the topography and hydrography of watercourses.

HYDROGRAPHY SERVICE

The Hydrography Service studies the purely geometric characteristics of drainage basins of watercourses. The data are obtained through topographic surveys. The studies consist mainly in establishing the longitudinal sections of rivers, the vertical control necessary for mapping, the sounding of lakes, the determining of the area, and relief of drainage basins.

During the 1965/66 fiscal year, the work consisted mainly in establishing altitude bench-mark lines along the rivers in order to determine the profile and to link these different survey lines to each other to ensure the quality of the surveying. The work was concentrated on the rivers of the St. Lawrence North Shore in the Havre-Saint-Pierre and Blanc Sablon areas. A summary of these works, including the number of miles surveyed, follows.

(*a*)	Magpie-Ouest river, from latitude 50°40' and longitude 64°31' to Vital lake	32
(*b*)	Link between the Magpie and Saint-Jean rivers	40
(*c*)	Romaine river, from latitude 50°25' and longitude 63°51' to Lozeau lake	142
(*d*)	Link between the Romaine and the Natashquan rivers	65
(*e*)	Natashquan river, from its mouth to latitude 51°55' and longitude 62°10'	154
(*f*)	Link between Natashquan river and Cormier lake	14
(*g*)	Olomane river, from latitude 50°35' and longitude 60°30 to latitude 51°20' and longitude 60°40'	35

(*h*)	Saint-Augustin river, from its mouth to latitude 51°47' and longitude 58°55'	50
(*i*)	Saint-Paul river, from its mouth to latitude 51°58' and longitude 57°51'	41
(*j*)	Link between Manitou river and Sheldrake	16
	Total number of miles surveyed	589

In order to carry out this work, eight survey parties were sent into the field from May to September. These parties included 40 students from various schools of engineering and 31 auxiliary employees such as cooks, canocmen, and linecutters.

Four students were hired to do office work during the summer of 1965. They worked mainly on the preparation of a series of pamphlets summarizing the survey work previously carried out on the rivers of the James Bay and Hudson Bay basins. These pamphlets give the description, the location and the altitude of all bench-marks placed in the forementioned basins. They will be published in 1966/67. The same information will also be available, in the near future, for the rivers of the North Shore and Ungava bay.

Within the scope of topographical studies of river basins, a program consisting in calculating the areas of drainage basins with the help of planimeters was established. This work is carried out in a systematic way on the most accurate maps available and covers all the rivers and streams of the Province. Figures obtained will be used in the future as the area of the drainage basin, thus eliminating the present problem of having several different figures for the same basin.

Since September 1965, the study of the water levels of lakes and rivers was transferred from the Hydrometry Service to the Hydrography Service. There were, at the end of March 1966, a total of 66 stations, 10 of which were equipped with recording apparatus. Until now, the choice of stations sites depended on requests for information from various department services and from the public in general. In the future, the Service foresees a network of limnometric stations at locations where water levels will serve as a basis for the determination of riparian rights. To serve these two purposes. the network is to be increased by about 15 stations annually.

HYDROMETRY SERVICE

Activities in 1965/66

Demands increased for information on the characteristics of the Province's watercourses regime, thus illustrating the need for the operation of an adequate network of limnometric stations. This network will make it possible to obtain the necessary data for studies on the regional variability of the outflow and the level and flow of watercourses in times of swelling and low water level. These studies on the regime of watercourses are motivated in part by the use of water for the following purposes: domestic, industrial and agricultural consumption, log-driving, navigation, leisure, etc.; and further, by the necessity of carrying out various engineering works, in order to enable the production of electrical or mechanical energy, the control of flood waters, the stabilization of water plans, the protection of banks, the construction of bridges, etc.

It is therefore apparent that, the role of the Hydrometry Service must be filled in the best possible way, because it is essential to the

rational operation of this renewable resource. Also, in order to plan its activities according to the present and future use of this resource, the Service is now active in four main fields. Its first responsibility is to collect first-rate hydrometric data enabling it to render the required services. Secondly, the Service is responsible for the publication of these data for the benefit of interested parties. In addition of these functions, the Service endeavors to continue short- and long-term hydrological studies so as to acquire a better knowledge of Quebec's regime of watercourses and to be able to operate the hydrous resources of the Province to their fullest. Finally, its fourth function consists in the operation of reservoir dams built to regularize the flow of certain watercourses. The activities of the Service during the 1965/66 fiscal year will be explained in detail in this report.

It should be noted that limnometric stations are now the responsibility of the Hydrography Service, which is part of the Hydrological Services. In this connection, the Northern and Western Divisions will continue, for practical reasons, to inspect the limnometric stations in New Quebec and in Témiscamingue. However, the examination and compilation of the data collected at these stations now come under the jurisdiction of the aforesaid Service.

Hydrometric Data

The Hydrometry Service has set up a five-year program that aims to double the number of gauging stations and to replace the manual equipment in existing station with recorders. This five-year plan will lead to an improvement of the data collected and to a better distribution of the stations in order to obtain a more exact appreciation of the characteristics of the flow of the Province's watercourses.

Formerly, the establishment of a network was mostly related to hydroelectric potential of the rivers and the choice of a station was limited by the accessibility of the site and by the availability of an observer. Today, water has become a major problem, owing to its ever-increasing uses on the industrial as well as on the domestic scene, and has thus led to the planning of a network of stations that takes into account these new needs.

The main advantage of these recorders is the obtaining of continued data. These data continuity improve the results since the daily flow is calculated from several readings. It is now possible to obtain more representative figures and determine the maximum and minimum instantaneous readings, which results in highly useful additional information. Moreover, continued recording is an indispensable tool in hydrological studies.

In order to obtain more precise results and also to reduce handling, the Service uses more perfected instruments such as that of the servomanometer type with a perforated tape. The use of this equipment eliminates the construction of wells, which are very costly, and the perforated tape enables the Service to calculate the flow in several stages through computer methods.

The Service is now studying the possibility of building immersed sills which will ensure the stability and sensibility of the height-flow relations at hydrometric stations where natural control is unstable. In other cases where conditions of flow by winch gauging do not produce accurate results, the Service intends to measure the flow by dilution methods (chemical gauging).

Achievements

In the line of works accomplished during the year under review the Hydrometry Service completed 1,191 gaugings and 1,718 visits. In addition to this, 26 visits were made to dam stations taking in the inspection of the dams and of the water level stations.

Part of the gauging concerned very specific works. Among these, 15 gaugings were carried out by measuring the speed of the water at every 0.1 of depth in order to learn more about the vertical curve of distribution of speed under various conditions of flow. Noteworthy too is a series of gaugings carried out in the Ungava region in December in order to define the running dry curve during the winter months. Moreover, 237 gaugings were carried out at three stations of the Saint-Raymond area to improve the technique of winter flow determination.

Pursuant to the five-year program all new stations, as well as relocated or improved stations, are now equipped with recorders. These recorders are generally of the perforated-tape type. Figures listed below attest to results obtained. On March 31, 1965, of the 150 gauging stations only 3 per cent were equipped with perforated tape recorders and 54 per cent with a limnograph. On March 31, 1966, these figures for the 168 stations had increased to 20 per cent and 50 per cent respectively.

NETWORK OF HYDROMETRIC STATIONS

Type	*March 31, 1965*	*1965/66*	*March 31, 1966*
Gauging stations	150	18	168
Power stations	28	—	28
Dam stations	31	4	35
Total:	209	22	231

As far as the density of the hydrometric network is concerned, following is the territorial distribution of gauging stations for the ten economic regions.

DISTRIBUTION OF GAUGING STATIONS IN THE TEN ECONOMIC REGIONS OF THE PROVINCE *

Economic Region	*Population June 1, 1965* * *	*Area (sq. mi.)*	*No. of stations*	*Density station/ 1,000 sq. mi.*
01 — Gaspé — South Shore	411,647	18,260	18	1.0
02 — Saguenay — Lake Saint-Jean	273,871	42,710	8	0.2
03 — Quebec	703,254	12,730	15	1.2
04 — Trois-Rivières	314,751	15,740	11	0.7
05 — Eastern Townships	485,238	7,510	19	2.5
06 — Montreal	838,697	15,010	16	1.1
07 — Greater Montreal	2,455,015	490	3	6.1
08 — Ottawa	201,862	13,950	6	0.4
09 — Abitibi — Témiscamingue	183,451	26,470	10	0.4
10 — North Shore — New Quebec	98,937	441,990	62	0.1

* Codes Service, Quebec Bureau of Statistics, Department of Industry and Commerce.

** Municipal Guide, 1966, Department of Industry and Commerce.

EQUIPMENT OF STATIONS ON MARCH 31, 1966

	Gauging	*Dam*
Limnometric scales	46	33
Limnographs	84	2
Perforated tape recorders	34	0

Among the special projects completed during the year, the installation of a limnophone on Chaudière river should be given first mention. The first of its kind in North America, this apparatus was put into service within the scope of the studies undertaken to control swelling. A phone call verbally reveals the instantaneous height of water and the last ten hourly observations.

With the five-year program, the projected network will comprise 15 to 20 stations leading to the study of characteristics of flow of small basins. The data collected at two stations at Rapin and Poutré rivers in New Quebec now serve to complete the study of Eastmain and La Grande river basins. During the year two other stations on Noire and Sacacomie rivers were put into service close to urban centers to solve water-supply problems.

Collaborating with the Study and Research Service in its project of studying the ice cover of Sainte-Anne river, this Service has installed a thermograph at Saint-Raymond to collect water temperature data.

Finally, an aerial ferry was built at the gauging station located downstream from Panet Falls. This construction facilitates flow measurements under difficult conditions especially during swelling periods.

Studies

The Service has undertaken certain study projects that were entrusted to the personnel of the Studies Division. Among these were:

1. Drawing up and compilation of the data relating to the determination of flow characteristics of the rivers of the Province of Quebec.
2. Study of certain precipitation swellings in the Chaudière basin, in order to reconstitute the unit-hydrograms at the stations located at Rapide-du-Diable and at the Victor, Famine, and Linière tributaries.
3. Determination of the topographical characteristics of the Chaudière River drainage basin.
4. Statistical distribution of the daily maximum flow of Chaudière river at the Saint-Lambert and Drolet stations from June to November inclusive. This hydrological data completed the specifications transmitted to tenderers for the construction of the dam in the Saint-Georges vicinity.

Different studies were undertaken for the purpose of improving the operation of the storage reservoirs of Kénogami, Morin, and Saint-François lakes. Hydrograms of swelling were drawn up according to the available hydrometeorological data. In many cases, these studies have shown that the data used were not sufficient to obtain the expected results. It was therefore decided to equip existing and new stations with perforated tape recorders and to complete the network of hydrometeorological stations.

In order to improve the operating conditions of Nord river, a special study on transport periods was carried out. This study showed that these were extremely varied according to the conditions of flow in the river. This study is being continued in an attempt to make more specific the results already obtained.

Studies on storage schedules were undertaken from aerial photography especially at the Saint-François reservoir. The continuation of these studies is foreseen in the case of Commissaires Lake reservoir.

International Hydrological Decade

The increase in population, the general improvement of living standards, the irrigation of new lands, and the increased implantation of new industries will all contribute to an increase in water needs. Whether it be to transport water over a long distance, to store it in reservoirs or to maintain its quality, installations and works necessary to obtain the available quantities will cost fabulous sums of money. In some areas of the Province where water reserves no longer meet with the demand, the problem is accentuated by the fact that the large reserves available are located at great distances.

It is only through a constant program coordinated with hydrological scientific observations and research that it will be possible to evaluate and operate the water resources of the Province.

Within the framework of the Decade, the Hydrology, Meteorology, and Gas, Water and Petroleum Services have teamed together to complete successfully certain studies which were recorded in last year's report. Projects undertaken by the Service are described below.

1. *Eaton river*

Inventory and analysis of basic data. Study of height-flow relations used for the period from 1932 to 1964. Revision and compilation on a daily basis of flow for purposes of publication.

2. *Flow measurement technique*

In order to improve the flow measurement technique by means of winch gauging, a study has been undertaken for the purpose of better defining the vertical speed distribution by increasing the number of observations. The first results seem to indicate that there exists a divergence between the figures of flow obtained through this method and those obtained through the conventional method.

3. *Presence of tritium in water*

The purpose of this project is to obtain basic data on the distribution of tritium in continental waters. Observations throughout the world on tritium fall-out have shown that this substance could be found in very large proportions in the hydrosphere. The Service's contribution to this international project consists in taking water samples of the St. Lawrence river at Champlain each month and sending these for analysis to the Atomic Energy of Canada Laboratory at Chalk River.

4. *Montmorency experimental forest*

The Service's participation in the Morency forest research program consisted in supplying the necessary equipment and technical assistance for the hydrological study of this forest. In the year of 1965/66, the Service saw to the preparation of plans and specifications as well as to the construction of a gauger at sub-basin No. 6. It is expected that within the next two years two other gaugers will be added to the adjacent sub-basins whose areas range from ½ sq.mi. to 3½ sq.mi. Three new gauging stations will also be added to the network.

Operation

The Service is also responsible for regulating the outflow in reservoirs that are under the direct jurisdiction of the Department. At the beginning of the 1965/66 fiscal year, Commissaires Lake reservoir was transferred

from the Quebec Pulp and Paper Corporation to the Hydrometry Service, which action brought to 32 the number of reservoirs under the Service's responsibility. In order to enable Hydro-Quebec to use in a more flexible way the water reserves located upstream from its hydroelectric power stations, the operation and maintenance of 12 reservoirs was transferred to this body on July 1, 1965; these reservoirs are on Saint-Maurice, Gatineau and Mitis rivers. Twenty reservoirs are still under the direct control of the Department.

Publications and Reports

In addition to answering numerous requests concerning water levels and the flow of several of the Province's watercourses, the Hydrometry Service publishes various reports during the course of each year for the benefit of interested groups. These reports contain varied information and are published weekly, monthly or annually.

Publications:

The three (3) major publications prepared during the 1965/66 year were the following hydrological directories: AH-1, AH-2, AH-3.

The AH-1 hydrological directory concerns the Ungava Bay basin for the years 1954 to 1963 whereas the AH-2 concerned the James Bay and Hudson Bay basins for the years 1949 to 1963. In these publications, results of hydrometric surveys carried out in the tributary rivers of these bays are presented.

Finally, the AH-3 hydrological directory concerns the basins of the Province of Quebec as a whole for the year 1964. Compilation of this publication, which will be available in 1967, was completed at the end of the year reviewed. The directory presents hydrometric data on gauging, limnometric, power, and dam stations.

Another important publication, HP-7, is the index of hydrometric stations in service since March 31, 1965. In it is to be found the complete network of 263 hydrometric stations on which the Service can supply information on request.

Reports:

Each month, eight (8) different reports regarding the level and flow of certain watercourses of the Province are prepared and sent to the Federal Government, to Hydro-Quebec, or to companies benefiting from storage at various reservoirs. Moreover, two (2) weekly reports are prepared for the benefit of Hydro-Quebec and the International St. Lawrence River Board of Control.

It is to be especially noted that for the purpose of collaborating with the publication of the monthly Water Resources Review published by the American Government, a report on the hydrological data of four (4) typical Quebec rivers is sent each month to Washington. This bulletin contains information on the conditions of flow and on the state of underground reserves throughout North America. Moreover, the Service's contribution to the Federal monthly bulletin concerning conditions of flow in the Ottawa River basin should be underlined.

Personnel

At the end of the year, the staff of the Service comprised 57 employees, of whom 16 were engineers and 20 were technicians or technical agents.

Henri St-Martin, an engineer, is at present taking post-graduate courses at Guelph, Ontario, to gain a master's degree. Pursuant to the technical exchange existing within the framework of the International Hydrological Decade, one engineer of the Service will receive a scholarship from the ASTEF for higher studies in France, whereas an ORSTOM hydrologist will be delegated to Quebec in order to get acquainted with the hydrology of the Canadian territory and to contribute to the solution of numerous problems in this field.

The engineers of the Service participated in a conference held in Quebec in June, 1965, which dealt with the planning of hydrometeorological networks. This conference was organized within the framework of the International Hydrological Decade which began in January 1965.

Finally, the Service actively cooperated in the work of the Waters sub-committee of CPAR.

METEOROLOGY SERVICE

The Meteorology Service comprises three divisions whose aims are the inspection of meteorological stations, the verification and compilation of data collected at these stations, and the study of the climatic conditions of Quebec.

The Inspection Division comprises an inspection chief and five qualified technicians who are responsible for the installation of stations and for controlling the quality of the work of the observers.

The present network of meteorological stations comprises 703 units, 476 of which are permanent stations, that is stations in operation all year. There are 227 seasonal stations, that is stations operating during the summer months only, especially during the forest-fire protection period. Permanent or seasonal stations that are also classified as forestry meteorology stations number 193: these are stations where the observer determines the forest inflammability index. These figures take into account abandoned stations and new additions.

During the year 1965/66, inspectors made 425 visits to the meteorological observers. For purposes of hydrologic, agricultural or forestry studies, they installed 20 permanent stations, 6 seasonal stations, 22 temporary stations and 10 automatic stations. The permanent stations were put into operation in the basins of Eaton, Chaudière, and Sainte-Anne rivers and at several other points in the Province. The new seasonal stations were installed in forestry territory, whereas the temporary stations were installed in order to complete the Eaton River basin network. As to the automatic stations, these were installed in the Sainte-Anne River basin (4) and in Northern Quebec (6).

Inspectors constantly keep up to date the map showing the Quebec meteorological stations and prepare for each newly installed station and for every station visited a report on the meteorological material and on the observation program and the observer's working conditions.

The Verification and Compilation Division, established to collect weekly and monthly reports from the regular stations, received, verified, and compiled, during 1965/66, data from 53 temporary climatological stations, 60 insolation stations, 16 rain-gauge stations, eight wind stations, five agrometeorological stations, and six stations where evaporation and soil temperature observations are made. During the period extending from May to November 1965, 20 stations also supplied daily grass minimum temperature readings. The Division verified calculations on the index of forest inflammability supplied weekly by 193 forestry meteorological station observers. A weekly report of this data was supplied to fire

wardens in charge of forest protection in the respective areas of the stations concerned.

The Division received special data from some 40 observers, cooperating in the study of the method presently used for evaluating forest-fire dangers. It prepared the 1965 index of stations and compiled snow-sample reports for the 1965/66 winter season.

The Verification and Compilation Division had a staff of eight persons during the year, two technicians and six clerks.

The Study and Data Division, with a staff of three engineers, three meteorologists, two technicians, and two clerks, did the analysis and the study of reported climatical data in reponse to various Provincial Government Departments in addition to supplying to the general public, monthly and annual summaries of meteorological observations. Researchers pursued, during the year reviewed, various hydrometeorological, climatological, and agricultural meteorological studies.

In hydrometeorology, researchers are at present evaluating the critical meteorological conditions that are causing floods in Chaudière and Saint-François rivers. Part of the project consists in the analysis of all the severe thunder storms that have affected the territory of Quebec during the last 50 years. This work is sufficiently advanced to enable the publication of a preliminary report on the evaluation of maximum possible precipitations for periods of time not exceeding 24 hours.

The analysis of maximum snow accumulations and the evaluation of the maximum rates of snow melting likely to take place and result in disastrous spring floods are now being completed.

Within the context of the International Hydrological Decade, meteorologists have perfected in the Eaton River basin a very dense meteorological network enabling them to carry out a detailed study of the hydrous summary of this basin and to come to solutions that can be applied to surrounding areas.

In climatology, a study of northern Quebec's climate based on all the data collected to date was undertaken and a preliminary atlas on the climatic conditions of southern Quebec is at the point of completion. The work undertaken at the request of various Departments will provide the means to answer adequately numerous requests for information.

During the summer of 1965 the Division's technicians continued the study of precipitations over all the Province. This study follows analyses of the effects of cloud-seeding operations last year. These operations were suspended in the fall of 1964.

Researchers completed the study of hydrometric conditions in Quebec, the study of freezing temperature probabilities and also the study of forest-fire dangers during the 1951-1965 period.

Finally, this Division has, during the last fiscal year, prepared the following climatic reports: 424 meteorological certificates, 2,063 photocopies of resumés for the general public, 852 photocopies of resumés for public utility companies, and 4,700 monthly climatological reports for the Meteorological Service of Canada. The engineers have also served the course of Justice by their evidence in 13 court appearances.

Miscellaneous

The activities of the International Hydrological Decade were continued during the year 1965/66. In this respect M. Slivitzky, Quebec representative to the Canadian National Committee, attended various meetings of this group whose aim is to coordinate Canadian activity in this field. As member of the Canadian delegation, Mr. Slivitzky attended the first meeting of the Coordination Council of UNESCO for the Inter-

national Hydrological Decade which took place in Paris from May 21 to June 5, 1965.

Within the scope of the Hydrological Decade's activities, an International Symposium on the Planning of Hydrometeorological Networks ("Planification des réseaux hydrométéorologiques") was held at Laval University in Quebec, June 15 to June 22. This meeting, held under the auspices of the World Meteorological Organization, and of the International Scientific Hydrology Association, grouped more than 200 specialists representing 30 nations.

The local organization of this meeting was directed by the Department of Natural Resources with the direct cooperation of Laval University.

During the fiscal year reviewed, the Technical Committee on the Ottawa River submitted to the Government a final report of its work. The director of the Waters Branch has continued to represent the Department on this Committee, which grouped representatives from the Federal, Ontario and Quebec Governments.

Mr. Slivitzky presented a paper entitled "Appraisal and Methods of Analysis" at the Fifth Canadian Symposium of Hydrology that was held in Montreal, February 23 and 24, 1966. This Symposium, which concerned statistical methods in hydrology, was organized by the Hydrology subcommittee of the National Research Council.

During the 1965/66 year, Mortimer Hendler replaced Michel Slivitzky as the representative of the Department of Natural Resources on the Hydrology Subcommittee, Joint Geodesy and Geophysics Committee of the National Research Council. This subcommittee aims at encouraging, facilitating and coordinating the development of hydrology and hydrological research throughout Canada.

M. Hendler and R. Ménard attended the two meetings of the Great Lakes Commission. This Commission is made up of representatives of eight American States, bordering the Great Lakes, and of those of the Provinces of Ontario and Quebec who attended the meetings as observers.

From March 16 to June 1, 1965, G.-O. Villeneuve travelled to France for studies under the ASTEF program.

Dr. Villeneuve represented the Department of Natural Resources on the International Agrometeorological Committee, a committee of the Federal Department of Agriculture.

Employees of the Department have attended numerous meetings, including the following : Eastern Snow Conference, the above-mentioned Montreal and Quebec meetings; Cloud Physics Congress in Reno, Nevada; Canadian Micrometeorological Symposium in Toronto; Hydrological Studies of Small Basins at Hubbard Brook, New Hampshire, and others.

PLANNING BRANCH

The Planning Branch, during the fiscal year, 1965/66, more than ever before, fulfilled its double role of counselling and of doing research work within the Department. At the beginning of the year, its main task was directed to the file which led to the setting up in July of the Quebec Mining Exploration Company (SOQUEM). Following this, the Branch studied numerous questions likely to affect political or administrative decisions. Thus, it took part in negotiations preceding the constitution of the "Chicoutimi Silicon Ltd." which involved hydroelectric power rights owned by the Department on Chicoutimi river. The Branch's activities were also related to those of the Mining and Waters Branches, as well as to some specific Hydro-Quebec projects : possible hydroelectric power installations on the Saint-Jean (Dickey, in Maine) and Churchill rivers; electricity distribution problems in a few small private or municipal systems : Ferme-Neuve, Sherbrooke, Saint-Joseph de la Rive, etc.

Through its Economic Studies Service, the Branch nevertheless pursued its task of studying specific projects of the Department, as well as certain general studies. Many projects pertaining to mining operations and the establishment of public works (access roads, villages, etc.) were studied, as well as some policies of more general nature such as joint programs on resources and the installation of hydroelectric and energetic resources. Working in conjunction with other Services of the Department and with other Departments, the Service participated in rationalization experiments of some fields of economical activity such as those of building materials, peat-bogs, etc.

As in the past, the Planning Branch actively participated in numerous working groups set up by the Economic Orientation Council or by the "Comité Permanent d'Aménagement des Ressources", in which the Department is represented. This representation resulted in numerous studies with various aims in view: tourist, agricultural, and other installation projects. One of the Service's economists participated in the two committees on Indian Affairs and devoted a good part of his time to them. The work of the BAEQ was also closely followed particularly the part concerning mining development.

André Marier, director, was named director general during the year. Two of the Service's economists were lent for a few months to the Department of Family and Welfare in order to undertake a special study. Again this year, one member of the Service was chosen to study at the E.N.A., where he is completing his education in administration and will take courses in specialized schools.

NEW QUEBEC BRANCH

Government activity in Northern Quebec during the 1965/66 fiscal year may be characterized by a growing concern for social advancement. The New Quebec Branch endeavors to improve the living conditions of the inhabitants, while respecting their cultural traits. This was the predominant achievement during the year reviewed irrespectively of the nature or diversity of the work. The opening of new Eskimo classes, the inventory of the immediate resources, the carrying out of administrative decisions within the natives' villages, the assistance given to native cooperatives, all these activities ultimately coincide with government preoccupations in matters of public health and social security for the inhabitants of northern Quebec. Two large divisions of the Branch, the Technical Services and the Administrative Services, working in close cooperation with Branch agents stationed in New Quebec, collaborate in this task of human betterment.

TECHNICAL SERVICES

The Technical Services comprise the Research and Documentation Service, the Engineering Service, the Education Service, and the Health and Social Security Service.

RESEARCH AND DOCUMENTATION SERVICE

The Research and Documentation Service is responsible for compiling the knowledge and information needed for the administration of northern Quebec. One of its main tasks is to make an inventory of the material and human resources of New Quebec regions necessary for government activity, as well as for the orientation of local economics. Thus, it prepared, during the summer of 1965, a monograph of Ivujivik and of the surrounding area, as well as a study on the economical potential of the area situated between Ivujivik and Povungnituk. Only such investigations as take into consideration the geographical, economical, and social factors can dictate the rational choice of new village sites. It was after this preliminary study that consideration was given to the feasibility of setting up the future agglomeration of Eskimo workers who will be employed by Asbestos Corporation at Deception Bay, either at the seaport where the ore will be shipped or at the mine itself, 40 miles inland.

The importance of marine and land fauna in the life of northern Quebec prompted the Research Service to hire a biologist to take a closer look at the inventory and management of animal species in New Quebec. What is needed is a thorough knowledge of the available species, as well as their numbers, including the number of those that are caught or slaughtered, so as to regulate the apportioning of industrial fishing, to judge requests for industrial fishing permits, and to judge requests for

the rental of fishing areas for sporting purposes in close cooperation with the Department of Tourism, Fish and Game, which delivers the permits according to the recommendations of the New Quebec Branch. An initial expedition, carried out during the summer of 1965 along the coast from Wakeham to Povungnituk, has provided a near complete knowledge of the marine species and the annual catches. Moreover, the Research Service opened talks with a view to importing and acclimatizing the musk-ox to Northern Quebec. This animal has been hitherto bred in Alaska and is renowned for the value of its wool and flesh.

In 1965, the Research Service also studied land transportation in the Ungava Peninsula with a view to finding ways to improve land communications between Ungava bay and Hudson bay. The possibility of using permafrost at Ivujivik for the conservation of food, especially hunting products, was likewise considered. Moreover, the Service prepared, at the request of the Quebec Commissioner to Expo 67, a map showing northern Quebec's resources, at a scale of 32 miles to the inch. The map serves for public information.

While managing detailed works, the Research Service advises the Department of Lands and Forests on land occupation in New Quebec, gathers meteorological observations in order to increase knowledge of the accessibility of northern locations, determines suitable sites for the construction of a house, building or airport for the Engineering Service, and initiates to northern life the personnel assigned to native settlements. It also gathers Eskimo location names, in cooperation with the Quebec Geography Board, in order to preserve the original toponymic character of location in northern Quebec, Thus, the Geography Board decided, after holding a competition among the Eskimos, to give the name "Putuniq" to the mining operation site designated by some as "Asbestos Hill".

A division of the Research Service is concerned with documentation on the north country and the Arctic, as well as the inhabitants of those regions. It includes a library that acquired, since its setting up a little more than a year ago, more than 1,100 technical books and that receives approximately 60 specialized periodicals, along with a map collection where maps published on northern Quebec may be found and consulted. These publications include marine maps of coastal regions and three series of topographical maps : the first one at the scale of 1 : 500,000, the second at 1 : 250,000, and the third at 1 : 50,000. The documentation also includes numerous Danish publications concerning Greenland Eskimos.

ENGINEERING SERVICE

The Engineering Service is responsible for the preparation and execution of northern village construction plans needed for government administration, local co-operatives and natives. In 1965, it constructed a warehouse and two houses at Saglouc — one to be used by the Government Agent and the other for his Eskimo assistant and family — a house for the Agent at Inoucdjouac, a school at Maricourt (Wakeham) and at Chimo, and a workshop-garage, a warehouse and a general pavilion at Povungnituk. Among these achievements, the school in Chimo and the pavilion in Povungnituk are certainly the most important. The school in Chimo houses, within its 100' x 50' area and its two storeys, five classes, a polyvalent room, and a Government agency, whereas the Povungnituk pavilion is essentially a 4,500-square-foot service house, mainly intended to lodge and train inhabitants wishing to enter the teaching profession.

It is believed that construction in the Northern tip of Quebec raises problems, mainly because of the climate and remoteness. Having tried

prefabricated construction in the past, the Engineering Service decided, whenever construction costs were equal to work materials on location, in order to develop the quality of work, to economize on heating, and to use more local manpower, supervised by trade workers imported from the south. Wood and asbestos are the materials most commonly used in the north for the construction of buildings. The buildings are erected, wherever possible, on concrete foundations, as was the case for the school in Chimo. However, the short navigation season, which usually runs from July 20 to September 15, along with the trans-shipment of goods which results from the lack of boarding docks in northern villages, sets demands for the specifications and ordering of materials which cannot be easily reconciled with the usual administrative delays.

EDUCATION SERVICE

Education of the natives is one of the most important preoccupations of the New Quebec Branch. In this field, Quebec's efforts enter, a little more each year, into the Eskimo back-country. In 1965 the Branch opened three new kindergarten classes, at Poste-de-la-Baleine, Povungnituk, and Fort-Georges; it also took charge of first-grade education at Chimo and Wakeham, where Eskimo youngsters have, for the first time, the opportunity to learn the elements of knowledge in their own language.

Furthermore, some Eskimos are associated with teaching in the capacity of assistants in each of these classes, and the Service hopes to provide training for native teachers who will act as schoolmasters among their own people.

The New Quebec Branch does everything in its power to provide a well-trained teaching staff for the natives. In 1965 it sent one of its employees to visit Eskimo schools in Greenland and specialized foreign language schools in Europe, so as to be able to draw up proper methods for developing the Eskimos' enthusiasm for learning and for inciting an outside interest in the Eskimo language. The preparation of recorded Eskimo lessons and of a small French-Eskimo dictionary will lead in the near future to the opening of an Eskimo language laboratory whose methods should greatly help the apprenticeship of the Eskimo language for the teaching and administrative personnel assigned to the north.

Among educational initiatives worthy of mention there is the social action project that 13 Quebec students, comprising males and females, pursued on behalf of the Branch in six New Quebec settlements during the summer of 1965 with a view to experimenting in a direct conversational method for introducing Eskimos to the language of the majority of Quebec's inhabitants. It became apparent that the Eskimos could easily pronounce French phonetics and the same experiment will be worthwhile repeating next year, enhanced by the use of audio-visual methods and framed within practical activity, such as the organization of recreational centers. Moreover, the journey of young Quebecers to the north during the summer, especially at a time when many Government agents are detained elsewhere, can provide greater assurance of Quebec's presence among the natives.

HEALTH AND SOCIAL SECURITY SERVICE

A nucleus Health and Social Security Service was formed during the preceding fiscal year with the Technical Services of the Branch in order to channel towards New Quebec the effects of Government policy in

matters relating to public health and social security. Assuming complete responsibility of Government action in New Quebec, the New Quebec Branch does not intend, however, to duplicate uselessly its action with that of the Services of the Department of Health or of the Department of Family and Social Welfare, which must be simultaneously effected and adapted to the most remote areas of the north. The Health and Social Security may well be the intermediate agent indispensable for adjusting, to the needs and living conditions of the natives, those measures and standards that have been conceived and applied essentially to serve the population of the south.

The main task of the Health and Social Security Service is to analyse the state of public health and living conditions of the natives in order better to define their needs and to find ways to satisfy them. Thus, the ties that one employee of the Service has started to establish during the past fiscal year between northern settlements and the Department of Family and Social Welfare have led to investigations among the peoples of the north and resulted in explanations of the Eskimos' problems to the proper Government services, so as to adapt the standards and types of social assistance that the natives may receive as a result of social measures in effect in the south, such as old-age assistance, allowances to 16- and 17-year-old school-age children, to the blind, to needy mothers, to the disabled, to persons unfit for work, and to widows and single women over 65.

Moreover the cooperation of the Department of Health is necessary to the New Quebec Branch in order to receive and organize the health and public hygiene services that must be extended to the people of the north. The Services of the Department of Health have cooperated in the establishment of plans for a 60-bed hospital to be built at Fort-Georges, on James bay. This project is not tied in with an over-all plan which would include the establishment in New Quebec of three medical centers, each one equipped with a small hospital and an outdoor clinic, and located in various areas so as to serve all the territory by means of small health centers in the neighbouring villages. It appears that this type of institution would, because of its flexibility best suit the needs of a population scattered throughout a vast territory and being still, in a large measure, deprived of the benefits of preventive and curative medicine and of public hygiene.

ADMINISTRATIVE SERVICES

The Administrative Services are responsible for supplying the personnel with the material means needed to carry out their tasks in northern settlements, as well as at administration headquaters in Quebec. Their main duties relate to the controlling of expenditures, obtaining staffs in native villages, the public transportation and shipment of goods in the north, and the inventory and care of the Branch's possessions, which are dispersed in every part of the territory. Two employees of the Administrative Services carried out a detailed inventory of the installations and buildings of the former Poste-de-la-Baleine air-base that the Federal Government transferred to the Quebec Government in August 1965.

Employees of the New Quebec Branch numbered 70 on March 31, 1966, 23 of whom were employed at the Quebec office, whereas 47 were stationed in northern settlements. Twenty-five of them were natives, not counting the Eskimo and Indian assistants hired on a temporary basis,

especially for the construction of houses in the north. During the fiscal year under review the Branch retained the services of two Eskimo women whose help as translators and interpreters can facilitate the task of Government Administration among their people.

The efficiency of the administration in New Quebec depends in a large measure on communications between the north and the south. Only the summer navigation season may be counted on for the shipment of the major part of the merchandise intended for the north. Food and building materials take this course, as well as oil products destined to villages that lack fuel distributors. This amounts to 1,100 tons of goods per year.

However, some progress was made in transport and communications in New Quebec during the fiscal year. For its part, the Branch maintained a monthly air service between Ungava Bay and Hudson Strait settlements for public transportation, shipment of goods, and mail service. On the other hand, Nordair Company Limited extended one of its weekly flights during the summer of 1965 to connect Montreal to Fort Chimo via Poste-de-la-Baleine, both ways, thus enabling passengers flying from Chimo to Poste-de-la-Baleine to avoid passing by Montreal. Progress was even more notable in the field of telephone communications. The Bell Telephone Company of Canada extended its radio-telephone service to Maricourt (Wakeham), Saglouc and Ivujivik in 1965 and it also established a separate system connecting the various New Quebec agencies. The people of eight New Quebec settlements may now communicate with the south by long-distance telephone. Government agencies in six settlements have direct communications.

GOVERNMENT AGENCIES

The number of agents of the New Quebec Branch in northern Quebec increased from seven to eight during 1965, since the opening of an agency in Inoucdjouac on Hudson bay. Quebec Government agents assigned to the north act mainly as representatives. They represent the Quebec Government in whose name they inform administration headquarters concerning the needs of the native population, and also explain and apply Government policy to the citizens of the north. Their main concern is to keep the Government informed on the population's problems; keep census statistics up to date; carry out investigations; fill out the necessary forms for social allowances; and supervise the occupation of lands so as to prevent building on Crown lands without the authorization of the Department of Lands and Forests. Their daily activities have, in fact, a thousand facets, from the help they give to Eskimo enterprises, the assistance they voluntarily offer to local co-operatives, and the recruitment of native manpower on behalf of Government and private concerns to the administration of the teaching staff and other workers assigned to their respective villages.

Apart from keeping in touch with the needs of the natives through its own agents, the New Quebec Branch assembles, each year, delegates from the various Eskimo villages to allow them to discuss common problems, formulate their views and inform the Quebec Government representative of these views. The first such meeting took place in August 1964 in Chimo; the second and third meetings were also held at Chimo on July 24 and 25, 1965, and March 25 and 26, 1966, respectively. It was noted that from one meeting to another an atmosphere of mutual understanding was gradually being established between the Eskimos and the Quebec Government. The Eskimos' initial reaction was one of satisfaction for

having been consulted for the first time by a Government concerned about their destiny. At the last meeting, the Eskimo delegates prepared a petition subsequently signed by family heads of their respective villages and requesting that the Government of Quebec look after their interests.

NATIVE CO-OPERATIVES

During the past fiscal year, the New Quebec Branch continued to encourage the development and growth of native co-operatives in northern villages. These co-operatives allow the natives to manage their own affairs so that they may progress free of any domination or paternalistic influence.

To this effect, the Branch pays an annual subsidy to the Quebec Co-operation Council, which undertakes to lend the money and necessary technical personnel to establish new co-operatives in northern Quebec. Thus in 1965/66, it placed $50,000 at the disposition of the three co-operatives that were being organized at Saglouc, Ivujivik, and Inoucdjouac. Moreover, it spent $10,000 to enable the Ivujivik Co-operative to purchase a store. It also placed a building used as a warehouse at the disposal of the Saglouc Co-operative. It agreed to pay the salary of the manager of the Indian-Eskimo co-operative of Poste-de-la-Baleine.

The Branch's assistance to native co-operatives does not stop there however. It also consists in awarding sustenance bursaries to Eskimos in training of the functioning of co-operatives at the Povungnituk co-operative: five Eskimos benefited from such bursaries during the 1965/66 fiscal year. This assistance also takes the form of technical assistance, which is voluntarily provided by the Engineering Service for the preparation of plans and orders for materials needed to construct co-operative stores. Agents of the Branch generously give encouragement and assistance to promote the co-operative movement and the success of co-operatives in their settlements. Finally, the New Quebec Branch placed at the disposal of the Povungnituk co-operative, part of the Eskimo pavilion, which is situated at the corner of Ste. Ursule Street and the ruelle des Ursulines in Quebec City. This building is destined to house an Eskimo Art gallerly and to accommodate Eskimo visitors to the city of Quebec.

Among the activities of the personnel of the New Quebec Branch, the contribution by some of its members in the work of other organizations during the fiscal year is also worthy of mention. Thus, the director general was invited to give a talk on Eskimo education to the Indian-Eskimo Association of Canada at Toronto on December 1, 1965. Eric Gourdeau also participated at a conference which took place in Winnipeg, on October 21 and 22, 1965, on the development of resources in Western Canada, under the auspices of the Ministers of the Canadian Council of Resources. He also gave two talks in a series of lectures on Northern Quebec sponsored by the Centre d'Etudes Nordiques of Laval University. He successively spoke on the general policy of the New Quebec Branch (March 3, 1966) and on the co-operative organization in New Quebec (March 17, 1966).

The head of the Technical Services gave two lectures from the same rostrum : the first on the Eskimo population of northern Quebec (January 27, 1966), and the second on the Implantation of Government Organization in New Quebec (February 17, 1966). Benoit Robtaille also gave a series of lectures, in November 1965, at the Department of Geography of the University of Montreal on the economic geography of northern Quebec. He also directed, on November 24, 1965, at the Department of Anthropology of the University of Montreal, a seminar on research in

New Quebec. Moreover, he presented a paper, at the 33rd ACFAS convention during the fall of 1965, entitled "Les Cuestas de l'Ouest du Nouveau-Québec".

Finally, the New Quebec Branch lent the much appreciated services of one of its members, Lionel Beaudoin, to edit the report of the Royal Commission of Inquiry into Fiscality and to write a booklet for the Quebec Economic Orientation Council.

Conclusion

After three years of existence and work, the New Quebec Branch has succeeded in changing appreciably the face of northern Quebec, as well as the attitude of the natives towards the Quebec Government. New buildings are erected each year with the stamp of Quebec; more and more Quebecers journey through the north every year; classes and original teaching methods are conceived to satisfy the needs of the natives; the Eskimo is regularly consulted and is more aware of the benefits of Government policy. No one now disputes the right of the Quebec Government to exercise its jurisdiction over its territory. The Eskimo no longer hesitates to express his desire to have, or his satisfaction at seeing, the Quebec Government assume all its responsibilities toward this ethnic group. In fine, with each passing day Quebec's presence is more and more advantageously felt from north of the 52nd parallel to Hudson strait.

INFORMATION AND PUBLICATIONS BRANCH

While pursuing its program undertaken in order to publicize the new mining legislation which was passed at the end of the preceding year, the Information and Publications Branch tackled a fundamental problem in 1965/66 : the recruiting of geologists, mining engineers, hydraulicians, and hydrologists needed in the Industry and in the Civil Service. In the hope of filling the gaps that are keenly touching this field, the Branch, in cooperation with professional associations, carried out a wide informational and educational program for high school students. The first phase of this program concerned the mining sector. It took the form of meetings with groups of students.

MEETINGS

During the fall of 1965, Patrick Thériault, director of the Branch, was asked to join the Permanent Committee on Education of the Quebec Branch of the Canadian Institute of Mining and Metallurgy. This Committee, whose president is H. Monette, was formed March 1, 1965, especially for the purpose of ensuring the succession of the professional staff in the mining industry. The other members of the Committee are : L.-G. Langlois, P.-A. Filteau, J. P. Goldsmith, I. W. Jones, and J.-P. Bolduc. From January 19 to March 15, 1966, the members of the Committee visited nearly one thousand students in the Quebec area. The program of these meetings included the following schools : Saint-Esprit; Tilly; Chauveau and Tardivelle Regional Schools; Quebec Seminary; Quebec Academy; St. Lawrence College; and Quebec High School. Each meeting included a lecture, the showing of an appropriate film and a discussion between the members of the Committee and the students. The latter showed much interest and similar experiments will be carried out at other schools in 1966/67.

EXHIBITIONS

In order to inform the public properly on the important changes brought to the mining legislation of Quebec, the Branch set up a mobile stand with panels showing the main points of Bills 8 (Mining Act), 9 (Mining Duties Act), and 10 (Charter of the Quebec Mining Exploration Company). This stand was used for the first time at the Provincial Exhibition which took place September 2 to September 12, 1965. Later, the stand was used at the regional exhibitions of Thetford Mines, Mont-Joli, Sept-Iles, and Rouyn-Noranda.

The Department also participated in the scientific exhibition held to underline the Forestry Sciences Week organized by the Laval University Forestry Engineering student association. On this occasion, the Branch stressed the working methods used by the Meteorology Service of the Department along with the possibilities offered students wishing to choose this career. Visitors were allowed to examine closely the various instruments used by the Meteorology Service. Explanatory notes enabled them to understand how these instruments function.

Moreover, the Branch contributed in an appreciable manner to the annual Fisheries Festival which took place at Shippagan, N.B., from July 8 to July 12, 1965. Four Quebec Government Departments took part in an exhibition organized for that event by the "Service du Canada Français d'outre-frontières" which comes under the jurisdiction of the Department of Cultural Affairs. The Department of Natural Resources, for its part, showed the main types of ore which are found in Quebec.

MISCELLANEOUS ACHIEVEMENTS

An important scientific congress constituting the world premiere of the International Hydrological Decade took place from June 15 to June 22, 1965, at the Faculty of Science of Laval University. The Information Branch handled the publicity for these sessions, which were attended by representatives of approximately 30 countries. The theme of the Congress, at which the Department had about 25 representatives, was the planning of hydrometeorological networks.

A 30-minute film in color, entitled "Le prix de l'eau", was produced by the Quebec Film Board at the request of the Branch. This film, showing the damages caused by pollution to a stream, well illustrates the efforts carried out by the Quebec Government to halt the pollution plague. "Le prix de l'eau" is to be shown for the first time at the Conference on Pollution and our Environment that will be held in Montreal in the fall of 1966.

The Branch has actively participated at meetings held during the year by the Subcommittee on Information of the "Comité permanent d'aménagement des ressources". The Subcommittee's task is to ensure the publicity of the projects approved by the CPAR; the latter advises the Government on works to be carried out under the ARDA Federal-Provincial agreement.

Again this year, the Branch was responsible for announcing, usually under the form of press releases, the administrative decisions taken by the authorities of the Department and also for preparing articles and publicity material for many daily newspapers and scientific magazines.

Requests for information sent to the Branch were numerous, especially on the part of students whose interest in Quebec's Natural Resources becomes increasingly evident each year. Many such requests came from other Provinces. Most of the requests for information received by

the Branch in 1965/66 concerned natural resources in general. Many of these were specifically related to the mining industry, mineral resources, and hydraulic resources.

Moreover, the distribution of publications, the library and the editing also come under the responsibility of the director of the Branch. The activities of these three divisions are summarized below.

DISTRIBUTION OF PUBLICATIONS DIVISION

The following list summarizes the activities of the staff of this Division during 1965/66 :

Publications distributed free of charge : 61,791 (maps excluded)
Publications sold : 7,210 studies and 5,874 maps
Notices and releases announcing the publication of 20 preliminary reports, 10 geological reports, 108 aeromagnetic maps, and 18 miscellaneous releases, a total of 33,780 notices
Mineral and rock samples collections : 1,701 sold and 107 distributed free of charge
Leaflets and meteorological bulletins distributed free of charge : 63,612

LIBRARY DIVISION

The library was completely reorganized in 1965/66. Formerly, there was a clear distinction between the mining library, the waters library, and the New Quebec library. The hiring of a professional librarian, Denys Munger, has enabled the grouping of the personnel, along with placing under the management of a single person the administration of the library's three sections.

The task of systematical reclassifying and recataloguing of the books and brochures was undertaken. Needless to say, it will take some years to complete this work.

Moreover, the Library Division has been publishing, since January 1966, a monthly bulletin informing its users of its functions and of its documentary resources.

The library received 2,788 new volumes, including books and brochures. Of these, 2,535 were sent free of charge to the Department. In addition 212 geological and other maps were received, free of charge for the most part.

The number of publications loaned amounted to 1,873 and the number of visits to the library totalled 1,896.

This Division subscribes to 214 periodicals. Also, 46 member subscriptions to various societies and associations come out of its budget.

PUBLISHING DIVISION

The Publishing Division has, as in the past, supervised the printing of the various published works, most of them in both French and English. The Division's staff edited and verified the manuscripts submitted, had them translated whenever necessary and prepared them for the printer. It followed closely all the phases of their printing.

Leaflets, circulars and forms for administrative and public use were also composed and printed by this Division. Close to a million of these were printed.

Following is the list of brochures published during 1965/66.

Preliminary Geological Reports

P. R. 531 — Houde-Masson Area, K. Schryver
545 — Montauban-Colbert Area, D.R. Pyke
546 — Hébertville Area, P. Lasalle
549 — Mont Vallières-de-Saint-Réal Area, J.-L. Robert
550 — Assinica Lake Area, L.B. Gillett
551 — Northeast Quarter of McKenzie Township, G. Duquette and A. Mathieu
552 — Saint-Michel-des-Saints Area, K. Schryver
553 — Northeast Quarter of Roy Township, A. Mathieu
554 — East Half of Gaboury Township, L. Kish
558 — Baskatong Reservoir Area, R.S. Jacoby

Final Geological Reports

G. R. 107 — Honorat-Reboul Area, W.B. Skidmore
122 — Châteauguay Area, T.H. Clark
123 — Frotet and Troilus Lakes Area, D.L. Murphy
124 — Takwa River Area, J.M. Neilson
125 — Northwest Quarter of Holland Township, J.J. Brummer
130 — Gouin Reservoir Basin, A.-F. Laurin

Meteorological Service Publications

M-18 — Echantillonnage de la neige, R. Perrier and G.-O. Villeneuve
M-19 — Sommaire des données hydrométriques, A. Bolduc and G.-O. Villeneuve
M-20 — Les dangers d'incendie forestier au Québec de 1951 à 1965, G.-O. Villeneuve
M.P.-3 — Données météorologiques de la station agronomique de Laval, G.-O. Villeneuve
M.P.-4 — Données météorologiques de la forêt Montmorency, G.-O. Villeneuve
M.P.-5 — Ecarts minimum de la température dans l'herbe et sous abri, G.-O. Villeneuve
M.P.-6 — Sommaire climatique, G.-O. Villeneuve
M.P.-7 — Sommaire climatique du Jardin botanique de Montréal, G.-O. Villeneuve

Hydrometry Service Publications

H.P.-11 — Répertoire des stations hydrométriques
AH-2 — Annuaire hydrologique de la baie James et de la baie d'Hudson, 1962
AH-3 — Annuaire hydrologique de Québec 1964

Hydraulic Domain Service Publications

D-3 — Aménagements hydrauliques du Québec en 1966
D-4 — Energie hydro-électrique générée au Québec en 1964

Hydraulic Services Publications

R-2 — Rivière Chaudière, courbes de remous dans la région des eaux mortes, J. Llamas
R-3 — Le cheminement critique, J. Llamas

Miscellaneous Publications

S-19 — Notions élémentaires de minéralogie
S-21 — Notions élémentaires de lithologie

S-91 — Instructions to Geologists
S-92 — Annual Report of the Department, 1964/65
S-95 — Oil and Gas Potential in Quebec and in the Maritime Provinces
S-97 — Field Work in 1965

LEGAL SERVICE

During the fiscal year 1965/66, the Legal Service devoted itself to the solution of legal problems and to the execution of numerous other duties regarding the application of the Quebec Mining Act, the Mining Duties Act, the Water-courses Act, and other related acts.

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

The Legal Service made recommendations for the solution of numerous conflicts.

The drafting of legal opinions constitutes an important part of the Legal Service's work. These opinions are given at the request of the various Branch directors and heads of Services of the Department. The legal opinions thus cover a wide range of subjects related to the application of the Quebec Mining Act and require the study of contracts and agreements between the Department and various bodies. Legal opinions are also given in answer to requests from the public in general.

PERSONNEL SERVICE

Apart from its regular activities, the Personnel Service's responsibilities were increased, during the 1965/66 fiscal year, as a result of the various collective bargaining contracts between the Quebec Government and the various newly-certified civil servants unions. Personnel officers actively cooperated with the Labor Relations services by assisting various interdepartmental committees on labor relations and by supplying the documentation and information needed for negotiations.

REGULAR ACTIVITIES OF THE DEPARTMENT

(a) Employees

Following are statistics regarding the employees of the Department for the 1965/66 fiscal year :

— On April 1, 1966, the number of persons employed by the Department of Natural Resources amounted to 705, as compared with 720 on March 31, 1965. Some 97 new employees were hired, whereas 112 left the Department during the year.

— The Department had 175 professionals under employment in 1964/65. The professional staff increased to 182 in 1965/66 and was distributed as follows :

PROFESSIONAL STAFF ON APRIL 1, 1966

Agronomist	1
Surveyors	3
Librarians	3
Biologist	1
Accountants	2
Legal advisors	4
Counselors in Industrial Relations	2
Economists	12
Geographers	5
Chemical engineers	15
Civil engineers	46
Electrical engineers	3
Forestry engineers	4
Geological engineers	53
Metallurgical engineers	8
Mining engineers	14
Engineering physicist	1
Meteorologists	4
Statistician	1
Total:	182

These figures do not include the staff of the Electricity and Gas Board, the Office of Rural Electrification, and the Quebec Pulp and Paper Corporation.

(b) Advancement and Public Competitions

In order to promote employees already employed by the Department or to recruit new personnel, the Department of Natural Resources, in cooperation with the Public Service Commission, organized six advancement competitions and five public competitions.

PROGRESS OF THE QUEBEC MINING INDUSTRY IN 1965

The value of mineral production in Quebec rose from $542.1 million in 1963 to $704.7 million in 1965. This represents an increase of $162.6 million (29.9%). The greatest advance during the past ten years took place in 1964 when the value of production increased by $145.5 million (26.8%) compared with that of the preceding year.

Considered in the national context, Quebec ranked second — following Ontario — in 1965 for metallic substances: $432.3 million for the year 1965 compared with $407.2 million in 1964.

In non-metallic substances, Quebec surpassed all other Canadian provinces in 1965, with a $158.7 million production compared with $164.8 million in 1964. The same is true for industrial minerals. In order to arrive at the sum total of $704.7 million, one must add the $113.5 million derived from the production of building materials in 1965. The comparative figure added in 1964 was $115.3 million.

The year 1965 saw a decline in iron ore production. While keeping ahead of asbestos, whose production value decreased from $124.9 million to $119 million, the production value of iron ore decreased by $20.3 million and amounted to $141.5 million in 1965 compared with $161.8 million in 1964.

This was compensated, in the field of metals, by an increase of $26.8 million in the value of copper production: $132.4 million compared with $105.6 million in 1964. This enabled copper to surpass asbestos for the first time in the table of mineral production.

Such as was the case for copper, zinc also reached a new high. The value of zinc production rose from $19 million in 1963 to $67 million in 1964 and $83.2 million in 1965.

The production of many other mineral substances increased markedly in 1965. This is especially true of silver, molybdenum and nickel.

The value of gold production decreased by $1.1 million, and reached approximately its average level of $35 million.

Iron Ore

Quebec produced 14.8 million tons of iron ore in 1965, more than any other Canadian province. However, the value of this production amounted to $141.5 million and, as far as value is concerned, Quebec was surpassed by Newfoundland whose value of iron ore production reached $168.4 million. During the year, the national production reached $419.3 million.

A pellet plant owned by Arnaud Pellets was established on the North Shore. The mill, which was built at Pointe-Noire near Sept-Iles, is supplied by the Wabush Lake mine in Labrador. Production capacity of the plant, which is in operation since July 1965, is about 5,000,000 tons a year. Total cost of this project amounted to $55 million.

Asbestos

For the first time in seven years, Canadian asbestos production, equivalent to approximately 40 per cent of world production, experienced a decline and dropped from $148 to $140 million, a decrease of 3 per cent.

Quebec, which produced 85 per cent of Canadian asbestos in 1965, contributed $5.4 million to this $8 million decrease.

However, without slowing its pace, the asbestos industry now branches out to the northwest tip of New Quebec. Asbestos Hill, where an asbestos-bearing zone of 20 million tons was discovered, is slated to become within the next few years a mining center just as active as Schefferville and Gagnon. Asbestos Hill represents total investments in the vicinity of $70 million.

Asbestos Corporation does the inventory of the mineral resources located at the top of Ungava Bay Peninsula, 40 miles from Deception Bay and 1,200 aerial miles from Montreal.

Along with the exploration and development works being done, a mining town and a seaport will have to be built for the shipment of the 100,000 tons of asbestos fiber that the Asbestos Hill mill will produce annually starting in 1970. This will become a completely integrated mining complex. Asbestos Corporation will use in New Quebec the same extraction methods as in its Thetford Mines operations. The ore will be mined by the open-pit method for the first 10 years and then by means of underground levels.

Copper — Zinc

Canadian copper production reached 517,247 tons valued at $388 million, an increase of 30,347 tons compared with that of the preceding year. Quebec produced 176,074 tons worth $132.4 million, that is 17,986 tons and $26.8 million more than the previous year.

As for Canadian zinc production, it climbed to $251.2 million in 1965, 30 per cent more than in 1964. This is due to growth in yield and to a pound price hike for zinc of nearly 1 cent. Quebec contributed $83.2 million to this total.

Many new copper and zinc producing mines began operations in 1965 and other developments are foreseen in the near future.

Development of the orebody of *Mines de Poirier Inc.*, where production began in December 1965, necessitated during the year investments of about $10 million. *Mines de Poirier Inc.*, a subsidiary of Rio Algom Mines, has a concentrator whose daily capacity is 1,500 tons.

Joutel Copper Mines, a subsidiary of Noranda Mines, continued preliminary work at the cost of several millions in Joutel township, a few miles north of Poirier township. Production is expected to start shortly at a 700-ton daily rate. Joutel Copper ore will be milled at the Mines de Poirier plant which is to be enlarged for this purpose.

In order to keep abreast of numerous and encouraging discoveries in Poirier and Joutel townships, the Department of Natural Resources decided to establish a new mining town, Joutel, which will serve the area. Built at a cost of $2 million Joutel will stand on the west bank of Harricana river, 83 miles north of Amos. In 1965/66 the Department spent $832,000 in Joutel, of which $797,000 is reimbursable by the municipality.

The operation of Cupra Mines was undertaken in September 1965, in Wolfe township. The ore is milled, at the rate of 800 tons a day, at the *Solbec Copper Mines Ltd.* mill, located in Stratford. Total cost to put this mine into production reached nearly $2 million.

Two expansion projects were undertaken by *Gaspé Copper Mines* in Murdochville: one of them increasing the daily capacity of its concentrator from 7,500 to 11,000 tons, the other setting up an open-pit mining operation to develop the massive ore of Copper Mountain by 1967.

Terra Nova Explorations Ltd., a subsidiary of Price Brothers and Company Limited, made an important copper discovery in Gaspésie Park, west of Murdochville. This discovery induced a rush of staking, prospecting and drilling crews into the area.

Finally, New Hosco Mines, at Matagami Lake, which began copper ore shipments to the Orchan Mines mill eight miles away in 1963, also intends to recuperate zinc with the installation of a zinc circuit at the Orchan mill.

Gold

In accordance with the persisting tendency of the post-war years, gold production decreased in Canada in 1965. It went down from $144.7 million in 1964 to $136.3 million in 1965.

The Quebec gold production decreased by 2.2 per cent, a decline of $35.2 million in 1964 to $34.1 million in 1965. Whereas the production of gold lode increased, the production of gold as a by-product of base metal mines decreased. The number of gold lode producing mines was 14, two more than in the preceding year.

Bourlamaque-Louvicourt Area — One of the four producing gold mines in 1965, Bevcon Mines Limited, stopped production in October.

Malartic Area — A heavy decrease in 1965 was caused by the closing at the beginning of the year of the operations of *Canadian Malartic Gold Mines* and of *Malartic Goldfields Limited.* This was partly compensated by the beginning of operations, in March, of *Camflo Mattagami Mines Limited.*

Chibougamau Area — *Wasamac Mines Limited,* which began production at the beginning of the year, has sharply increased the production of this area.

Molybdenum — Bismuth

For the sixth consecutive year, the Canadian production of molybdenum increased. From 1,200,000 pounds valued at $2,100,000 in 1964 production of this metal rose to 10,200,000 pounds valued at $17.5 million.

Three British Columbia mines and four Quebec mines accounted for all the molybdenum produced in Canada.

Molybdenite Corporation of Canada, which operates a 900-ton-capacity grating mill, is located at Lacorne, north of Val-d'Or. This company treated 253,000 tons of ore in 1965, recuperating 683,202 pounds of molybdenum along with bismuth as a by-product.

Preissac Molybdenite Corporation, in which Molybdenite Corporation of Canada holds a substantial interest, began in September 1965 the production at its mine located in the Preissac Lake area, approximately five miles north of Cadillac. Estimated annual production is 1,200,000 pounds.

As for *Anglo-American Molybdenite Corporation,* it started operations in August 1965 at its mine located approximately three miles north of Cadillac. Its reserves stand at approximately 3 million tons. The company's mill, which produces molybdenum and bismuth as a by-product, has a capacity of 1,200 tons a day.

Finally, it should be stressed that *Gaspé Copper Mines,* a subsidiary of Noranda Mines, recuperates molybdenite concentrates as a by-product at is copper operation in Murdochville. It produced 493,492 pounds of molybdenite in 1965. Production will easily reach a million pounds a year when this company will have completed, in 1967, the installation of its mine at Copper Mountain and the extension of its concentrator.

MINERAL PRODUCTION OF QUEBEC IN 1964 AND 1965

SUBSTANCES		1964 FINAL FIGURES		1965 ESTIMATED FIGURES	
		Quantity	*Value*	*Quantity*	*Value*
METALLIC SUBSTANCES					
Bismuth	pounds	175,157	$ 320,826	310,767	$ 803,901
Cadmium	pounds	236,487	766,218	290,078	806,417
Cobalt	pounds	86,091	185,957	95,000	205,200
Columbium	pounds	2,163,359	2,282,522	2,300,000	2,350,000
Copper	pounds	316,176,181	105,602,844	352,148,034	132,407,661
Gold	ounces	934,769	35,287,530[2]	906,417	34,199,113[2]
Iron (metal)	tons	429,383	18,700,185	368,000	16,596,380
Iron (ore)	tons	15,512,916[1]	161,880,175	14,781,630[1]	141,584,305
Lead	pounds	7,908,961	1,062,964	7,954,752	1,232,987
Molybdenum	pounds	1,185,074	1,991,294	2,218,320	4,107,704
Nickel	pounds	4,677,108	3,928,771	6,610,060	5,552,450
Selenium	pounds	279,834	1,357,195	280,000	1,350,000
Silver	ounces	4,564,558	6,390,381	5,315,163	7,435,913
Tellurium	pounds	64,063	416,409	64,000	415,000
Titaniferous ore	tons	24,970	237,603	8,500	83,725
Zinc	pounds	473,080,673	67,035,531	551,575,168	83,287,850
TOTAL METALS			$407,446,405		$432,418,606
NON-METALLIC SUBSTANCES					
I — Industrial minerals					
Asbestos	tons	1,285,564	$124,923,453	1,236,260	$119,022,297
Feldspar	tons	9,149	212,052	10,830	241,621
Industrial lime	tons	334,739	3,764,737	317,634	3,517,115
Industrial limestone and marble	tons	1,204,500	3,130,063	1,230,000	3,200,000
Lithium	pounds	1,056,408	1,155,282	1,035,048	1,164,060
Magnesitic dolomite and brucite		—	3,569,619	—	4,007,241
Marl	tons	84,487	147,852	68,439	119,768
Mica	pounds	765,814	838,056	486,550	23,560
Ochre and iron oxide	tons	1,033	79,250	235	22,325
Peat (moss and humus)	tons	84,127	2,205,054	91,628	2,358,449
Quartz and industrial sand	tons	459,195	2,692,249	493,042	2,688,368
Soapstone and talc	tons	17,256	199,049	17,000	216,000
Sulfur	tons	226,161	1,470,591		2,236,237
Titanium (oxide and other products)	tons	379,925[1]	21,270,144		19,955,350
TOTAL INDUSTRIAL MINERALS			$164,899,003		$158,772,391
II — Building materials					
Building lime	tons	34,315	$ 357,928	33,000	$ 345,000
Building stone	tons	38,908,631	44,325,717	35,669,804	40,160,809
Cement	tons	2,628,841	41,590,355	2,870,930	45,845,120
Clay products	tons	—	6,839,772	—	6,562,548
Sand and gravel	tons	47,907,486	22,207,399	44,000,000	20,600,000
TOTAL BUILDING MATERIALS			$115,321,171		$113,513,477
GRAND TOTAL			$687,666,579		$704,704,474

1 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.

2 Value in Canadian funds. According to the international rate which is $20.671-834 an ounce troy, the Quebec production is equivalent to $19,323,389 for 1964 and to $18,737,301 for 1965.

Published by
Information and Publications Branch
Department of Natural Resources