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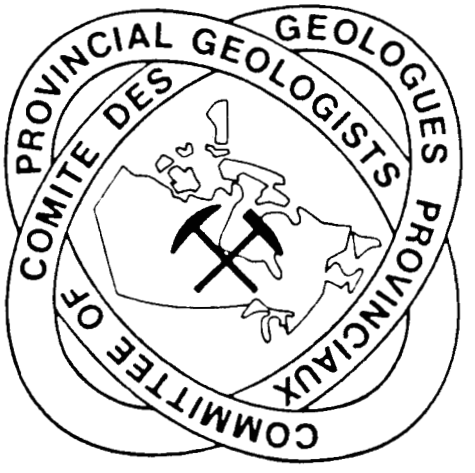
1986

PROVINCIAL GEOLOGISTS JOURNAL
JOURNAL DES GÉOLOGUES PROVINCIAUX



VOLUME 4

PUBLICATION ANNUELLE DU
COMITÉ DES GÉOLOGUES PROVINCIAUX

PUBLISHED ANNUALLY BY
COMMITTEE OF PROVINCIAL GEOLOGISTS

AVANT-PROPOS

Nous sommes heureux de vous présenter le volume 4 du Journal des géologues provinciaux. Lorsque nous avons accepté le mandat d'éditer et de publier ce quatrième volume, c'était avant tout pour nous l'occasion de témoigner de l'importance que nous accordons à cette publication et aussi afin d'assurer sa continuation.

Nous désirons remercier toutes les personnes ainsi que les institutions qui ont aidé à assembler le volume 4. Parmi celles-ci, mentionnons W.R. Smyth, Ministry of Energy, Mines and Petroleum resources, British Colombia; James Christopher, Department of Energy and Mines, Saskatchewan; V. Milne et G. Kendricks, Ministry of Northern Development and Mines, Ontario; et P. Giles, Department of Energy and Mines, Nova Scotia.

Le Service de la géoinformation du ministère de l'Energie et des Ressources du Québec a édité et compilé le présent volume. Nos remerciements s'adressent tout particulièrement à Luc Chauvin et son équipe pour avoir permis la réalisation de ce volume avec un si bref échéancier.

Le Journal des géologues provinciaux est disponible dans chaque province et territoire au comptoir habituel servant à diffuser l'information géoscientifique.

André F. Laurin
Sous-ministre adjoint
Exploration géologique et minérale (Mines)
Ministère de l'Énergie et des Ressources,
Québec

FOREWORD

We are pleased to present Volume 4 of the Provincial Geologists Journal. When we accepted to edit and publish Volume 4, we did so because all of us recognized the importance the Journal has for our individual organizations and industries and the need to perpetuate the Journal was self-evident.

I would like to thank all the people and institutions that helped put together this volume. They include W.R. Smyth, Ministry of Energy, Mines and Petroleum Resources, British Colombia; James Christopher, Energy and Mines, Saskatchewan; V. Milne and G. Kendricks, Ministry of Northern Development and Mines, Ontario; and P. Giles, Department of Energy and Mines, Nova Scotia.

The Geoinformation Service of the Ministry of Energy and Resources, Quebec, edited and compiled the present volume. Special thanks go to Luc Chauvin and his team for producing the volume in such a short period of time.

The Provincial Geologist Journal is available in each province and territory through the offices of geological surveys or relavant information centres or distribution offices of mineral resources departments of provincial or territorial governments.

André F. Laurin
Sous-ministre adjoint
Exploration géologique et minérale (Mines)
Ministère de l'Énergie et des Ressources,
Québec

THE COMMITTEE OF PROVINCIAL GEOLOGISTS
CHAIRMAN'S REPORT 1986

It is ten years since the Committee of Provincial Geologists was formed at the Meeting of the Provincial Mines Ministers in St. John's, Newfoundland. The Chief Geologists or equivalent from each provincial and territorial Survey of Mineral Resources Division comprise the Committee. In anticipation of future devolution of mineral resource responsibilities for the northern territories, the Yukon and Northwest Territories governments were given observer status in 1985.

The Committee provides a forum for discussion of those geological and mineral resource exploration and development issues that lie within the jurisdiction of the Provinces, and through contacts with private sector mineral oriented organizations maintains an effective and highly useful liaison with most of the components of the mineral industry. The Committee, through its individual members, is a major component of the National Geological Survey's Committee, through which a formal communication channel has been established with the Geological Survey of Canada. Committee representation on the Geoscience Council of Canada provides an effective window to many other facets of the earth science community in Canada. Active participation in the annual convention of the Prospectors and Developers' Association is maintained through a Provincial Day, during which activities in the provinces and regions as well as their resource potential are discussed, and through the Provincial Room in which each province and territory advertises to the mining and mineral exploration community activities and potential within its domain.

The Committee meets twice a year: in March, just prior to the Prospectors and Developers' Convention; and usually in September in conjunction with the Provincial Mines Ministers' Conference. Various mining, exploration and related mineral industry groups and federal agencies are invited to discuss issues of current interest with the Committee.

A topic of high priority has been the maintenance, expansion and enhancement of Canada's geoscience data base. Mineral exploration and development, land use planning, and geo-technical hazard evaluation, a growing concern as our country becomes more and more urbanized, are all dependent for success of this data base. Under the current economic restraint that affects all levels of the Canadian economy, the need to enhance the effectiveness of all geoscientific investigations, and to preserve and ultimately to make available both the results and data generated by such investigations has become more apparent. Thus, among the topics of concern to the Committee, ones which are regularly discussed with private industry, academic and federal communities are:

(1) Computerization of the various types of data files that have been built up, and how these can be made available to potential users.

(2) Capture and preservation of geological data, including drill core, produced by various industry activities, and data produced by geochemical and geophysical surveys.

(3) Review of government supported geological programs to enhance their usefulness and relevance to private and public sector needs and to avoid, as far as possible, non-productive duplication of work.

To further these goals at the individual survey level, Mineral Exploration Liaison Committees have been formed to improve communications between the various provincial geoscience organizations and their client communities. Most of these committees are made up of industry and academic representatives.

The Committee published Volume 3 of its Journal in March 1986. This Journal, by publicizing the work of the Committee and of the member organizations, provides a vehicle to acquaint the many client groups of provincial surveys with basic information on provincial survey operations.

Achievements of Committee of Provincial Geologists in 1986

1) A survey of geological data files was conducted to ascertain the status and variety of such data bases and their availability to industry and other public users.

2) A survey of Mineral Development Agreements was completed in order to share experiences and expertise with these programs and ensure there will be no unnecessary duplication of studies.

3) Consultations continued to develop and ensure the use of standard geological map symbols.

4) A survey of the methods used in the discovery of Canadian mineral deposits was begun. First results for mines that began production during the past 20 years will be published in the next Committee Journal.

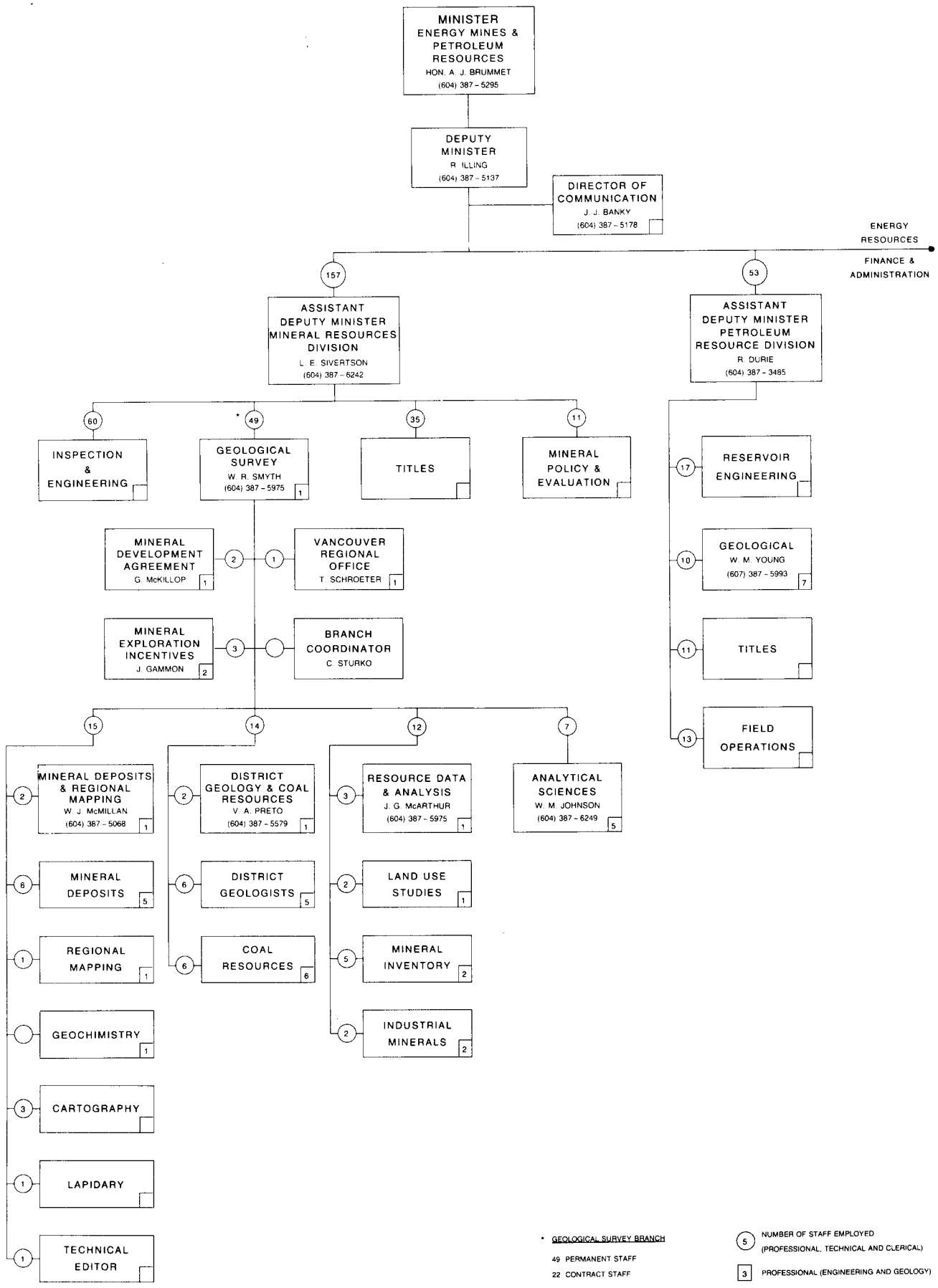
5) A Provincial Room, at which all provincial and territorial geological surveys displayed their products and advertised their current activities, was held at the March Prospectors and Developers Convention in Toronto. More than 1500 people viewed these exhibits.

W.A. Padgham

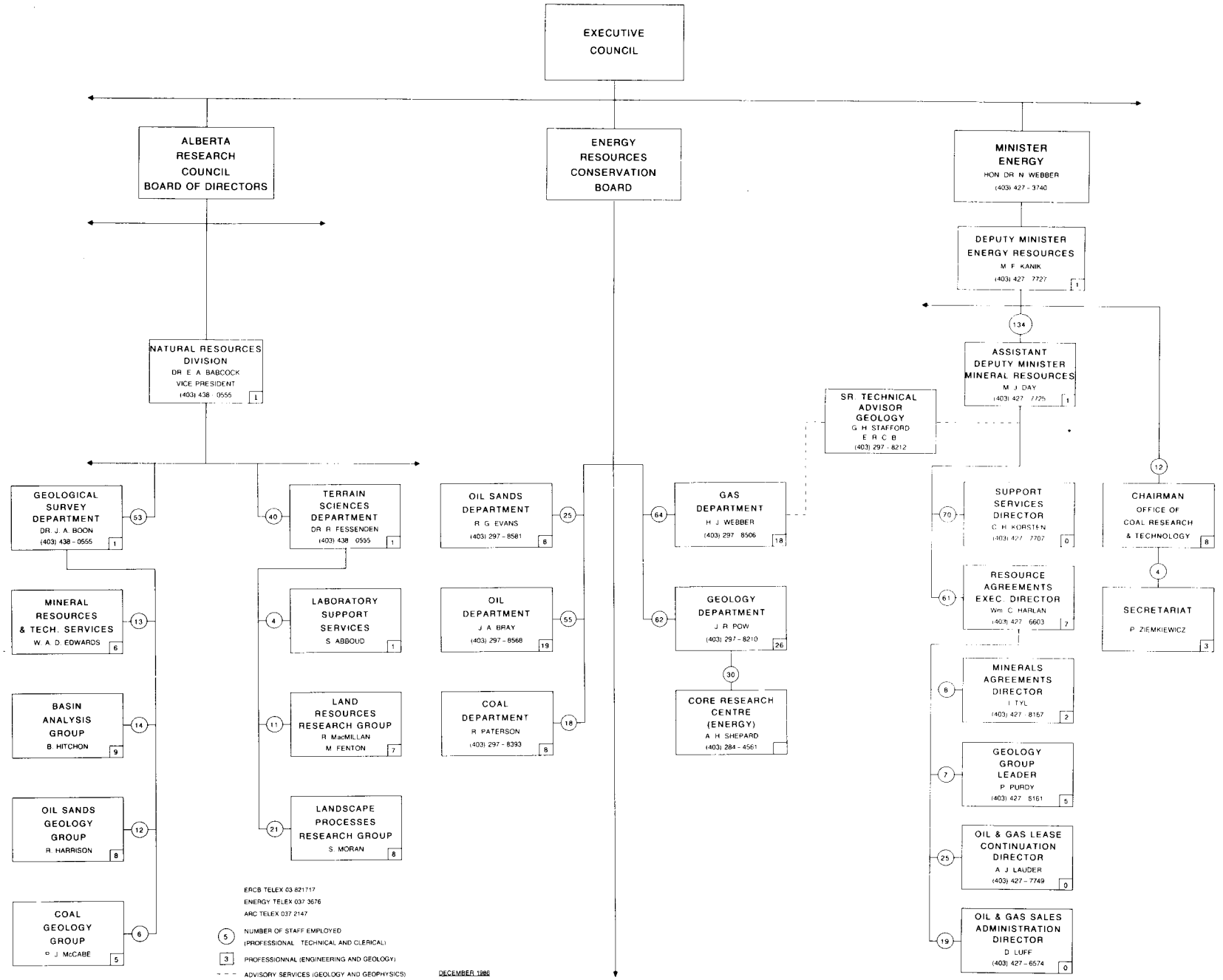
GEOSCIENCE ORGANIZATION CHARTS

Each provincial and territorial government in Canada has developed its own organizational structure for conducting geoscientific survey and research work. Some provinces have what is formally called a Geological Survey (e.g. Ontario Geological Survey), but in most jurisdictions the main elements of the geological survey function are embraced in one or more Branches or Divisions of provincial Mines/Energy/Natural Resources Departments (e.g. the British Columbia Ministry of Energy, Mines and Petroleum Resources is divided into a Mineral Resources Division and a Petroleum Resources Division, with the bulk of geological survey and research work conducted in the Geological Branch of the Mineral Resources Division). The following organization charts are set out in standard format to help alleviate confusion amongst potential users of provincial geoscience services. The charts contain reference to the lines of reporting of the various units in each hierarchy, the manpower associated with each separate jurisdiction, and the names and telephone numbers of key individuals in each system.

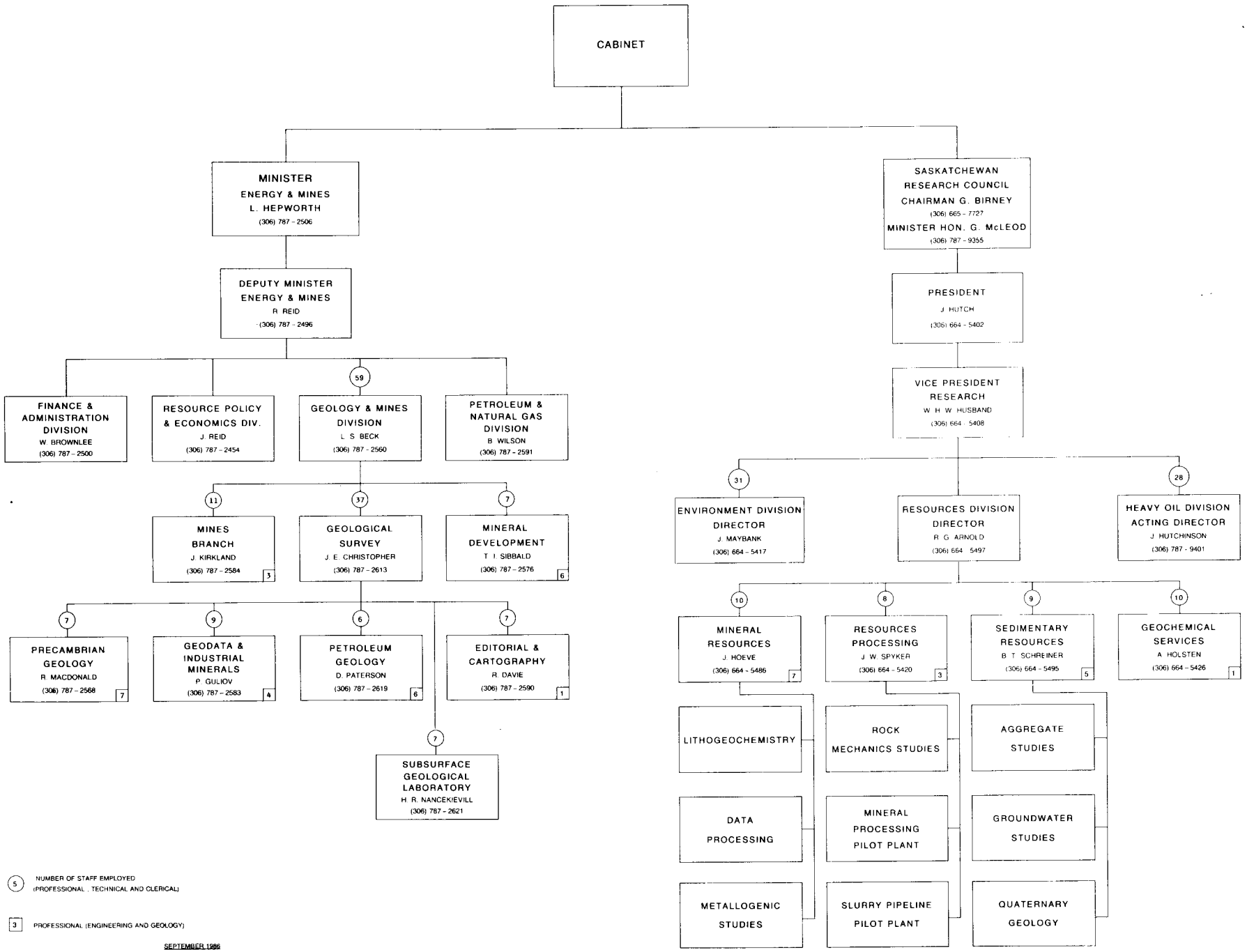
BRITISH COLUMBIA GEOSCIENCE ORGANIZATION CHART



ALBERTA GEOSCIENCE ORGANIZATION CHART



SASKATCHEWAN GEOSCIENCE ORGANISATION CHART

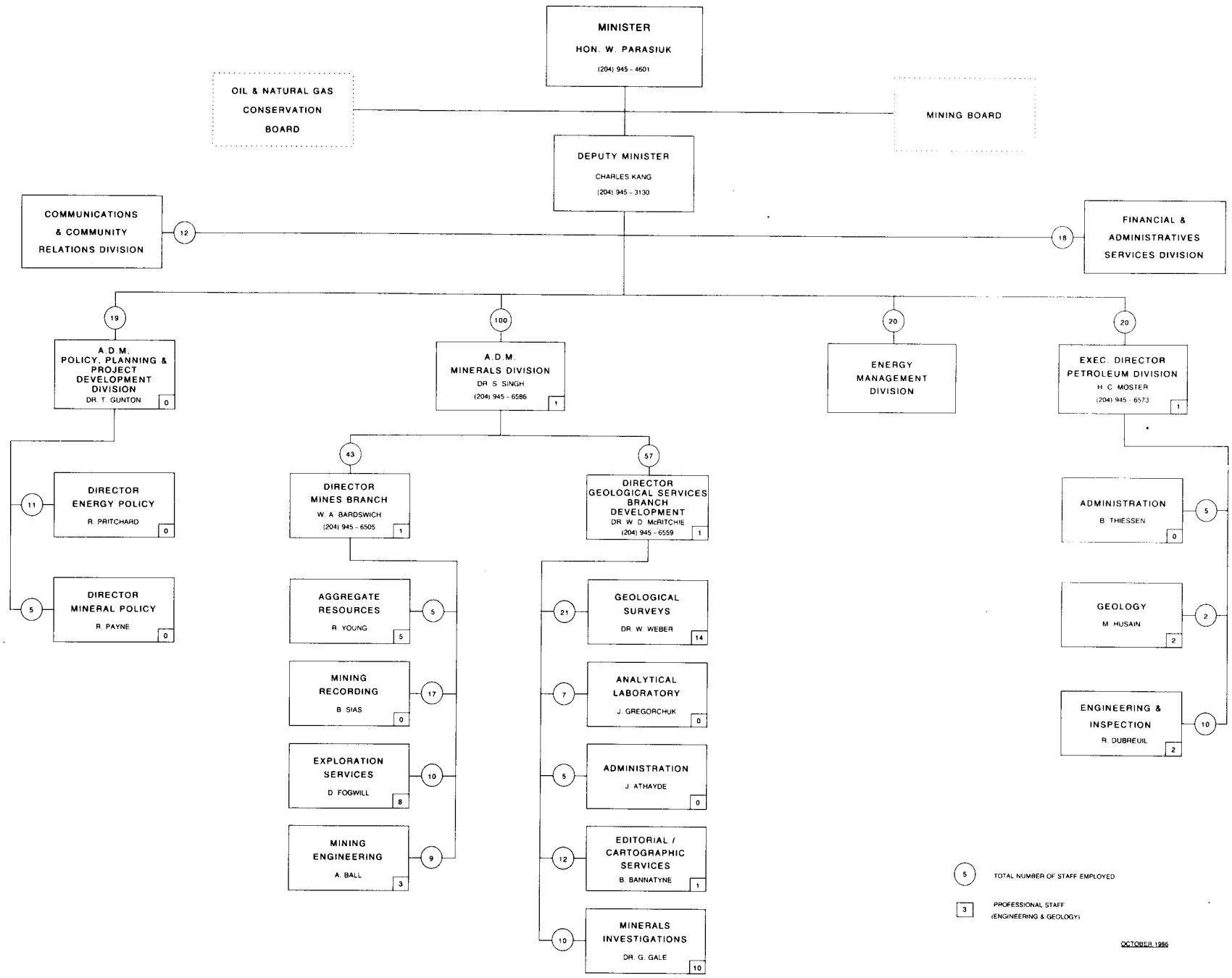


(5) NUMBER OF STAFF EMPLOYED (PROFESSIONAL, TECHNICAL AND CLERICAL)

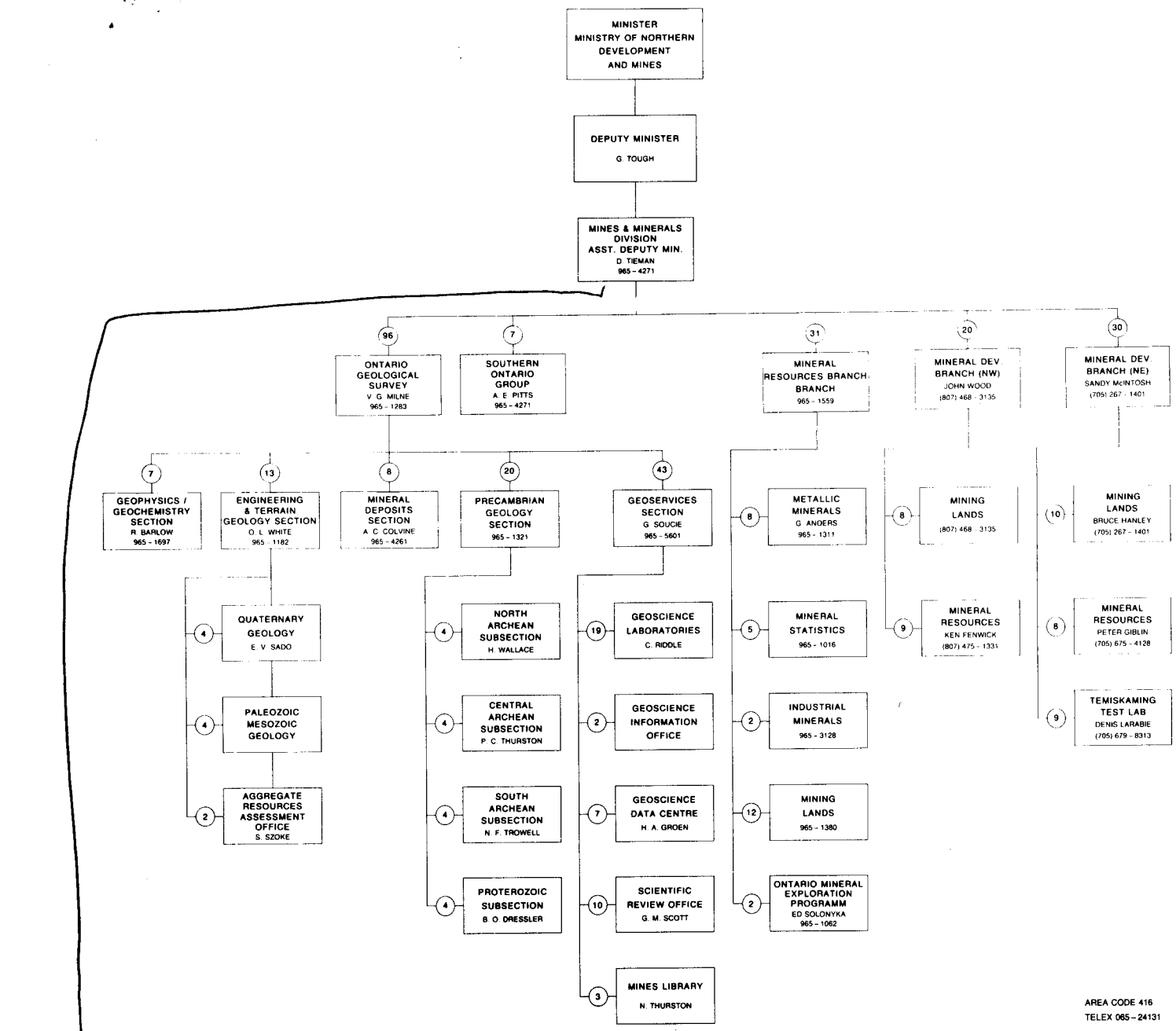
[3] PROFESSIONAL (ENGINEERING AND GEOLOGY)

SEPTEMBER 1986

MANITOBA GEOSCIENCE ORGANIZATION CHART



ONTARIO GEOSCIENCE ORGANIZATION CHART



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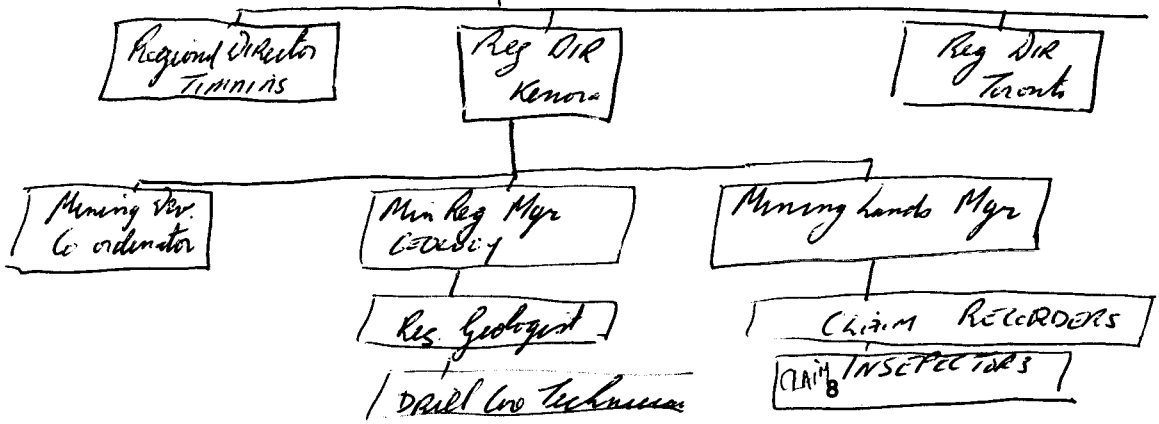
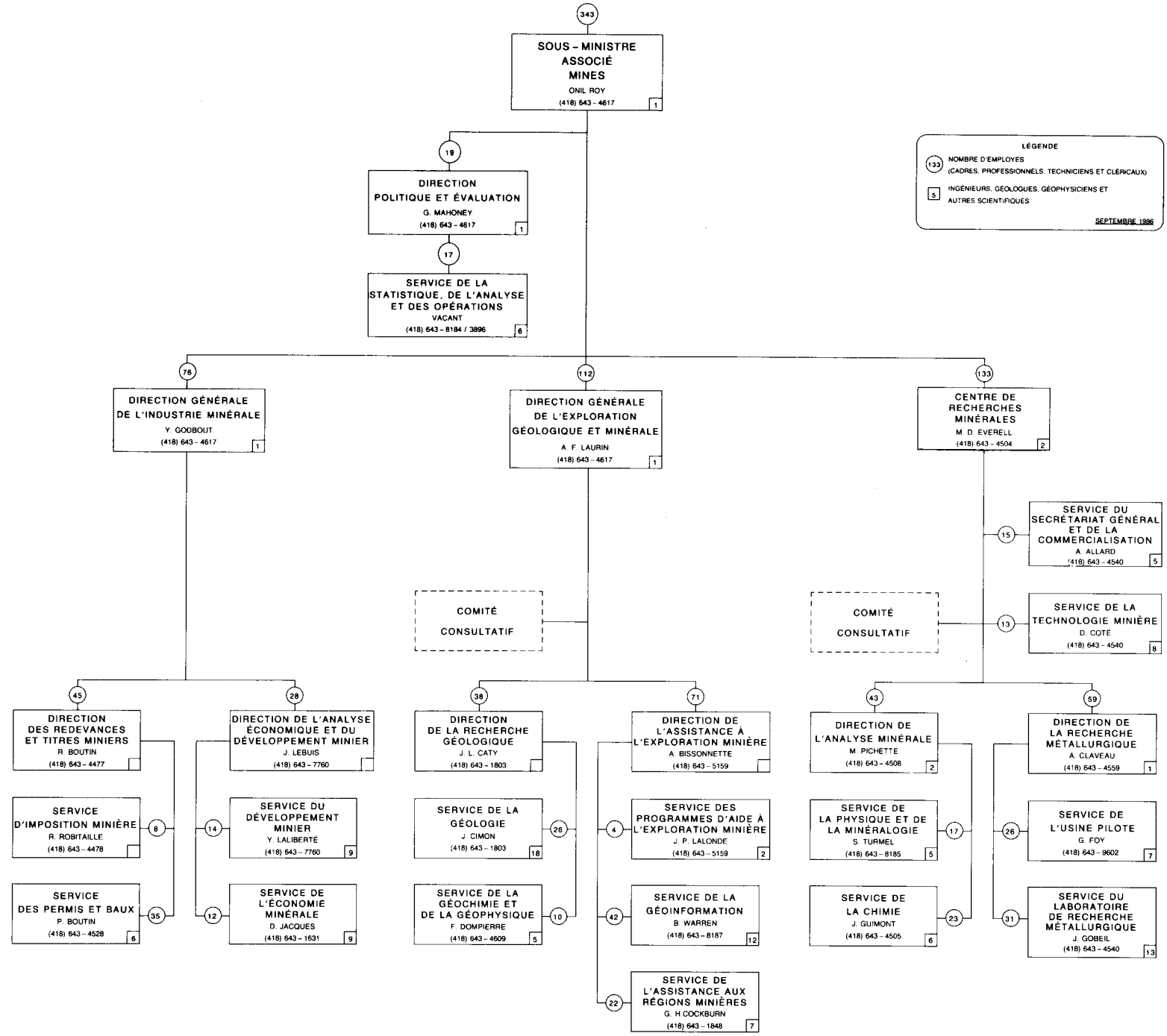
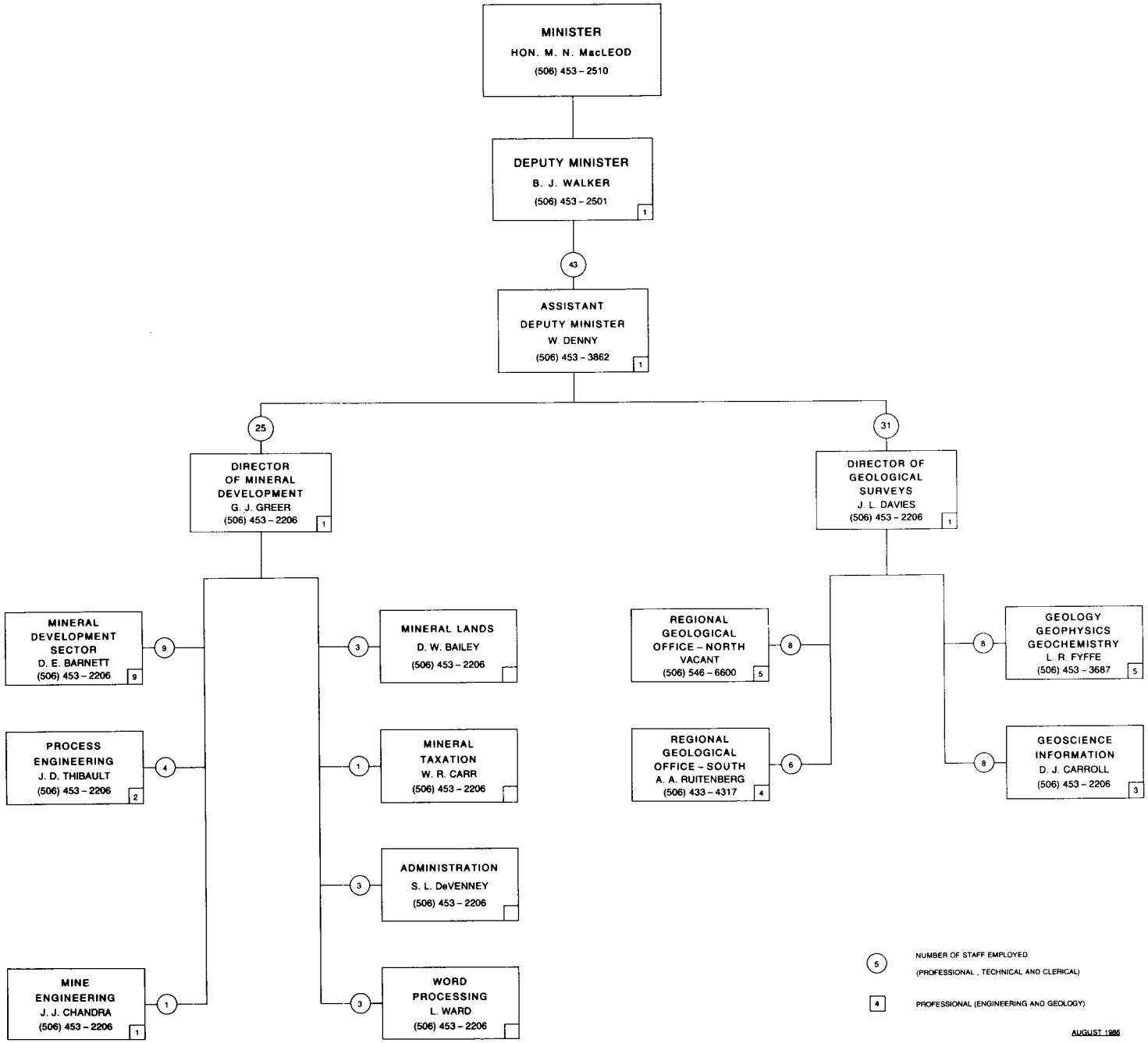


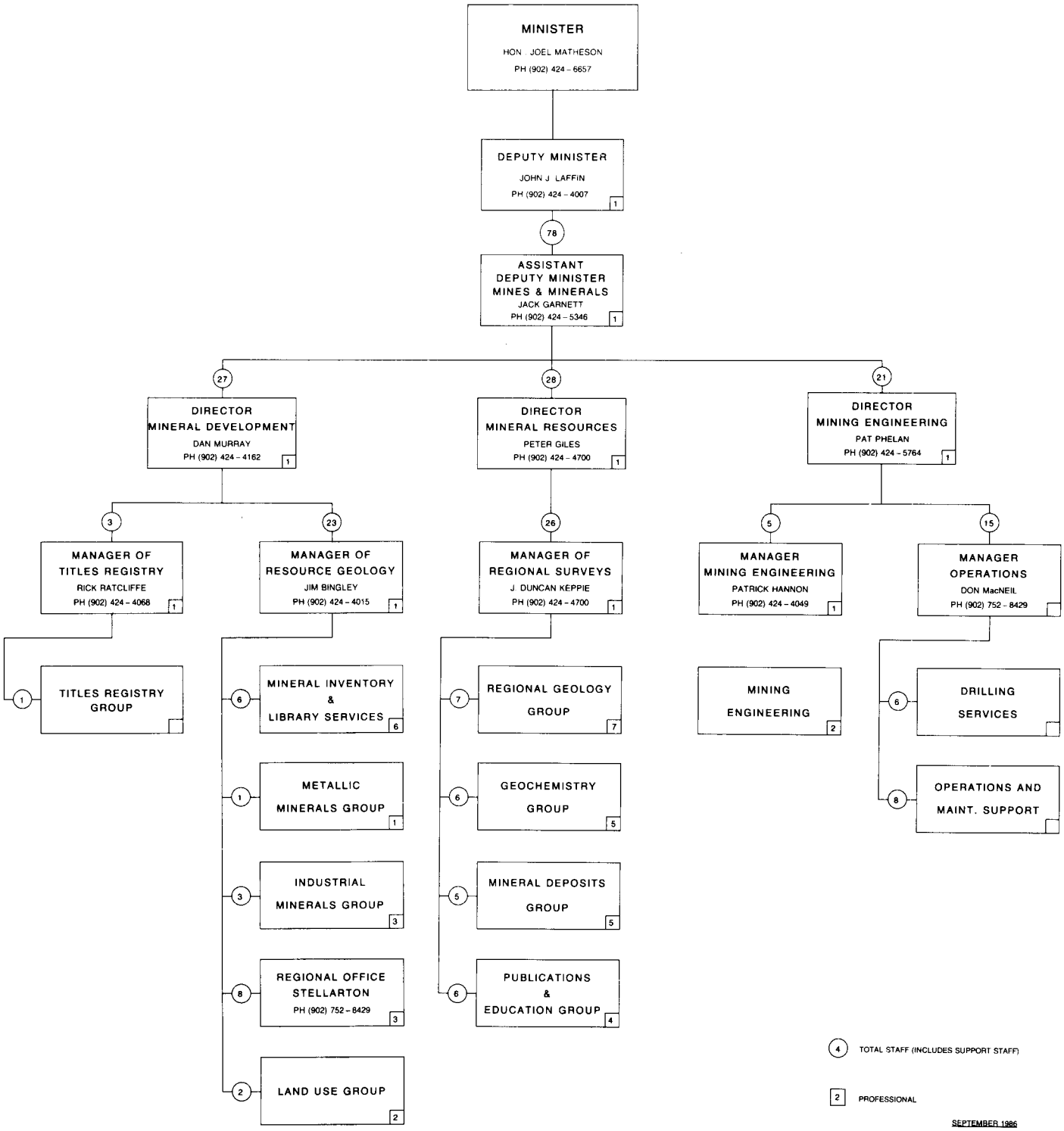
ORGANIGRAMME GÉOSCIENCE DU QUÉBEC



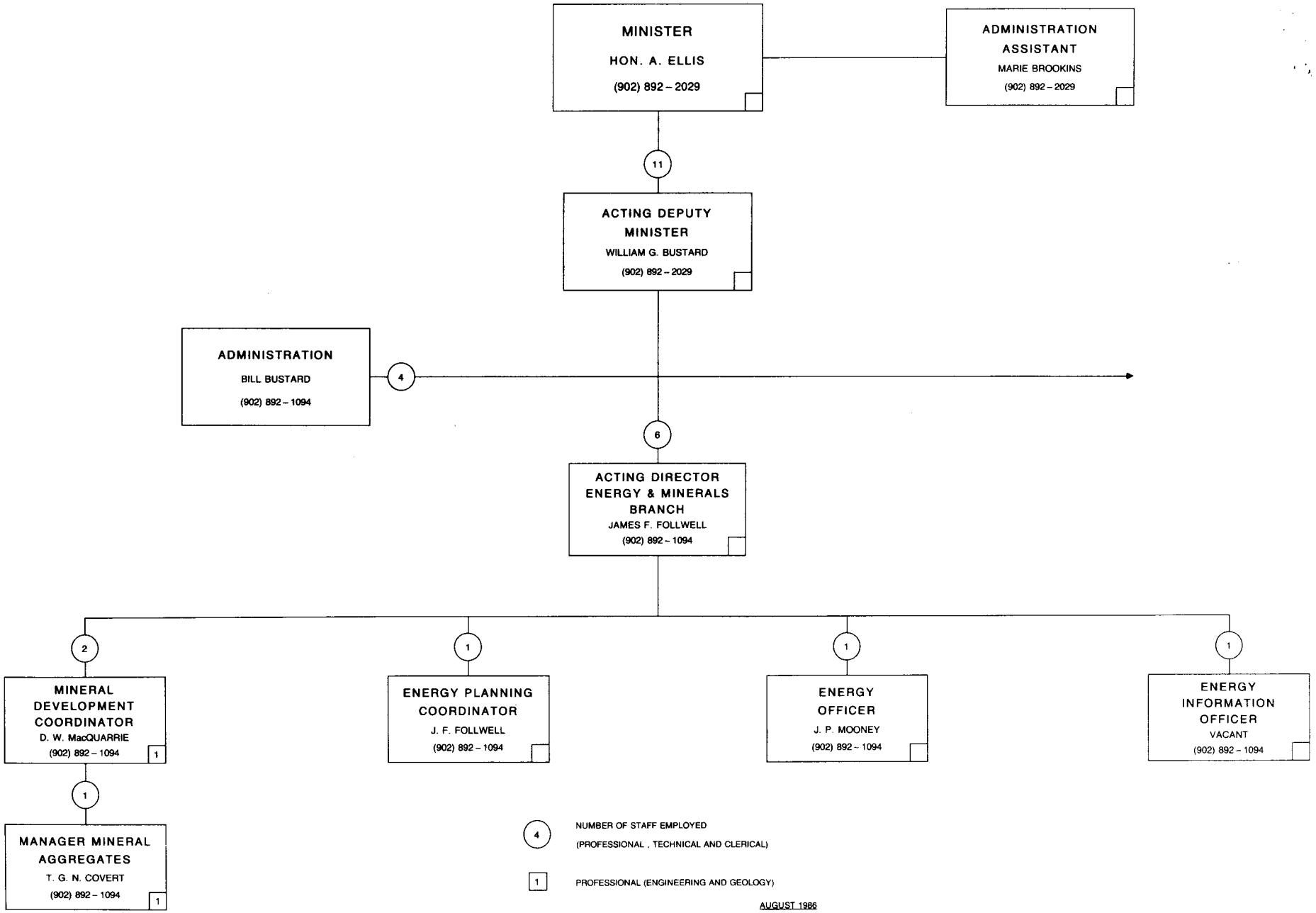
NEW BRUNSWICK GEOSCIENCE ORGANIZATION CHART



NOVA SCOTIA GEOSCIENCE ORGANIZATION CHART

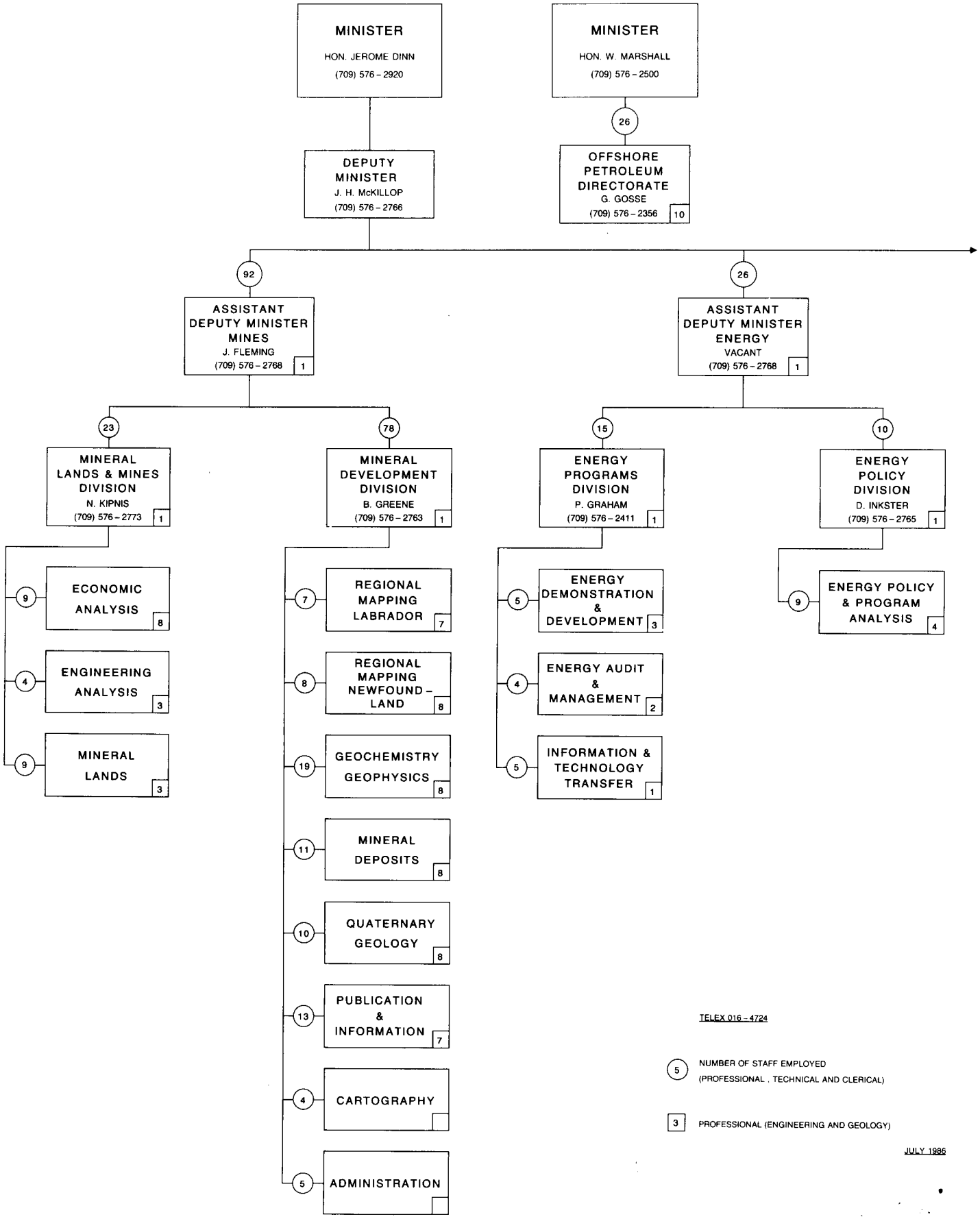


PRINCE EDWARD ISLAND GEOSCIENCE ORGANIZATION CHART

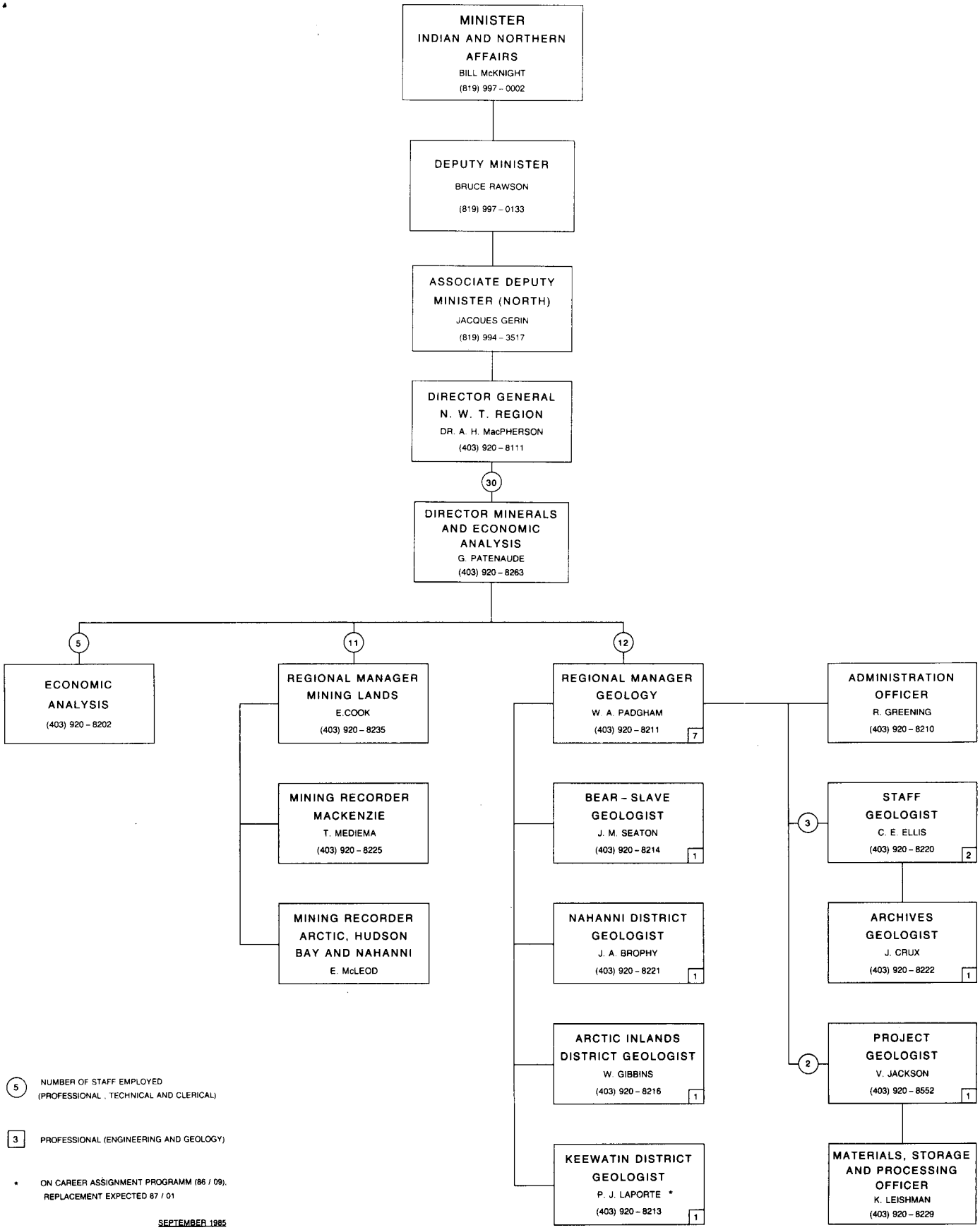


AUGUST 1986

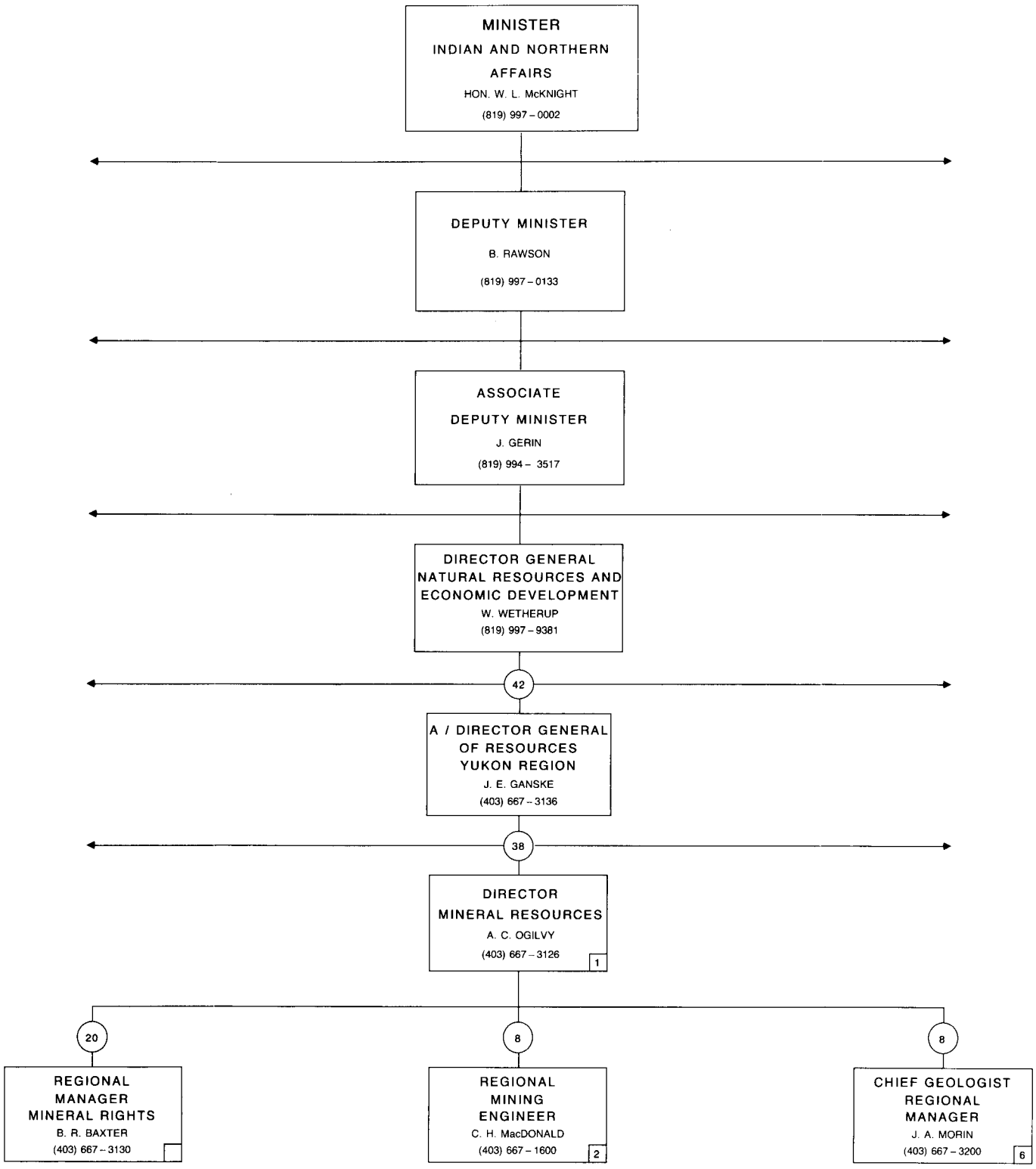
NEWFOUNDLAND GEOSCIENCE ORGANIZATION CHART



NORTHWEST TERRITORIES GEOSCIENCE ORGANIZATION CHART



YUKON GEOSCIENCE ORGANIZATION CHART



(5) NUMBER OF STAFF EMPLOYED (PROFESSIONAL , TECHNICAL AND CLERICAL)

[3] PROFESSIONAL (ENGINEERING AND GEOLOGY)

SEPTEMBER 1985

PROVINCIAL GEOLOGICAL SURVEY EXPENDITURES, 1985-86

PROVINCIAL GEOSCIENCES EXPENDITURES
1985—1986

PROVINCE/ TERRITORY	SURVEY EXPENDITURES $ x 10^6	% OF TOTAL	TOTAL 1985 VALUE OF PROVINCIAL MINERAL PRODUCTION* $ x 10^6	SURVEY EXPENDITURES AS % OF TOTAL VALUE OF PROVINCIAL MINERAL PRODUCTION	AREA OF PROVINCE/ TERRITORY $km^2 x 10^3$	SURVEY $ SPENT/km^2	POPULATION (1981) x 10^3	SURVEY $ SPENT/ CAPITA
Newfoundland	5.1	8.7	927.1	0.55	405	12.6	568	9.0
Nova Scotia	4.0	6.8	327.8	1.22	55	72.4	847	4.7
Prince Edward Island	0.1	0.2	1.6	5.40	6	14.8	123	0.7
New Brunswick	1.3	2.2	550.3	0.24	73	17.8	696	1.9
Quebec	15.6	26.7	2 236.8	0.70	1 541	10.0	6 438	2.4
Ontario	15.8	27.0	4 565.6	0.35	1 069	14.8	8 625	1.8
Manitoba	3.5	6.0	828.5	0.42	650	5.3	1 026	3.4
Saskatchewan	2.2	3.8	3 782.6	0.06	652	3.4	968	2.3
Alberta	4.7	8.0	27 346.0	0.17	661	7.2	2 238	2.1
British Columbia	4.0	6.8	3 465.0	0.12	948	4.3	2 744	1.5
Yukon	0.8	1.4	58.0	1.38	483	1.6	23	34.8
Northwest Territories	1.3	2.2	843.8	0.15	3 380	0.4	46	28.3
TOTALS	**58.4**	—	**44 933.1**	—	**9 922**	—	**24 343**	—

*Preliminary; includes petroleum and natural gas values as follows:
Manitoba, $180.4; Saskatchewan, $2 350.0; Alberta, $25 752.6; British Columbia, $862.0
[1]Includes Mineral Development Branch and Geological Surveys Branch expenditures

PROVINCE: BRITISH COLUMBIA
1985—1986

PROGRAMS	SURVEY/ RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS (OR FACILITIES)	PERMANENT[1] SMY	CASUAL SMY	SALARIES PERMANENT $	SALARIES CASUAL/ TEMPORARY $	OPERATING EXPENDITURES $	TOTALS $
Chief's Office	GB (MRD)	EMPR/ EMR	1	2	1	74 006	32 000	25 148	131 154
Core Repositories	GB (MRD)	EMPR	1[2]	1	—	21 000	—	1 000	22 000
Geochemical Surveys:									
(1) Bedrock	GB (MRD)	EMPR	—	—	—	—	—	—	—
(2) Drainage	GB (MRD)	EMPR/ EMR	2	—	—	—	5 000	220 000	225 000
(3) Soil	—	—	—	—	—	—	—	—	—
Geological Surveys, Bedrock:									
(1) Reconnaissance (>1:100 000)	—	—	—	—	—	—	—	—	—
(2) Detailed (>1:50 000)	GB (MRD)	EMPR/ EMR	10	15	6	543 106	170 000	616 092	1 329 198
Geological Surveys, Surficial:									
(1) Reconnaissance (>1:100 000)	—	—	—	—	—	—	—	—	—
(2) Detailed (>1:50 000)	GB (MRD)	EMPR	1	1	—	—	—	—	—
Geophysical Surveys:									
(1) Airborne Electromagnetic	—	—	—	—	—	—	—	—	—
(2) Airborne Magnetic	—	—	—	—	—	—	—	—	—
(3) Ground Magnetic	—	—	—	—	—	—	—	—	—
(4) Gravity	—	—	—	—	—	—	—	—	—
(5) Seismic	—	—	—	—	—	—	—	—	—
(6) Radiometric	—	—	—	—	—	—	—	—	—
Hydrogeological Surveys	OM	—	—	—	—	—	—	—	—
Education	GB (MRD)	EMPR	11	1	—	33 456	—	21 155	54 611
Laboratory Analysis	GB (MRD)	EMPR	8	8	—	252 451	—	121 195	373 646
Mineral Deposit Inventory and Analysis	GB (MRD)	EMPR/ EMR	4	13	3	410 020	33 000	327 789	770 809
Oil and Gas Inventory and Analysis	GB (PRD)*	EMPR	2	10	—	408 000	—	85 000	493 000
Publications	EMPR	EMPR	11	2	—	—	—	—	—
District Geologist's Office	GB (MRD)	EMPR	7	7.5	1	393 408	19 052	177 377	589 837
Petroleum Subsurface Investigations	GB (PRD)*	EMPR	1	1	—	50 000	—	15 000	65 000
Water Resource Inventory and Analysis	OM	—	—	—	—	—	—	—	—
TOTALS									
GB (MRD)	—	—	—	**50.5**	**11**	**1 727 447**	**259 052**	**1 509 756**	**3 496 255**
GB (PRD)	—	—	—	**11**	—	**458 000**	—	**100 000**	**558 000**

[1]Full Time Employees
[2]Charlie Lake
*GB (MRD) — Geological Branch (Mineral Resources Division)
GB (PRD) — Geological Branch (Petroleum Resources Division)
EMPR — Ministry of Energy, Mines and Petroleum Resources
OM — Other Ministries
EMR — Energy, Mines and Resources Canada
(Canada — B.C. Mineral Development Agreement)

PROVINCE: ALBERTA
1985—1986

PROGRAMS	SURVEY/ RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS (OR FACILITIES)	PERMANENT SMY	CASUAL SMY	SALARIES PERMANENT $	SALARIES CASUAL $	SUPPLIES & SERVICES $
Chief's Office	ARC/AENR	ARC/AENR	2	9.5	—	294 252*	—	128 917*
Core Repositories	ARC/ERCB	RC/ERCB	2	35.0	3.0	900 000	60 000	60 000
Geological Surveys/Bedrock:								
(1) Reconnaissance (>1:100 000)	—	—	—	—	—	—	—	—
(2) Detailed (1:31 680)	—	—	—	—	—	—	—	—
Geological Surveys, Surficial:								
(1) Reconnaissance (>1:10 000)	ARC	ARC/AENR	1	2.0	—	84 500	—	23 000
(2) Detailed (>1:50 000)	ARC	ARC	5	2.0	—	88 000	—	31 000
(3) Reclamation/Environmental Impact	ARC	LCRC/ARC	2	10.0	2.0	475 000	50 000	368 000
Geophysical Surveys	—	—	—	—	—	—	—	—
Hydrogeological Surveys	ARC	ARC/AENR	5	12.0	0.5	391 504	—	33 054
Information and Education	ARC	ARC	1	1.4	—	63 800	—	9 500
Laboratory Analysis	ARC	AOSTRA/ARC AENR	5	8.0	—	350 000	—	112 500
Mineral Deposit Inventory and Analysis	ARC	ARC/AENR	4	8.0	—	321 463	—	52 252
Energy Resource Inventory and Research:								
(1) Petroleum and Natural Gas	ARC/ERCB	ERCB/ARC AENR	3	23.5	.3	925 000	3 500	400 000
(2) Oil Sands	ARC/ERCB	ERCB/ARC AOSTRA	10	14.0	.6	520 000	14 000	80 000
(3) Coal Geology	ARC	AENR/ARC	5	6.0	—	348 223	—	21 383
TOTALS	—	—	**38**	**117.4**	**4.4**	**4 114 242**	**77 500**	**537 606**

ARC — Alberta Research Council
AENR — Alberta Energy and Natural Resources
AOSTRA — Alberta Oil Sands Technical Research Authority
ERCB — Energy Resources Conservation Board
LCRC — Land Council and Reclamation Council
TAU — TransAlta Utilities Ltd.
*ARC figures available only

PROVINCE: SASKATCHEWAN
1985—1986

PROGRAMS	SURVEY/ RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS (OR FACILITIES)	PERMANENT SMY	CASUAL SMY	SALARIES PERMANENT $	SALARIES CASUAL/ TEMPORARY $	OPERATING EXPENDITURES $
Administration (Head Office)	SGS	SGS	1	9.0	0.8	268 500	18 600	45 200
*Core Repositories	SGS	SGS	1	7.0	1.3	152 400	23 000	25 300
Geochemical Surveys: (UofR)								
(1) Bedrock	—	—	—	—	—	—	—	33 000
(2) Drainage	—	—	—	—	—	—	—	—
(3) Vegetation	SGS	SGS	1	1.0	1.0	49 500	17 400	24 200
Geological Surveys, Bedrock:								
(1) Reconnaissance (1:100 000)	SGS	SGS	3	3.0	3.3	163 000	114 750	155 200
(2) Detailed (1:50 000)	—	—	—	—	—	—	—	—
Geophysical Surveys, Surficial:								
(1) Reconnaissance (1:100 000)	SRC	SGS	1	—	—	—	—	10 000
(2) Detailed (1:50 000)	—	—	—	—	—	—	—	—
Geophysical Surveys:								
(1) Airborne Electromagnetic	—	—	—	—	—	—	—	—
(2) Airborne Magnetic	—	—	—	—	—	—	—	—
(3) Ground Magnetic	—	—	—	—	—	—	—	—
(4) Gravity	—	—	—	—	—	—	—	—
(5) Seismic	—	—	—	—	—	—	—	—
(6) Geothermal	—	—	—	—	—	—	—	—
Hydrogeological Surveys	—	—	—	—	—	—	—	—
Information and Education	SGS	SGS	1	—	—	—	—	—
Laboratory Analysis	SRC/UofR Carleton	SGS	2	—	—	—	—	15 000
Mineral Deposit Inventory and Analysis Including Industrial Minerals	SGS	SGS	4	3.0	1.0	147 000	30 000	49 450
Oil and Gas Inventory and Analysis	SGS	SGS	1	7.0	1.0	198 000	18 500	11 000
Publications	SGS	SGS	—	—	—	—	—	73 500
†Resident Geologist's Office	SGS	SGS	2	3.0	0.8	112 600	11 000	31 900
Subsurface Investigations	SGS	SGS	5	7.0	—	286 500	—	11 000
Water Resource Inventory and Analysis	—	—	—	—	—	—	—	—
Metallogenic Mineral Deposit Studies	SGS	SGS	1	2.0	1.0	97 500	7 500	20 200
TOTALS	—	—	—	**42.0**	**10.2**	**1 475 000**	**240 750**	**507 450**
Grand Total	**2 218 100**							

SGS — Saskatchewan Geological Survey
SRC — Saskatchewan Research Council
UofR — University of Regina
*Sedimentary rocks
†Includes igneous-metamorphic core storage

PROVINCE: MANITOBA
1985—1986

PROGRAMS	SURVEY/ RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS (OR FACILITIES)	PERMANENT SMY	CASUAL SMY	SALARIES PERMANENT $	SALARIES CASUAL $	OPERATING EXPENDITURES $
Core Repositories	MM	CAN/MAN	4	2.00	.08	66 900	3 600	90 300
Geochemical Surveys:								
(1) Bedrock	—	—	—	—	—	—	—	—
(2) Drainage	—	—	—	—	—	—	—	—
(3) Soil	MGS	MAN	3	1.00	1.38	43 500	23 000	90 700
(4) Peat	MGS	MAN	—	—	—	—	—	23 700
Geological Surveys, Bedrock:								
(1) Reconnaissance (1:100 000)	MGS	MAN	2	.46	.27	43 000	8 000	2 500
(2) Detailed (1:50 000)	MGS	MAN	15	8.00	5.02	365 700	96 800	127 000
(3) Phanerozoic	MGS	MAN	1	1.00	—	46 800	—	15 200
Geological Surveys, Surficial:								
(1) Reconnaissance (1:50 000)	—	—	—	—	—	—	—	—
(2) Detailed (1:50 000)	—	—	—	—	—	—	—	—
(3) Resource Management	—	—	—	—	—	—	—	—
Geophysical Surveys:								
(1) Airborne Electromagnetic	—	—	—	—	—	—	—	—
(2) Airborne Magnetic, Gradiometer	—	—	—	—	—	—	—	—
(3) Ground Magnetic	MGS	MAN	1	1.00	.13	36 000	4 000	2 100
(4) Gravity	—	—	—	—	—	—	—	—
(5) Seismic	—	—	—	—	—	—	—	—
(6) Radiometric	—	—	—	—	—	—	—	—
(7) Remote Sensing	MGS	CAN/MAN	1	—	—	—	—	900
Hydrogeological Surveys	—	—	—	—	—	—	—	—
Information, Education, Assessment Services and Compilation	MGS/MM	CAN/MAN	7	3.00	.07	90 900	6 800	41 700
Laboratory Analysis	MGS	MAN	3	11.00	2.00	316 800	18 100	53 400
Mineral Deposit Inventory and Analysis	MGS/UNIV	MAN	16	4.00	9.16	204 700	167 200	258 300
Industrial Minerals	MGS	MAN	4	2.00	5.19	73 600	72 700	29 000
Oil and Gas Inventory and Analysis	—	—	—	—	—	—	—	—
Publications	MGS	MAN	39	—	—	—	—	54 400
Resident Geologist's Office	—	—	—	—	—	—	—	—
Subsurface Investigations, Industrial Mininerals Drilling and Management	MGS	MAN	2	2.00	.32	57 600	12 100	32 700
Water Resource Inventory and Analysis	—	—	—	—	—	—	—	—
Other:								
(1) Administration	MGS	MAN	—	5.00	—	185 500	—	288 600[1]
(2) Drafting	MGS	MAN	—	12.00	—	342 000	—	12 500
(3) Uranium/Lead and Rubidium/Strontium Analyses	MGS/UNIV/ GSC	CAN/MAN	6	.06	—	6 300	—	46 700
TOTALS	—	—	—	**53.00**	**26.12**	**1 879 300**	**412 300**	**1 169 700**

GSC — Geological Survey of Canada
MGS — Manitoba Geological Services Branch
MM — Manitoba Mines Branch
UNIV — Universities
CAN — Canada
MAN — Manitoba
[1]Includes 188.1 for Field Equipment and Capital

PROVINCE: ONTARIO
1985—1986

PROGRAMS	FUNDING AGENCY	NO. OF PROJECTS (OR FACILITIES)	MAN-YEARS PERMANENT	MAN-YEARS CASUAL	SALARIES PERMANENT $	SALARIES CASUAL $	OPERATING EXPENDITURES $	TOTALS $
Administration (Head Office)	MNR	—	5	1	116 000	67 000	106 000	289 000
Core Repositories	MNDM	7	4	8	76 000	150 000	166 000	392 000*
Geochemical Surveys/Research	—	—	—	—	—	—	—	—
Geophysical Surveys:								
Airborne Electromagnetic	MNR/MNA	10	7	6	253 000	64 000	915 000	1 232 000
Gravity	—	—	—	—	—	—	—	—
Seismic	—	—	—	—	—	—	—	—
Geological Surveys:								
Precambrian	MNR/MNA/ DREI	20	20	21	846 000	596 000	654 000	2 096 000
Geological Surveys:								
Phanerozoic	—	—	—	—	—	—	—	—
Quaternary	MNR/MNA	9	13	10	456 000	247 000	209 000	912 000
Aggregate	—	—	—	—	—	—	—	—
Geoservices:								
Publications	—	—	—	—	—	—	—	—
Laboratory Analysis	MNR/MNA/ DREI	—	38	15	1 194 000	327 000	1 233 000	2 754 000
Assessment Services	—	—	—	—	—	—	—	—
Equipment, Vehicles	—	—	—	—	—	—	—	—
Information, Education, Library	MNR/MNA	—	5	—	105 000	37 000	54 000	196 000
Mineral Deposits Studies Including Industrial Minerals	MNR/MNA/ DREI	20	8	15	355 000	294 000	235 000	884 000
Resident Geologist's Offices	MNR/MNA	—	35	63	1 242 000	1 170 000	582 000	2 994 000
Geoscience Research Grants Program	MNR	23	—	—	—	—	502 000	502 000
Exploration Technology Development Fund	BILD	18	—	1	—	—	837 000	837 000
Hydrocarbon Energy Resources Program	BILD	7	—	10	—	331 000	1 228 000	1 559 000
Drill Core Storage Program	BILD	3	—	—	—	—	1 187 000	1 187 000
TOTALS	—	**117**	**135**	**150**	**4 643 000**	**3 283 000**	**7 908 000**	**15 834 000**

MNR — Ontario Ministry of Natural Resources
MNA — Ontario Ministry of Northern Affairs
DREI — Federal Department of Regional Expansion of Industry
BILD — Board of Industrial Leadership Development
*Estimate

PROVINCE: QUEBEC
1985—1986

PROGRAMS	DIR. GÉNÉRALE EXPLORATION GÉOL. ET MINÉRALE	FUNDING AGENCY MINISTÈRE ÉNERGIE ET RESSOURCES	NO. OF PROJECTS	PERMANENT STAFF MAN-YEARS P-T-C	CASUAL STAFF* MAN-YEARS	BUDGET ALLOCATIONS* $
Core Repositories	—	—	—	—	—	79 500
Geochemical Surveys:	DGEGM	—	—	3P-2T-1C	14.0	—
(1) Bedrock	DGEGM	***MER/EMR	1	—	—	20 000
(2) Drainage	—	***MER/EMR	6	—	—	812 800
(3) Lakes	—	—	2	—	—	308 000
Geological Surveys, (Bedrock)	DGEGM	***MER/EMR	36	14P-3T-4C	85.0	5 949 000
Geological Surveys, (Surficial)	—	—	—	—	—	—
Geological Surveys:	—	—	—	2P-1T	6.0	—
(1) Airborne Electromagnetic	DGEGM	***MER/EMR	5	—	—	1 236 000
(2) Airborne Magnetic	—	—	—	—	—	—
(3) Ground Magnetic	—	—	—	—	—	—
(4) Gravity	DGEGM	***MER/EMR	1	—	—	1 000 000
(5) Others (Sismique-réfraction)	—	MER/EMR	2	—	—	31 500
Hydrogeological Surveys	—	—	—	—	—	—
Information and Education	DGEGM	MER	1	—	—	25 000
Laboratory Analysis	DGEGM	MER	—	—	—	300 000
Mineral Deposit Inventory Analysis	DGEGM	***MER/EMR	4	4P-1T	—	279 400
Publications and Cartography	DGEGM	MER	—	7P-16T-2C	—	960 000
Publications Distribution	DGEGM	MER	—	4P-1T-7C	1.9	172 500
Resident Geologist's Offices**	DGEGM	MER	—	8P-4T-9C	2.2	275 500
Subsidies	DGEGM	MER	40	2P-1C	40.0	2 971 700
Research and Development	DGEGM	MER	1	—	2.0	200 000
Geoscience Information Acquisitions	DGEGM	MER	8	5P	2.0	786 500
Other (Informatique-bureautique)	DGEGM	MER	5	—	—	234 000
TOTALS	**—**	**—**	**112**	**49P-28T-24C**	**153.1**	**15 641 400**

P: Professional
T: Technical
C: Clerical
*Salaries of permanent staff not included
**Regional representatives
***Program I, Canada/Québec subsidiary agreement on mineral development

PROVINCE: NEW BRUNSWICK
1985—1986

PROGRAMS	SURVEY/ RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS (OR FACILITIES)	STAFF-YEARS PERMANENT	STAFF-YEARS CONTINUING AUXILIARY	STAFF-YEARS SUMMER AUXILIARY	SALARIES PERMANENT $	SALARIES CONTINUING AUXILIARY $	SUMMER AUXILIARY $	OPERATING EXPENDITURES $
Core Repositories	GSB	DNRE	5	—	—	0.25	—	—	3 000	5 308
Geochemical Surveys:										
(1) Bedrock	—	—	—	—	—	—	—	—	—	—
(2) Drainage	GSB	DNRE	1	—	—	—	—	—	—	20 000
(3) Soil	—	—	—	—	—	—	—	—	—	—
Geological Surveys, Bedrock:										
(1) Reconnaissance (1:100 000)	—	—	—	—	—	—	—	—	—	—
(2) Detailed (1:20 000)	GSB	DNRE	2	2	—	1.0	67 816	—	14 868	51 849
Geological Surveys, Surficial:										
(1) Reconnaissance (1:100 000)	—	—	—	—	—	—	—	—	—	—
(2) Detailed (1:50 000)	—	—	1	—	—	0.5	—	—	8 000	17 200
Geophysical Surveys:										
(1) Airborne Electromagnetic	—	—	—	—	—	—	—	—	—	—
(2) Airborne Magnetic	—	—	—	—	—	—	—	—	—	—
(3) Ground Magnetic	—	—	—	—	—	—	—	—	—	—
(4) Gravity	—	—	—	—	—	—	—	—	—	—
(5) Seismic	—	—	—	—	—	—	—	—	—	—
(6) Radiometric	—	—	—	—	—	—	—	—	—	—
Hydrogeological Surveys	—	—	—	—	—	—	—	—	—	—
Information and Education	GSB	DNRE	2	3	—	—	75 375	—	—	52 241
Laboratory Analysis	GSB	DNRE	1	2	—	—	45 410	—	—	14 570
Metallic-Mineral Deposit Inventory and Analysis	GSB/ MDB	DNRE	1	2	—	—	77 074	—	—	22 813
Industrial Minerals:			1							
(1) Evaporites	MDB	DNRE	—	1	—	0.25	35 476	—	3 584	8 000
(2) Limestone	MDB	DNRE	—	—	—	—	—	—	—	—
(3) Granular Resources	MDB	DNRE	2	2	—	0.5	68 404	—	2 758	27 670
Coal Inventory and Analysis	—	—	—	—	—	—	—	—	—	—
Oil and Gas-Oil Shale Inventory and Analysis	MDB	DNRE	2	2	—	1.25	68 068	—	4 000	—
Publications	GSB	DNRE	—	3	—	—	56 731	—	—	9 618
Resident Geologist's Office	GSB	DNRE	3	8	—	—	296 177	—	—	122 470
Subsurface Investigations	—	—	—	—	—	—	—	—	—	—
Peat Inventory	MDB	DNRE	1	1	—	0.25	30 160	—	3 987	18 950
Water Resource Inventory and Analysis	—	—	—	—	—	—	—	—	—	—
Other Studies*	GSB/ MDB	DNRE	3	2	—	—	63 075	—	4 000	21 854
TOTALS	**—**	**—**	**25**	**28**	**—**	**4.0**	**891 766**	**—**	**38 439**	**354 955**

Grand Total ..... **$1.3 million**

GSB — Geological Surveys Branch
MDB — Mineral Development Branch
DNRE — Department of Natural Resources and Energy
*Includes mineral economic, and mining studies and various research projects supported by GSB

PROVINCE: NOVA SCOTIA
1985—1986

PROGRAMS	SURVEY RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS (OR FACILITIES)	PERMANENT STAFF MAN-YEARS	CASUAL STAFF MAN-YEARS	BUDGET ALLOCATIONS $
Core Repositories	NSDME	NSDME/ NSDOD	3	3	1	230 000
Geochemical Surveys:	NSDME	NSDME/ NSDOD	2	1	1	140 000
(1) Bedrock	—	—	—	—	—	—
(2) Drainage	—	—	—	—	—	—
(3) Soil	—	—	—	—	—	—
Geological Surveys, Bedrock:	—	—	—	—	—	—
(1) Reconnaissance (>1:100 000)	—	—	—	—	—	—
(2) Detailed (>1:50 000)	NSDME	NSDME/ NSDOD	6	3	7	680 500
Geological Surveys, Surficial:						
(1) Reconnaissance (>1:100 000)	—	—	—	—	—	—
(2) Detailed (>1:50 000)	NSDME	NSDME	2	1	2	160 000
Geophysical Surveys:						
(1) Airborne Radiometrics	—	—	—	—	—	—
(2) Airborne Magnetic (includes VLF-EM)	—	—	—	—	—	—
(3) Ground Magnetic	—	—	—	—	—	—
(4) Gravity	—	—	—	—	—	—
(5) Seismic	—	—	—	—	—	—
Hydrogeological Surveys	—	—	—	—	—	—
Information and Education	NSDME	NSDME/ NSDOD	1	2	1	208 000
Laboratory Analysis (included in budgets above)	—	—	—	—	—	—
Mineral Deposit Analysis	NSDME	NSDME/ NSDOD	9	4	5	275 000
Mineral Deposit Inventory	NSDME	NSDME/ NSDOD	4	3	2	100 000
Coal and Peat	NSDME	NSDME/ NSDOD	3	7	2.6	573 000
Oil and Gas Inventory and Analysis	NSDME	NSDME	1	5	0.8	539 000
Publications	NSDME	NSDME/ NSDOD	N/A	2	—	180 000
Resident Geologist's Office	NSDME	NSDME	N/A	15	—	412 400
Subsurface Investigations	NSDME	NSDME	N/A	4	7	486 400
TOTALS	—	—	**31**	**46**	**29.4**	**3 984 300**

NSDME — Nova Scotia Department of Mines and Energy
NSDOD — Nova Scotia Department of Development

TERRITORY: NEWFOUNDLAND
1985—1986

PROGRAMS	SURVEY/ RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS (OR FACILITIES)	PERMANENT[1] SMY	CASUAL SMY	PERMANENT $	SALARIES CONTRACT[1] $	CASUAL $	OPERATING EXPENDITURES $
Director's Office	NDME	NDME	—	6	2	139 600	30 800	8 000	119 900
Core Repositories	NDME	NDME	3	2	2	36 000	30 000	6 300	56 700
Geochemical Surveys:									
(1) Bedrock	—	—	—	—	—	—	—	—	—
(2) Drainage	NDME	NDME	3	3	10	132 200	—	33 500	78 000
(3) Soil	—	—	—	—	—	—	—	—	—
Geological Surveys, Bedrock:									
(1) Reconnaissance (>1:100 000)	NDME	NDME/ DEMR	5	6	21	171 000	70 000	124 600	844 200
(2) Detailed (>1:50 000)	NDME	NDME/ DEMR	6	7	6	134 000	116 200	19 200	234 200
Geological Surveys, Surficial:									
(1) Reconnaissance (>1:100 000)	—	—	—	—	—	—	—	—	—
(2) Detailed (>1:50 000)	NDME	NDME	7	9	14	86 000	201 000	68 400	273 900
Geophysical Surveys:									
(1) Airborne Electromagnetic	—	—	—	—	—	—	—	—	—
(2) Airborne Magnetic	—	—	—	—	—	—	—	—	—
(3) Ground Magnetic	NDME	NDME	1	1	2	—	34 000	9 000	36 000
(4) Gravity	NDME	NDME	1	—	2	—	—	8 000	45 000
(5) Seismic	—	—	—	—	—	—	—	—	—
(6) Radiometric	—	—	—	—	—	—	—	—	—
Hydrogeological Surveys:	—	—	—	—	—	—	—	—	—
Information and Education	NDME	NDME	—	—	—	—	—	—	—
Laboratory Analysis	NDME	NDME/ DEMR	1	10	2	140 000	75 800	5 300	176 500
Mineral Deposit Inventory and Analysis	NDME	NDME/ DEMR	7	15	12	202 000	228 000	38 000	506 300
Publications	NDME	NDME/ DEMR	N/A	17	—	241 900	94 300	—	230 909
Resident Geologist's Office	—	—	—	—	—	—	—	—	—
Subsurface Investigations	—	—	—	—	—	—	—	—	—
Water Resource Inventory and Analysis	—	—	—	—	—	—	—	—	—
TOTALS	**—**	**—**	**34**	**76**	**73**	**1 282 700**	**880 100**	**320 300**	**2 601 600**
Grand Total	**5 084 700**								

[1]Includes long term temporary staff
NDME — Newfoundland Department of Mines and Energy
DEMR — Department of Energy, Mines and Resources, Canada

TERRITORY: NORTHWEST TERRITORIES
1985—1986

PROGRAMS	SURVEY/ RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS (OR FACILITIES)	PERMANENT SMY	CASUAL SMY	SALARIES PERMANENT $	SALARIES CASUAL/ TEMPORARY $	OPERATING EXPENDITURES $
Head Office (Administration, General Support)	INA	INA	1	3.4	0.1	220 000	2 000	110 000
Core Repositories	INA	INA	1	0.4	0.2	20 000	2 000	17 000
Geochemical Surveys:								
(1) Bedrock	—	—	—	—	—	17 000	—	9 000
(2) Drainage	—	—	—	—	—	—	—	—
(3) Soil	—	—	—	—	—	—	—	—
Geological Surveys, Bedrock:								
(1) Reconnaissance (1:100 000)	—	—	1	0.3	0.3	7 000	8 000	23 000
(2) Detailed (1:50 000)	INA	INA	20	1.2	2.5	40 000	70 000	160 000
Geological Surveys, Surficial:								
(1) Reconnaissance (1:100 000)	—	—	—	—	0.1	—	2 500	8 000
(2) Detailed (1:50 000)	INA	INA	—	—	0.2	—	5 000	8 000
Geophysical Surveys:								
(1) Airborne Electromagnetic	—	—	—	—	—	—	—	—
(2) Airborne Magnetic	—	—	—	—	—	—	—	—
(3) Ground Magnetic	—	—	—	—	—	—	—	—
(4) Gravity	—	—	—	—	—	—	—	—
(5) Seismic	—	—	—	—	—	—	—	—
(6) Radiometric	—	—	—	—	—	—	—	—
Hydrogeological Surveys	—	—	—	—	—	—	—	—
Education	INA	INA	1	0.1	—	7 000	—	3 000
Laboratory Analysis	INA	INA	1	0.1	—	3 000	—	26 000
Mineral Deposit Inventory and Analysis	INA	INA	7	3.0	—	149 700	—	131 400
Oil and Gas Inventory and Analysis	—	—	—	—	—	—	—	—
Publications	INA	INA	2	3.0	0.4	120 000	—	25 000
Resident Geologist's Office	—	—	—	—	—	—	—	—
Subsurface Investigations	—	—	—	—	—	—	—	—
Water Resource Inventory and Analysis	—	—	—	—	—	—	—	—
Other:								
(1) Prospectors' Assistance	INA	MRD	—	—	—	—	—	—
(2) Geological Contracts	INA	—	12	0.5	—	30 000	—	97 000
TOTALS								
Geology Division	**—**	**—**	**—**	**12.0**	**3.8**	**613 700**	**89 500**	**608 400**
Grand Totals	**—**	**—**	**—**	**12.0**	**3.8**	**613 700**	**89 500**	**608 400**

INA — Indian and Northern Affairs, Canada
MRD — Mineral Rights Division INA

TERRITORY: YUKON
1985—1986

PROGRAMS	SURVEY/ RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS (OR FACILITIES)	PERMANENT SMY	CASUAL SMY	SALARIES PERMANENT $	SALARIES CASUAL/ TEMPORARY $	OPERATING EXPENDITURES $
Head Office (Administration, General Support)	INA	INA	1	3.0	0.5	98 000	7 000	110 000
Core Repositories	INA	INA	1	0.5	—	15 000	2 000	10 000
Geological Surveys, Bedrock:	INA	INA	2	—	0.5	—	10 000	25 000
(1) Detailed (1:50 000)	—	EDA	1	—	1.3	—	56 000	34 000
Geological Surveys, Surficial:								
(1) Detailed (1:50 000)	INA	INA	2	0.5	0.5	25 000	22 000	15 000
Education	INA	INA	1	—	—	—	—	15 000
Laboratory Analysis	INA	INA	3	—	—	—	—	7 000
Mineral Deposit Inventory and Analysis	INA	INA	9	3.5	2.0	165 000	46 000	65 000
Publications	INA	INA	1	0.5	—	18 000	—	—
Other:								
TOTALS								
Exploration and Geological Services Division, Yukon	—	—	—	—	—	**362 000**	**87 000**	**247 000**
Grand Totals	—	—	**21**	**8.0**	**4.8**	**362 000**	**143 000**	**281 000**

INA — Indian and Northern Affairs Canada
EDA — Canada — Yukon Economic Development Agreement

GEOLOGICAL PROGRAM HIGHLIGHTS

PROVINCIAL AND TERRITORIAL GEOLOGICAL SURVEYS 1985 — 1986

BRITISH COLUMBIA GEOLOGICAL SURVEY

BRITISH COLUMBIA MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES

The British Columbia Geological Survey is one of four branches in the Mineral Resources Division. In 1986, the name was changed from Geological Branch to Geological Survey Branch to better reflect its primary purpose of conducting geoscientific surveys.

For the Survey, 1986 was an exciting year in its colourful 91-year history. In July 1985, the Province joined with the Federal Government and signed a $10 million 5-year Mineral Development Agreement under ERDA to further development of the Province's exploration and mining industries. Of this, $6.7 million will be spent on expanding Branch geological and geochemical surveys and improving Branch geoscience data systems. In 1986, the Branch carried out some 30 field projects (figure 1 and table 1). Noteworthy is an ambitious new program of regional 1:50 000 scale mapping, aimed at providing systematic coverage of poorly understood or underexplored parts of the Province. Four senior contract geologists will deliver this program under the direction of Senior Staff Geologist Don MacIntyre.

In April 1986, the branch was reorganized to give a clear mandate and responsibilites to the four sections so they can better deliver the core program and projects under the Mineral Development Agreement. Coal responsibilities were combined into one subsection under Senior Geologist Ward Kilby, and subsections responsible for regional mapping and geochemistry were created. Also, in June 1986, an office was opened in Vancouver, headed by Senior Regional Geologist Tom Schroeter. The aim of this office is to increase communication and liaison between the Survey, which has headquarters in Victoria and senior industry, government, and university officials, which have their headquarters in Vancouver. The following overview adheres to the new organizational breakdown.

MINERAL DEPOSITS AND REGIONAL MAPPING SECTION

This section comprises three subsections, each charged with carrying out geoscientific surveys.

THE MINERAL DEPOSITS SUBSECTION conducts geologic and metallogenic studies of metallic mineral deposits in mining camps and in areas with mineral wealth potential to determine the distribution, origin, mode of formation and exploration guidelines for deposits.

1986 subsection highlights

Two compilation maps were published in 1986, one portraying the gold and silver deposits of onshore B.C. compiled by Andre Panteleyev and Tom Schroeter, and the other, the mineral deposits of offshore B.C., compiled by Andre Panteleyev and Keri Marks. Major field projects were undertaken by Gerry Ray in the Hedley Gold Camp; Andre Panteleyev in the Quesnel mineral belt; Don MacIntyre in the Babine Range in an area of newly discovered Au-Ag quartz veins hosted by Jurassic volcanics at Dome Mountain; B.N. Church in the Bralorne gold camp; and T. Hoy in the Skokumchuk area of southeastern B.C.

In addition, a number of detailed studies of individual deposits were undertaken by University of British Columbia graduate students under a research agreement with the University of British Columbia Geology Department; including the Bralorne-Pioneer Gold Vein (C. Leitch), Indian River-Britannia Volcanogenic Belt (D. Reddy), Midway Massive Sulphide Deposit (J. Bradford).

REGIONAL MAPPING SUBSECTION conducts systematic 1:50 000 scale mapping. Although maps of this scale are generally accepted as an essential precursor to effective mineral exploration, only 5 percent of British Columbia has been covered by maps of this scale. In 1986 four new multi-year projects were initiated: the Sicker Volcanogenic Belt, Vancouver Island (N. Massey), Mesozoic and Tertiary Volcanic Rocks of the Intermontane Belt at Taseko Lake and Whitesail Lake areas (K. Glover and L. Diakow); and the autochthonous and allochthonous shelf and oceanic sequences at Midway area, Northwest B.C. (J. Elson). In addition, the Branch

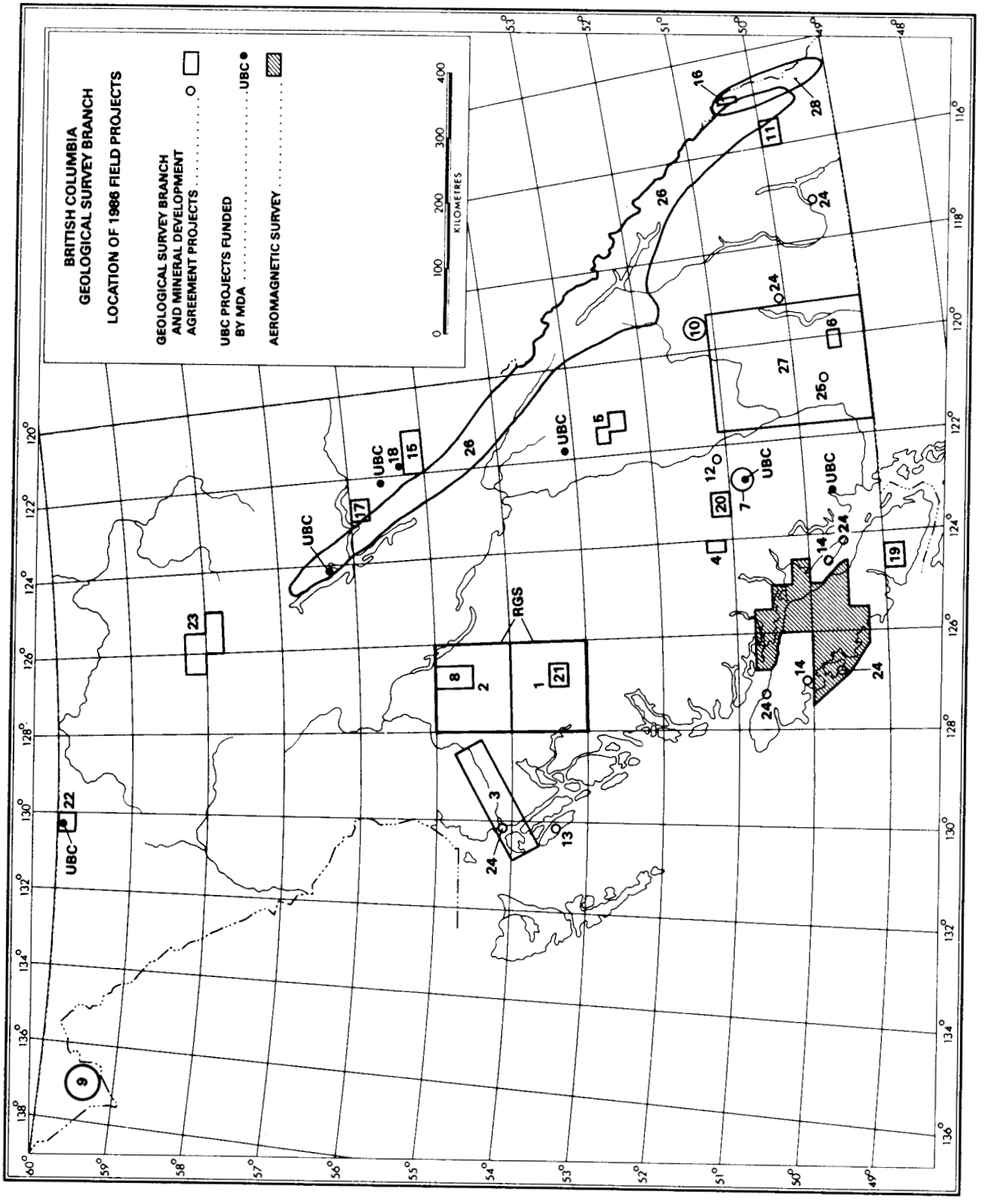


Figure 1. Distribution of program in British Columbia

TABLE 1: SUMMARY OF MAJOR PROJECTS IN 1986

(Numbers refer to Figure 1)

Map No.	Project	Principal Researcher	Area
1	Regional Geochemical Survey	W. Johnson	Whitesail Lake
2	Regional Geochemical Survey	W. Johnson	Smithers
3	Geochemical Orientation Survey	P. Matysek	N. Central Coast Mts.
4	Chilko Lake Park Proposal	G. McLaren	Chilko Lake
5	Quesnel Mineral Belt	A. Panteleyev	Quesnel
6	Hedley Gold Camp	G. Ray	Hedley
7	Bralorne Gold Camp	N. Church	Bridge River
8	Babine Range Metallogenic Study	D. MacIntyre	Dome Mountain
9	Alexander Terrane Metallogeny	D. MacIntyre	St. Elias Mountains
10	Adams Plateau Metallogeny	T. Hoy	Adams Plateau
11	Skookumchuk Regional Mapping	T. Hoy	Kimberley
12	Gold Deposits of S. B.C.	T. Schroeter	Southern B.C.
13	Metallogeny of N.W. B.C.	D. Lefebure	N.W. B.C.
14	Gold Deposits of Vancouver Island	P. Wilton	Vancouver Island
15	Correlation Studies – N.E. Coalfield	W. Kilby	Peace River
16	Correlation Studies – Elk Valley Coalfield	D. Grieve	Elk Valley
17	Carbon Creek Map Area	A. Legun	N.E. B.C.
18	Sukunka Coal Deposit	A. Legun	N.E. B.C.
19	Sicker Regional Mapping Project	N. Massey	Vancouver Island
20	Taseko Regional Mapping Project	K. Glover	Taseko-Bridge River Area
21	Whitesail Regional Mapping Project	L. Diakow	Whitesail Lake
22	Midway Regional Mapping	J. Nelson	N. B.C.
23	Gataga Regional Mapping Creek	K. McClay	Driftpile
24	Dimension Stone Surveys	G. White	B.C.
25	Olivine Deposits	G. White	Princeton
26	Carbonatite Kimberlite Evaluation	J. Pell	Golden
27	Industrial Mineral Potential of Tertiary Basins	Geotex Consultants	Okanagan
28	Phosphate Study	S. Butrenchuk	Fernie

partially sponsored a University of London mapping project in the Driftpile Creek area of Northeast B.C. (K. McClay).

REGIONAL GEOCHEMISTRY SUBSECTION conducts geochemical orientation and follow-up surveys in connection with the Regional Geochemical Survey Program, that has been conducted in cooperation with the Geological Survey of Canada for the past 10 years. In 1986, contract geochemist, Paul Matysek, converted results of past surveys so they are available to the public in microcomputer format on floppy disks; he also undertook a heavy mineral sampling program in the two 1986 RGS survey areas – Whitesail Lake and Smithers map sheets.

DISTRICT GEOLOGY AND COAL RESOURCES SECTION

The District Geology Subsection maintains an up-to-date inventory of the geology, mineral deposits, exploration trends, and developments in the districts. Prospector training and advice and consultation to the mineral and coal industry is also provided.

These functions include reviewing duties for the annual volume Exploration in B.C. as well as providing descriptions of mineral properties visited. District Geologists are also involved in smaller scale metallogenic studies and early in the new year provide an annual review of mineral exploration.

In 1986 Paul Wilton continued his study of precious metal deposits in the Insular Belt and Dave Lefebure examined the setting of the Sulphurets gold deposits in Northwest B.C.

Results of 1986 fieldwork by district staff on selected hot exploration targets will appear in the annual volume Exploration in B.C.

The Tenth Annual Mineral Exploration Course for Prospectors was held at the Cowichan Lake Forestry Research Station in May 1986. Twenty-six students attended. In addition, basic prospector courses were delivered in five locations throughout the Province in 1986. E.L. Faulkner completed a new and comprehensive instruction manual for prospectors which will become the basic instruction tool for these courses.

THE COAL RESOURCES SUBSECTION is responsible for mapping, inventory and analysis of British Columbia coalfields and for the approval of coal exploration assessment reports. A computer file of coal exploration data – COALFILE and a coal core repository at Fort St. John is maintained. In 1986, the Coal Act Regulations were extensively revised. Field studies in 1986 concentrated on stratigraphic coal measures and coal seam correlation in the Elk Valley Coalfield (D. Grieve), Northeast Coalfield – Butler Ridge area (A. Legun), and in the Tumbler Ridge area (W. Kilby).

RESOURCE DATA AND ANALYSIS SECTION

THE MINERAL INVENTORY SUBSECTION collects, compiles, and interprets mineral exploration data submitted by industry. A library of over 14 000 mineral assessment reports is maintained and approximately 1000 reports are added annually. In 1986, the library was available for sale on microfiche format. The information collected from industry is summarized and published annually in the volume Exploration in British Columbia.

An open file summary of "Occurrence and Distribution of Platinum-Group Elements in British Columbia" by J. Rublee was published in 1986. The information was gathered from published and unpublished reports on file with the Ministry.

This subsection is spearheading a Branch project to design and redevelop the computer mineral inventory system – MINFILE. The database redesign was completed in 1985 and programming commenced using the fourth generation software product ULTRA. The project is behind schedule due to instability of the software produce and the unforeseen amount of complex programming required for a relational database.

THE INDUSTRIAL MINERALS SUBSECTION conducts studies on industrial mineral deposits to determine their distribution, grade, and quality to promote their development. In 1986 studies were undertaken on dimension stone, olivine, and phosphate, and a study of the interior Tertiary Basins was initiated to determine the potential for commercial deposits of kaolin, fireclay, ceramic clays, bentonite, zeolite, and pozzolans. A post-doctoral study on carbonatite and kimberlite deposits and a Ph.D study on the Aley Carbonatite in N.E. British Columbia were sponsored by the Branch at the University of British Columbia.

THE LAND USE SUBSECTION carries out field and office evaluations of proposed land alienation areas. In 1986, the Government of British Columbia appointed a Wilderness Advisory Committee to enquire into and make recommendations on land use designations for 16 areas and 8 park boundaries in the Province. This subsection provided the Committee with a comprehensive evaluation of the mineral potential of the study areas. In 1986, Graeme McLaren completed fieldwork in the proposed Chilko Lake Park.

ANALYTICAL SCIENCES SECTION

This section provides a complete range of analyses of rocks, minerals, and ores in support of projects conducted by Branch geologists.

This section is responsible for certifying assayers in the Province and for managing the Regional Geochemical Survey Program.

In 1986 the Section took delivery of a new XRF unit.

FINANCIAL ASSISTANCE FOR MINERAL EXPLORATION (FAME)

In March 1986, the Government of British Columbia announced a new, one year, $5 million program to provide grants in support of private sector mineral exploration. The program is administered by the Geological Survey.

The program has three components; prospector assistance, mineral exploration incentive and accelerated mine exploration. Grants up to one third of exploration costs were awarded to ~~74~~ prospectors, ~~60~~ exploration projects and ~~19~~ mine exploration projects in 1986. Major criteria applied in awarding the grants were: technical quality, state of project advancement, incremental benefits, local economic impact, and the applicant's financial commitment and financial need.

ALBERTA GEOLOGICAL SURVEY
ALBERTA RESEARCH COUNCIL

The activities of the Alberta Geological Survey were organized into four groups, namely:

1. Basin Analysis Group
2. Mineral Resources Group
3. Coal Geology Group
4. Oil Sands Geology Group

The following overview adheres to this organizational breakdown. Further information on any of the Survey's projects or operations can be obtained by reference to the publication list or to the Annual Report of Investigations of the Alberta Geological Survey.

BASIN ANALYSIS

The major effort of the Basin Analysis Group within the past year has been directed at extending the hydrogeological work reported last year for the Cold Lake area, Alberta, both southward and into Saskatchewan. The objective is to model the effects of deep waste disposal in the Cold Lake oil sands deposit and adjacent heavy oil areas. This is a jointly funded project with Alberta Environment.

Work which has continued on a variety of other studies includes; a) a regional and detailed stratigraphic and structural examination of the Peace River Arch; b) evaluation of the geo-pressured and geothermal regimes in the Beaufort-Mackenzie Basin, under contract to the Geological Survey of Canada; c) preparation of several papers dealing with deep waste disposal; and c) the development of techniques for use with large databases when studying the fluid and heat regimes in sedimentary basins.

MINERAL RESOURCES

The Mineral Resources Group of the Alberta Geological Survey is involved with fundamental geological research on Alberta's non-fuel resources and the resource applications of these commodities. Fundamental research (mapping and core analysis) focused on aggregate, limestone, and uranium in 1985/86. Resource analyses were completed for limestone, gold, sodium sulphate, lead-zinc, silica sand, gypsum, phosphate, dimension stone, and aggregate. The Mineral Resources Group received funding for this project from the Alberta Departments of Energy/Forestry, Lands, and Wildlife in five separate contracts.

The Aggregate mapping program continues as one of the most important industrial mineral studies in Alberta. Mapping is being done in the northern (Bistcho, Peerless, and Calling Lake areas) and western (Rocky Mountain House) parts of the province at a reconnaissance level. An economic evaluation of aggregate in the eastern-central part of Alberta was published in 1985. This analysis is based on the detailed information (1:50 000 scale) gathered from more than 50 NTS sheets which were mapped between 1977 and 1983. The rate of depletion of the resources in the region is estimated and recommendations made for more effective aggregate resource management.

A number of maps and reports were published for the Precambrian Shield/Athabasca Basin area of northeastern Alberta and core from uranium and gold exploration programs in this region was filed with the Mineral Core Research facility of the Alberta Geological Survey. Complete coverage of the Shield area, through maps and reports, was achieved in 1986. Compilations of geological maps, at 1:250 000 scale, are also available for both the Precambrian Shield and Athabasca Basin areas. Research studies and further compilations are underway to document and evaluate the mineral occurrences and potential of the region.

A project to document and evaluate Alberta's knowledge of the metallic and industrial minerals of the province was commenced in 1985 with the publication of a bibliographic reference catalogue of 21 commodities and four commodity profile reports (limestone, gold, sodium sulphate, and lead-zinc). Additional four commodities were analyzed in 1986 (silica sand, gypsum, phosphate, and dimension stone). The commodity profile reports provide a ready source of technical data and clearly identify research needs for the future.

The Mineral Resources Group also coordinates the computing, laboratory, and information services of the Alberta Geological Survey. Laboratory and computing services are presently located in a new facility in Edmonton's Research and Development Park. Most of the focus of information services has been with Alberta's geological bibliographic reference database named GEODIAL. This database is freely accessible and is being used by the entire geological community in Alberta.

COAL GEOLOGY

The Coal Geology Group completed a major contract for Alberta Energy/Forestry, Lands, and Wildlife to make an evaluation of the plains coal deposits. Three reports documenting the coal resources of the Belly River Group, the Horseshoe Canyon Formation, and the Ardley Coal

Zone were completed in March 1986. The maps and reports detail the geological character and resource potential of the units. These reports were significant in that they delineated huge coal resources previously poorly understood. The findings of these assessments should be particularly useful in the future designation of coal fields for underground mining.

A geological model developed for the lower Horseshoe Canyon Formation coals and applicable for the Belly River Group coals helps to explain many of the depositional trends observed. The model involves a coastal plain setting characterized by shore-parallel peat swamps which are 30 to 50 km inland from actual shorelines. Frequent transgressions and regressions of the ancient seas resulted in deposition of many thin peat beds. The peats could only accumulate for a relatively short time because of frequent periods of marine transgression. Repeated transgressive-regressive cycles resulted in an interfingering of the coal-bearing sequences of the Lower Horseshoe Canyon Formation with thick marine sequences of the contiguous Bearpaw Formation. The best coal deposits are located in this zone of interfingering. The north-south orientation of the ancient peat swamps, parallel to the shorelines, explains the elongate geometry of coal trends.

The Ardley coal zone, however, was deposited in the lower Tertiary at a time when terrestrial sedimentation was prevalent throughout Alberta. Clastic sediments associated with the Ardley coals are predominantly fluvial in origin. There are also some lacustrine sediments and paleosols. The development of the Ardley coal zone appears to be the result of basin-wide control on sedimentation, either tectonic or climatic, which allowed the development of extensive peat swamps with little introduction of clastics for a long period of time. The coal zone extends northward from Township 30 to the outcrop edge and westward to the "disturbed belt" at the margin of the foothills. As a general rule, the amount of coal increases toward the west.

Since early in 1986 members of the group have been concentrating on proposal development, detailed work plans for new projects, and a comprehensive review of the current status of coal geology within Alberta. New research initiatives in geostatistics related to coal geology and integration of coal data in a geographical information system have been initiated. The group's research in the future will address coal quality from a geological perspective. The scope of these new programs will be finalized in the Fall of 1986.

OIL SANDS GEOLOGY

Activities within the Oil Sands Group of the Alberta Geological Survey focus on regional stratigraphic synthesis, sedimentological studies, mapping, and characterization of Alberta's non-conventional oil sands and heavy oil resources, and supporting specialist studies in palynology. A substantial part of the funding for this group is derived from various contracts with two main agencies: the Alberta Oil Sands Technology and Research Authority (AOSTRA), and Alberta Energy and Natural Resources (AENR).

Research under the AOSTRA/AENR/ARC Joint Program addresses two major areas. The first of these is documentation and interpretation of the character of those oil sands resources in the unmapped parts of the oil sands deposits. This mapping and research provides fundamental insight into the fluid content, stratigraphical, sedimentological, and mineralogical framework, and reservoir boundaries of individual deposits. Within the Cold Lake Deposit, work is aimed primarily at development of a depositional model to explain variations in reservoir quality in the north Cold Lake area. In the central part of the Athabasca Deposit, a suite of bitumen resource maps is being prepared to outline the extent, quality, and characteristics of the oil sand horizons. Models of facies patterns document sedimentological controls on the distribution and quality of the resource.

The second major area under the Joint Program addresses the increasing need to provide detailed fabric analysis for sophisticated geological evaluations of individual reservoirs, pools, pilot sites, and recovery schemes. The Reservoir Geology Modelling project is developing detailed geological and petrophysical models of pools/reservoirs being considered for thermal pilot or enhanced oil recovery projects in order to aid reservoir engineers in numerical modelling and operational strategy decisions.

In contrast to the more fundamental and public AOSTRA/AENR/ARC Joint Program, the AOSTRA Strategic Program is intended to provide a confidential forum within which applied proprietary research on resource assessment and development can be undertaken. Research is concentrated on specific geological investigations relating to problems of resource assessment, pilot siting and operations, and process transferability.

In addition to these regional studies, a great deal of time and effort has been devoted, through AOSTRA's technical and financial partnership in several industry-operated in-situ pilot projects, to proprietary, site-specific, reservoir studies.

The palynological research provides important fundamental data for subtle problems of facies analysis and stratigraphic separation. In addition, two long-term investigations are presently underway: (a) a synthesis of numerous individual studies previously done on the Lower Cretaceous oil sand deposits; and (b) a study of the coal-bearing Late Cretaceous strata in the Red Deer River Valley of southern Alberta.

SASKATCHEWAN GEOLOGICAL SURVEY
SASKATCHEWAN DEPARTMENT OF ENERGY AND MINES

Those mineral industry activities which demanded the most attention in 1985 were petroleum and natural gas, by virtue of record-breaking exploration and development; potash, because of water breakthroughs endangering two of the mines; and kaolin and gold for their high growth potential as new industries which are unfolding in Saskatchewan. Apart from an all-out successful effort to cope with the massive inflow of data from petroleum related activities, the bulk of the budgetary operational resources was concentrated on the Precambrian Shield of Northern Saskatchewan to support the rising level of gold exploration.

Field project operations were again funded under the Canada-Saskatchewan Subsidiary Mineral Development Agreement 1984-89 which is in its second year.

The provincial "Gold Belt Geology" program consists of a number of projects ranging from detailed bedrock mapping to detailed mineral deposit and geochemical studies in areas perceived to have the highest potential for gold exploration. These are especially concentrated in the triangle of country between La Ronge, Reindeer Lake, and Flin Flon.

Bedrock mapping was continued in the Central La Ronge Metavolcanic Belt at 1:20 000 scale. Two field parties worked in the belt. This was the second year of the mapping program which is expected to be completed as far south as the Churchill River by the end of fiscal year 1986-87. This region is currently regarded as the most promising gold exploration terrain in the province. The open file reports issued and the presentations made to the mineral industry have provided regional criteria for gold exploration targets in the belt. These mapping projects were supported by work on regional compilation geologic and metallogenic maps as well as by geochemical studies in the La Ronge region by the University of Regina.

Results of a project to test biogeochemical exploration methodology show a positive relation between plant uptake of gold and mineralized zones, and establish the value of this technique in the exploration for gold in glaciated terrains. Geochronological and isotopic studies were conducted with Carleton University, the University of Regina as well as Kansas University, in order to provide a chronological framework for classifying bedrock units, thereby leading to improved models for mineralization. Likewise, the Saskatchewan Research Council undertook to prepare a report on the Quaternary (glacial) geology of the La Ronge-Reindeer-Flin Flon triangle area as a guide to methodology for gold exploration.

A total of 590 mineral exploration assessment files submitted under the Mineral Disposition Regulations were processed, 178 visitors were received, and 118 requests for information were handled. Two indexes to assessment files, for the Reindeer and La Ronge Mining Districts, were published. Some 1800 visits were recorded at the Resident Geologists' Offices.

The mineralized core collection, stored in La Ronge, received additions totaling some 3925 m in length from the Dawn Lake, Cluff Lake, Dominique-Peter, Fond-du-Lac, and Stewart Island uranium ore bodies; from four other uranium projects in the Athabasca Basin; and from several gold properties in the La Ronge and Flin Flon Belts. About 90 persons examined cores from the collection during the fiscal year.

Work was continued on the Saskatchewan Mineral Deposits Index with the documentation of 117 new occurrences and updating of the records. The index provides a primary reference for mineral exploration and land use planning. A total of 18 major requests for index data were handled. In general, the number of information requests increased over the previous year. This was primarily a result of the current gold exploration boom in northern Saskatchewan.

In industrial minerals, two projects were initiated under the Canada-Saskatchewan Mineral Development Agreement:

1. a four-year project with the University of Saskatchewan to examine geological anomalies in potash mines and to develop a spatial predictive methodology;
2. a project to compile a bibliography of potash mine data relevant to anomalous geological conditions as a basis for developing a standard nomenclature, and as a guide for mine research.

Other projects include studies of the Winnipegosis and Dawson Bay Formations in the eastern potash mining district, and the petrology of the potash-bearing members of the Prairie Evaporite.

Approximately 170 technical inquiries were handled on a wide variety of industrial minerals. This represents about a 6 percent increase over the previous year.

Petroleum-related activity continued its hectic pace. This is reflected in the work of the Well Records Unit, where 3162 new well files were created and 3300 new wells were added to the computerized well information system.

Demand for information services increased substantially during the period. The staff pulled and refiled the records of 32 000 wells, provided industry with over 63 000 pages of photocopied data, and conducted 102 computerized data searches. Over 16 000 submissions of technical data were processed and 1500 letters requesting overdue information of delinquent companies were mailed.

In-house studies of the subsurface formations of Southern Saskatchewan were reduced to two in the Lloydminster heavy oil region, because of the involvement of staff in handling the petroleum data overload. A co-operative program of investigation for strata with hydrocarbon source potential was, however, initiated through the Geological Survey of Canada with funding from the Office of Energy Research and Development. Success in this program will enable a better focused search for new petroleum prospects beyond the present heavily explored districts.

The 1985 Annual Open House of the Geological Survey was attended by some 250 people and included participation from the Universities of Saskatchewan and Regina, the Saskatchewan Research Council, and members of industry. The event provided a synopsis of the geological work being done in the province by public agencies.

SASKATCHEWAN RESEARCH COUNCIL RESOURCES DIVISION

Lithogeochemistry
A comparative study was completed of lithogeochemical data files for a number of unconformity-type uranium deposits in the Athabasca Basin. Preliminary results from a study of gold deposits in the La Ronge and Flin Flon areas have shown that geochemical signatures are associated with epigenetic vein deposits.

Data analysis
Correspondence analysis techniques are being used routinely in geochemical analysis. Programs have been modified to make them run on both IBM and Macintosh personal computers. A new project is being undertaken with CNRS/INRIA, France, to develop an image analysis/remote sensing system for the integrated study of mineral exploration data.

Metallogenic studies
Investigations are continuing of the relationships between the formation of unconformity-type uranium ores and the evolution of the Athabasca Basin. Publications in preparation include a paper on the significance of a stationary redox front as a critical factor in the formation of high grade uranium deposits, and a paper entitled "Cover-basement Interaction and the Origin of U-Ni-Co Mineralization in the Athabasca Basin: Isotopic Evidence C-H-O." A project is underway to investigate the possible relationship between episodes of diabase dike intrusion (thermal events) into the Athabasca Basin and the formation of uranium ores.

The diagenetic-hydrothermal model of uranium ore formation is being extended to the formation of other metals in sedimentary basins. A paper is in press outlining a possible common diagenetic-hydrothermal origin for unconformity-type uranium and stratiform copper deposits.

A study of the metallogenesis of gold in the Beaverlodge district is continuing as a cooperative project with the staff of the division and a student at the University of Saskatchewan.

Rock mechanics studies
This project includes the design, development, and fabrication of stress cells, extensometers and data acquisition systems for remote locations primarily for the potash mining industry. A triaxial testing facility is being commissioned which has the capacity to test large 200-mm diameter by 400-mm long cores. A project is underway to investigate the stress-strain-time behavior of cores from the COMINCO potash mine. A research project has been initiated in cooperation with the University of Saskatchewan to investigate crystal size effects in triaxial tests.

Mineral processing
Recent projects undertaken include bench scale processing of Saskatchewan uranium and gold ores, and studies of the fate of thorium, nickel, and arsenic in uranium mine tailings. Studies are continuing on the upgrading of Saskatchewan's kaolin resources. Some advice has been provided to private industry on the quality and uses of silica sand deposits.

Slurry pipeline studies
Recent studies have been focused on the pipelining of tailings for the design of tailings transport systems and for developing computer models of flow regimes in pipelines. Oil-in-water emulsion studies are being initiated as an option for the transport of heavy crude oil in pipelines.

Aggregate resources
The inventory of aggregate resources of selected areas of the plains region is continuing. Five aggregate resources potential maps, using surficial geology maps at a scale of 1:250 000, were published for the Melville (62I & K), Yorkton (62M & N), Wynyard (72P), Rosetown (72O), and Kindersley (72N) NTS map sheets. It is planned to initiate more detailed aggregate maps at 1:50 000 scale for high demand areas which would summarize the location, extent, quantity, and quality of aggregate resources.

Groundwater resources

A series of ten Geology and Groundwater Resources maps with cross sections at 1:100 000 scale are being prepared for use in groundwater and soil salinity studies as a cooperative project with the Saskatchewan Institute of Pedology, University of Saskatchewan. Monitoring and analysis of data from the network of 50 site groundwater observation wells is continuing. Detailed studies of the rate of flow and chemistry of groundwater in glacial tills at two sites near Saskatoon, being carried out in cooperation with the Institute for Groundwater Research, University of Waterloo, will be completed this year. Groundwater monitoring and sampling in the vicinity of a waste disposal facility at a potash mine is continuing. A project to investigate the occurrence and migration of pesticides in the subsurface in agricultural areas is being initiated in cooperation with the National Hydrology Research Institute which has recently moved to Saskatoon.

Quaternary geology

Quaternary geology studies are being undertaken in the La Ronge Gold Belt. A report of the field work completed in 1985 in the Waddy Lake area has been completed. The report describes the geology and gold geochemistry of the surficial deposits and will assist exploration companies in the interpretation of till geochemistry projects. Field work during the summer of 1986 was concentrated in the Sulphide Lake-Hebden Lake area. A compilation of existing information on the Quaternary geology and related geochemistry in the La Ronge-Reindeer Lake-Flin Flon region was undertaken for the Saskatchewan Geological Survey. A more modern facility to concentrate heavy minerals, such as gold, from surficial sediments was established.

In the plains region, five surficial geology maps were completed at 1:250 000 scale (see the section on Aggregate Resources). A project was initiated to evaluate the benefits of computer-aided map preparation using commercially available software for both mini- and microcomputers.

Geochemical services

The geochemical analysis laboratory provides analytical services to in-house projects and external clients such as mining companies operating in Saskatchewan. Approximately 25 000 analyses per year are performed on rocks, cores, ores, soils, lake sediments, and organic samples.

GEOLOGICAL SERVICES BRANCH
MANITOBA ENERGY AND MINES

INTRODUCTION

In this, the third year of the Canada-Manitoba Mineral Development Agreement (1984-89)[1] an accelerated level of industry-supportive, minerals-oriented programming was again mounted by the Provincial Department of Energy and Mines in concert with parallel program delivery by EMR Canada.

The joint Federal/Provincial Workplan for 1986-87 was approved by the Management Committee to the Agreement in February, 1986, and copies distributed in March to members of the newly constituted Mining and Mineral Exploration Liaison Committees.

The Sector A Geoscientific program encompassed 55 Provincial and 22 Federal projects with operational budgets of one million and two million dollars, respectively. In large part, the

[1] A subsidiary Agreement to the Economic and Regional Development Agreement (ERDA).

projectswere conducted by staff of the Manitoba Geological Services Branch (MGSB) and the Geological Survey of Canada (GSC).

Even though Provincial Sector A budgets were reduced to 66 percent of those available in 1985, efforts were still maintained in all districts of concern with a special focus on the Lynn Lake-Ruttan and Flin Flon-Snow Lake mineral belts (figure 1). For several projects, the initial field objectives set under the MDA were attained, and the stage was set for data compilation, analysis, and final report production during the concluding years of the Agreement.

Briefing sessions were given in each of the northern mining districts and a complete review of all MDA activities was presented to the Winnipeg section of the CIM in April prior to the field season. Government-industry field tours and demonstrations were held in the Thompson and Flin Flon-Snow Lake areas. However, an extensive demonstration planned for the Cross Lake region had to be postponed in the face of extraordinarily high water levels on the Nelson River, a factor which also necessitated radical rescheduling of mapping programs planned for the Jenpeg region.

A progress report covering all aspects of Sector A programming during fiscal year 1985-86 was released in August, 1986. Other Open File reports were released throughout the year together with numerous brochures on various aspects of Agreement programming.

The reduced funding levels had an adverse effect on the Province's ability to sponsor support studies and, accordingly, applied geoscience research (AGR) efforts were constrained to 6 projects, 4 being with the University of Manitoba. The Geological Survey of Canada sponsored 12 AGR projects, 6 through the University of Manitoba and 6 to universities and agencies in other provinces.

MGSB staff also provided input to other MDA Sectoral activities including drilling of tailings at Sherridon and Flin Flon, dimension stone site-selection in southeast Manitoba, acquisition of kaolin samples from Black Island for beneficiation studies by CANMET, and editorial and technical input to brochures on industrial minerals, gold, basal till studies, educational programs, and a contracted evaluation of feldspar from Bernic Lake.

Enquiries from the private sector focused principally on gold and platinum, with an equivalent level of demand for information on industrial minerals including high-calcium limestone, silica, gypsum, kaolin, building stone, peat, and crushed stone (dolomite).

Even though the MDA mechanism continues to facilitate the generation of useful, timely and pragmatic geoscientific information, as a backdrop and underpinning to exploration initiatives in the Province, efforts are still being made to encourage and maintain a high level of dialogue between all interested parties.

The principal successful elements of the MDA approach appear to be:

1. the emphasis given to task-oriented and co-operative (parallel and integrated) program delivery by the Federal and Provincial Surveys (with full support from other agencies, universities, etc.)
2. an increased level and commitment to liaison and collaboration with industry geologists in all stages of programming from planning to implementation
3. a concerted effort to increase everybody's awareness of the programming through wide-spread circulation of interim and progress reports, briefs, etc.
4. an elevated sense of urgency fostered by immediate association with communities over-shadowed by possible mine closure, as well as the awareness that these difficulties are part of a much larger crisis requiring readjustments on a national as well as international scale
5. provision of the Governmental staffing and budgetary resources necessary to plan, mount, audit, restructure, and conclude a coherent and unbroken five-year Survey program; and, most importantly

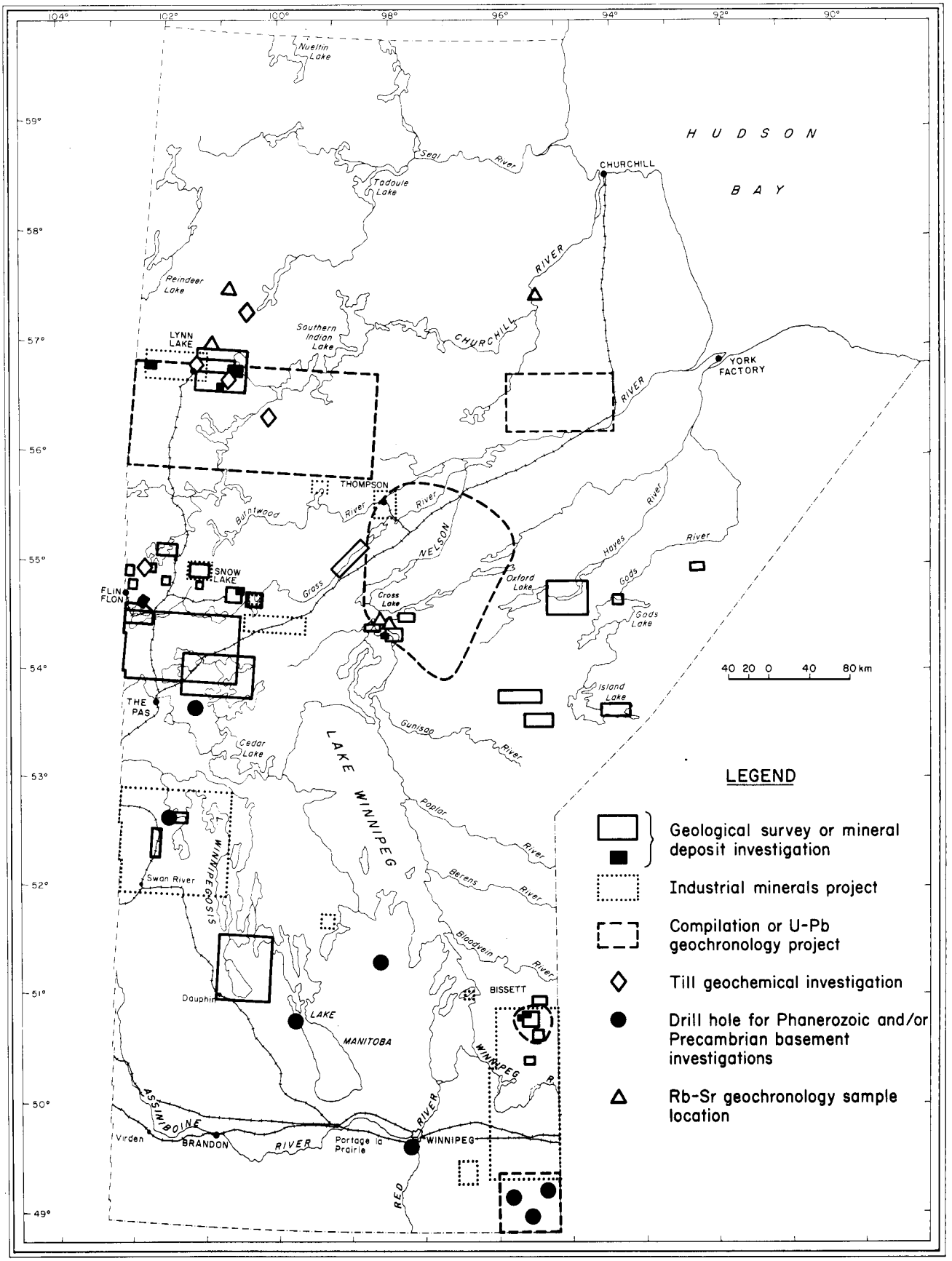


Figure 1. Manitoba field projects

6. a coincident upsurge and expansion of the Private Sector's ability to mount aggressive exploration programs funded in large part with capital stemming from flow-through shares

In addition to its MDA commitments, the Provincial Geological Services Branch also contributed to a Workshop convened in April, 1986, at the University of Manitoba. Discussions led to the formation of a steering committee and the formulation of a proposal for a lithoprobe geophysical and geological transect of the Trans-Hudson Orogen, with coordinated participation by universities in Manitoba and Saskatchewan. If accepted, the proposal could lead to the generation of unique data on megascopic crustal features associated with the Churchill-Superior Province boundary, as well as additional near-surface data of use to the mining sector.

Studies of Quaternary deposits led to joint MGSB/GSC involvement in the regional documentation of the Gillam area, as well as Provincial participation in the EMR-sponsored reconnaissance of sea-floor sediments and submarine resources in Hudson Bay.

A Devonian outcrop belt tour provided to Home Oil was reportedly helpful in interpreting reef structures in Saskatchewan and in the subsequent discovery of a producing well in that province.

MGSB staff also collaborated in other research projects involving U-Pb geochronology (University of Kansas); fluid inclusion studies, geothermobarometry of the Pikwitonei region; petrographic investigation of the Namew Lake deposit (University of Regina); and ongoing cooperative studies with geologists from NASA on anorthosites from the Pikwitonei region and elsewhere in the Province.

LYNN LAKE-RUTTAN DISTRICT (including northern Churchill Province)
Documentation of mineral deposits in the Lynn Lake area was completed as a first step to creating a mineral deposit inventory for the district. The results will be compiled into 1:50 000 synoptic maps identifying, on a geological base, the deposit type, host rock to mineralization, ore type by weight and volume, and other relevant parameters of the deposits.

Detailed mapping and geochemical sampling at Sheila, Ralph, Spider, Farley, and Motriuk Lakes compared these sections with those of the MacLellan gold mine, and extended the Agassiz Metallotect at least 5 km southwest of Lynn Lake to Margaret Lake. Other settings of gold mineralization between Franklin and Wasekwan Lakes were also investigated, as was the relationship between stratigraphy and base-metal mineralization in the Lynn Lake Rhyolite complex, and the West Anomaly near Ruttan.

Vegetation studies at the MacLellan Mine, Spider, Farley, and Dot Lakes (as well as the Ferguson Mine near Herblet Lake) encountered much lower levels of trace gold in alder twigs than has been recorded from control studies in Saskatchewan. It was concluded that the gold contents of ash from alder twigs may be substantially affected by the drainage pattern of the sampling area.

Multi-spectral remote sensing data have now been acquired for the Lynn Lake region, and will be used to search for metal-induced stress in vegetation associated with blind mineralization along the entire length of the Agassiz Metallotect.

Basal till studies initiated in 1985, and subsequently adopted by exploration companies active in northern Manitoba, encountered anomalous arsenic and gold values in the Ruttan region in till deposited on the lee side of large outcrops. Several factors indicated a principal source associated with the Vol Fault.

Till sampling east of Great Island, Seal River, confirmed earlier reported high arsenic values, some of which were significantly well above regional background values. These results, together with previously identified lake sediment geochemical anomalies and recent accounts of extensive arsenopyrite traced to bedrock northwest of Great Island, collectively indicate a hitherto unrecognized metallogenic signature and high gold potential for the greenstones of this region.

U-Pb zircon ages from porphyritic granite and monzocharnockite in the Chipewyan Batholith are coeval, agree with those from the Saskatchewan extensions of the pluton, and appear to indicate emplacement of magma at 1855 Ma into slightly older (1875-1880 Ma) crustal rocks. Although intense deformation appears to have waned by 1832 Ma, the largely post-tectonic dike on Reindeer Lake giving this age shows evidence of subsequent deformation and recrystallization.

FLIN FLON-SNOW LAKE DISTRICT

Detailed mapping, sampling, and mineral deposit investigations focused on the Vamp, Tartan Lake, Baker Patton, Neso Lake, Twin Lake, and Fay Lake deposits. At Tartan Lake, the recognition of a distinctive zonation in the shear zones, and pattern of alteration, will assist the search for extensions to the shear zones containing the main mineralization. Preliminary geological maps of volcanogenic sulphide mineralization were prepared for the Baker Patton and Fay Lake occurrences.

In the Snow Lake region, the bulk of data acquisition for preparation of 1 :50 000 and 1 :20 000 scale metallogenic maps has been completed. Further evidence was obtained supporting the concept that polymetallic quartz veins, within or close to mafic volcanic rocks containing Cu-Zn massive sulphide deposits, represent a genetically associated 'leakage' or 'sweat-out' alteration phenomenon.

Industrial minerals investigations focused on garnet and sillimanite deposits at Star Lake, talc at Iskwasum Lake, dolomite south of the exposed Flin Flon and Snow Lake greenstone district, and kaolin associated with the Paleozoic unconformity.

Mineral deposits studies in the Kisseynew terrain entailed detailed mapping of selected mineral occurrences at Puffy, Walton, and Evans Lakes as well as a reconnaissance north of Nokomis Lake and south of Walton Lake. It is now apparent that quartzofeldspathic gneisses may locally occur within the so-called Nokomis greywacke sequence; however, the structural as opposed to stratigraphic controls on this more complex configuration have yet to be resolved.

Mapping at a scale of 1 :20 000 in the Flin Flon region extended coverage into the Athapapuskow Lake area and confirmed the principal structural control by major block-bounding faults of several different ages, as well as the difficulty of correlating stratigraphy and mineralized zones between fault blocks.

Reconnaissance mapping of the Tartan and Aimée Lakes area established the late emplacement age of the gabbro complex which hosts the sulphide and gold mineralization.

Continuing work in the Kisseynew Lake area provided further confirmation that a single mineralized metallotect is an oversimplified concept since the paragneissic sequences contain numerous amphibolite layers at different levels within the intensely deformed migmatitic complex. A unit of metamorphosed feldspar-phyric basalt at Weasel Bay, and a metamorphically armoured norite intrusion south of Imperial Lake, may represent northern extensions of the Amisk Group and Boundary Intrusions, respectively.

On Kississing Lake intensive documentation of shoreline exposures seems to confirm the existence, at a regional scale, of the three principal lithologic associations defined by earlier workers (garnet-biotite-graphite gneiss, amphibolites, and quartzofeldspathic gneiss). However, in detail this simplistic grouping appears invalid and numerous instances occur where units appear out of sequence and with little along-strike continuity. Preliminary interpretations of structural history indicate at least three folding events (recumbent, isoclinal, cross-folding), the latter with associated brittle deformation. Mineral occurrences/conductors appear associated with the amphibolite sequence, especially in areas of considerable deformation intensity.

Geological mapping at a scale of 1 :15 840 in the Chisel-Morgan Lakes area, delineated several major fault structures and identified more than one age of synvolcanic quartz-phyric tonalite displaying Fe-Mg alteration networks. A direct though tentative corollary to this is the inference

that associated hydrothermal activity (and hence mineralizing events), may have spanned a considerable time interval during the evolution of the Flin Flon-Snow Lake greenstone belt and consequently mineral deposits may occur at several rather than a single stratigraphic level in the volcanic sequence.

Close to 400 samples collected from granitic intrusives in the Flin Flon belt are being analyzed at the University of Manitoba as the initial step of a longer term program to geochemically categorize the felsic intrusions of this region and evaluate their metallogenic potential.

Ten additional drill holes were put down south of Athapapuskow Lake as a continuation of the sub-Paleozoic compilation in the Project Cormorant area.

SOUTHEAST MANITOBA DISTRICT

An additional 30 mineral occurrences were examined in the Rice Lake region bringing documentation in this region near to completion. Particular attention was given to gold associated with epigenetic sulphide mineralization at the 'Tut' occurrence, gold-bearing quartz veins in a 2 km long stratigraphic unit at Lily Lake, and gold within arkosic rocks of the Edmunds Lake Formation.

Samples from the Dumbarton Mine/Maskwa West pit, the Wards occurrence, New Manitoba Mine, Hititrite and Mayville occurrences, English Lake and the Bird River Complex, returned only sub-economic and/or marginally detectable Pt and Pd values, as did 50 samples from the Neepawa mafic-ultramafic complex.

Industrial minerals activities continued evaluation of potential sites for dimension stone in southeast Manitoba as well as collection of additional samples of kaolin on Black Island using a solid stem auger.

Ground truthing of peat bogs near Grindstone Point was conducted in cooperation with the Manitoba Centre for Remote Sensing and the University of Manitoba Department of Botany, as part of an ongoing program to evaluate the use of remote sensing as a means to conducting a rapid and economic regional inventory of sphagnum peat bogs.

Detailed mapping near Stormy Lake and the Manigotagan River refined the structure and stratigraphy of the Wadhope-Gunnar Anticlinorium as well as the transition from volcanism to sedimentation in the Rice Lake Group. Several new factors of economic significance were unveiled including definition of subaerial volcanics, location of volcanic vents and a structural control of mineralization in gabbroic rocks.

Backhoe sampling in the Manigotagan area confirmed the presence of trace gold in reworked littoral glacial sands, and a potential for placer deposits.

An evaluation of geophysical and subsurface drill hole information has led to an enhanced interpretation of the Precambrian geology beneath Phanerozoic cover rocks in the Whitemouth and Black Island areas.

THOMPSON DISTRICT

In north-central Manitoba the industrial minerals evaluation focused on marble in the Thompson and Pipe open pits, cordierite in the Nelson House region, and alteration minerals at the Ruttan Mine. Samples were also collected from the Manasan quarry which may have a potential as a source for lump silica.

Mapping at a scale of 1:20 000 at Cross Lake extended eastwards to encompass supracrustal sequences at Butterfly Lake as well as all lithologies in the Jenpeg forebay, on Playgreen and Kiskittogisu Lakes. Geologically, the latter area is similar to the Molson Lake batholithic domain comprising an older suite of large batholith complexes with an extended tectonic history. The batholiths predate the Cross Lake supracrustal sequence. Detailed sampling of anorthosites and the associated magnetite/ilmenite deposit on Pipestone Lake was extended westwards to

include the "West Channel" anorthosite between the Minago River and Kiskitto Lake. Although no chromitite seams were discovered in this anorthosite, numerous samples were collected for analysis and the initial appraisal suggests mineralogical and textural similarities with the Fiskenaesset complex in Greenland, a generally high anorthite content, as well as some potential for building stone.

In Thompson the recent development of INCO's new open pit mine facilitated detailed documentation of a complete reference section of metasedimentary and mafic-ultramafic rocks, associated with the ore zone, which are only sporadically and incompletely exposed elsewhere. Several factors appear to support an originally Archean age for ultramafics exposed in the Pit.

Geochemical, rare earth, and trace element analyses are being undertaken, with cooperation from the University of Manitoba, on mafic and ultramafic rocks along the Thompson belt, and rubidium-strontium determinations were also initiated on felsic intrusions and late deformation zones (pseudotachylite). Together with detailed and regional structural studies funded by the GSC, and the U-Pb geochronology program, these projects represent a concerted attempt to come to grips with the geology of the Churchill-Superior boundary zone, to understand the paragenesis of the nickel deposits, and to evaluate the potential for other types of mineralization.

U-Pb geochronology in the Pikwitonei-Cross Lake region consistently revealed the presence of two distinct events at a number of localities throughout the Pikwitonei subprovince, although minor differences in these ages were also evident. The older ages all fall within a limited range, i.e. 2719 (Sipiwesk), 2690 (Natawahunan) and 2695 Ma (Cauchon); however, the younger set encompasses a time span of 44 Ma with the youngest age occurring at Cauchon Lake where post-granulite pegmatite has been dated at 2629 Ma.

Ages on a Cross Lake-Molson Lake dike (1884 Ma), a Cuthbert Lake ultramafic dike (1883 Ma) and the Fox River Sill itself (1884 Ma) suggest that these intrusions are coeval and possibly comagmatic, recording an intrusive event that took place after extrusion of the Lynn Lake arc volcanics (1917 Ma) and slightly prior to intrusions along the Churchill River magmatic zone, and the contemporaneous Ruttan volcanics (1878 Ma).

NORTHWEST SUPERIOR PROVINCE – GODS-ISLAND LAKE REGION

A reconnaissance of the Ponask Lake region encountered widespread mylonites, amphibolites and quartz diorite, but, with the exception of some small mafic intrusions, no economically significant mafic or ultramafic complexes were encountered. Consequently, there appears to be little potential for economic Ti, V, Cr, or Pt mineralization in the area.

The continuing evaluation of rare-element pegmatites in the Province, by the University of Manitoba, has brought to light extensive and possibly economically significant occurrences of petalite in pegmatitic leucogranite at Red Sucker Lake. The associated highly fractionated geochemical anomaly is not only large but compares favourably with that developed over the Bernic Lake pegmatite in southeast Manitoba.

SOUTHERN MANITOBA

Documentation of industrial minerals in the Duck Mountain area was undertaken to provide background data for an industrial minerals potential map, the first of several intended for southern Manitoba.

Four projects were conducted as part of the stratigraphic mapping, and stratigraphic and industrial minerals drilling program. Sampling and core drilling of the Stonewall Formation were undertaken to provide accurate stratigraphic control on the location of the Silurian/Ordovician boundary in Manitoba. Additional drilling was undertaken to obtain a detailed profile of a Winnipegosis reef and to establish a model for reef development.

Outcrop mapping was completed in the Clearwater-Cormorant-Moose Lake area as part of an extensive program, also involving 'scout' drilling, designed to provide information on the lower

Paleozoic sequences, as well as additional control on the distribution of units in the Precambrian basement inferred from gradiometer surveys conducted by the GSC.

Eight Precambrian sites in southeastern Manitoba were cored as part of a project to evaluate the quality of selected granitic rocks as ornamental/dimension stone.

EXPLORATION SERVICES

The Exploration Services Section of the Mines Branch continued core collection and cataloguing of existing holdings at its four facilities – Lynn Lake, Thompson, The Pas, and Winnipeg. A considerable effort was expended to condense holdings at Lynn Lake and Thompson, and in the construction of additional racking at the Thompson River Base. Consolidation of core in Winnipeg has been suspended and awaits the availability of new quarters at Midland Street currently occupied by the Department of Highways.

Compilation work resulted in the issuance of several new brochures and publications, including a Bibliography of Manitoba Geology, updates to the Manitoba Mineral Inventory, and the new Index to Non-confidential Assessment Reports.

GEOLOGICAL SURVEY OF CANADA

A comprehensive array of programs was also delivered by the Geological Survey of Canada as the Federal contribution to the MDA. These included several new aeromagnetic gradiometer surveys of the Elbow Lake, Hargrave River, and Moose Lake regions near Flin Flon, and Rice Lake (NTS 52M/4 and 52L/13NE) and Whitemouth (52E/6, 11) areas in southeast Manitoba.

Total field and vertical gradient maps at a scale of 1:50 000 were released for the Laurie Lake-Lynn Lake and Issett Lake-Pemichigamau Lake areas on April 29, 1986.

Regional lake sediment geochemical surveys were extended to the Red Sucker Lake and Island Lake region (NTS areas 53K, 53L, 53M (S 1/2) and 53E (N 1/2)), and regional till sampling and surficial mapping to NTS areas 63N, 63-O (W 1/2), 64B (S 1/2) and the north half of 63K near Flin Flon. The Terrain Sciences Division is also continuing research into the influence of glacial Lake Agassiz clays on the geochemistry of recent lake sediments, including deep coring of several lakes to assess vertical geochemical variations and possible vertical pathways for metal migration.

Detailed geological mapping is continuing near Laurie Lake and the Fox Mine, as well as investigations concentrated on examining alteration zones associated with volcanogenic massive sulphide deposits in the Lynn Lake, Flin Flon, and Snow Lake areas.

U-Pb ages have been determined for several of the key units in the southern Churchill Province and others are near to completion.

Mineral investigations in the Flin Flon area involve the study of gold metallogeny, the metallogeny of mafic and ultramafic rocks and the study of deep footwall alteration zones below massive sulphide deposits.

A Master's degree will be completed at Carleton University on the pervasive silicification of rocks deep in the footwall to the Chisel Mine. Gold studies involved mapping of areas containing gold deposits in the Elbow Lake and Snow Lake regions, as well as around Phantom Lake, in Saskatchewan.

A University of Manitoba study, characterizing the mafic and ultramafic intrusions in the Flin Flon-Snow Lake Belt, concentrated this year on the Reed Lake Pluton.

The Namew Lake PGE-nickel deposit was also investigated.

In the Bissett area, the GSC continued regional structural studies in the area centred on the San Antonio Gold Mine. The University of Manitoba continued its work on the mine-scale structures controlling the gold mineralization.

On the Chrome Property, in the Bird River layered intrusion, mapping of the chromite layers continued at a 1:100 scale.

Farther south, several students from the University of Manitoba engaged in studies on the Falcon Lake Stock including a thesis on the internal structure of the plug as well as studies of the petrography and gold mineralization, the latter centred on the Sunbeam-Kirkland Mine.

In the Thompson region the U-Pb geochronology program under contract to the Royal Ontario Museum continued, with the area of interest extended to Cross Lake, where mapping by provincial geologists has revealed well exposed rock types amenable to age dating.

A University of Toronto doctoral study investigated the structural setting of the Thompson Belt based on a detailed transect from the Pikwitonei granulite terrain to the Churchill-Superior boundary.

Under the Mineral Investigations sub-program the structure and related geology of the nickel deposits at the Thompson Mine constitutes a Ph.D. study at the University of New Brunswick.

The Terrain Sciences Division supervised a shallow seismic survey in the Thompson area along a line towards Gillam, the objective being to define thick deposits of glacial material that can be drilled during the 1987/88 season in the hope of characterizing the glaciation that has affected much of Northern Manitoba.

Several 1:250 000 scale Quaternary maps covering a large portion of the Superior Province in Manitoba are also being compiled from airphoto interpretations, together with selected ground truthing.

ONTARIO MINISTRY OF NORTHERN DEVELOPMENT AND MINES

MINES AND MINERALS DIVISION

ONTARIO GEOLOGICAL SURVEY

During 1985-1986, the Ontario Geological Survey (OGS) carried out a large number of independent, geological, geophysical, geochemical, geochronological, and mineral deposit studies (figure 1). In addition, studies were undertaken in cooperation with the ministry's regional geological staff, personnel from a number of universities, and several private consulting firms. Funding for a number of regional stimulation projects was provided by the Ontario Ministry of Northern Development and Mines and the Government of Canada. The Ministry carried out 59 field projects in various parts of the province and supported 24 applied research projects by Ontario universities as well as 17 exploration technology development projects by the private sector of Ontario's mineral industry. The program highlights are detailed below.

PRECAMBRIAN SECTION

Staff of the Precambrian Section took part in 19 geological mapping projects and special studies; 13 involved detailed mapping (1:15 840), one was a regional reconnaissance survey (1:50 000), four were surveys to solve specific geologic problems, and one was a regional tectono-stratigraphic project. Regional reconnaissance in the Central Uchi Subprovince has located regional scale shear zones which control distribution of three recent gold discoveries,

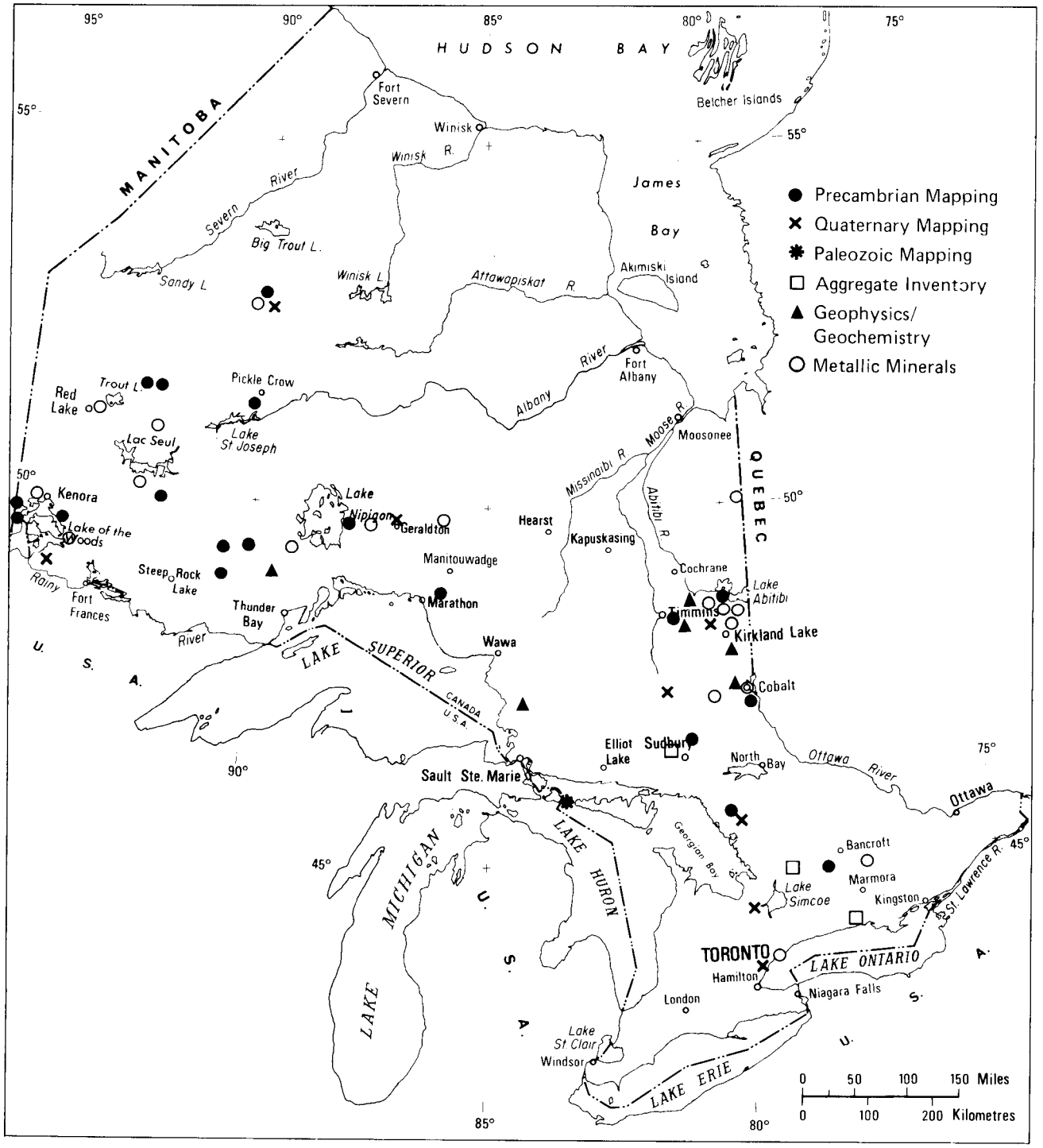


Figure 1. Distribution and types of programs in Ontario.

and has extended regional scale stratigraphic units to cover almost half the Subprovince. Work in the Cobalt area is designed to refine potential sedimentologic controls on gold mineralization in the Huronian sediments forming a cratonic cover sequence in Northeastern Ontario. In the Hemlo gold camp, detailed mapping at the property scale is defining folds in the shear zones spatially associated with the gold deposits; progress is being made on lithologic correlation between properties. A structural study in the Lake of the Woods Greenstone Belt is designed to provide a structural framework for two detailed mapping projects and one regional tectono-stratigraphic project. A project on the geology of mafic-ultramafic intrusions has elucidated the controls on platinum group metal mineralization at Lac des Iles. Work continues on projects designed to produce new regional scale interpretations in the Kirkland Lake-Larder Lake and Lakehead-Atikokan areas. These projects and further regional synthesis will be integrated in a revised 1:1000 000 geologic map of Ontario.

ENGINEERING AND TERRAIN GEOLOGY SECTION

Staff of the Engineering and Terrain Geology Section carried out 15 projects across the Province involving Quaternary geology and Paleozoic/Mesozoic geology, Aggregate Assessment, and a Hydrocarbon Energy Resources Inventory Program. Staff of the Quaternary Geology Subsection were involved in seven projects. Three projects involved mapping and special studies in three gold camps (Black River-Matheson, Hemlo, and Opapimiskan Lake) to establish the geological framework and develop drift exploration strategies. Four projects undertaken in Southern Ontario included mapping and stratigraphic studies in the Port Stanley, Brampton, and Renfrew County areas. The fourth project was the completion of a geological report of Algonquin Provincial Park which was accompanied by an inventory of geological features for use by Park's staff to prepare interpretation programs for Park visitors. Late in the year, staff initiated a study of the internationally-known geological sections at the Don Valley Brickyard and commenced work on a compilation map of the Quaternary geology of Ontario. Throughout the year, Quaternary staff participated in several mineral exploration/geochemistry and scientific meetings. Preparation of guidebooks for the 1987 Congress in Ottawa of the International Quaternary Association involved considerable staff input.

Paleozoic/Mesozoic Geology Subsection staff completed the final year of a five-year Hydrocarbon Energy Resources Program (HERP) to assess peat, lignite, oil shale, and conventional oil and gas resources within the Province. A considerable volume of basic data on these resources was released during the year and more data is currently being prepared for inclusion in the final reports. Two new projects were commenced this year. Detailed mapping of Cockburn Island (Lake Huron) involved the production of an updated geological map and the completion of a stratigraphic test hole to a depth of 521 m to the Precambrian basement. A second study to extend over a period of two years was initiated to provide a geological database for a review of Ontario's Limestone Industries. This project was undertaken jointly by staff of the OGS and private consultants and was funded by the Ministry of Natural Resources.

Staff of the Aggregate Assessment Office continued with the preparation of Aggregate Resources Inventory Papers (ARIP). Assessments of sand and gravel potential were completed for six Southwestern Ontario townships (Amabel, West Wawanosh, Hibbert, Wallace, Adelaide, and Oxford). Seven townships were investigated in the Massey area (Gough, Harrow, May, Salter, Shakespeare, Victoria, and Truman) of Northern Ontario. A special study to investigate aggregate quality (especially with respect to chemical reactivity) was initiated in 20 townships northwest of Sudbury.

MINERAL DEPOSITS SECTION

The major components of the Section's program continued to be field studies of gold mineralization, including studies in the Red Lake, Beardmore-Geraldton and Abitibi camps. These studies approached completion in 1985/86. More recent studies continued in this program. These studies include projects in the North Caribou Lake Belt, Lake of the Woods, Uchi-Confederation Lakes, Shebandowan, Mishibishu Lake, Black River-Matheson, and Detour Lake areas.

The Section increased investigation of industrial mineral resources and uses, with programs on clay and ceramics resources, building stone, phosphates and lithophile elements.

Work was initiated on Platinum Group Elements in the Lac des Iles area as part of a broader program in co-operation with the Precambrian Section.

New projects were started and utilized funding provided by the Canada-Ontario Mineral Development Agreement. These projects are in the Lake of the Woods, Rowan-Kakagi Lakes, Ignace, Beardmore-Geraldton, Cobalt, and Madoc areas.

GEOPHYSICS/GEOCHEMISTRY SECTION

A helicopter-borne EM and magnetic field survey covering 1540 km^2 was flown in the Hearst-Kapuskasing area and was released in July 1986. Also, a fixed-wing magnetometer and time domain EM survey was flown over 3910 km^2 of the Pickle Lake Volcanic Belt and is due for release in the last quarter of 1986. Airborne magnetic data from the 1984 Black River-Matheson (BRiM) project were processed to produce a second vertical derivative map. Ground EM surveying was continued on the Nighthawk Lake geophysical test range. Central loop transient EM and loop-loop frequency domain EM soundings were performed on the overburden test range near Matheson, Ontario, and interpretation work is under way. A project to map deep basement conductors is in progress in the Cobalt Embayment area of east-central Ontario. Approximately 650 new gravity stations were established in the Lac des Iles area east of Thunder Bay. Also, a humus geochemistry survey was carried out near Lac des Iles as well as two other similar surveys over mineral showings near Opapimiskan Lake. An experimental lake sediment survey is also in progress in the Opapimiskan Lake area. Interdisciplinary regional geochemical surveys have been completed north of Sudbury and at Algoma south of the Montreal River. The reconnaissance overburden sampling program in the BRIM area continued through 1986 using mainly sonic drilling methods and 102 holes have been completed.

GEOSERVICES SECTION

Compilation and computerization of mineral deposit and rock chemical data was continued by the Geoscience Data Centre. The mineral deposit database contained skeleton information on 5680 deposits by year end; and the PETROCH database provided selective access to analytical data on 20 400 samples taken by ministry geologists. Also, new Mines and Minerals Division publications and exploration assessment work reports were indexed and added to both the in-house database and the national GEOSCAN bibliographic file. This file currently totals 18 000 Ontario Geological Survey entries. On request, retrievals are made for the public from the various computerized data files maintained. The 1985 Supplement to the Index to Published Reports and Maps by the Mines and Minerals Division was published. The Geoscience Data File, the system providing standardized access to exploration reports received from the industry, was maintained for the Sault Ste. Marie and Sudbury Resident Geologists' offices.

Several development projects were completed on the SCIEX "ELAN" inductively-coupled plasma-mass spectrometer (ICP-MS) system. These include a routine method for the determination of a complete rare earth element package at or below chondrite levels; a routine method for the determination of U, Th, Pb, and T1; and a routine method for Sn Work on the 'in situ' laser ablation of mineral grains was presented at the 1986 Pittsburgh Conference.

In addition, a two-day international ICP-MS Workshop was organized in Toronto by the Geoscience Laboratories, providing an opportunity for users and manufacturers from around the world to discuss ICP-MS applications.

A coulometric method to the determination of carbonate carbon in rock samples was developed and applied to 41 international geochemical reference samples.

Dr. Chris Riddle contributed articles on Rock and Mineral Analysis to the forthcoming Encyclopedia of Science and Technology which is being published by Academic Press.

The Scientific Review Office initiated and developed a computerized geoscience information system (GEOSIS) for geoscience data covering Ontario. It is based on the existing Ontario Geological Survey computerized publishing system, part of which will be enhanced to form

GEOSIS. A pilot study has commenced testing all aspects of GEOSIS including data input methods, data storage and retrieval, response rate to user queries, and user friendliness. Three issues of the GEOSIS newsletter have been distributed to about 700 interested companies and individuals worldwide.

The Mines Library provides an information and reference service to Ministry personnel and the mining industry on the geology of Ontario and its mineral deposits. During 1985/86, the Library responded to approximately 9000 requests for information.

GEOSCIENCE RESEARCH AND DEVELOPMENT

In 1985/86, the Ontario Geoscience Research Grants Program awarded 26 grants totalling $500 000 to 10 Ontario universities. The grants finance mission-oriented research in Ontario which is closely integrated with, but does not duplicate the activities of the Ontario Geological Survey. The Exploration Technology Development Program supported joint ventures with Ontario companies, offering research and development capabilities leading to the development of innovative technology, specifically in those areas which support the mineral exploration industry. In total, the 1985/86 program supported 17 projects involving 16 Ontario companies with expenditures totalling $836 800. Reports by OGRF and ETDF recipients were presented at the annual Ontario Geological Survey Geoscience Research Seminar on December 4 and 5, 1985.

MINISTÈRE DE L'ÉNERGIE ET DES RESSOURCES GOUVERNEMENT DU QUÉBEC

SECTEUR « MINES »

Pour l'année 1986-87 l'objectif de base du ministère, en ce qui concerne le secteur Mines, est de promouvoir le développement de l'industrie minérale du Québec par un ensemble de mesures visant à appuyer l'initiative et le leadership du secteur privé, tout en s'assurant que l'exploitation des ressources minérales se fait selon les meilleurs intérêts des Québécois. Plus particulièrement, il s'agit de:

1. stimuler les investissements privés pour le développement de nouveaux gisements, l'expansion des capacités de production existante et la modernisation des usines de première transformation;
2. localiser la recherche et le développement sur des projets spécifiques répondant aux besoins de l'industrie et pouvant aider à consolider notre position concurrentielle et susciter le développement industriel à court et moyen terme;
3. contribuer au renouvellement des réserves domestiques pour les minerais de cuivre et de zinc et favoriser la diversification de la production minérale dans les régions du Québec par la stimulation de l'exploration minière;
4. assurer la promotion et la défense de l'amiante et, au niveau mondial, promouvoir l'adoption de législations visant un usage sécuritaire de ce produit.

Chacune des trois directions générales du secteur « Mines » répond plus spécifiquement à l'une ou l'autre des grands objectifs cités.

LA DIRECTION GÉNÉRALE DE L'INDUSTRIE MINÉRALE (DGIM)

La DGIM a pour mandat de favoriser le développement, l'exploitation et la transformation des ressources minérales du Québec par l'entreprise privée. Elle administre des programmes d'assistance financière et les législations minières. De plus, cette direction générale analyse les facteurs économiques et réglementaires qui ont une incidence sur l'industrie minérale en vue

d'en dégager les orientations et les programmes gouvernementaux susceptibles de contribuer à l'essor des entreprises minières oeuvrant au Québec.

Programmes d'assistance financière

Infrastructures de développement minéral:
Ce programme est inscrit dans le cadre de l'Entente auxiliaire Canada-Québec sur le développement minéral. Son objectif est de favoriser l'implantation de nouvelles installations de production et de transformation de minéraux au Québec qui soient hautement productives et concurrentielles au plan mondial, grâce à une intervention gouvernementale qui assurera l'implantation des infrastructures nécessaires à leur avènement. En vertu de ce programme, la contribution des gouvernements au coût de construction des infrastructures (routes, lignes électriques, ponts, pipelines, sites résidentiels, aquaduc, égouts, tec.) pourra atteindre 20 % du coût total du projet d'immobilisation.

Études technico-économiques:
L'objectif de ce programme est de favoriser l'élaboration de projets industriels miniers et d'inciter l'industrie minérale à analyser diverses avenues susceptibles d'améliorer sa productivité et sa compétitivité. En vertu de ce programme, une assistance financière de 50 % du coût de réalisation d'études technico-économiques et de travaux d'expérimentation destinés à vérifier la praticabilité ou la viabilité économique d'un projet peut être accordée, avec un maximum de 250 000 $ par projet. Cette assistance peut atteindre 75 % des dépenses admissibles pour des études de marché et de commercialisation dans le secteur des minéraux industriels.

Politique fiscale
Les entreprises qui oeuvrent dans le secteur de la production minière au Québec et les particuliers qui veulent y investir, bénéficient de nouveaux avantages fiscaux suite aux modifications qui ont été apportées à la fiscalité minière lors du Discours sur le budget du 23 avril 1985.

Impôt sur le revenu des particuliers:
Avant le 1er janvier 1986, un particulier pouvait déduire, dans le calcul de son revenu pour une année d'imposition, 166 2/3 % des frais d'exploration engagés au Québec. Cette déduction est maintenant prolongée jusqu'au 1er janvier 1988 pour les frais qui, à compter du 1er janvier 1986, auront été engagés pour des programmes d'exploration et sous réserve que ce particulier ne soit pas un exploitant minier.

Droits payables par les exploitants:
Pour donner effet aux mesures relatives aux droits de mines payables par les exploitants, le gouvernement a adopté, le 19 décembre 1985, la Loi 3 modifiant la Loi concernant les droits sur les mines.

Depuis le 23 avril 1985, les droits payables à même les profits annuels des entreprises sont fixés à 18 %. De plus, l'exemption de base qui était de 250 000 $, a été remplacée par un crédit de droits de 90 000 $. La partie de ce crédit qui n'est pas utilisée dans une année d'imposition peut être reportée sur les trois années ultérieures.

Par ailleurs, un régime de droits négatifs a été introduit dans la loi. Ainsi l'exploitant d'une mine au Québec et une société d'exploration minière peuvent se faire rembourser, à certaines conditions, 18 % de la perte d'une année, jusqu'à concurrence de 18 % des dépenses d'exploration, de mise en valeur et de la dépréciation des investissements en immobilisations effectués depuis le 24 avril 1985 au Québec. La partie d'une perte qui ne fait pas l'objet du crédit remboursable est assujettie à la nouvelle règle de report des pertes.

Cette dernière permet maintenant à un exploitant de reporter les pertes d'un exercice financier sur les trois années précédentes et sur les sept années suivantes.

LE CENTRE DE RECHERCHES MINÉRALES

Le Centre de recherches minérales (CRM) est l'une des trois directions générales du secteur Mines du ministère de l'Énergie et des Ressources (MER). Le Centre répond aux attentes de l'industrie et offre un soutien technologique aux entreprises minières et métallurgiques afin qu'elles puissent augmenter leur productivité et se mesurer avec avantage à la concurrence internationale. Le CRM est devenu depuis quelques années un organisme axé presque exclusivement sur le service à la clientèle industrielle. L'orientation du Centre se caractérise par le souci de se mettre davantage au service de l'industrie; ses dépenses en 1985-86 se sont élevées à 7,6 millions $.

Il est composé de trois entités opérationnelles qui sont l'Analyse minérale, la Recherche métallurgique et la Technologie minière.

Analyse minérale

La direction de l'Analyse minérale (DAM) fournit aux intervenants du secteur minéral québécois des services d'analyse et de recherche spécialisée. Les dépenses totales de la DAM se sont élevées à 2,9 millions $ en 1985-86. Près des deux tiers de l'effort d'analyse sont consacrés à satisfaire les besoins analytiques de la direction générale de l'Exploration géologique et minérale (DGEGM) du ministère de l'Énergie et des Ressources (MER). Ces données analytiques sont essentielles pour augementer la connaissance géologique du territoire québécois. Ces services d'analyse sont évaluées à plus d'un million $ par année. D'autres travaux d'analyse sont exécutés directement pour le bénéfice d'entreprises qui ont des besoins particuliers à combler dans ce domaine. Au total, plus de 46 000 échantillons de minéraux, de roches, de sols, de sédiments et d'eaux souterraines ou de surface ont été acheminés en 1985-86 au laboratoire du CRM. Ce travail analytique représente plus de 900 000 dosages, déterminations et études minéralogiques. Les teneurs des éléments dosés peuvent varier de quelques fractions de partie par milliard (ppb) jusqu'à 50 % dans certains cas. Ces exigences requièrent l'utilisation de nombreuses techniques d'analyse différentes et de systèmes automatisés et informatisés hautement performants tels que la spectrométrie d'émission atomique au plasma (ICP) et la spectrométrie des rayons-X.

Actuellement, la direction de l'Analyse minérale investit surtout pour développer tout le secteur de la minéralogie. Elle fait tous les efforts requis pour doter le CRM d'un laboratoire de minéralogie où l'on retrouve des spécialistes et des instruments diversifiés et sophistiqués capables de fournir rapidement et avec précision tous les résultats d'analyses minéralogiques et physiques susceptibles d'aider les scientifiques du secteur minéral. Les nouveaux systèmes mis en place, dont un microscope à balayage couplé à un analyseur d'images, contribuent fortement à augmenter les possibilités d'analyse dans le domaine de la minéralogie.

Traitement des minérais et métallurgie extractive

La direction de la Recherche métallurgique (DRM) offre l'ensemble des services techniques nécessaires à la valorisation d'une gamme étendue de différents minerais comme le fer, l'or, le niobium, le zinc, le cuivre, les minéraux industriels, etc. Elle s'implique aussi dans le domaine du contrôle et de l'optimisation des procédés minéralurgiques en vue de satisfaire les besoins prioritaires des industriels miniers. Les dépenses totales de la DRM se sont élevées à 3,7 millions $ en 1985-86.

La survie de l'industrie du minerai de fer au Québec-Labrador repose en grande partie sur la réduction des coûts et sur la mise en marché de nouveaux produits mieux adaptés aux besoins de la sidérurgie. La recherche, le développement et le transfert technologique doivent jouer un grand rôle dans l'atteinte de ces objectifs. Le CRM possède un équipement élaboré et le noyau le plus important d'ingénieurs-chercheurs et de techniciens d'expérience dans ce domaine au Canada.

Dans le secteur de l'or, le CRM est le seul laboratoire québécois qui offre une expertise complète tant au niveau laboratoire qu'à l'échelle pilote. Il offre à la clientèle industrielle des services techniques de qualité tant dans le domaine de la valorisation de nouveaux gisements que dans celui de l'amélioration des exploitations existantes.

Dans le secteur des minéraux industriels, le CRM, avec le personnel scientifique et les équipements dont il dispose, peut jouer un rôle de premier plan en collaborant avec les entreprises du secteur. Il peut contribuer au développement de nouvelles utilisations des minéraux industriels du Québec et à la mise en exploitation de nouveaux dépôts. L'usine-pilote du CRM est la seule du genre au Québec. Elle est au service de l'industrie minière et métallurgique et met à sa disposition un ensemble d'équipement évalué à plus de 20 millions $.

Exploitation minière

Le service de Technologie minière (STM) effectue et coordonne des études et des travaux dans le domaine de l'exploitation minière afin d'aider l'industrie à optimiser la rentabilité des entreprises et à promouvoir la production rationnelle des substances minérales. Les services du STM s'adressent directement aux exploitants miniers. Le STM intervient principalement dans trois domaines: celui du contrôle du terrain, du génie industriel minier et de l'information appliquée. Il procède à des essais de laboratoire pour connaître la nature et la résistance de la roche ainsi qu'à des mesures in situ pour déterminer l'intensité des pressions. En ingénierie minière, il contribue à améliorer la conception et le rendement de divers éléments comme le fonctionnement des ventilateurs, les dimensions des ouvertures, les systèmes de soutènements, etc. Il contribue à augmenter la productivité et favorise le transfert des connaissances et de la technologie aux exploitants miniers concernés. Par exemple, aux exploitants de mines souterraines, le STM offre, en collaboration avec l'Association des Mines de Métaux du québec Inc., les services d'un expert en entretien des treuils de mines. Le bon fonctionnement du treuil est essentiel pour maintenir élevée la productivité de la mine et assurer la sécurité des employés. Le STM fait des efforts particuliers pour améliorer les échanges et les contacts avec l'industrie afin de mieux connaître ses besoins et lui procurer un meilleur service.

LA DIRECTION GÉNÉRALE DE L'EXPLORATION GÉOLOGIQUE ET MINÉRALE

L'année financière 1986-87 fut comme l'année précédente marquée par un haut niveau d'activités en acquisition de connaissances géoscientifiques et par la consolidation du programme d'assistance financière à l'exploration minière.

Ainsi, la DGEGM a consacré près de 11,1 millions $ sur volet « acquisition de connaissances » et un montant de 9,0 millions $ fut consacré à des programmes d'assistance financière à l'exploration et à la préparation et à la diffusion de la géoinformation.

Service de la géologie

Sud du Québec:

La région de la Gaspésie a fait l'objet en 86-87 de 7 projets de terrain pour un montant global de 890 000 $. Ces projets se regroupent comme suit: cartographie géologique de base; études stratigraphique et tectonique; étude relationnelle et génétique de corps volcaniques; et une étude métallogénique.

En Estrie-Beauce, nous avons réalisé 9 projets pour un montant global de 660 000 $. Parmis ces projets, 6 étaient consacrés à la cartographie et aux études tectono-stratigraphiques, 2 portaient sur la métallogénie régionale et un dernier sur les amas granitiques.

L'Ouest du Québec:

La programmation 1986-87 de la Division de l'ouest comprend 12 projets évalués à 2,0 millions $. Cette somme représente une augmentation de près de 1,0 million $ par rapport à 85-86 et est attribuable en grande partie au projet de synthèse structurale à Chibougamau et aux forages stratigraphiques.

Les projets de l'année peuvent être regroupés en deux grandes catégories: les levés détaillés (6) à l'échelle de 1:20 000 et les études spécifiques (5). Les levés détaillés ont été réalisés dans les régions de Casa Bérardi – Matagami, de Rouyn-Noranda, de Val-d'Or, de Chibougamau et de la rivière Eastmain.

Deux des études spécifiques font l'objet de thèses de doctorat et trois de ces projets portent sur la gîtologie, dont particulièrement l'étude métallogénie sur la région de Val-d'Or – Malartic.

Nous avons terminé au cours de l'été la section de forages stratigraphiques dans le secteur de la mine Lemoine à Chibougamau et entreprendrons à la fin de l'hiver les forages stratigraphiques du projet Harricana – Grasset.

Nord-Est du Québec:
Dans ce vaste territoire, un montant de 2,1 millions $ a été alloué à la poursuite de quelque 18 projets regroupés dans trois régions distinctes: la Fosse de l'Ungava, la Fosse du Labrador et le Grenville à l'est de Havre St-Pierre.

Dans la Fosse de l'Ungava, la cartographie systématique au 1:50 000 s'est poursuivie en bordure des régions couvertes antérieurement. Nous avons entrepris, suite à l'intérêt pour les platinoïdes dans ce secteur, des études détaillées reliées à la pétrologie des volcanites et des filons-couches ainsi que des études gîtologique et métallogénique.

Dans la Fosse du Labrador, nous avons poursuivi la cartographie au 1:50 000 dans l'Archéen à l'ouest de Schefferville, suite aux découvertes d'indices d'or dans ce secteur. Le programme de cartographie dans l'arrière-pays de la Fosse s'est poursuivi au cours de l'été 1986, et nous y avons greffé 5 projets, dont la pétrologie du batholite de De Pas, la lithostratigraphie et la métallogénie d'un secteur à potentiel aurifère, la géochronologie de la région de la rivière George et une étude des caractéristiques structurales par Landsat de la même région.

Deux projets importants, l'un portant sur l'évolution tectono-métamorphique, l'autre sur la métallogénie des gîtes Zn-Cu-Pb-Au-Ag, ont eu lieu dans le secteur nord de la Fosse du Labrador. Nous avons aussi continué, plus au sud, le programme d'étude et d'évaluation du potentiel minéral dans le Groupe de Wakeham dans le Grenville près de Havre-St-Pierre.

Minéraux industriels
En 1986-87, sept (7) projets ont été retenus par la Division des minéraux industriels. Quatre sont reliés à l'inventaire des minéraux industriels dont celui d'inventaire régional dans la région de Wakefield en Outaouais et celui des indices de wollastonite dans la région de St-Sauveur. La division a aussi effectué trois projets d'inventaires régionaux de matériaux de construction et de la tourbe, sur la Basse-Côte-Nord en particulier.

Service de géochimie-géophysique

Division de la géochimie:
L'inventaire géochimique du territoire québécois a fait l'objet de deux levés. L'un, concernant les sédiments de ruisseau d'une partie de l'Estrie et de la Beauce, a pour but de développer le potentiel aurifère des Appalaches, l'autre, sur des sols dans la région du lac Grasset, a pour but d'identifier des cibles économiques dans le secteur à l'Ouest de Matagami.

Nous avons entrepris, à l'automne, une vaste campagne de forages stratigraphiques (*Rotasonic*) des dépôts meubles dans la région de Harricana-Grasset afin d'aider les compagnies à mieux interpréter leurs données de géochimie du till de base.

En plus de ces principaux projets d'inventaire la division de géochimie a réalisé en cours d'année de nombreux projets de recherche ou de suivi afin de sensibiliser l'industrie à la géochimie d'exploration et aussi d'améliorer l'efficacité des techniques utilisées.

Division de la géophysique:
L'inventaire géophysique du Québec s'est poursuivi en 86-87; ainsi, un levé électromagnétique et spectrométrique aéroporté a été effectué durant l'été dans la région aurifère à l'ouest de Schefferville et un levé électromagnétique héliporté a été effectué dans la région de Beauceville.

De plus, en cours d'année, les données de quatre levés électromagnétiques entrepris en 1985 ont été traitées et rendues prêtes pour publication.

Une équipe géophysique du MER a fait des coupes sismiques dans la région de Joutel-Selbaie afin de définir les contacts géologiques, l'épaisseur des dépôts superficiels et certains accidents géologiques.

Un répertoire des travaux géohysiques effectués par le MER a été préparé.

À partir de 1985-86, le MER produit des cartes couleurs du champ magnétique total résiduel et du gradient magnétique vertical calculé pour tous ses nouveaux levés aériens.

ASSISTANCE À L'EXPLORATION MINIÈRE

Cette direction a pour mandat de promouvoir l'exploration minière au Québec et, à cette fin, offre aux sociétés minières, aux prospecteurs, aux universitaires et autres, l'information géoscientifique pertinente, élabore et met en oeuvre des politiques et des programmes d'assistance à l'exploration minière et représente le secteur Mines du MER en région.

Assistance aux régions minières

Le Service de l'assistance aux régions minières a pourvuivi ses activités de représentation de l'ensemble du secteur Mines en région par l'organisation de plusieurs colloques en région dont les thèmes touchaient aussi bien au développement et à la transformation qu'à l'exploration des ressources minérales.

Les représentants régionaux ont participé activement au choix des projets de recherche géologique, chacun dans leurs districts respectifs, dans une perspective de coordination entre le processus d'acquisition de connaissances géoscientifiques, propre au gouvernement, et les besoins de l'industrie minière.

Le service a, d'autre part, initié un projet pilote de lithothèque à air libre, dans la région de Rouyn-Noranda en mettant de l'avant le principe d'un autofinancement par les utilisateurs. Les dépenses ainsi encourues par les compagnies seraient admissibles à titre de travaux statutaires. Le projet a fait l'objet d'un accord de principe avec les gens de l'industrie et devrait se concrétiser au cours de l'exercice financier 1987-88.

Géoinformation

Le ministère de l'Énergie et des Ressources a décidé d'implanter des systèmes informatisés de production et de diffusion de la documentation géoscientifique. Ces systèmes devront permettre à l'industrie minière d'avoir un accès plus rapide et plus efficace à la masse de plus en plus considérable d'informations géoscientifiques disponibles concernant le territoire québécois. Une étude de faisabilité actuellement en cours permettra de préciser les nouvelles technologies et les nouveaux modes de production qui sont le mieux adaptés aux besoins du ministère et de l'industrie.

Dans le domaine de l'information géoscientifique, signalons la publication de la carte minérale du Québec à l'échelle de 1 : 1 500 000. Quelque 120 nouveaux documents concernant les résultats des travaux géoscientifiques du ministère ont été rendus disponibles. En cours d'année, la clientèle a commandé quelque 33 000 copies des rapports géoscientifiques du ministère.

Programme d'assistance financière à l'exploration

Le programme d'assistance financière à l'exploration minière mis de l'avant en avril 1985 s'est poursuivi cette année. Ce programme est en vigueur jusqu'au 31 mars 1987.

Pour l'année financière 1985-86, plus de 2.9M $ ont été versés en subventions. Sur les 66 projets présentés touchant les trois volets du programme, 43 ont été retenus. Ainsi, 34 projets d'exploration minière se sont partagés 2.6M $, un projet de construction d'une route d'accès à

l'exploration s'est vu octroyer 27 500 $, et huit projets de mise à l'essai de nouvelles technologies en exploration minière ont reçu près de 0.3M $.

Les zones désignées de Matagami, Chibougamau-Chapais et de la Gaspésie ont bénéficié chacune de subventions de plus de 0,5M $ pour la réalisation de travaux d'exploration par l'industrie minière. Ce sont les projets axés sur la recherche du cuivre/zinc qui ont accaparé plus de 95 % des subventions à l'exploration. Le programme a ainsi permis la réalisation de plus de 100,00 mètres de forages tout en maintenant ou en créant de l'emploi pour 85 personnes/années dans l'industrie de l'exploration minière.

Le point marquant de l'impact du programme est la découverte du gisement Isle-Dieu par Exploration Noranda à Matagami. La compagnie a d'ailleurs annoncé sa décision d'aller en production, ce qui engendrera des investissements de l'ordre de 35M $ pour la réalisation des infrastrutures nécessaires auxquels s'ajoutent les retombées économiques sur la région par le biais des salaires versés et de l'achat de biens et service au cours des années d'opération.

Pour l'année financière 1986-87, 4.3M $ de subventions ont été octroyés dans des travaux d'exploration dont plus de 2M $ dans la seule région de Chibougamau-Chapais où les producteurs actuels font face à un problème d'épuisement des réserves économiquement exploitables. Les impacts de l'aide financière accordée en 1986-87 ne peuvent actuellement être évalués puisque tous les projets d'exploration subventionnés sont toujours en cours.

MINERAL RESOURCES DIVISION

NEW BRUNSWICK DEPARTMENT OF NATURAL RESOURCES

Many of the activities of the Mineral Resources Division in 1985 were funded by a Federal-Provincial Mineral Development Agreement (MDA) that expires in 1989. New Brunswick's part of the MDA budget for 1985-86 was $1.97 million. The Provincial budget for the Mineral Resources Division for the same period amounted to $1.3 million (see Provincial Geosciences Expenditures 1985-86, this volume).

MDA PROGRAMS

MDA programs fall into four categories, these are: (1) geoscience, (2) mining and mineral technology, (3) economic development, and (4) public information and evaluation. A summary of the agreement is tabulated in VOLUME III of the JOURNAL under SURVEY OF FEDERAL-PROVINCIAL MINERAL DEVELOPMENT AGREEMENTS.

GEOSCIENCE

Studies of granitic plutons and associated mineral deposits were begun in southern and central New Brunswick. M.J. McLeod reports that the eastern lobe of the Carboniferous St. George batholith (A, see location map, Figure 1) comprises three biotite granite phases. The oldest coarse-grained but variable-textured phase contains local swarms of tin- and tungsten-bearing greisen veins. In the Burnt Hill-Dungarvon area (B, see location map, Figure 1) E. MacLellan started a study aimed at determining the petrochemical evolution of the late Devonian-early Mississippian granites and associated tin-tungsten mineralization.

Studies of gold potential were initiated by S.E. Watters in the Cape Spencer-Mispec Beach area (C) (see Figure 1) near Saint John, and by G. Philpott and J.L. Davies in the Nigadoo-Millstream area (D) (Figure 1) in northeastern New Brunswick. In the Cape Spencer area, gold along with pyrite is concentrated in the altered arkosic sedimentary rocks surrounding shallow-plunging quartz-vein stockworks below major thrust planes. The host rocks are intensively folded and thrusted slices of Carboniferous and older sedimentary and plutonic rocks.

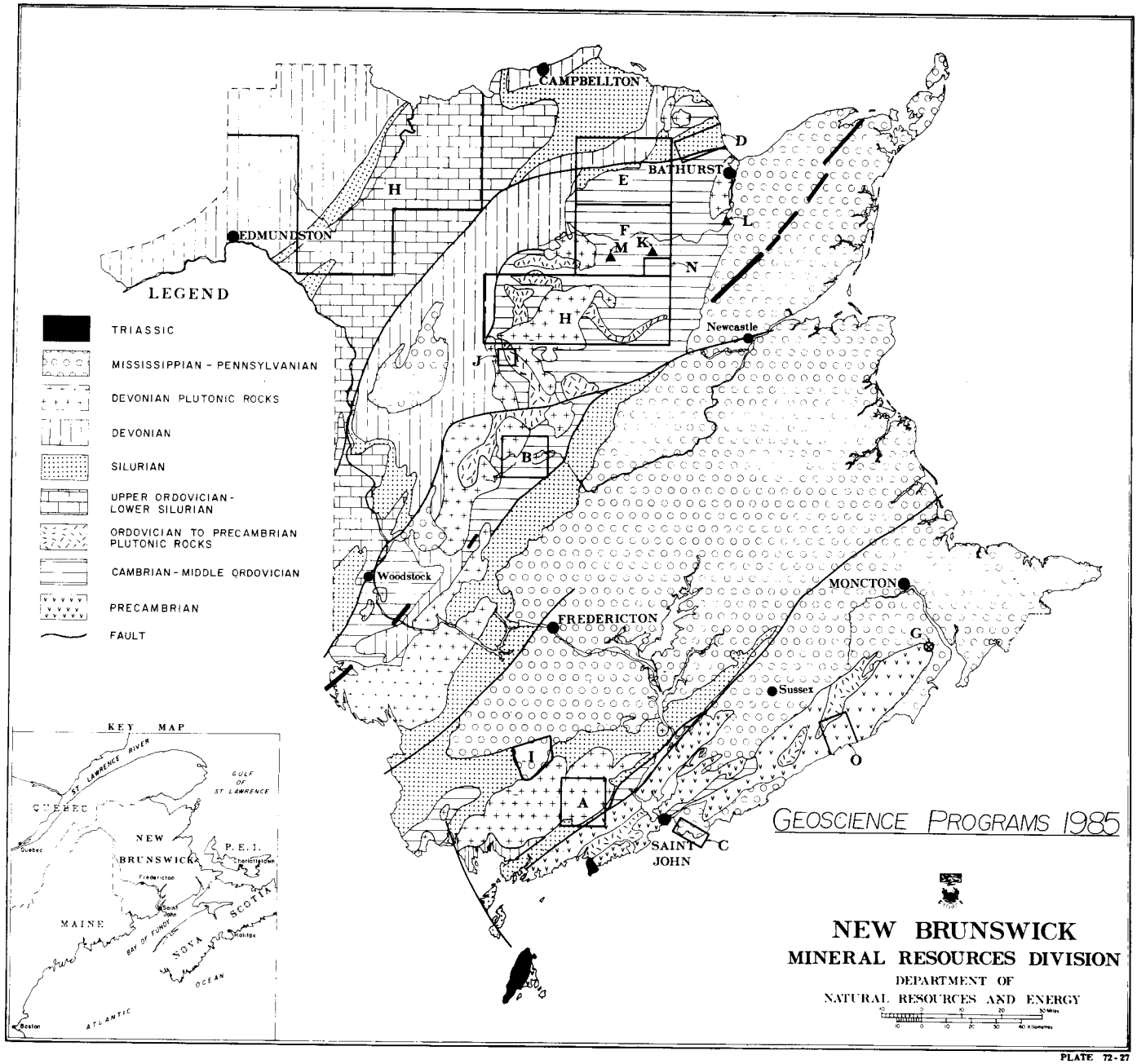


Figure 1. Distribution of programs in New Brunswick.

Many gold, silver, and base-metal mineral discoveries have been made in the Nigadoo-Millstream River over the past 100 years, although only one (the Nigadoo zinc-lead-silver deposit) has been mined. Most occurrences are vein or skarn types hosted by Silurian sedimentary rocks that unconformably overlie polydeformed Ordovician turbidites and mafic volcanic rocks. The transcurrent Rocky Brook-Millstream Fault System seems to have provided the plumbing system for hydrothermal solutions associated with Devonian magmatism.

A surficial geology mapping project was begun in the Tetagouche Lake area (E) (Figure 1) in northern New Brunswick. It is hoped that results of this work will provide useful information for the mineral exploration industry, as well as aid the Forest Service in forest site classification. A.G. Pronk reports that till compositions are related to local bedrock, although some components have been transported 20 km eastward. Samples obtained from the A, B, and C horizons on a 2 km grid will be analyzed for several elements including gold.

To aid mineral exploration in the Bathurst-Newcastle mining district, a project was begun to compile all exploration data filed with the Mineral Resources Division over the past 35 years. The data is to be plotted on 1:10 000 base maps covering approximately 37 000 km. In 1985, however, funds were only available for production of twenty-five (25) digitized base maps for NTS map area 21 O/8 (see Figure 1, F).

To accommodate the ever increasing amount of drill core the Province is asked to collect and store, a new storage facility was built in Sussex with MDA funds. Two large facilities are located in Bathurst, and two smaller ones in Fredericton. G. Crouse, recently appointed Core Librarian, is responsible for all matters involving drill core.

ECONOMIC DEVELOPMENT

Projects in this category include: (1) study of limestone resources and an up-date on the state of the industry by T.C. Webb; (2) a geologic and economic assessment of the Albert Oil Shale (G, Figure 1) by C. St. Peter; and (3) contract granular resources mapping in central and northwestern New Brunswick. (H, Figure 1).

PROVINCIALLY FUNDED PROGRAMS

S.R. McCutcheon continued his study of the Mississippian Mount Pleasant caldera (I, Figure 1). Five 1:20 000 geology maps covering the structure were completed in 1985. L.R. Fyffe investigated amphibolites from the Miramichi Zone (J, Figure 1) to determine their age, variously ascribed to the Precambrian, Cambro-Ordovician, or Ordovician.

A.A. Ruitenberg and J.L. Davies began work on a report dealing with gold in New Brunswick. The initial findings were the subject of a paper presented at the 1986 Prospectors and Developers Meeting. Dr. Ruitenberg is also compiling a metallogenic map of New Brunswick, and has taken the initial steps toward preparation of a computerized mineral deposit data file.

In Bathurst-Newcastle mining district, R.R. Irrinki began an assessment of the larger, better grade, massive zinc-lead-silver-copper sulphide deposits to establish an inventory of potential Zn-Pb-Ag-Cu ore in the region. The so-called Stratmat deposits (Cominco Limited) (K, Figure 1) and a related sulphide body owned by Heath Steele Mines were the first to be evaluated. Future plans will involve the Key Anacon (L) and Half Mile Lake deposits (M, Figure 1). J.A. MacIntosh is in the final stages of his report covering the area surrounding the Heath Steele Mine (N, Figure 1).

To help prospecting for gold in southern New Brunswick, a surficial geology mapping project was started in the Goose Creek area (O, Figure 1) by P.G. Chiswell and L. Long. Two major and one minor till sheets were identified. "B" horizon samples will be analyzed for gold and several other elements.

Other work carried out by the Division includes hydrocarbon investigations in the southeastern and northeastern parts of New Brunswick by T. Martel; and economic studies of mining properties, compilation of mineral production statistics, and investigation of mineral based

manufacturing opportunities by J.J. Chandra. Chandra is also continuing to study the 1983 Miramichi earthquake epicentre, and the use of salt as backfill in potash mines.

PUBLIC INFORMATION, EVALUATION, AND ADMINISTRATION

This program, directed by D.J.J. Carroll, comprises (1) Public Awareness, aimed at promoting the MDA agreement and the Mineral Industry in general, and publicizing the benefits derived from the programs, (2) advanced prospecting courses, and (3) editorial activities related to the publishing of project results. The latter is the responsibility of B.W. Carroll and S.A. Abbott.

GEOSCIENTIFIC SURVEYS

NOVA SCOTIA DEPARTMENT OF MINES AND ENERGY

INTRODUCTION

Geoscience investigations at the Department of Mines and Energy are divided among three Divisions. In the Mines and Minerals Branch, the Mineral Resources Division and Mineral Development Division provide geological expertise in non-energy resource matters. The Energy Resource Division of the Energy Branch deals with energy minerals and commodities.

The Energy Resources Division is responsible for long term and applied research on the geological setting of coal, oil shales, peat, oil, and natural gas. The Division is charged with the responsibility of determining the broad aspects of the geological environment for these energy commodities so that, in the future, private sector and government development may proceed with an understanding of the quantity and quality of these commodities.

The Mineral Development Division is concerned with the development of mineral deposits through applied geological research. This division monitors all exploration work in the Province, maintains drill core libraries, and develops the GEOSCAN database.

The Mineral Resource Division undertakes long term geological research to increase the knowledge about the geological development and mineral deposits of the Province. These projects focus on the geological development of broad structural features and their associated mineral occurrences and deposits. The Division provides support for the Mines and Minerals Branch Education and Public Awareness Program.

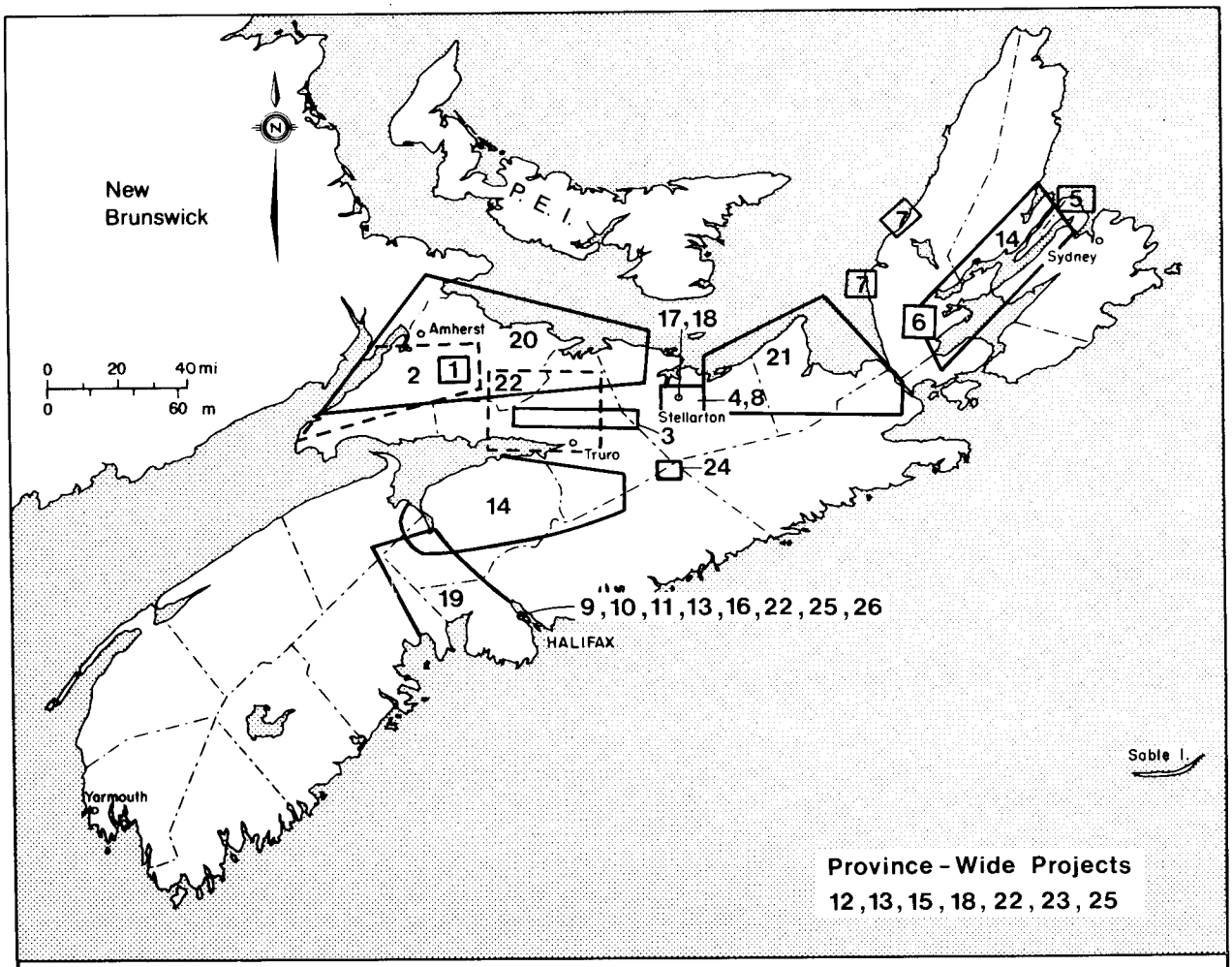
In support of these varied mandates in three divisions, the Department employs over 25 geologists. During the 1985/86 fiscal year, the geological staff of the Department nearly doubled as a result of implementation of the many projects supported by the Canada-Nova Scotia Mineral Development Agreement (CNSMDA). Between 1984 and 1989, over $27 million will be spent (Canada $16.1 million and Nova Scotia $10.9 million) on programs that develop the Province's mineral resources and mineral industry.

The 1985 fiscal year was the first fully operational year for CNSMDA supported projects. Many of these projects complement similar projects in Nova Scotia by the Geological Survey of Canada (GSC). All of the work is coordinated through the CNSMDA.

ENERGY RESOURCES DIVISION ACTIVITIES

Coal

Staff of the Energy Resources Division supervised eleven varied projects (figure 1). Many of these projects focused on former producing coal fields. Stratigraphic and sedimentological studies continued in the Springhill, Debert-Kemptown, and Pictou coalfields to delineate the coal



GEOSCIENCE ACTIVITIES DURING 1985/86

Energy Resources Division

1. Geological mapping - Springhill coalfield
2. Seismic survey - Springhill*
3. Geological mapping - Debert-Kemptown
4. Stratigraphic work - (Stellarton graben) Pictou coalfield
5. Diamond-drilling - Pt. Aconi
6. Diamond-drilling - Maple Brook syncline, stratigraphy and paleonology
7. Offshore seismic survey - Port Hood and Inverness coalfields*
8. Oil shales project - Pictou coalfield, Stellarton graben*
9. Coal geology computerization project*
10. Coal and sedimentological research
11. Onshore oil and natural gas evaluation*

Mineral Development Division

12. Gold resources inventory project*
13. Land use data compilation*
14. Gypsum - anhydrite resources project*
15. Building stone resource project*
16. Mineral inventory*
17. Drill core libraries*
18. Exploration monitoring, regional office

Mineral Resources Division

19. South Mountain Batholith*
20. Cumberland Basin*
21. Regional surficial mapping*
22. Geochemical studies*
23. Metallotectonic studies*
24. Liscomb complex*
25. Mineral deposit investigations*
26. Public education and awareness program*

* indicates financial support from the Canada-Nova Scotia Mineral Development Agreement.

Figure 1. Locations and types of Geoscience projects undertaken by the Nova Scotia Department of Mines and Energy.

horizons and extensions. Seismic surveys in the Springhill coalfield and offshore from the Port Hood-Inverness coalfield were designed to explore the subsurface structure and extension of coal seams.

Two locations in the Province were explored with diamond drilling The extensions of the Point Aconi coal seams were evaluated by drilling, and the structure and coal quality in the Maple Brook Syncline were assessed.

Oil shales are exposed in many parts of northern Nova Scotia and Cape Breton Island. Work has begun on evaluating the quality and quantity of this resource. The first part of the project is centred in the Pictou Coalfield (Stellarton Graben).

All coal information in the Province is presently being placed in a coal information database. Specific information about part production, coal quality in a specific seam, or geological information about a coalfield may be accessed by interested parties when this database has been completed.

Oil and natural gas

The valuation of Nova Scotia's energy resources also included undertaking geological projects on oil and gas resources situated onshore and offshore.

The Division is responsible for all petroleum exploration and development activities onshore, and works in conjunction with the Nova Scotia office of the Canada Oil and Gas Lands Administration (COGLA), in the administration of offshore Nova Scotia. Work continued on compiling reports containing information about onshore petroleum shows, wells, and geophysical information. The reports are nearing completion and are expected to be available in the fall of 1986 to all companies exploring for petroleum resources in "onshore" Nova Scotia. Studies were undertaken to better understand the geology and provide an improved definition of reserves for a number of offshore significant discoveries. The Division produced a publication reviewing oil and gas activities during the past year.

Significant petroleum-related events happened in the onshore and offshore environments during the past year, but exploration activity focused offshore, primarily in the Sable Island area.

Regulations governing onshore oil and gas exploration and production activity were put in place and negotiations were undertaken with onshore licence holders under these new regulations.

In the offshore, a number of exploration agreements expired and new exploration agreements were negotiated by governments and industry. For the first time, the Canada-Nova Scotia Oil and Gas Board requested to be informed, through the Call for Nominations, of any Crown lands companies would be interested in acquiring offshore.

Progress was made on the Venture Gas Project. Additional drilling was undertaken to firm up the reserves and applications were made by the producers to the regulatory authorities to export the gas from the Venture States. Negotiations commenced between the governments of Nova Scotia and Canada regarding changes to the Canada-Nova Scotia Agreement on Offshore Resource Management and Revenue Sharing concluded in 1982.

MINERAL DEVELOPMENT DIVISION ACTIVITIES

The Division has developed several major commodity studies under the CNSMDA to help the private sector develop these mineral resources. A major study of gold in former gold districts and other areas of Nova Scotia is designed to investigate the diversity of geological environments and their economic potential. Two other commodity studies will assess the reserves of gypsum-anhydrite and building stone. Both projects involve concurrent emphasis on the development on new uses and markets for these commodities (figure 1).

Geologists in the Division are assembling information databases for land use and mineral inventory. The land use project was developed to compile information about the uses of mineral

potential land and to diminish the alienation of these lands. Mineral inventory is a broad heading for the compilation of a drill hole database, journal literature, and data pertaining to mining operations. This material will become part of GEOSCAN information database in the Department.

The Mineral Development Division maintains an extensive drill core library at the Stellarton regional office. During the 1985/86 fiscal year over 157 000 feet (48 000 m) of diamond drill core were added to the library holdings. Monitoring of exploration activity is carried out from the regional office.

MINERAL RESOURCES DIVISION ACTIVITIES

The CNSMDA is supporting many long term mineral resource studies of parts of Nova Scotia (figure 1). The South Mountain Batholith Project is presently assessing the geology and mineral potential of this large granitoid body in southern Nova Scotia by means of bedrock and surficial deposits mapping. Seven 1:50 000 map sheets have been produced from the 1985-86 mapping activity. The project goal is to test the potential of this large area to host East Kemptville type deposits (Sn-Cu-Zn-Ag) and other deposits (Sb, Au, Mo, Mn, Be, rare earths).

During 1985/86, the first major field effort began on the regional mapping and total mineral resource assessment of the Cumberland Basin. Another major regional project is the mapping of surficial Pleistocene deposits across northern Nova Scotia. The search for mineral occurrences is being continued in this project through the use of till geochemistry.

A joint federal-provincial project began the assessment of stream sediment geochemistry and its relationship to the geology of individual stream catchment basins. An additional part of this regional geochemistry project is the compilation of all geochemical data into a comprehensive geochemical atlas.

Work began on the evaluation of several mineral deposits under the Mineral Deposits Investigation Project. Over the term of the CNSMDA, geologists from the Geological Survey of Canada and the Department will be working together to understand the geology of the major mineral deposits in Nova Scotia. Closely related to this project is a Metallotectonic Study of the Province. Through the use of new geological data applied to plate tectonic models, a better appreciation is being sought of the location and emplacement of mineral deposits.

As part of the CNSMDA work nearly all granitoid bodies in southern Nova Scotia will be studied by the Geological Survey of Canada or the Department. One of these plutons, the Liscomb Complex, is the subject of a field mapping and of geochemical studies.

The Education and Public Awareness Program promotes an understanding of the minerals, geology, and mineral industry in Nova Scotia and the importance of the CNSMDA. Prospecting courses, displays, publications, and education material for schools were prepared and completed during 1985/86.

EXPLORATION ACTIVITY

Mineral exploration in Nova Scotia during 1985 continued at a moderate level. The total area held under exploration licenses increased from 1 258 720 acres (509 397 ha) in 1984 to 1 288 920 acres (521 619 ha). The value of exploration and development work rose to an estimated value of $8 000 000 from $7 300 000 in 1984. Development of several gold properties to near production, and the successful mining operations at Rio Algom's East Kemptville tin mine have encouraged the exploration and mining sector. Nova Scotia looks forward to continued progress in the development of a healthy and diversified mineral industry. Geoscience activities are an important part of this development.

ENERGY AND MINERALS BRANCH, PRINCE EDWARD ISLAND
DEPARTMENT OF ENERGY AND FORESTRY

INTRODUCTION

The goal of the Prince Edward Island Minerals Branch is to develop the capability to respond effectively to public requests and needs relating to mineral, oil, and gas administration. In addition, the branch is striving to become the centre of expertise on the geology of Prince Edward Island and is committed to carrying out essential geological survey activities.

The highlight of the 1985/86 fiscal year was the signing of the Canada-Prince Edward Island Mineral Development Subsidiary Agreement designed to evaluate the province's onshore mineral aggregate (sand and gravel) resources. Other activities undertaken during the year included the hosting of the 42nd Annual Mines Ministers' Conference in September, and the indexing and entry of the province's mineral resources information into GEOSCAN, the national database for geological bibliographic information.

The 1985/86 fiscal year saw no fewer than four companies holding oil and natural gas permits to approximately 1.6 million acres of offshore territory and to 1.5 million acres of onshore land. Bro Resources Limited showed a renewed interest in the H.B. Fina *et al.* Green Gables #1 Well which was originally drilled in 1972. At year end, Bro Resources Limited was attempting to stimulate the well in the hopes of being able to produce commercial quantities of natural gas.

MINERAL DEVELOPMENT SUBSIDIARY AGREEMENT

On January 7, 1986, representatives from both the federal and provincial governments signed a three-year, 300 000 $ Canada-Prince Edward Island Subsidiary Agreement. The Agreement became effective as of 2 January 1986 and will terminate on 1 January 1989. It is being funded on an 80 %/20 % federal-provincial basis and will be totally delivered by the Province.

The purpose of the Agreement is to carry out programs with the objective of moving the Province closer to self-sufficiency in mineral aggregates (sand and gravel). Program I, namely Onshore Aggregate Resources, will permit a comprehensive qualitative and, where possible, quantitative analysis of both surficial and bedrock mineral aggregate deposits within the Province. This program will involve the collection and assessment of existing information, air photo interpretation, as well as ground investigation and mapping and the sampling and testing of selected sites. Program II, namely, Public Information and Evaluation will ensure that the results of Program 1 are transferred to potential developers. It is hoped that such an evaluation will provide potential developers with basic information on the nature, size, and potential for the development of the aggregate resources of the Province.

NEWFOUNDLAND DEPARTMENT OF MINES AND ENERGY
MINERAL DEVELOPMENT DIVISION

INTRODUCTION

The Mineral Development Division of the Newfoundland Department of Mines and Energy is responsible for obtaining, interpreting, and disseminating the geoscientific data required for the optimal development of the Province's mineral resources. To that end, the Division carries out continuing programs in bedrock geological mapping, geochemical and geophysical surveys, mineral deposit studies, surficial mapping, and information services. Many of these programs were funded under the five year (1984-1989) Canada-Newfoundland Mineral Development Agreement in 1985. The 1985 field program is summarized in Figure 1 and Table 1.

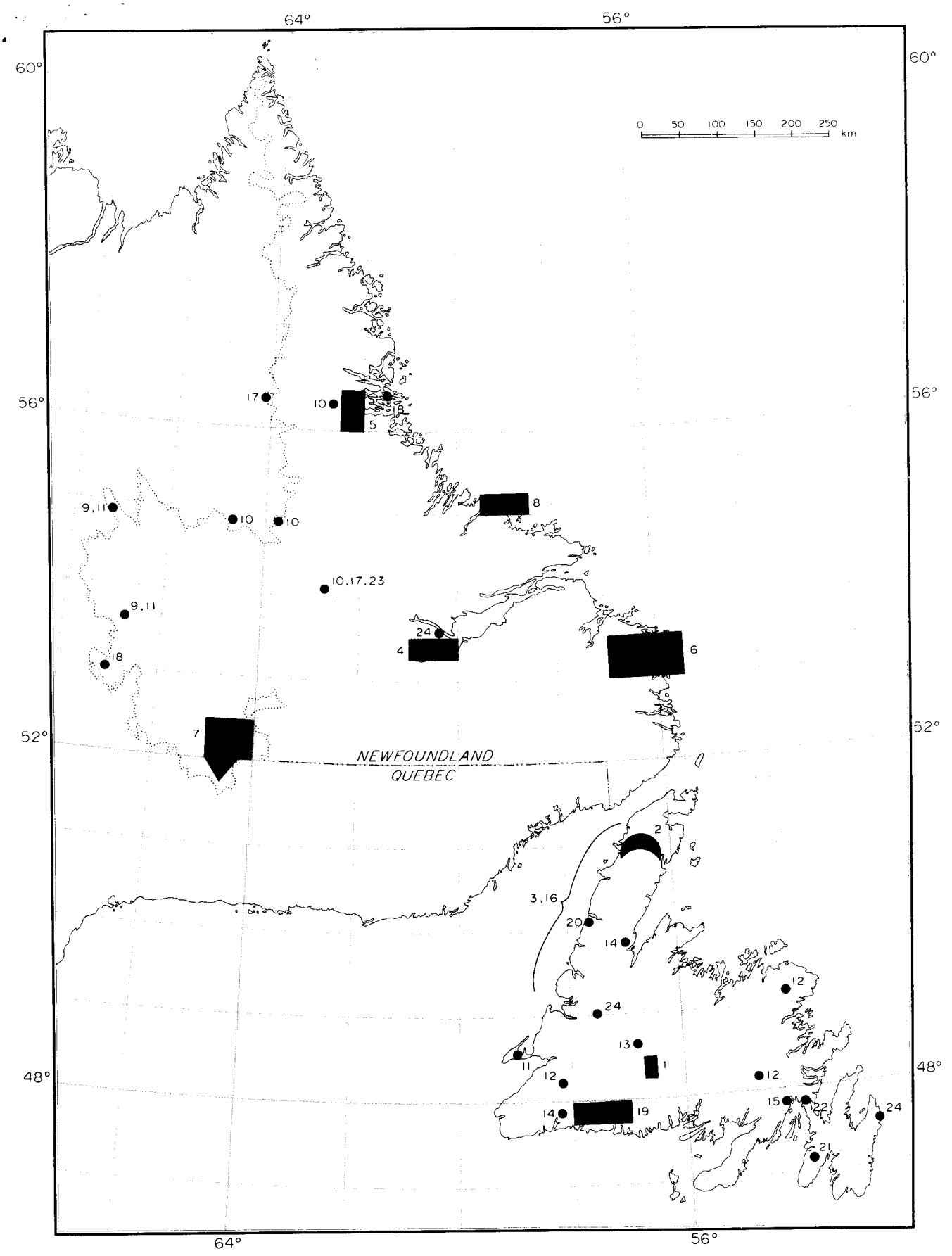


Figure 1. Distribution of field projects, 1985 (Numbers refer to Table 1)

Table 1: Summary of 1985 Field program, Newfoundland Department of Mines and Energy

(Numbers refer to Figure 1)

N°	Project Geologist	Project Name (and scale)	1985 NTS Area
A. Geological Mapping Sections			
1.	S. Colman-Sadd	Bay d'Espoir project (1:50K)	12A/7
2.	I. Knight	Daniel's Harbour project (1:50K)	12I/15,16; 12P/1,2
3.	D. Boyce	Biostratigraphic studies	
4.	R. Wardle	Goose Bay project (1:100K)	13F/7,8
5.	B. Ryan	Strange Lake project (1:110K)	14D/1,8
6.	C. Gower	Eastern Grenville project (1:100K)	13H/SE
7.	G. Nunn	Western Grenville project (1:100K)	23A/SE, 22P/15
8.	A. Kerr	Lithogeochemistry of granitoid rocks, Makkovik area	13J/13, 14,15; 13O/2,3
B. Geochemistry/Geophysics Section			
9.	J. Butler	Geochemical follow-up, Labrador Trough	
10.	J. McConnell	Geochemical follow-up, granitoid terranes	
11.	J. Tod	Geophysical support – magnetics and EM	
12.	H. Miller	Geophysical support – gravity	
C. Mineral Deposits Section			
13.	B. Kean	Metallogeny, volcanogenic sulphide deposits, Victoria Lake area	12A/9, 10,11,16
14.	J. Tuach	Metallogeny of Newfoundland granitoids	11O/9,15,16; 12H/10,15
15.	C. O'Driscoll	Metallogeny, Avalon Zone and A. Huard	1M/12, 1M/16
16.	A. Howse	Industrial Minerals Survey, western Newfoundland	
17.	R. Miller and J. Meyer	Metallogeny of Labrador granitoids Labrador	24A/8, 13L/1
D. Quaternary Geology Section			
19.	B. Sparkes	Quaternary Mapping, South Coast (1:50K)	11P/13; 12A/4
20.	M. Mihychuk	Quaternary Mapping, Daniel's Hr.	12I, 12H
21.	D. Bragg	Bedrock Aggregate Inventory, Avalon Peninsula	1L, 1M
22.	M. Ricketts	Detailed Aggregate Assessment, Placentia Bay	1M/3, 1M/16
23.	M. Batterson	Quaternary Mapping, Letitia Lake (1:50K)	
E. Publications and Information Section			
24.	A. Harris	Drill Core Collection and Storage	

GEOLOGICAL MAPPING

A general assessment of the geoscientific database in Newfoundland and Labrador was carried out in the early 1970s. That study identified a need for bedrock geological mapping as a basis for mineral exploration, mineral potential assessment, and land use planning. Much of the Divisions effort since that time has been directed towards geological mapping, at the 1:50 000 scale in Newfoundland and at the 1:100 000 scale in the larger, more remote areas of Labrador. Geological maps at these scales are now available for about 50 percent of the Province, and the program is continuing.

Two field mapping projects were carried out in Newfoundland in 1985. Ian Knight continued his work on the Cambro-Ordovician carbonates along the west coast. Steve Colman-Sadd continued his mapping north of Bay d'Espoir. Three of the Newfoundland project geologists remained in the office during the 1985 season, completing maps and reports dealing with the south-central part of the island, where field work was completed in 1984.

Five mapping parties were active in Labrador. Bruce Ryan began a three year project in northern Labrador in the area of the Zr-Nb-REE deposits at Strange Lake. Ges Nunn, Dick Wardle, and Charlie Gower continued their mapping projects in the western, central, and eastern parts of Grenville Province, respectively. Andy Kerr initiated a new project aimed at the mapping and a lithogeochemical study of granites in the Makkovik area.

Significant results derived from the 1985 mapping program included: the delineation of a major unconformity within the carbonate sequence in western Newfoundland which controlled lithofacies in subsequent deposits and must be considered the primary control of most of the base metal mineralization in the area; the identification of mineralized granites in the Cape Makkovik area; the subdivision of Grenville gneisses into thrust-fault bounded terranes in southeastern and southwestern Labrador, and the subdivision of the Nain igneous complex and associated gneisses in northern Labrador.

GEOCHEMISTRY/GEOPHYSICS

The Division continued its program of follow-up studies over anomalies revealed by regional lake sediment surveys. J. Butler conducted follow-up investigations over base-metal anomalies in the Labrador Trough, while J. McConnell investigated F, Mo, and U anomalies in east-central Labrador and initiated a pilot project to investigate geochemical methods for gold exploration. J. Tod conducted geophysical studies in support of follow-up mapping, and mineral deposit studies. H. Miller, on sabbatical leave from Memorial University, carried out gravity surveys over the Ackley Granite, the Middle Ridge Granite, and in the Gander area. P. Davenport continued with a computer analysis of regional geochemical data and compilation of a geochemical atlas of Newfoundland.

The laboratory performed a wide variety of chemical analyses in support of the Division's programs and completed installation of a new ARL 3520 sequential quantometer for the analysis of rare earths and other highly refractory elements. A modern graphite furnace was added to our atomic absorption equipment for the analysis of gold in the parts per billion range. The computer unit completed a review of the computer requirements of the Division and initiated a pilot project on the integration of regionalized multivariate data in geology, geochemistry, geophysics, and mineral deposits.

The Geological Survey of Canada, under the Canada-Newfoundland Mineral Development Agreement, completed reconnaissance geochemical lake sediment surveys of northern Labrador to Latitude 58°39'N.

MINERAL DEPOSITS

The Mineral Deposits Section is responsible for metallogenic studies, industrial mineral surveys, and mineral inventory. Four metallogenic projects were conducted in 1985. B. Kean continued his study of volcanogenic sulphide deposits in central Newfoundland. R. Miller worked on the geological setting and mineralogy of the rare earth deposits at Strange Lake and Letitia Lake. C. O'Driscoll and A. Huard continued their examination of gold mineralization on the Burin

Peninsula. J. Tuach initiated a new study of gold deposits associated with granitoid rocks in western and southern Newfoundland. P. Dean began work on a new metallogenic map of the island part of the Province.

In the industrial minerals field, A. Howse initiated a reconnaissance study of marble occurrences in western Newfoundland, and was successful in identifying high quality marble deposits with potential for use in the filler, lime, and whitening industries. J. Meyer completed an assessment of dolomite and silica deposits in western Labrador, and initiated an assessment of the potential of the anorthosites and labradorite occurrences in the Nain area; dolomite deposits outlined by the study in the Wabush area are currently being developed for use in the manufacture of self-fluxing iron-ore pellets.

C. O'Driscoll and his staff completed the manual mineral occurrence file for the island of Newfoundland, and for western Labrador. Computerization of the file for the island of Newfoundland was also completed, and a number of mineral occurrence maps were published.

QUATERNARY GEOLOGY

The Quaternary Geology Section continued programs in surficial mapping and aggregate resource assessment. Three Quaternary mapping projects were carried out in 1985. B. Sparkes initiated a new, long term project in southwestern Newfoundland, in the vicinity of the Cinq Cerf gold discovery. M. Batterson completed surficial mapping and till geochemistry in the area of the rare earth deposits at Letitia Lake in Labrador. M. Mihychuk carried out detailed mapping and drift prospecting studies near the zinc deposits at Daniel's Harbour. The Letitia Lake till geochemistry indicated several anomalous areas unrelated to known deposits.

Aggregate resource inventory continued in the immediate area of communities and in areas identified for development associated with offshore oil. F. Kirby conducted detailed aggregate assessments in municipal areas, and worked with municipal planning process. M. Ricketts carried out a detailed assessment of the aggregate resources in the Placentia Bay area, where construction of concrete platforms for offshore use is anticipated. D. Bragg conducted a survey of possible bedrock aggregate sources on the Avalon Peninsula.

PUBLICATIONS AND INFORMATION SECTION

A new editor, F. Blackwood, was appointed to the Publications and Information Section in 1985. The results of the Division's field projects were released in some 47 publications and open files, the latest being typeset on the Division's new Compugraphic Powerview IV system. The drill core storage program, under the direction of A. Harris, added some 24 000 m of core to the collection. The technical information management team, under N. Mercer, handled a record number of new reports and requests for information, completed microfiching of the geofiles for the island of Newfoundland, and continued contributions to GEOSCAN.

GEOLOGY DIVISION

DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT

NORTHWEST TERRITORIES

The Northern Affairs Program of INAC is responsible for the administration of all non-oil and gas mineral resources in the Northwest Territories (N.W.T.). The Geology Division, under this authority, acts much as a provincial geological survey. Its major tasks or functions are to:

1. maintain a geological database to assist in the furtherance of mineral exploration and development;

2. monitor mining and mineral exploration;
3. review technical assessment work submitted through the Mining Lands Division;
4. provide advice and assistance, where possible, to individuals or organizations interested in any aspect of mineral resources and geology in the Northwest Territories;
5. expand geological knowledge of the Northwest Territories, its mineral deposits, and mineral potential;
6. administer resources allocated to the Geology Division so as to further the above functions.

The following section elaborates on the above functions and describes some of the activities undertaken to fulfill these:

1. The Division husbands the geological/mineral exploration/mining database for the Northwest Territories and makes available as much as possible of the information collected.

To this end, the Division:

i. maintains a geological/assessment work archive;

ii. maintains a core library in which to store core, mineral, and rock samples to assist those interested;

iii manages the mineral resource side of the Regional Natural Resources Library for the Northwest Territories.

The Staff and Archives Geologist, assisted by an Archives Technician, maintain the archive. More than a third of their time is devoted directly to assisting archive users and information seekers. Another third is devoted to maintaining the archive. Much of the remainder of their time goes into assisting in the preparation of the Division's various publications, namely Mineral Industry Reports, Exploration Overviews, Previews, the Division's contributions volumes, and numerous open file releases. Ten percent is spent on mineral deposit related research and field investigations. Recently, the geological archive was reorganized to make its upkeep more efficient and to enhance the long term integrity of the files stored there. The Division is awaiting a new shelving system which should simplify and condense the document storage area and more than double the space available for clients to work in.

The Core Library Manager spends only a small part of his time on the library and its collections; he also manages the extensive field equipment store, and this year also has had to act as an expeditor.

Some term or student resources are used as well to handle the considerable work load relating to the database.

2. The Division monitors mines and mineral exploration in order to:

i. keep abreast of developments, record developments, and be able to advise the ministry and other interested persons or groups;

ii. develop and maintain expertise and knowledge on the geology of the Northwest Territories and its mineral deposits in order to assist interested people and evaluate assessment submissions and generally enforce those parts of the Canada Mining Regulations delegated to the Division.

The Division does this by:

i. visiting mines approximately once each year;

ii. visiting as many exploration projects in the field as time and operating and maintenance funds permit;

iii. contacting mineral exploration people in their offices, as they pass through Yellowknife, and at conferences;

iv. monitoring trade publications and the popular press for information on mining and exploration.

The continued shift of exploration effort from uranium, base metals, and tungsten to gold and, to a lesser extent, the platinoids, has resulted in a major shift in mineral exploration in the Northwest Territories. There has been a decline in exploration in all areas of the N.W.T. except in the Archean parts of the Churchill Province (Keewatin District) and in the Slave Province. The latter structural province contains four producing gold mines, two gold mines at the bulk testing stage, and another which commenced underground exploration and bulk sampling in 1986.

Because nearly 80 percent of all exploration is at present (1986) concentrated in the Slave Structural Province, two additional District Geologists were assigned, in the spring of 1986, to work in that area.

3. The Division reviews assessment and Prospecting Permit submissions for acceptance under the Canada Mining Regulations in order to ensure these submissions are useful, complete, and are in compliance with the regulations. They also assist in the review of Prospecting Permit applications.

4. The Division conducts and assists others to conduct geological studies within the N.W.T., including mapping at various scales, but mainly at 1:50 000 and larger, and mineral deposit studies including mapping of showings. Our assistance to other groups, the Geological Survey of Canada, universities, prospectors, and less commonly, mineral exploration companies or consultants include:

i. an expediting service for associated groups working with the Division under contract;

ii. expediting resources and storage for Geological Survey of Canada crews operating out of Yellowknife;

iii. visits, on request, to prospectors in the field to advise them on prospecting techniques and on the potential of the area they are working in or of finds they have made;

iv. advice to mineral exploration geologists on their work, problems, and showings, when requested, mainly during property visits;

v. advice and consultations to/with students/contractors, etc. working for or with the Division;

vi. cooperation with all groups to maximize transportation resources and reduce the overall cost of field work.

5. The Division expends considerable time and effort on administration of expenditures and personnel (especially in these days of restraint when special effort is required to obtain approval to conduct normal operations). For this reason, in any Mineral Development Agreement the Division is called on to manage, the Division will insist on obtaining a budget for the services of an administration manager, with a strong geological background, to organize MDA delivery.

GEOLOGY DIVISION 1986 PROJECTS

	Project	Description	Scale	Personnel (months)
1.	Russell Lake (NTS 85 J/13, 85 O/3,4)	Mapping supracrustals – granitoids – volcanics –	1:30 000 1:50 000 1:10 000	5 (1.0)
2.	Hood River (NTS 75 L/9, 10,15,16)	Mapping southern extension of the High Lake Volcanic Belt		6 (1.5)

Project	Description	Scale	Personnel (months)
3. Superficial Mapping	Russel Lake and Hood River areas and end-glacial marine sediments along Coronation Gulf from Paulatuk to Spence Bay		1 (2.5)
4. Hope Bay (NTS 77 A)	Volcanic belt mapping. Detailed mapping of ultramafic sills		2 (1.5)
5. Octopus Formation (NTS 85 J/7,8)	Yellowknife Volcanic Belt	1:10 000	3 (1.0)
6. Ellington Lake (NTS 86 E/11)	Bear Province Supracrustal (mainly volcanic) Belt	1:50 000	2 (1.5)
7. Jackfish Island (NTS 85 J/1,8)	Yellowknife Bay area, southeastern end of Yellowknife Volcanic Belt (Duck and Burwash Formations)	1:10 000	1 (2.5)
8. Cameron River Volcanic Belt (NTS 85 I/15)	Mapping to elucidate structurel and stratigraphy	1:10 000	2 (1.0)
9. Cameron River Volcanic Belt & Sleepy Dragon Metavolcanic Complex (NTS 85 I/15)	Structural mapping of the relationships of volcanics of the Yellowknife Supergroup to the basement complex		2 (1.0)
10. Point Lake Area (Kess-Karrah Bay) (NTS 86 H/7)	Structural relationships of the Yellowknife Supergroup to the basement complex		4 (5.0)
11. Kam/Banting Transition	Mainly logging of core from holes drilled by Golden Marlin Resources. Advice to Octopus project		1 (1.0)
12. Western Plutonic Complex	Mapping granitoids along the western side of the Yellowknife Volcanic Belt to investigate the granite-gold connection	1:50 000	3 (1.0)
13. Nonacho Basin	Mapping of the extensions of the Nonacho Group. Collection of material for heavy mineral analysis and gold content	1:50 000	2 (2.0)
14. Gold Vein Studies	Detailed mapping of gold quartz veins in the Burwash Formation (Yellowknife Basin)		1 (0.5)
15. Deformation Studies, Yellowknife Basin	Detailed studies to clarify structural relationships in the Slave Province (W.K. Fyson, Carleton University)		contract
16. Dating in the Bear Province	Geochronological studies in the Wopmay Orogen. (Cooperative work by S.A. Bowring, Washington University, with the Geological Survey of Canada)		contract
17. Dating in the Slave Province	Geochronological studies in many parts of the Slave Province to improve maps and relate the mineral deposits to structural events		1 (0.2)

Project	Description	Scale	Personnel (months)
18. Mineral Deposit Studies	Mineralogical studies, Thor Lake rare metal deposits (W.G. Smith, University of Alberta)		contract
19. Mineral Deposit Studies	Geology and mineralogy of the N-81 ore body, Pine Point Mines (R.L. Morton, University of Alberta)		contract

EXPLORATION AND GEOLOGICAL SERVICE DIVISION

YUKON DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT

ACTIVITIES FALL 1985 TO SUMMER 1986

The Exploration and Geological Services Division (EGSD), Yukon, consists of six geologists, an office manager, a map salesperson, and a secretary. The Division is part of the Mineral Resources Directorate of the Northern Affairs Program (NAP) in Yukon as well as the Mineral Rights and Mining Engineering Divisions. NAP is one of five programs of the Federal Department of Indian Affairs and Northern Development and has responsibilities in Yukon for mineral resource management much the same as any provincial department of mines. Most of the projects described below were funded by EGSD, with the exception of those projects of the Mineral Resources Sub-Agreement of the Canada-Yukon Economic Development Agreement (EDA).

Chief Geologist Jim Morin coordinated and monitored most projects of the division and of the EDA. His main ongoing project involves precious metal mineralization and volcanic rocks.

Minerals Geologist Grant Abbott examined mineral showings in west-central Yukon in association with ongoing Geological Survey of Canada regional mapping work. The showings are mainly breccia related and are hosted by Late Proterozoic rocks. Extensional mafic volcanism, associated volcanogenic polymetallic mineralization, and relevant Proterozoic stratigraphy were investigated by 1 : 50 000 scale mapping in the Hart River Area (116 A 10). Geology of the silver-lead veins in the Hess Mountains at the Plata-Inca property (105 O 12 and N 9), and geology and structure associated with mineralization in the Pelly Mountains were written up as reports in Yukon Geology Vol. 1.

Placer Geologist Steve Morrison continued his ongoing examinations of placers in the Klondike and Sixty Mile River areas. He completed his M. Sc. Thesis work on the sedimentology of the Plio-Pleistocene White Channel gravel deposits and co-authored a paper on them for "Yukon Geology". He also compiled and edited the guidebook for the International Quaternary Association field trip to be held in the Yukon in summer 1987.

He also coordinated investigations into heap leaching potential of altered and unaltered auriferous gravels as an extension of the Division sponsored studies on epithermally altered bedrock and gravel in the Klondike.

Staff Geologist Diane Emond wrote a paper on tin-tungsten mineralization in the Mayo-Mcquesten area of central Yukon for "Yukon Geology". She spent much of 1986 on maternity leave and was replaced from February to September by Brian Lueck.

Staff Geologist Dave Downing continued 1:50 000 scale mapping in the Sekulmun Lake area of Southwestern Yukon (115 H 12). Early Cenozoic volcanic rocks overlie a Mesozoic basement of gneisses, schists, and granitic rocks. The objective of this study is to determine the controls and associations of epithermal – and porphyry-style mineralization that occurs in these rocks.

Office Geologist Bill Lebarge joined the division in January 1986 and assisted with several of the Division's field projects during the summer.

Greg Lynch continued his study of mineral and metal zonation in the Keno Hill area of central Yukon (105 M) as part of a Ph. D. program at the University of Alberta. The first field season was sponsored by the EDA and this second by EGSD, with some support coming from United Keno Hill Mines both years. Fluid inclusions, metamorphic and hydrothermal mineral assemblages, metal abundance, sulphur isotopes, and geology all point to zonation centred about the Roop Lakes Batholith.

The Canada/Germany Science and Technology Exchange Agreement saw several geoscience studies conducted in the Yukon in 1986. Within this framework, EGSD provides direction and partial support for German students working on projects that geologically have some economic significance.

Ulrich Glasmacher finished field work for his Ph. D. Thesis at the University of Aachen, Germany. The thesis deals with the physiochemistry of hydrothermal mineralization associated with Cretaceous-Tertiary volcanic rocks in the Sixty Mile River area(116 C 2), Sekulmun Lake (115 H 12), and Prospector Mountain (115 I 5), all within the Yukon Crystalline Terrain.

Two other students from the University of Aachen conducted fieldwork in the Livingstone Creek area for their Diploma theses. Rudy Reible studied the sedimentology, stratigraphy, and heavy mineral assemblages of gold-bearing placer gravels, and Ludwig Stroink concentrated on structure, petrology, and economic geology of the surrounding bedrock.

Tom Skulski finished his field work in the Miocene Wrangell volcanic rocks of the Kluane Range in southwestern Yukon (115 G 5). It forms the basis for his Ph. D. Thesis at McGill University regarding structure, stratigraphy, and petrochemistry. The geology of the area is being documented on maps at a scale of 1:25 000. These rocks host large areas of hydrothermal alteration that may have some potential economic significance, especially for precious metals.

Also in this part of the Kluane Range (115 G 5), as part of an M. Sc. Thesis at the University of Alberta, Mike Power investigated a large land subsidence-slide feature at Cement Creek. Major movement has locally dammed a creek and created very unstable areas of detached bedrock within a larger area that has suffered much hydrothermal alteration.

Jennifer Smith studied the structural setting and metamorphic aureole of the late Cretaceous Mt. Mye Batholith northeast Lof the Faro Mine (105 K 3,6). The study forms the basis of an M. Sc. Thesis at the University of Alberta and is part of an effort by EGSD to understand more fully the regional geology of the zinc-silver-lead rich Anvil District.

Steve Johnston conducted his second summer of field work in the Aishihik Lake area (115 H) as the basis for a Ph. D. Thesis at the University of Alberta. The study concerns the structural, metamorphic, and petrogenetic aspects of the large Aishihik Lake Batholith. Preliminary findings indicate that these early Mesozoic granitic rocks may be thrust upon North American Crust and actually underlie part of the Whitehorse Trough.

Mike Cathro studied the structural and physiochemical aspects of important gold-bearing mantos and quartz veins of the Ketza River Deposit in the Pelly Mountains of south central Yukon (105 F 9). The mineralization appears to be zoned from a subjacent stock through biotite hornfels to gold-bearing, and later lead-zinc-silver-bearing mantos and veins.

The study forms the basis of a thesis at the Colorado School of Mines.

Charlie Roots mapped early- to mid-Paleozoic volcanic rocks in the Dawson map area (116 B) on a contract basis in conjunction with a Geological Survey of Canada regional mapping project. EGSD is interested in the potential of these rocks for both syngenetic and epigenetic mineralization.

Monica Pride studied, on a contract basis, Eocene volcanic rocks in the Tintina Trench (105 K S, 105 F N). These rocks host an important disseminated epithermal gold deposit at Grew Creek. This study of volcanofacies, structure, alteration, and petrochemistry may point toward further potential for other similar mineralization.

Mike Cosec conducted a summer field study of a gold-bearing copper-iron skarn at Jackson Creek north of the Whitehorse Copper Belt. The mineralization is located within retrograde actinolite-magnetite skarn that is locally bismuth rich.

Under the Canada-Yukon Economic Development Agreement (EDA), a Mineral Resources Subagreement was struck in May, 1985, that consists of three programs: I. Geological mapping, II. Geochemistry, and III. Placer mining technology. EGSD managed and administered Program I, which consisted of three contract geological mapping projects during the summer of 1986: Dawson Range West, Dawson Range East, and Rancheria.

The Dawson Range West contract was awarded to Archean Engineering of Vancouver for the 1:50 000 scale geological mapping of 115 I 5, 115 J 9 and 10. The basic geology consists of a metasedimentary terrane of probable Paleozoic age that is intruded by Mesozoic granitic plutons and is overlain by late Cretaceous volcanic rocks. The Dawson Range East contract was awarded to Focus Minerals of Sudbury for 115 I 3 and 6. Here, the geology is similar, but is complicated by yet another volcanic suite of early Cenozoic age. Porphyry systems involving copper, molybdenum, and gold and hydrothermal veins bearing gold, silver, and base metals summarize the economic geology reasons for this work.

The Rancheria contract was awarded to Tesso International of Toronto for 105 B 7 and 8. The basic geology consists of a Paleozoic miogeoclinal sedimentary sequence intruded by the Cretaceous Cassiar Batholith and subsequent small plutonic bodies of Eocene age. Mineralization consists of silver, lead, zinc veins and replacement bodies, and tungsten-tin bearing quartz veins.

Multi-element stream sediment geochemical data for 105 C,D, and 115 I and H was released in July and August 1986. In addition, gold, cadmium, tin, and antimony analyses of samples collected during earlier surveys of 105 B and F were also released. Much industry interest was generated and several previously unknown mineralized areas were indicated.

During the summer of 1986, multi-element stream sediment geochemical surveys were carried out in western Yukon (115 O, N-east 1/2 and 115 J, K-east 1/2) under the management and administration of the Geological Survey of Canada. The results will be forthcoming in early summer 1987.

Most of the information generated from the above projects was disclosed by way of an informal end of field season meeting in mid-October in Whitehorse, the Whitehorse Geoscience Forum in early December 1985, and at the Cordilleran Round Up in Vancouver in late January 1986.

1985-1986

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D.A. Grieve, and P.R. Elkins: Correlation and Comparison of Two Coal-Bearing Zones between Ewin Pass and Bare Mountain, Elk Valley Coalfield, Southeastern British Columbia (82G/15, 82J/2).

D.A. Grieve, and W.E. Kilby: Flathead Ridge Coal Area, Southern Dominion Coal Block (Parcel 82), Southern British Columbia (82G/7).

G.E. Ray, and J. McClintock and W. Roberts: A Comparison Between the Geochemistry of the Gold-rich and Silver-rich Skarns in the Tillicum Mountain Area (82F/13, 82K/4).

G.E. Ray, and A. Spence: The Potassium-rich Volcanic Rocks at Tillicum Mountain-Their Geochemistry, Origin, and Regional Significance (82F/13, 82K/4).

Z.D. Hora, and B.N. Church: Zeolites in Eocene Rocks of the Penticton Group, Okanagan-Boundary Region, South-central British Columbia (82E).

T. Hoy: The Rebar and Sherpa Lead-zinc Occurrences, Shuswap Complex (82L/10).

T. Hoy, and F. Goutier: Rea Gold (Hilton) and Homestake Volcanogenic Sulphide-barite Deposits, Southeastern British Columbia (82M/4W).

T. Hoy and J. Pell: Carbonatites and Associated Alkalic Rocks, Perry River Sand Mount Grace Areas, Shuswap Complex, Southeastern British Columbia (82M/7, 10).

P. Schiarizza: Geology of the Eagle Bay Formation Between the Raft and Baldy Batholiths (82M/5, 11, 12).

G.E. Ray: Gold Associated with a Regionally Developed Mid-Tertiary Plutonic Event in the Harrison Lake Area, Southwestern British Columbia (92G/9; 92H/3, 4, 5, 6, 12).

G.E. Ray, J.T. Shearer, and R.J.E. Niels: The Geology of the Carolin Mine Gold Deposit in Southwestern British Columbia and the Geochemistry of its Replacement Sulphide-Albite-Quartz-Gold Mineralization (92H/11).

G.E. Ray, R. Simpson, W. Wilkinson, and P. Thomas: Preliminary Report on the Hedley Mapping Project (92H/8, 82E/5).

E.L. Faulkner: Blackdome Deposit (92O/7E, 8W).

E.L. Faulkner: British Columbia Regional Geochemical Survey (RGS) Release, Preliminary Results (93G/E 1/2, 93H/2 1/2, plus parts of 93H/E 1/2).

A.J. Boronowski, and W.M. Johnson: Regional Geochemical Surveys RGS 13-Prince George 93G/W 1/2 and McBride 93H/E 1/2; RGS 14 – McLeod Lake 93J.

A.J. Boronowski: 1985 Orientation Survey, A Follow Up of Two 1984 Regional Geochemical Survey, Geochemically Anomalous Drainages by Panned Stream Sediment and Silt Sampling, Blackwater Mountain Area (93G/2) and Clear Mountain Area (93H/6).

B.N. Church: The Bob Creek Gold-silver Prospect (93L).

B.N. Church: A Computer Program of the Determination of Molecular Norms for the Fine-grained and Altered Rocks of the Bob Creek Area (93L/7).

W.E. Kilby: Biaxial Reflecting Coals in the Peace River Coalfield (98O,P,I).

W.E. Kilby: Some Chemical and Mineralogical Characteristics of Tonsteins and Bentonites in Northeast British Columbia (93O,P,I; 94A).

A. Legun, and P. Elkins: Wapiti Syncline Phosphate Potential (93J/10, 7).

A. Legun: Geology of the Carbon Creek Area (93O/15).

H.P. Oppelt: Stratigraphy and Character of the Bluesky Formation (94A,B,H,G; 93I,O,P).

T.G. Schroeter, L.J. Diakow, and A. Panteleyev: Toodoggone River Area (94E).

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G.L. Dawson, and D.J. Alldrick: Geology and Mineral Deposits of the Kitsault Valley (103P/11, 12).

J. Koo: Geology of the Klappan Coalfield in Northwestern British Columbia (104H/2, 3, 6, 7).

A.F. Wilcox, and C. Borsholm: MINFILE.

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STOREY, C.C. 1986: BUILDING AND ORNAMENTAL STONE INVENTORY IN THE DISTRICTS OF KENORA AND RAINY RIVER; ONTARIO GEOLOGICAL SURVEY, MINERAL DEPOSITS CIRCULAR 27, 168 P.

AGGREGATE RESOURCES INVENTORY PAPERS

CAMBRIDGE DISTRICT OFFICE, ENGINEERING AND TERRAIN GEOLOGY SECTION 1985a: AGGREGATE RESOURCES INVENTORY OF THE KITCHENER-WATERLOO-CAMBRIDGE AREA, NTS 440P/15NE AND 40P/16NW, REGIONAL MUNICIPALITY OF WATERLOO, SOUTHERN ONTARIO; ONTARIO GEOLOGICAL SURVEY, AGGREGATE RESOURCES INVENTORY PAPER 102, 35 P.

— 1985b: AGGREGATE RESOURCES INVENTORY OF THE TOWNSHIP OF WOOLWICH, NTS 40P/15E AND 40P/16SW, REGIONAL MUNICIPALITY OF WATERLOO, SOUTHERN ONTARIO; ONTARIO GEOLOGICAL SURVEY, AGGREGATE RESOURCES INVENTORY PAPER 103, 32 P.

ENGINEERING AND TERRAIN GEOLOGY SECTION 1985a: AGGREGATE RESOURCES INVENTORY OF CAVAN, NORTH MONAGHAN AND SOUTH MONAGHAN TOWNSHIPS, NTS 31D/1, 31D/2NE, 31D/7SE AND 31D/8SW, PETERBOROUGH COUNTY, SOUTHERN ONTARIO; ONTARIO GEOLOGICAL SURVEY, AGGREGATE RESOURCES INVENTORY PAPER 96, 37 P.

— 1985b: AGGREGATE RESOURCES INVENTORY OF THE CITY OF GUELPH AND GUELPH TOWNSHIP, NTS 40P/9N AND 40P/16S, WELLINGTON COUNTY, SOUTHERN ONTARIO; ONTARIO GEOLOGICAL SURVEY, AGGREGATE RESOURCES INVENTORY PAPER 88, 30 P.

— 1985c: AGGREGATE RESOURCES INVENTORY OF THE TOWN OF HALDIMAND, NTS 30L/13, 30M/4S, 40I/16E AND 40P/1SE, REGIONAL MUNICIPALITY OF HALDIMAND-NORFOLK, SOUTHERN ONTARIO; ONTARIO GEOLOGICAL SURVEY, AGGREGATE RESOURCES INVENTORY PAPER 64, 35 P.

— 1985d: AGGREGATE RESOURCES INVENTORY OF THE CITY OF PORT COLBORNE AND TOWN OF FORT ERIE, NTS 30L/14N AND 30L/15NW, REGIONAL MUNICIPALITY OF NIAGARA, SOUTHERN ONTARIO; ONTARIO GEOLOGICAL SURVEY, AGGREGATE RESOURCES INVENTORY PAPER 117, 34 P.

GEOLOGICAL DATA INVENTORY FOLIOS

BANCROFT RESIDENT GEOLOGIST'S OFFICE 1986: CHANDOS TONWSHIP, NTS 31C/12NW, 31C/13W, 31D/9NE AND 31D/16E, PETERBOROUGH COUNTY; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 280, 26 P.

COBALT RESIDENT GEOLOGIST'S OFFICE 1986a: BURNABY TOWNSHIP, NTS 31L/13NW, NIPISSING DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 310, 18 P.

— 1986b: JOCKO TOWNSHIP, NTS 31L/11SE, NIPISSING DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 288, 18 P.

— 1986c: LA SALLE TOWNSHIP, NTS 31L/12NW AND 31L/13SW, NIPISSING DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 311, 18 P.

— 1986d: LUNDY TOWNSHIP, NTS 31M/12SW AND 41P/9SE, TIMISKAMING DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 286, 20 P.

— 1986e: MCAUSLAN TOWNSHIP, NTS 031L/12NW AND 31L/13SW, NIPISSING DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 312, 20 P.

— 1986f: MEDINA TOWNSHIP, NTS 41P/8SE, TIMISKAMING DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 287, 18 P.

KENORA RESIDENT GEOLOGIST'S OFFICE 1986a: BARKER BAY AREA, NTS 52F/6SE, KENORA DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 284, 16 P.

— 1986b: LOWER MANITOU LAKE AREA, NTS 52F/7SW, KENORA DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 313, 36 P.

— 1986c: MEGGISI LAKE AREA, NTS 52F/7SE, KENORA DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 314, 18 P.

KIRKLAND LAKE RESIDENT GEOLOGIST'S OFFICE 1985a: FRECHEVILLE TOWNSHIP, NTS 32D/12SE, COCHRANE DISTRICT, ONTARIO; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 268, 16 P.

— 1985b: LAMPLUGH TOWNSHIP, NTS 32D/12SW, COCHRANE DISTRICT, ONTARIO; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 267, 14 P.

— 1985c: MARRIOTT TOWNSHIP, NTS 32D/5NE AND 32D/12SE, COCHRANE DISTRICT, ONTARIO; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 273, 20 P.

— 1986a: BEATTY TOWNSHIP, NTS 42A/9SW, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 266, 36 P.

— 1986b: HOLLOWAY TOWNSHIP, NTS 32D/5NE AND 32D/12SE, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 272, 32 P.

SAULT STE MARIE RESIDENT GEOLOGIST'S OFFICE 1986a: ANDERSON TOWNSHIP, NTS 41J/12NW AND 41K/9NE, ALGOMA DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 309, 14 P.

— 1986b: BRUYERE TOWNSHIP, NTS 42C/1N AND 42C/8S, ALGOMA DISTRICT, ONTARIO; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 294, 24 P.

— 1986c: COPENACE TOWNSHIP, NTS 42C/1NE AND 42C/8SE, ALGOMA DISTRICT, ONTARIO; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 295, 14 P.

— 1986d: CORBIERE TOWNSHIP, NTS 42C/2E, ALGOMA DISTRICT, ONTARIO; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 297, 56 P.

— 1986e: DAUMONT TOWNSHIP, NTS 41J/13SW, ALGOMA DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 307, 16 P.

— 1986f: DOLSON TOWNSHIP, NTS 42C/1, ALGOMA DISTRICT, ONTARIO; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 298, 18 P.

— 1986g: DUMAS TOWNSHIP, NTS 42C/7S, ALGOMA DISTRICT, ONTARIO; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 290, 14 P.

— 1986h: DUNPHY TOWNSHIP, NTS 42C/7SE, ALGOMA DISTRICT, ONTARIO; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 291, 14 P.

— 1986i: ECHUM TOWNSHIP, NTS 42C/1E, ALGOMA DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 299, 16 P.

— 1986j: GAUDRY TOWNSHIP, NTS 41O/4, ALGOMA DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 303, 14 P.

— 1986k: GLASGOW TOWNSHIP, NTS 42C/8N, ALGOMA DISTRICT, ONTARIO; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 289, 18 P.

— 1986l: HUGHES TOWNSHIP, NTS 41J/13SW, ALGOMA DISTRICT, ONTARIO; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 308, 16 P.

— 1986m: LOACH TOWNSHIP, NTS 41N/8, ALGOMA DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 300, 14 P.

— 1986n: LUNKIE TOWNSHIP, NTS 41J/13NW AND 41O/4SW, ALGOMA DISTRICT, ONTARIO; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 305, 14 P.

— 1986o: MUSQUASH TOWNSHIP, NTS 42C/2, ALGOMA DISTRICT, ONTARIO; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 296, 16 P.

— 1986p: RAAFLAUB TOWNSHIP, NTS 41N/1N AND 41N/8S, ALGOMA DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 301, 14 P.

— 1986q: RIGGS TOWNSHIP, NTS 42C/8S, ALGOMA DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 292, 38 P.

— 1986r: RUNNING TOWNSHIP, NTS 41N/1NE, 41N/8SE, 41O/4NW AND 41O/5SW, ALGOMA DISTRICT,; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 302, 18 P.

— 1986s: TUPPER TOWNSHIP, NTS 41K/16, ALGOMA DISTRICT, ONTARIO; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 306, 16 P.

— 1986t: WEST TOWNSHIP, NTS 42C/8SE, ALGOMA DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 293, 24 P.

— 1986u: WISHART TOWNSHIP, NTS 41K/16NW AND 41N/1SW, ALGOMA DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 304, 14 P.

SIOUX LOOKOUT RESIDENT GEOLOGIST'S OFFICE 1986a: COUCHEEMOSKOG LAKE AREA, NTS 52A/8SE, PATRICIA KENORA DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 276, 20 P.

— 1986b: DONA LAKE AREA, NTS 52O/8NE, PATRICIA KENORA DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 279, 42 P.

— 1986c: *ECHO TOWNSHIP, NTS 52F/16NW, KENORA DISTRICT*; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 318, 32 P.

— 1986d: PONSFORD LAKE AREA, NTS 52O/9SW, PATRICIA KENORA DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 274, 22 P.

— 1986e: SMOCK LAKE AREA, NTS 52G/13NE, KENORA DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 319, 20 P.

— 1986f: TARP LAKE AREA, NTS 52O/9SE, PATRICIA KENORA DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 275, 42 P.

SUDBURY RESIDENT GEOLOGIST'S OFFICE 1985a: HART TOWNSHIP, NTS 41I/12NE, SUDBURY DISTRICT, ONTARIO; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 245 , 22 P.

— 1985b: HESS TOWNSHIP, NTS 41I/NW, SUDBURY DISTRICT, ONTARIO; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 244, 26 P.

— 1985c: MUNSTER TOWNSHIP, NTS 41I/13E AND 41I/14W, SUDBURY DISTRICT, ONTARIO; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 241, 16 P.

— 1986a: *DENISON TOWNSHIP, NTS 41I/6NW, SUDBURY DISTRICT*; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 315, 52 P.

— 1986b: DRURY TOWNSHIP, NTS 41I/5NE AND 41I/6NW, SUDBURY DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 285, 42 P.

— 1986c: HYMAN TOWNSHIP, NTS 41I/5NE, SUDBURY DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 282, 36 P.

— 1986d: MACKELCAN TOWNSHIP, NTS 41I/15E, SUDBURY DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 251, 20 P.

— 1986e: SHAKESPEARE TOWNSHIP, NTS 41I/5SW, SUDBURY DISTRICT; ONTARIO GEOLOGICAL SURVEY GEOLOGICAL DATA INVENTORY FOLIO 283, 34 P.

GEOPHYSICAL-GEOCHEMICAL SERIES MAPS

Airborne electromagnetic surveys

ONTARIO GEOLOGICAL SURVEY 1985a: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/13NE, 53B/14NW, 53G/3SW, 53G/4SE, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 716, SCALE 1:20 000.

— 1985b: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/14NW, 53G/3SW, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 717, SCALE 1:20 000.

— 1985c: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/14NE, 53G/3SE, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 718, SCALE 1:20 000.

— 1985d: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/14NE, 53B/15NW, 53G/2SW, 53G/3SE, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 719, SCALE 1:20 000.

— 1985e: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/15NW,53G/2SW, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 720, SCALE 1:20 000.

— 1985f: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/15NW,53G/2SW, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 721, SCALE 1:20 000.

— 1985g: *AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY* MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/15NE,53G/2SE, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 722, SCALE 1:20 000.

— 1985h: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/15NE,53B/16NW, 53G/1SW,53G/2SE, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 723, SCALE 1:20 000.

— 1985i: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, *OPAPIMISKAN LAKE AREA, NTS 53B/14NW, PATRICIA KENORA DISTRICT*; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 724, SCALE 1:20 000.

— 1985j: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/14NE, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 725, SCALE 1:20 000.

— 1985k: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/14NE,53B/15NW, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 726, SCALE 1:20 000.

— 1985l: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/15NW, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 727, SCALE 1:20 000.

— 1985m: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/15NW, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 728, SCALE 1:20 000.

— 1985n: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/15NE, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 729, SCALE 1:20 000.

— 1985o: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/15NE,53B/16NW, *PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL* SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 730, SCALE 1:20 000.

— 1985p: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/16NW, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 731, SCALE 1:20 000.

— 1985q: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/14SW, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 732, SCALE 1:20 000.

— 1985r: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/14SE, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 733, SCALE 1:20 000.

— 1985s: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/14SE,53B/15SW, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 734, SCALE 1:20 000.

— 1985t: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/15SE,53B/16SW, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 735, SCALE 1:20 000.

— 1985u: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/16SW, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 736, SCALE 1:20 000.

— 1985v: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/16SW, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 737, SCALE 1:20 000.

— 1985w: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/9NW,53B/10NE, 53B/15SE,53B/16SW, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 738, SCALE 1:20 000.

— 1985x: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/9NW,53B/16SW, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 739, SCALE 1:20 000.

— 1985y: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/9W, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 740, SCALE 1:20 000.

— 1985z: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/9, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 741, SCALE 1:20 000.

— 1985A: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/9E, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 742, SCALE 1:20 000.

— 1985B: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/9SW, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 743, SCALE 1:20 000.

— 1985C: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/9S, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 744, SCALE 1:20 000.

— 1985D: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/9SE, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 745, SCALE 1:20 000.

— 1985E: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53A/12SW,53B/9SE, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 746, SCALE 1:20 000.

— 1985F: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53A/12SW, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 747, SCALE 1:20 000.

— 1985G: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/8NW, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 748, SCALE 1:20 000.

— 1985H: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/8N, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 749, SCALE 1:20 000.

— 1985I: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53B/8NE, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 750, SCALE 1:20 000.

— 1985J: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53A/5NW,53B/8NE, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 751, SCALE 1:20 000.

— 1985K: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53A/5NW, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 752, SCALE 1:20 000.

— 1985L: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OPAPIMISKAN LAKE AREA, NTS 53A/5NW, PATRICIA KENORA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 753, SCALE 1:20 000.

— 1986a: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OBA-KAPUSKASING REGION, PELLETIER-ECCLESTONE TOWNSHIPS AREA, NTS 42G/4SW, ALGOMA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 822, SCALE 1:20 000.

— 1986b: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OBA-KAPUSKASING REGION, PELLETIER-ECCLESTONE TOWNSHIPS AREA, NTS 42G/4N, ALGOMA AND COCHRANE DISTRICTS; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 823, SCALE 1:20 000.

— 1986c: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OBA-KAPUSKASING REGION, PELLETIER-ECCLESTONE TOWNSHIPS AREA, NTS 42G/3NW AND 42G/4NE, ALGOMA AND COCHRANE DISTRICTS; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 824, SCALE 1:20 000.

— 1986d: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OBA-KAPUSKASING REGION, PELLETIER-ECCLESTONE TOWNSHIPS AREA, NTS 42G/3NW AND 42G/6SW, ALGOMA AND COCHRANE DISTRICTS; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 825, SCALE 1:20 000.

— 1986e: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OBA-KAPUSKASING REGION, PELLETIER-ECCLESTONE TOWNSHIPS AREA, NTS 42G/3N AND 42G/6S, ALGOMA AND COCHRANE DISTRICTS; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 826, SCALE 1:20 000.

— 1986f: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OBA-KAPUSKASING REGION, PELLETIER-ECCLESTONE TOWNSHIPS AREA, NTS 42G/3NE AND 42G/6SE, COCHRANE DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 827, SCALE 1:20 000.

— 1986g: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OBA-KAPUSKASING REGION, PELLETIER-ECCLESTONE TOWNSHIPS AREA, NTS 42G/2NW, 42G/3NE, 42G/6SE AND 42G/7SW, COCHRANE DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 828, SCALE 1:20 000.

— 1986h: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OBA-KAPUSKASING REGION, PELLETIER-ECCLESTONE TOWNSHIPS AREA, NTS 42G/3NE, ALGOMA AND COCHRANE DISTRICTS; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 829, SCALE 1:20 000.

— 1986i: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OBA-KAPUSKASING REGION, PELLETIER-ECCLESTONE TOWNSHIPS AREA, NTS 42G/2NW AND 42G/3NE, ALGOMA AND COCHRANE DISTRICTS; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 830, SCALE 1:20 000.

— 1986j: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OBA-KAPUSKASING REGION, DERRY-MINNIPUKA TOWNSHIPS AREA, NTS 42C/16N AND 42F/1S, ALGOMA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 831, SCALE 1:20 000.

— 1986k: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OBA-KAPUSKASING REGION, DERRY-MINNIPUKA TOWNSHIPS AREA, NTS 42C/16NE AND 42F/1SE, ALGOMA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 832, SCALE 1:20 000.

— 1986l: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OBA-KAPUSKASING REGION, DERRY-MINNIPUKA TOWNSHIPS AREA, NTS 42B/13NW, 42C/16NE, 42F/1SE AND 42G/4SW, ALGOMA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 833, SCALE 1:20 000.

— 1986m: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OBA-KAPUSKASING REGION, DERRY-MINNIPUKA TOWNSHIPS AREA, NTS 42B/13NW AND 42G/4SW, ALGOMA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 834, SCALE 1:20 000.

— 1986n: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OBA-KAPUSKASING REGION, DERRY-MINNIPUKA TOWNSHIPS AREA, NTS 42B/13NE AND 42G/4SE, ALGOMA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 835, SCALE 1:20 000.

— 1986o: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OBA-KAPUSKASING REGION, DERRY-MINNIPUKA TOWNSHIPS AREA, NTS 42C/16N, ALGOMA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 836, SCALE 1:20 000.

— 1986p: AIRBORNE ELECTROMAGNETIC SURVEY TOTAL INTENSITY MAGNETIC SURVEY, OBA-KAPUSKASING REGION, DERRY-MINNIPUKA TOWNSHIPS AREA, NTS 42C/16NE, ALGOMA DISTRICT; BY AERODAT LIMITED, ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 837, SCALE 1:20 000.

Geochemical maps

FORTESCUE, J.A.C. 1985a: A STANDARD APPROACH TO THE STUDY OF THE GEOCHEMISTRY OF HUMUS, WILLIAMS PROPERTIES, HEMLO, NTS 42C/NW, THUNDER BAY DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 754.

— 1985b: A SMALL SCALE LAKE SEDIMENT GEOCHEMICAL SURVEY, BATCHAWANA MOUNTAIN AREA, NTS 41N/1, 41N/2 AND 41O/4, ALGOMA DISTRICT, ONTARIO; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 755, SCALE 1:400 000.

— 1985c: PRELIMINARY STUDIES OF LAKE SEDIMENT GEOCHEMISTRY IN AN AREA NORTHEAST OF SUDBURY, NTS 41I/15, 41P/2, 41P/7 AND 41P/10, SUDBURY AND TIMISKAMING DISTRICTS; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 756, SCALE 1:200 000.

— 1986: GEOCHEMICAL STRATIGRAPHY OF ORGANIC LAKE SEDIMENTS, SELECTED LAKES AND EAST OF LAKE SUPERIOR; ONTARIC GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 757.

FORTESCUE, J.A.C., WEBB, J.R. 1986: THE GEOCHEMISTRY OF SEDIMENTS AND WATERS FROM MICHIPICOTEN ISLAND, NTS 41N/12N AND 41N/13S, ALGOMA DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 758.

Sonic drillhole maps

ONTARIO GEOLOGICAL SURVEY 1986a: SONIC DRILLHOLE 84-01, CARR TOWNSHIP, NTS 42A/9SW, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 761, SCALE 1:100 000.

— 1986b: SONIC DRILLHOLE 84-02, CARR TOWNSHIP, NTS 42A/9SW, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 762, SCALE 1:100 000.

— 1986c: SONIC DRILLHOLE 84-03, BEATTY TOWNSHIP, NTS 42A/9SW, COCHRANE; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 763, SCALE 1:100 000.

— 1986d: SONIC DRILLHOLE 84-04, BEATTY TOWNSHIP, NTS 42A/9SW, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 764, SCALE 1:100 000.

— 1986e: SONIC DRILLHOLE 84-05, CARR TOWNSHIP, NTS 42A/9SW, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 765, SCALE 1:100 000.

— 1986f: SONIC DRILLHOLE 84-06, BEATTY TOWNSHIP, NTS 42A/9SW, COCHRANE DISTRICT,; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 766.

— 1986g: SONIC DRILLHOLE 84-07, CARR TOWNSHIP, NTS 42A/9SW, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 767.

— 1986h: SONIC DRILLHOLES 84-08 AND 84-11, BEATTY AND HISLOP TOWNSHIPS, NTS 42A/9SW, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 768.

— 1986i: SONIC DRILLHOLE 84-09, HISLOP TOWNSHIP, NTS 42A/9SW, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 769.

— 1986j: SONIC DRILLHOLE 84-10, BEATTY TOWNSHIP, NTS 42A/9SW, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 770.

— 1986k: SONIC DRILLHOLE 84-12, BEATTY TOWNSHIP, NTS 42A/9SW, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 771.

— 1986l: SONIC DRILLHOLE 84-13, HISLOP TOWNSHIP, NTS 42A/9SW, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 772.

— 1986m: SONIC DRILLHOLES 84-14 AND 84-16, HISLOP AND PLAYFAIR TOWNSHIPS, NTS 42A/8NW, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 773.

— 1986n: SONIC DRILLHOLE 84-15, PLAYFAIR TOWNSHIP, NTS 42A/8NW, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 774.

— 1986o: SONIC DRILLHOLE 84-17, HISLOP TOWNSHIP, NTS 42A/8NW, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 775.

— 1986p: SONIC DRILLHOLES 84-18 AND 84-19, BOWMAN AND MCCANN TOWNSHIPS, NTS 42A/8NW AND 42A/9SW, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 776.

— 1986q: SONIC DRILLHOLES 84-20 AND 84-21, BOWMAN AND CARR TOWNSHIPS, NTS 42A/9SW, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 777.

— 1986r: SONIC DRILLHOLE 84-22, TAYLOR TOWNSHIP, NTS 42A/10SE, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 778.

— 1986s: SONIC DRILLHOLE 84-23, CARR TOWNSHIP, NTS 42A/10SE, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 779.

— 1986t: SONIC DRILLHOLE 84-25, CURRIE TOWNSHIP, NTS 42A/10SE, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 780.

— 1986u: SONIC DRILLHOLE 84-26, CURRIE TOWNSHIP, NTS 42A/10SE, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 781.

— 1986v: SONIC DRILLHOLE 84-27, TAYLOR TOWNSHIP, NTS 42A/10SE, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 782.

— 1986w: SONIC DRILLHOLE 84-29, CURRIE TOWNSHIP, NTS 42A/7NE, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 783.

— 1986x: SONIC DRILLHOLES 84-30 AND 84-34, STOCK AND TAYLOR TOWNSHIPS, NTS 42A/10SE, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 784.

— 1986y: SONIC DRILLHOLE 84-31, BOND TOWNSHIP, NTS 42A/10SW, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 785.

— 1986z: SONIC DRILLHOLE 84-32, STOCK TOWNSHIP, NTS 42A/10SW, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 786.

— 1986A: SONIC DRILLHOLE 84-33, STOCK TOWNSHIP, NTS 42A/10SE, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 787.

— 1986B: SONIC DRILLHOLE 84-35, STOCK TOWNSHIP, NTS 42A/10SE, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 788.

— 1986C: SONIC DRILLHOLE 84-36, STOCK TOWNSHIP, NTS 42A/10SW, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 789.

— 1986D: SONIC DRILLHOLE 84-37, STOCK TOWNSHIP, NTS 42A/10SE, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 790.

— 1986E: SONIC DRILLHOLES 84-38 AND 84-39, TAYLOR TOWNSHIP, NTS 42A/10SE, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 791.

— 1986F: SONIC DRILLHOLES 84-40, 84-41 AND 84-42, TAYLOR AND CARR TOWNSHIPS, NTS 42A/10SE, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 792.

STEELE, K.G., MCCLENAGHAN, M.B., BAKER, C.L. 1986a: SONIC DRILLHOLE 84-24, BOWMAN TOWNSHIP, NTS 42A/10SE, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 759.

— 1986b: SONIC DRILLHOLE 84-28, CURRIE TOWNSHIP, NTS 42A/7NE, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 760.

Backhoe till maps

ONTARIO GEOLOGICAL SURVEY 1986a: BACKHOE TILL SAMPLES, STOCK, TAYLOR, CARR, CURRIE, BOWMAN AND SHERATON TOWNSHIPS, NTS 42A/7, 42A/8NW, 42A/9SW AND 42A/10S, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 793.

— 1986b: BACKHOE TILL SAMPLES, CLERGUE, WALKER AND WILKIE TOWNSHIPS, NTS 42A/9NW AND 422A/10N, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 795.

— 1986c: BACKHOE TILL SAMPLES, COULSON, BEATTY AND HISLOP TOWNSHIPS, NTS 42A/8NW AND 42A/9W, COCHRANE; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 794.

— 1986d: BACKHOE TILL SAMPLES, PLAYFAIR AND MCCANN TOWNSHIPS, NTS 42A/7NE AND 42A/8NW, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, GEOPHYSICAL-GEOCHEMICAL SERIES MAP 80 796.

PRELIMINARY MAPS

Back hoe till maps

STEELE, K.G., MCCLENAGHAN, M.B., BAKER, C.L. 1986: GOLD GRAINS IN BACKHOE TILL SAMPLES (1984-1985), MATHESON-LAKE ABITIBI AREA, NTS 32D/5, 32D/12, 42A/7, 42A/8, 42A/9 AND 42A/10, COCHRANE DISTRICT; ONTARIO GEOLOGICAL SURVEY, MAP P-2983, SCALE 1:100 000.

Bedrock aggregate assessment maps

TROTTER, R.D. 1986: BEDROCK AGGREGATE ASSESSMENT OF RENFREW COUNTY, RENFREW SHEET, BROUGHAM, ADMASTON, HORTON, BLITHFIELD, BAGOT AND MCNAB TOWNSHIPS, NTS 31F/2N, 31F/6SE, 31F/7, 31F/8NW AND 31F/10S; ONTARIO GEOLOGICAL SURVEY, MAP P-2851, SCALE 1:50 000.

TROTTER, R.D. 1986: BEDROCK AGGREGATE ASSESSMENT OF RENFREW COUNTY, PEMBROKE SHEET, ALICE, PEMBROKE, STAFFORD, WESTMEATH, WILBERFORCE, GRATTAN, BROMELY AND ROSS TOWNSHIPS, NTS 31F/6NE, 31F/7NW, 31F/10, 31F/11, 31F/14S AND 31F/15; ONTARIO GEOLOGICAL SURVEY, MAP P-2852, SCALE 1:50 000.

Geochronology maps

EASTON, R.M. 1986a: GEOCHRONOLOGY COMPILATION MAP FOR ONTARIO, SHEET 1: SOUTHERN ONTARIO; GRENVILLE PROVINCE AND ENVIRONS, AR-AR AND K-AR ISOTOPIC SYSTEMS; ONTARIO GEOLOGICAL SURVEY, MAP P-2840, SCALE 1:1 013 760.

EASTON, R M. 1986b: GEOCHRONOLOGY COMPILATION MAP FOR ONTARIO, SHEET 2: SOUTHERN ONTARIO; GRENVILLE PROVINCE AND ENVIRONS, RB-SR, ND-SM, U-PB AND OTHER ISOTOPIC SYSTEMS; ONTARIO GEOLOGICAL SURVEY, MAP P-2841, SCALE 1:1 013 760.

EASTON, R M. 1986c: GEOCHRONOLOGY COMPILATION MAP FOR ONTARIO, SHEET 3: EAST-CENTRAL ONTARIO, ALL ISOTOPIC SYSTEMS; ONTARIO GEOLOGICAL SURVEY, MAP P-2842 , SCALE 1:1 013 760.

EASTON, R M. 1986d: GEOCHRONOLOGY COMPILATION MAP FOR ONTARIO, SHEET 4: WEST-CENTRAL ONTARIO, ALL ISOTOPIC SYSTEMS; ONTARIO GEOLOGICAL SURVEY, MAP P-2843 , SCALE 1:1 013 760.

EASTON, R M. 1986e: GEOCHRONOLOGY COMPILATION MAP FOR ONTARIO, SHEET 5: NORTHWESTERN ONTARIO, ALL ISOTOPIC SYSTEMS; ONTARIO GEOLOGICAL SURVEY, MAP P-2844 , SCALE 1:1 013 760.

Paleozoic geology maps

RUSSELL, D.J., WILLIAMS, D.A. 1985a: PALEOZOIC GEOLOGY, BRUDENELL AREA, NTS 31F/6, SOUTHERN ONTARIO; ONTARIO GEOLOGICAL SURVEY, MAP P-2731, SCALE 1:50 000.

— 1985b: PALEOZOIC GEOLOGY, COBDEN AREA, NTS 31F/10, SOUTHERN ONTARIO; ONTARIO GEOLOGICAL SURVEY, MAP P-2730, SCALE 1:50 000.

— 1985c: PALEOZOIC GEOLOGY, FORT COULONGE, NTS 31F/15, SOUTHERN ONTARIO; ONTARIO GEOLOGICAL SURVEY, MAP P-2728, SCALE 1:50 000.

— 1985d: PALEOZOIC GEOLOGY, GOLDEN LAKE AREA, NTS 31F/11, SOUTHERN ONTARIO; ONTARIO GEOLOGICAL SURVEY, MAP P-2729, SCALE 1:50 000.

— 1985e: PALEOZOIC GEOLOGY, PEMBROKE AREA, NTS 31F/14, SOUTHERN ONTARIO; ONTARIO GEOLOGICAL SURVEY, MAP P-2727, SCALE 1:50 000.

— 1985f: PALEOZOIC GEOLOGY, RENFREW AREA, NTS 31F/7, SOUTHERN ONTARIO; ONTARIO GEOLOGICAL SURVEY, MAP P-02732 PALEO, SCALE 1:50 000.

WOLF, R.R. 1986: PALEOZOIC GEOLOGY, COCKBURN ISLAND, NTS 41G/14W, MANITOULIN DISTRICT; ONTARIO GEOLOGICAL SURVEY, MAP P-2987, SCALE 1:50 000.

Mineral deposit map

FYON, A.J., LANE, L. 1986: ASSESSMENT OF THE GOLD POTENTIAL IN THE UCHI-CONFEDERATION-WOMAN LAKES AREA, NTS 52N/2, PRELIMINARY RESULTS, PATRICIA KENORA DISTRICT; ONTARIO GEOLOGICAL SURVEY, MAP P-2989, SCALE 1:50 000.

Petroleum resources maps

ONTARIO GEOLOGICAL SURVEY 1985a: STRUCTURE, TOP PRE-HAMILTON, DEVONIAN CARBONATES, LAKE ERIE MAP A, NTS 30L/11, 30L/14 AND 30L/15, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2740, SCALE 1:100 000.

— 1985b: STRUCTURE, TOP PRE-HAMILTON, DEVONIAN CARBONATES, LAKE ERIE MAP B, NTS 30L/5, 30L/12 AND 30L/13, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2741, SCALE 1:100 000.

— 1985c: STRUCTURE, TOP PRE-HAMILTON, DEVONIAN CARBONATES, LAKE ERIE MAP C, NTS 40I/8, 40I/9 AND 40I/6, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2742, SCALE 1:100 000.

— 1985d: STRUCTURE, TOP PRE-HAMILTON, DEVONIAN CARBONATES, LAKE ERIE MAP D, NTS 40I/7 AND 40I/10, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2743, SCALE 1:100 000.

— 1985e: STRUCTURE, TOP PRE-HAMILTON, DEVONIAN CARBONATES, LAKE ERIE MAP E, NTS 40I/3, 40I/6 AND 40I/11, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2744, SCALE 1:100 000.

— 1985f: STRUCTURE, TOP PRE-HAMILTON, DEVONIAN CARBONATES, LAKE ERIE MAP F, NTS 40H/13, 40I/4 AND 40I/5, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2745, SCALE 1:100 000.

— 1985g: STRUCTURE, TOP PRE-HAMILTON, DEVONIAN CARBONATES, LAKE ERIE MAP G, NTS 40G/9, 40G/16, 40J/1 AND 40J/8, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2746 , SCALE 1:100 000.

— 1985h: STRUCTURE, TOP PRE-HAMILTON, DEVONIAN CARBONATES, LAKE ERIE MAP H, NTS 40G/10, 40G/14, 40G/15, 40J/2 AND 40J/3, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2747, SCALE 1:100 000

— 1985i: STRUCTURE, TOP PRE-HAMILTON, DEVONIAN CARBONATES, ESSEX COUNTY, NTS 40G/15, 40J/S, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2748, SCALE 1:100 000.

— 1985j: STRUCTURE, TOP PRE-HAMILTON, DEVONIAN CARBONATES, KENT COUNTY, NTS 40I/5, 40I/12 AND 40J/E, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2749, SCALE 1:100 000.

— 1985k: STRUCTURE, TOP PRE-HAMILTON, DEVONIAN CARBONATES, LAMBTON COUNTY, NTS 40I/12, 40I/13, 40J/E, 40O/1, 40P/4 AND 40P/5, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-02750 PETROL, SCALE 1:100 000.

— 1985l: STRUCTURE, TOP PRE-HAMILTON, DEVONIAN CARBONATES, ELGIN COUNTY, NTS 40I/5, 40I/NW, 40I/10 AND 40I/15, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2751, SCALE 1:100 000.

— 1985m: STRUCTURE, TOP PRE-HAMILTON, DEVONIAN CARBONATES, REGIONAL MUNICIPALITY OF HALDIMAND-NORFOLK, NTS 30L/13, 30L/14, 30M/4, 40I/NE AND 40P/1, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2752, SCALE 1:100 000.

— 1985n: STRUCTURE, TOP PRE-HAMILTON, DEVONIAN CARBONATES, MIDDLESEX COUNTY, NTS 40I//NW, 40I/15, 40P/SW AND 40P/2, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2753 , SCALE 1:100 000.

— 1985o: STRUCTURE, TOP PRE-HAMILTON, DEVONIAN CARBONATES, OXFORD COUNTY, NTS 40I/15, 40P/SE, 40P/3 AND 40P/6, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2754, SCALE 1:100 000.

— 1985p: STRUCTURE, TOP PRE-HAMILTON, DEVONIAN CARBONATES, BRANT COUNTY, NTS 30M/4, 40I/15, 40I/16 AND 40P/SE, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD. ONTARIO GEOLOGICAL SURVEY, MAP P-2755, SCALE 1:100 000.

— 1985q: STRUCTURE, TOP PRE-HAMILTON, DEVONIAN CARBONATES, REGIONAL MUNICIPALITY OF NIAGARA, NTS 30L/13, 30L/14 AND 30M/SW, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2756, SCALE 1:100 000.

— 1985r: STRUCTURE, TOP PRE-HAMILTON, DEVONIAN CARBONATES, HURON COUNTY, NTS 40P/W, 40P/15 AND 41A/4, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2757, SCALE 1:100 000.

— 1985s: STRUCTURE, TOP PRE-HAMILTON, DEVONIAN CARBONATES, PERTH COUNTY, NTS 40P/3, 40P/6, 40P/7, 40P/10, 40P/11, 40P/14 AND 40P/15, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2758, SCALE 1:100 000.

— 1985t: STRUCTURE, TOP PRE-HAMILTON, DEVONIAN CARBONATES, BRUCE COUNTY, NTS 40P/13, 40P/14, 41A/W AND 41H/SW, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2759, SCALE 1:100 000.

— 1985u: ISOPACH GROSS COLUMBUS SANDSTONE SECTION, LAKE ERIE MAP A, NTS 30L/11, 30L/14 AND 30L/15, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2760, SCALE 1:100 000.

— 1985v: ISOPACH GROSS COLUMBUS SANDSTONE SECTION, LAKE ERIE MAP B, NTS 30L/5, 30L/12 AND 30L/13, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2761, SCALE 1:100 000.

— 1985w: ISOPACH GROSS COLUMBUS SANDSTONE SECTION, LAKE ERIE MAP C, NTS 40I/8, 40I/9 AND 40I/16, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2762, SCALE 1:100 000.

— 1985x: ISOPACH GROSS COLUMBUS SANDSTONE SECTION, LAKE ERIE MAP D, NTS 40I/7 AND 40I/10, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2763, SCALE 1:100 000.

— 1985y: ISOPACH GROSS COLUMBUS SANDSTONE SECTION, LAKE ERIE MAP E, NTS 40I/3, 40I/6 AND 40I/11, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2764, SCALE 1:100 000.

— 1985z: ISOPACH GROSS COLUMBUS SANDSTONE SECTION, LAKE ERIE MAP F, NTS 40H/13, 40I/4 AND 40I/5, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2765, SCALE 1:100 000.

— 1985A: ISOPACH GROSS COLUMBUS SANDSTONE SECTION, LAKE ERIE MAP G, NTS 40G/9, 40G/16, 40J/1 AND 40J/8, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2766, SCALE 1:100 000.

— 1985B: ISOPACH GROSS COLUMBUS SANDSTONE SECTION, LAKE ERIE MAP H, NTS 40G/10, 40G/14, 40G/15, 40J/2 AND 40J/3, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2767, SCALE 1:100 000.

— 1985C: ISOPACH GROSS COLUMBUS SANDSTONE SECTION, ESSEX COUNTY, NTS 40G/15, 40J/SE, 40J/3 AND 40J/6, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2768, SCALE 1:100 000.

— 1985D: ISOPACH GROSS COLUMBUS SANDSTONE SECTION, KENT COUNTY, NTS 40I/5, 40I/12, 40J/SE, 40J/9 AND 40J/10, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2769, SCALE 1:100 000.

— 1985E: ISOPACH GROSS COLUMBUS SANDSTONE SECTION, LAMBTON COUNTY, NTS 40I/12, 40I/13, 40J/NE, 40O/1, 40P/4 AND 40P/5, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2770, SCALE 1:100 000.

— 1985F: ISOPACH GROSS COLUMBUS SANDSTONE SECTION, ELGIN COUNTY, NTS 40I/5, 40I/NW, 40I/10 AND 40I/15, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2771, SCALE 1:100 000.

— 1985G: ISOPACH GROSS COLUMBUS SANDSTONE SECTION, REGIONAL MUNICIPALITY OF HALDIMAND-NORFOLK, NTS 30L/13, 30L/14, 30M/4, 40I/NE AND 40P/1, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2772, SCALE 1:100 000.

— 1985H: ISOPACH GROSS COLUMBUS SANDSTONE SECTION, MIDDLESEX COUNTY, NTS 40I/NW, 40I/15, 40P/SW AND 40P/2, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2773, SCALE 1:100 000.

— 1985I: ISOPACH GROSS COLUMBUS SANDSTONE SECTION, OXFORD COUNTY, NTS 40I/15, 40P/D, 40P/6 AND 40P/SE, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2774, SCALE 1:100 000.

— 1985J: STRUCTURE BASE, COLUMBUS SANDSTONE, LAKE ERIE MAP A, NTS 30L/11, 30L/14 AND 30L/15, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2775, SCALE 1:100 000.

— 1985K: STRUCTURE BASE, COLUMBUS SANDSTONE, LAKE ERIE MAP B, NTS 30L/5, 30L/12 AND 30L/13, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2776, SCALE 1:100 000.

— 1985L: STRUCTURE BASE, COLUMBUS SANDSTONE, LAKE ERIE MAP C, NTS 40I/8, 40I/9 AND 40I/16, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2777, SCALE 1:100 000.

— 1985M: STRUCTURE BASE, COLUMBUS SANDSTONE, LAKE ERIE MAP D, NTS 40I/7 AND 40I/10, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2778, SCALE 1:100 000.

— 1985N: STRUCTURE BASE, COLUMBUS SANDSTONE, LAKE ERIE MAP E, NTS 40I/3, 40I/6 AND 40I/11, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2779, SCALE 1:100 000.

— 1985P: STRUCTURE BASE, COLUMBUS SANDSTONE, LAKE ERIE MAP F, NTS 40H/13,40I/4 AND 40I/5, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2780, SCALE 1:100 000.

— 1985Q: STRUCTURE BASE, COLUMBUS SANDSTONE, LAKE ERIE MAP G, NTS 40G/9, 40G/16, 40J/1 AND 40J/8, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2781, SCALE 1:100 000.

— 1985R: STRUCTURE BASE, COLUMBUS SANDSTONE, LAKE ERIE MAP H, NTS 40G/10, 40G/14, 405/15, 40J/2 AND 40J/3, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2782, SCALE 1:100 000.

— 1985S: STRUCTURE BASE, COLUMBUS SANDSTONE, ESSEX COUNTY, NTS 40G/15, 40J/2E, 40J/3 AND 40J/6, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2783, SCALE 1:100 000.

— 1985T: STRUCTURE BASE, COLUMBUS SANDSTONE, KENT COUNTY, NTS 40I/5, 40I/12, 40J/SE, 40J/9 AND 40J/10, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2784, SCALE 1:100 000.

— 1985U: STRUCTURE BASE, COLUMBUS SANDSTONE, LAMBTON COUNTY, NTS 40I/12, 40I/13, 40J/7, 40J/8, 40J/NE, 40O/1, 40P/4 AND 40P/5, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2785, SCALE 1:100 000.

— 1985V: STRUCTURE BASE, COLUMBUS SANDSTONE, ELGIN COUNTY, NTS 40I/5, 40I/NW, 40I/10 AND 40I/15, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2786, SCALE 1:100 000.

— 1985W: STRUCTURE BASE, COLUMBUS SANDSTONE, MIDDLESEX COUNTY, NTS 40I/NW, 40I/15, 40P/SW AND 40P/2, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2787, SCALE 1:100 000.

— 1985X: STRUCTURE BASE, COLUMBUS SANDSTONE, OXFORD COUNTY, NTS 40I/15, 40P/SE, 40P/3 AND 40P/6, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2788, SCALE 1:100 000.

— 1985Y: ISOPACH ORISKANY-SPRINGVALE SANDSTONE, LAKE ERIE MAP A, NTS 30L/11, 30L/14 AND 30L/15, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2789, SCALE 1:100 000.

— 1985Z: ISOPACH ORISKANY-SPRINGVALE SANDSTONE, LAKE ERIE MAP B, NTS 30L/5, 30L/12 AND 30L/13, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2790, SCALE 1:100 000.

— 1985aa: ISOPACH ORISKANY-SPRINGVALE SANDSTONE, LAKE ERIE MAP C, NTS 40I/8, 40I/9 AND 40I/16, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2791, SCALE 1:100 000.

— 1985bb: ISOPACH ORISKANY-SPRINGVALE SANDSTONE, LAKE ERIE MAP D, NTS 40I/7 AND 40I/10, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2792, SCALE 1:100 000.

— 1985cc: ISOPACH ORISKANY-SPRINGVALE SANDSTONE, LAKE ERIE MAP E, NTS 40I/3, 40I/6 AND 40I/11, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2793, SCALE 1:100 000.

— 1985dd: ISOPACH ORISKANY-SPRINGVALE SANDSTONE, LAKE ERIE MAP F, NTS 40H/13, 40I/4 AND 40I/5, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2794, SCALE 1:100 000.

— 1985ee: ISOPACH ORISKANY-SPRINGVALE SANDSTONE, LAKE ERIE MAP G, NTS 40G/9, 40G/16, 40J/1 AND 40J/8, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2795, SCALE 1:100 000.

— 1985ff: ISOPACH ORISKANY-SPRINGVALE SANDSTONE, LAKE ERIE MAP H, NTS 40G/0, 40G/14, 40G/15, 40J/2 AND 40J/3, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2796, SCALE 1:100 000.

— 1985gg: ISOPACH ORISKANY-SPRINGVALE SANDSTONE, ESSEX COUNTY, NTS 40G/15, 40J/SE, 40J/3 AND 40J/6, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2797, SCALE 1:100 000.

— 1985hh: ISOPACH ORISKANY-SPRINGVALE SANDSTONE, KENT COUNTY, NTS 40I/5, 40I/12, 40J/SE, 40J/9 AND 40J/10, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2798, SCALE 1:100 000.

— 1985ii: ISOPACH ORISKANY-SPRINGVALE SANDSTONE, LAMBTON COUNTY, NTS 40I/12, 40I/13, 40J/NE, 40J/7, 40J/8, 40O/1, 40P/4 AND 40P/5, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2799, SCALE 1:100 000.

— 1985jj: ISOPACH ORISKANY-SPRINGVALE SANDSTONE, ELGIN COUNTY, NTS 40I/5, 40I/NW, 40I/10 AND 40I/15, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2800, SCALE 1:100 000.

— 1985kk: ISOPACH ORISKANY-SPRINGVALE SANDSTONE, REGIONAL MUNICIPALITY OF HALDIMAND-NORFOLK, NTS 30L/13, 30L/14, 30M/4, 40I/NE AND 40P/1, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2801, SCALE 1:100 000.

— 1985ll: ISOPACH SYLVANIA SANDSTONE, MIDDLESEX COUNTY, NTS 40I/NW, 40I/15, 40P/SW AND 40P/2, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2802, SCALE 1:100 000.

— 1985mm: ISOPACH ORISKANY-SPRINGVALE SANDSTONE, OXFORD COUNTY, NTS 40I/15, 40P/SE, 40P/3 AND 40P/6, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2803, SCALE 1:100 000.

— 1985nn: ISOPACH SYLVANIA SANDSTONE, ESSEX COUNTY-LAKE ERIE, NTS 40J/3, 40J/6, 40J/SE, 40G/10, 40G/14 AND 40G/15, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2804, SCALE 1:100 000.

— 1985oo: STRUCTURE, TOP DEVONIAN SULPHUR WATER-POROSITY, ESSEX COUNTY, NTS 40G/15, 40J/SE, 40J/3 AND 40J/6, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2805, SCALE 1:100 000.

— 1985pp: STRUCTURE, TOP DEVONIAN SULPHUR WATER-POROSITY, KENT COUNTY, NTS 40I/5, 40I/12, 40J/SE, 40J/9 AND 40J/10, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2806, SCALE 1:100 000.

— 1985qq: STRUCTURE, TOP DEVONIAN SULPHUR WATER-POROSITY, LAMBTON COUNTY, NTS 40I/12, 40I/13, 40J/NE, 40J/7, 40J/8, 40O/1, 40P/4 AND 40P/5, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2807, SCALE 1:100 000.

— 1985rr: STRUCTURE, TOP DEVONIAN SULPHUR WATER-POROSITY, ELGIN COUNTY, NTS 40I/5, 40I/NW, 40I/10 AND 40I/15, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2808, SCALE 1:100 000.

— 1985ss: STRUCTURE, TOP DEVONIAN SULPHUR WATER-POROSITY, REGIONAL MUNICIPALITY OF HALDIMAND-NORFOLK, NTS 30L/13, 30L/14, 30M/4, 40I/NE AND 40P/1, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2809, SCALE 1:100 000.

— 1985tt: STRUCTURE, TOP DEVONIAN SULPHUR WATER-POROSITY, MIDDLESEX COUNTY, NTS 40I/NW, 40I/15, 40P/SW AND 40P/2, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2810, SCALE 1:100 000.

— 1985uu: STRUCTURE, TOP DEVONIAN SULPHUR WATER-POROSITY, OXFORD COUNTY, NTS 40I/15, 40P/SE, 40P/3 AND 40P/6, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2811, SCALE 1:100 000.

— 1985vv: STRUCTURE, TOP DEVONIAN SULPHUR WATER-POROSITY, HURON COUNTY, NTS 40P/W AND 41A/14, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2812, SCALE 1:100 000.

— 1985ww: STRUCTURE, TOP DEVONIAN SULPHUR WATER-POROSITY, PERTH COUNTY, NTS 40P/3, 40P/6, 40P/7, 40P/10, 40P/11, 40P/14 AND 40P/15, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2813, SCALE 1:100 000.

— 1985xx: STRUCTURE, TOP DEVONIAN SULPHUR WATER-POROSITY, BRUCE COUNTY, NTS 40P/13, 40P/14, 41A/W, 41A/15 AND 41H/SW, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2814, SCALE 1:100 000.

— 1985yy: ISOPACH TOP DEVONIAN CARBONATE TO TOP SULPHUR WATER-POROSITY, ESSEX COUNTY, NTS 40G/15, 10J/SE, 40J/3 AND 40J/6, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2815, SCALE 1:100 000.

— 1985zz: ISOPACH TOP DEVONIAN CARBONATE TO TOP SULPHUR WATER-POROSITY, KENT COUNTY, NTS 40I/5, 40I/12, 40J/SE, 40J/9 AND 40J/10, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2816, SCALE 1:100 000.

— 1985AA: ISOPACH TOP DEVONIAN CARBONATE TO TOP SULPHUR WATER-POROSITY, LAMBTON COUNTY, NTS 40I/12, 40I/13, 40J/NE, 40J/7, 40J/8, 40O/1, 40P/4 AND 40P/5, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2817, SCALE 1:100 000.

— 1985BB: ISOPACH TOP DEVONIAN CARBONATE TO TOP SULPHUR WATER-POROSITY, ELGIN COUNTY, NTS 40I/5, 40I/NW, 40I/10 AND 40I/15, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2818, SCALE 1:100 000.

— 1985CC: ISOPACH TOP DEVONIAN CARBONATE TO TOP SULPHUR WATER-POROSITY, REGIONAL MUNICIPALITY OF HALDIMAND-NORFOLK, NTS 30L/13, 30L/14, 30M/4, 40I/NE AND 40P/1, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2819, SCALE 1:100 000.

— 1985DD: ISOPACH TOP DEVONIAN CARBONATE TO TOP SULPHUR WATER-POROSITY, MIDDLESEX COUNTY, NTS 40I/NW, 40I/15, 40P/SW AND 40P/2, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2820, SCALE 1:100 000.

— 1985EE: ISOPACH TOP DEVONIAN CARBONATE TO TOP SULPHUR WATER-POROSITY, OXFORD COUNTY, NTS 40I/15, 40P/SE, 40P/3 AND 40P/6, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2821 , SCALE 1:100 000.

— 1985FF: ISOPACH TOP DEVONIAN CARBONATE TO TOP SULPHUR WATER-POROSITY, REGIONAL MUNICIPALITY OF NIAGARA, NTS 30L/13, 30L/14, 30M/SW, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2822, SCALE 1:100 000.

— 1985GG: ISOPACH TOP DEVONIAN CARBONATE TO TOP SULPHUR WATER-POROSITY, HURON COUNTY, NTS 40P/W AND 4QA/4, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2823, SCALE 1:100 000.

— 1985HH: ISOPACH TOP DEVONIAN CARBONATE TO TOP SULPHUR WATER-SPOROSITY, PERTH COUNTY, NTS 40P/3, 40P/6, 40P/7, 40P/10, 40P/11, 40P/14 AND 40P/15, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2824, SCALE 1:100 000.

— 1985II: ISOPACH TOP DEVONIAN CARBONATE TO TOP SULPHUR WATER-POROSITY, BRUCE COUNTY, NTS 40P/13, 40P/14, 41A/W, 41A/15 AND 41H/SW, SOUTHERN ONTARIO; BY BAILEY GEOLOGICAL SERVICES LTD., ONTARIO GEOLOGICAL SURVEY, MAP P-2825, SCALE 1:100 000.

Precambrian geology maps

AYER, J.A., GIL, K.M. 1986: PRECAMBRIAN GEOLOGY, RAT PORTAGE BAY, NORTHERN PART, NTS 52E/9NW AND 52E/10NE, BIGSTONE BAY PROJECT, KENORA DISTRICT; ONTARIO GEOLOGICAL SURVEY, MAP P-2966, SCALE 1:15 840.

— 1986: PRECAMBRIAN GEOLOGY, RAT PORTAGE BAY, SOUTHERN PART, NTS 52E/9W AND 52E/10E, BIGSTONE BAY PROJECT, KENORA DISTRICT; ONTARIO GEOLOGICAL SURVEY, MAP P-2967, SCALE 1:15 840.

BERGER, B.R., MACMILLAN, D.W., ROY, P.L. 1986a: PRECAMBRIAN GEOLOGY, ECCLESTONE AND PARTS OF OPASATIKA, BOURINOT, CARGILL AND SHANLY TOWNSHIPS, HEARST-KAPUSKASING AREA, NTS 42G/2NW, 42G/3NE, 42G/6SE AND 42G/7SW, ALGOMA AND COCHRANE DISTRICTS; ONTARIO GEOLOGICAL SURVEY, MAP P-2963, SCALE 1:31 680.

— 1986b: PRECAMBRIAN GEOLOGY, RYKERT, FERGUS AND PARTS OF ABBOTT AND OPASATIKA TOWNSHIPS, HEARST-KAPUSKASING AREA, NTS 42G/3N AND 42G/6S, ALGOMA AND COCHRANE DISTRICTS; ONTARIO GEOLOGICAL SURVEY, MAP P-2962 , SCALE 1:31 680

BORN, P., WORONA, R., STEPHENSON, C. 1986: PRECAMBRIAN GEOLOGY, HAVILLAND-GOULAIS BAY AREA, NTS 41K/16SW, ALGOMA DISTRICT; ONTARIO GEOLOGICAL SURVEY, MAP P-2959, SCALE 1:15 840.

BOWEN, R.P., LOGOTHETIS, J., HEATHER, K.B. 1986a: PRECAMBRIAN GEOLOGY, MISHIBISHU LAKE AREA, NORTH-CENTRAL SECTION, NTS 42C/4SE, THUNDER BAY DISTRICT; ONTARIO GEOLOGICAL SURVEY, MAP P-2969, SCALE 1:15 840.

— 1986b: PRECAMBRIAN GEOLOGY, MISHIBISHU LAKE AREA, NORTHEASTERN SECTION, NTS 42C/3SW, THUNDER BAY AND ALGOMA DISTRICTS; ONTARIO GEOLOGICAL SURVEY, MAP P-2970, SCALE 1:15 840.

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RELEASE OF UPDATED MINERAL OCCURRENCE RECORDS ON MICROFICHE

N.T.S. 1N – 13 microfiche duplicates
N.T.S. 11P – 9 microfiche duplicates
N.T.S. 12A – 31 microfiche duplicates

RELEASE OF MICROFICHE OF OPEN GEOFILES – LABRADOR (Part 6)

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ARTICLES

TRANSPORTATION SYSTEMS AND THE MINERAL INDUSTRY

A presentation to the plenary session of the 43rd annual meeting of Mines Ministers, Banff September 14-17, 1986

By the Provincial Geologists Committee

A presentation to the plenary session of the Mines Ministers Conference, Banff September 1986 by the Committee of Provincial Geologists.

SUMMARY

Historically, transportation systems in much of Canada were built to service mineral developments, and in the long run such transportation systems were paid for, both the construction and the operation, by levies made on the transportation of the mineral commodities produced, or on the supplies and personnel the mines required.

Future discoveries of world class mineral deposits can:

a) make existing transportation routes profitable, ensuring their continued service and,

b) make it feasible to construct new transportation routes that will permit other developments and settlement to take place.

Enhancement, expansion and improvement of access to the Geoscience data base will greatly assist mineral exploration in finding more world class deposits, thus making the mining industry and Canada's transportation systems more viable.

INTRODUCTION

Minerals constitute both the largest tonnage and greatest bulk of all materials moved on modern transportation systems. During times of slow economic growth, such as at present, the economics of mineral production and mineral exploration are much more affected by transportation costs than during times of rapid economic expansion and high mineral prices. During the past five years, as mineral prices fluctuated widely, transportation systems that are dependent on minerals have been seriously affected. Mineral producers competing in a shrinking market have seen transportation costs become a major factor in their survival and, in many jurisdictions, exploration has shifted steadily away from the high bulk, low value commodities to high value low bulk commodities, particularly gold, and more recently the platinoids.

Mining and mineral exploration have been in the forefront of development in many of Canada's frontier areas. Transportation routes, developed to serve the Caribou and Klondike goldfields, the silver-base metal rich Kootenay, Slocan and Rossland areas of B.C., and the silver and oil deposits of the western Mackenzie District, laid the foundation for development and settlement in these areas. The most recent major mineral transportation system built in Canada, the Norman Wells Pipeline, was financed by private capital.

Because other organizations making presentations to-day will cover most aspects of mining and commodity transportation, the Provincial Geologists Committee's presentation will concentrate on the effects of transportation costs on mineral exploration, and particularly, its effect on the metals side of that exploration. **It will also draw attention to the importance of mineral deposit development in financing transportation routes that open up new areas for exploitation and settlement.**

MINERAL EXPLORATION

Canadian mineral exploration is a multi-billion dollar industry. In 1985 hard rock mineral exploration expenditures in Canada exceeded one billion dollars, and oil and gas exploration expenditures were at least 5 times as great. These levels of exploration expenditure are

critically affected by the world demand for minerals which are quickly reflected in commodity prices.

Governmental attempts to ameliorate the effects of decline in demand and prices on the minerals industry are usually directed towards improving the competitiveness of various sections of the production side of the industry. Royalty and tax aspects of the complex cost equation are most commonly the major concern of the producers. Assistance with major costs, such as power, transportation, and other infrastructures, have recently become more important. Likewise, the increasing public concern over the environment and wilderness preservation has made costs related to these issues an important impediment to profitability, and hence threatens viability of existing operations and the development of new ones.

Such concerns and their related costs also affect mineral exploration. Any increase in costs raises the threshold of grade and tonnage required for the progression of a mineral deposit from the exploration stage to the development stage, and finally to the production stage.

THE MINERAL EXPLORATION INDUSTRY AND TRANSPORTATION

Transportation costs can be a major portion of the cost of exploring for and exploiting a mineral deposit. Exploration in frontier areas is most obviously affected. The more remote the region, the more likely exploration groups are to reject the exploration opportunities presented because they cannot justify the expenditure when, for example, transportation costs may be greater than 50 % of the exploration budget.

Small exploration groups and prospectors are most strongly penalized by transportation costs. They do not have as ready an access to tax deductible dollars as do the mining operators and larger companies. Thus we find that most junior mining companies, exploration syndicates, and prospectors work close to transportation networks.

It is an axiom in the mining industry that it is the smaller organizations, the prospectors, the syndicates, the promoters, who find the mineral showings and develop them to a state that attracts the developmental dollars of the larger mining companies. Mineral exploration attracts small scale entrepreneurs and is one of the last entreprises that provides a home for the entrepreneurial capitalist. The importance of the efforts of such people is underscored by the recent Hemlo discoveries. They represent an important and highly productive mine finding segment of the exploration industry and governments at all levels should strive to assist their efforts. There are two main ways that governments can assist small exploration groups, without taking on the problems of monitoring and attempting to control their expenditures.

First they can provide the geological data base on which all explorers depend. Expenditures on the geological data base are of use to all explorers, and give little advantage to one group over the other, with the exception of course of the more enlightened users.

Second they can provide more roads, or in some frontier areas such as the Northwest Territories, strategically placed airstrips to reduce transportation costs, and extend the frontiers of exploration. Such expenditures also give little advantage to one group over the other, and better, cheaper transportation alternatives can only enhance regional economic expansion.

We suggest that these expenditures should be considered long term investments. The roads we build today will certainly be in use 25 years from now, and possibly 100 years from now. For example, the road built in Saskatchewan during the 1970's to supply the Rabbit Lake uranium mine and nearby exploration is, in the 1980's, supporting gold exploration and the new Star Lake gold mine development. Portions of the Canol Road, built during the war, have greatly assisted in exploration in parts of the Yukon and adjacent NWT.

MINERAL DISCOVERIES: AN ENGINE OF DEVELOPMENT

Much has been said about the need to provide transportation routes to assist in economic development and in exploitation of mineral deposits. But the history of mineral deposit development records a different perspective. It is rarely that major mineral discoveries follow on the

construction of transportation routes. There are far more examples of routes developed in order to exploit major discoveries. Canadian examples are legion and include the systems established recently in the Yukon to exploit the Keno Hill silver deposits, the Clinton Creek asbestos deposit, the Anvil Range lead zinc deposits and the Cantung tungsten deposit. The main transportation routes in the NWT were also built to reach and exploit mineral resources at Norma Wells, at Port Radium, at Pine Point and at Yellowknife. Transportation systems have even more recently been built in British Columbia to exploit coal deposits and earlier in Saskatchewan and Manitoba to reach major resources at Flin Flon, Snow Lake, Lynn Lake and Thompson. Numerous examples can be found in Ontario and Quebec, notably roads to Red Lake and to Chibougamou, and railroads to tap the iron deposits along the Quebec-Labrador border.

These routes were all developed because mineral deposit exploitation required them. The final cost to the public treasury has been minimal. We should therefore consider how we can ensure discovery of more world-class deposits which will stand the cost of any new transportation link needed for their exploitation.

Mineral discoveries result from the application of exploration techniques in areas of favourable geology. Governments can ensure further discoveries:

1. by assisting in the development and preservation of the geological data base by expanding support for geological survey work, particularly in the area of detailed geological mapping, and by providing incentives to industry to record their exploration data in publically available data base systems,
2. by providing support for research and development in mineral exploration technology, and
3. by ensuring that lands with mineral potential are not withdrawn from exploration.

Continued development of the geological data base is in any case required to ensure our mineral economy has access to modern data when the next increase in demand for minerals comes, as it surely will, and a modern expanded road network is needed to provide access to potential mineral lands for efficient and cost effective exploration and development. Ensuring future major discoveries by improving exploration technology and the geological data base through which it operates will contribute to the development of new transportation systems at minimal long term cost to the taxpayers of this nation.

GEOSCIENCE DATA MANAGEMENT

by V.G. Milne, Ontario Geological Survey

INTRODUCTION

Within geoscience survey organizations information transfer has always been a crucial component of operations, whether for encouraging mineral exploration, supporting mineral potential evaluation, government policy development, land use planning, engineering applications, or many of the other uses of earth resource data. Acquisition, research and contemplation of information by the geoscientist is the beginning; providing easy public access to accurate, comprehensive geoscience information and informed interpretation is the goal. The survey geoscientist has always been in the information business; what is being experienced in the 'information age' is a revolution in the means of processing, managing and accessing that information. Not surprisingly, therefore, geoscientists are increasingly involved, and variably enthused or disillusioned, with hardware, software, systems development, compatibility and crashing.

Geoscience data/information in Provincial survey repositories has been acquired from many sources over several decades and exists in a wide type and quality range of numerical, graphical, textual, and map formats. Observations recorded 20, 50, 100 years ago are often still significant. The simple cumulative volume of this information alone makes comprehensive detailed assessment by manual processes time-consuming and error-prone. The time required by a geological mapper or mineral explorationist to provide an assessment of an area is either increasingly consumed in background compilation, or the investigator proceeds in ignorance of past work, perhaps missing important features or expensively duplicating previous efforts. In these circumstances the promises of computers are as seductive as they are inevitable. But what can the current technology do, is it worth the cost and how much will it cost?

Most Provincial surveys have entered into 'computerization' and, based upon different program priorities, have entered at different points in the information stream. The purpose of this short article is to report briefly on the progress of the geoscience database management system, GEOSIS, under development in the Ontario Geological Survey.

GEOSIS

In 1985 the Mines and Minerals Division, Ontario, initiated a program to improve the accessibility of geoscience information by creating a province-wide computerized Geoscience Spatial Information System, GEOSIS, which is a map-related database management system designed to effectively integrate computerized geoscientific, map, report, and exploration information.

The GEOSIS program is an extension of the existing Ontario Geological Survey computerized publishing system. In addition to creating a spatial database of the map and report data flowing through the computerized publishing system from this time forward, Geosis is designed ultimately to incorporate information now contained in geoscience information folios, assessment files, mineral deposit inventories, chemical analysis data files, and report and map index files.

A pilot study, funded under the Canada Ontario Mineral Development Agreement, COMDA, was conducted by the Ontario Geological Survey in 1985/86 to test the feasibility and effectiveness of the essential aspects of GEOSIS. The pilot project was successfully completed in November 1986 and work is proceeding on the full development of the database management system.

A critically important aspect of any geological feature is its geological environment, its spatial relationship to other adjacent or distant geological features. Maps have been used for centuries because of their ability to display not only positional data but also spatial relationships. Spatial information systems are designed to permit the geoscientist to work with map data and descriptive data from several different sources simultaneously and thus mimic the spatial portrayal capability of maps.

The pilot study has tested the feasibility and effectiveness of all aspects of GEOSIS including database design and use, data input methods and costs, and user interface friendliness. The technological capabilities now available in data input methods such as text scanning, graphics and map scanning and digitizing bring the conversion of large volumes of existing information to computerized databases within the realm of practical possibilty. Linked with the expanded power of microcomputers, the enormous storage capacity of optical disks and the current capabilities of network operating systems, the development of an integrated, spatially-related database management system is possible.

The objective of GEOSIS is to provide explorationists, geoscientists and other users from government, industry and universities, at their place of work, with a cost effective and integrated method of accessing geoscience data collected and managed by the Mines and Minerals Division.

CONCLUSION

The understanding gained from the GEOSIS pilot project indicates it is practical to build a spatially related database management system. A complete system with comprehensive databases will take many years, large expenditures and will engender ongoing maintainance. A clear strategy with well defined, staged objectives is essential in order to maximize cost benefit, avoid wastage (the dollar potential of which is very large) and to provide direction and control to the implementation process.

This will not be a simple matter in that a strategy will be required to adjust to progressive technological developments, concurrent management system development, database building, applications implementation and fluctuation in support committment while continuing to maintain a satisfactory level of information service.

REPORTS ON TECHNICAL LIAISON COMMITTEES

Technical Liaison Committees, acting as advisory bodies to government sponsored geological programs bearing on the mineral resources of the province or territory, arose out of a suggestion by the Prospectors and Developers Association to the Committee of Provincial Geologists. The introduction of such committees was formally endorsed by the Mines Ministers at their 40th Annual Meeting held in Regina in 1983.

THE YUKON MINERAL EXPLORATION LIAISON COMMITTEE

The Yukon Mineral Exploration Liaison Committee (YMELC) was formed in spring of 1984. Chairman is the Chief Geologist of Exploration and Geological Services Division (EGSD) of the DIAND Northern Affairs Program in Yukon. The YMELC meets semi-annually in the spring and fall and is used as a consultative group to advise on the merits and wherewithal of projects currently being undertaken, finished and being considered for the future of EGSD. Minutes of the meetings (including YMELC recommendations and comments) are directed to the Director of Mineral Resources with northern Affairs Program in Yukon.

Membership are as follows:

President of the Yukon Chamber of Mines,

President of the Yukon Prospectors Association,

Representative of the executive of the Whitehorse Branch of the Canadian Institute of Mining and Metallurgy,

Representative of a major private sector mineral concern in Yukon (currently Hudson Bay Exploration and Development),

President of the Klondike Placer Miners Association,

Representative of the Government of Yukon, Department of Mines and Small Business,

Chief Geologist, Exploration and Geological Services Division, Department of Indian Affairs and Northern Development, Yukon.

The committee ensures that communication is maintained between the mineral exploration industry and the Exploration and Geological Services Division. Results include the following:

— establishment of an annual "end of field season" meeting to be held in Whitehorse in October of each year to informally summarize EGSD and industry field season results,

— priorizing of areas to be geologically mapped in detail,

— establishment of a committee to arrange the Whitehorse Geoscience Forum and also to advise on its scheduling,

— airing and discussion of government projects to ensure maximum usefulness to the mineral exploration industry.

THE NORTHWEST TERRITORIES MINERAL EXPLORATION LIAISON COMMITTEE

The Committee's Terms of Reference are to advise the appropriate level of government of its evaluations and recommendations regarding governement related mineral activity in the Northwest Territories, concentrating on the activities of the Geology Division of the Northern Affairs Program.

At present the Committee has a member from the Geological Survey of Canada, two members from the Northern Affairs Program Geology Division, four representatives from the Northwest Territories Mining Industry, and a representative from the Geology Department at the University of Alberta.

The committee had one formal meeting in 1985. The difficulty of getting the committee members together in Yelowknife was the main impediment to meeting more often.

The committee requested that the Minerals Directorate of the Northern Affairs Program standardize its map scales by:

(1) having preliminary geological maps drawn at international standard scales; and

(2) switching all claim maps to standard 1:50 000 Surveys and Mapping Branch topographical sheets as soon as such maps are available.

BRITISH COLUMBIA GEOLOGICAL SURVEY TECHNICAL LIAISON COMMITTEE

The Technical Liaison Committee was formed in 1984 at the request of the Minister of Energy, Mines and Petroleum Resources to support the Geological Survey Branch, recommend and criticize projects of the Branch, document industry comments and reactions to programs and give assistance and support in Geological Survey Branch presentations to Treasury Board.

Since then, the Committee has scheduled two meetings a year. One is held in Victoria in the Fall to meet with Geological Survey employees to review progress of individual projects; the second is held in Vancouver in the Spring to review planned projects and budgets for the coming year. Other meetings are called to discuss extraordinary business that may arise.

Mandate of the committee is as follows:

1) to aid and stimulate the growth of the mineral resource industry in British Columbia by the collection and dissemination of geological data,

2) to co-ordinate mapping with the Geological Survey of Canada,

3) to identify natural hazards, and

4) to make liaison with other departments within the government.

The Technical Liaison Committee comprises eight individuals from varied aspects of the geological community in British Columbia. A list of current members follows:

R. Smyth; Geological Branch; Ministry of Energy, Mines and Ressources

D. McKelvie; Coal Division; Denison Mines Ltd.

R.S. Hewton; Exploration Office; Cassiar Mining Corporation

C.A. Aird; Esso Minerals Canada

H.D. Meade; Mining Division; Westmin Resources Ltd.

A.J. Sinclair; Department of Geological Sciences; University of British Columbia

O.E. Owens; Exploration; Cominco Ltd.

R.B. Campbell; Geological Survey of Canada

In addition to regular comments on specific programs, the Technical Liaison Committee has made the following recommendations:

1) Up-to-date field maps are a basic need of the mineral industry and society at large. Their preparation should be the primary activity of the Geological Survey Branch,

2) Current financing of the Geological Survey Branch is insufficient to allow it to accomplish the foregoing mandate. Budgets should be increased to allow field mapping to be undertaken. MDA funding has temporarily overcome the shortage of funds but long-term planning should include increases.

3) A staff geologist is required in Vancouver to be available to the large mining-exploration population resident there. Geological Survey Branch has acted upon this recommendation and a Vancouver office is being opened.

4) Nominations for an Advisory Committee to the Analytical Laboratory were provided to Geological Survey Branch.

5) Suggestions for field projects and types of surveys to be conducted using Mineral Development Agreement Funds.

ALBERTA GEOLOGY ADVISORY COMMITTEE

The program of the Alberta Geological Survey is reviewed annually by the Geology Advisory Committee.

The Committee:

Provides advice to the Director of the Natural Resources Division of the Alberta Research Council; meets at least once a year to review all Alberta Research Council projects involving geology in order to provide advice on research methods and approaches being utilized, the direction of effort and the nature and quality of the outputs; and maintains an interface with external advisors who provides advice for strategic planning related to needs for geological research in all of the Council's program areas.

The committee consists of at least nine external members, from whom the Chairman is selected, and includes representatives from:

Energy company – major

Energy company – small independent Canadian

Minerals company

Canadian Society of Petroleum Geologists

Alberta Energy and Natural Resources

Geotechnical Consulting Company

Energy Resources Conservation Board

Geological Survey of Canada

Geology Department of an Alberta university

It also includes three members of staff of the Alberta Research Council as follows:

Director of the Natural Resources Division, who attends as an observer and relays advice from the Committee to the appropriate Program Committee or Research Committee of the Alberta Research Council;

Head of the Alberta Geological Survey who serves as an information resource to and receives advice from the Committee, but does not participate in its deliberations; and

Research Officer (recording secretary).

Membership term on the committee is three years, with turnover dates staggered so that one third of the membership changes annually.

SASKATCHEWAN GEOLOGICAL LIAISON COMMITTEE

The Saskatchewan Geological Liaison Committee was drawn together following the direction of the 40th Provincial Mines Ministers' Meeting in Regina, Saskatchewan, 1984. Membership of the committee is designed to reflect a cross-section of the working geological milieu of the province, and totals 8 as taken from the Saskatchewan Geological Survey, Saskatchewan Research Council, the University of Saskatchewan, the University of Regina, the Saskatchewan Mining Association, the Canadian Institute of Mining and Metallurgy – Geology Division, the Prospectors and Developers Association (Saskatchewan – Manitoba) and the Independent Mineral Developers Association.

Objective of the committee is to preview and review programs of the Saskatchewan Geological Survey in order to provide input to projects with respect to industry concerns and linkages with sister organizations.

Membership has been as follows:

G.L. Colborne (PDA) – Chairman

J.E. Christopher (SGS) – Secretary

R. Arnold (S.R.C.)

L.A. Clark, R.T. Laine (C.I.M.)

D.M. Kent (U. of R.)

L. Homeniuk, K. Lehnert-Thiel (S.M.A.)

E.G. Nisbet (U. of S.)

A major concern of the committee in the year was focussed on the restricted size of the Geological Survey's budget and consequently the scope of its program. The constraint impacted most heavily on the higher cost field mapping and mineral development projects, but it was also noted that the program areas in petroleum geology and industrial minerals were operating at near minimum levels.

Another concern arose from out of the broad base of the committee itself. Its membership is drawn from the 4 major geological institutions, 1 professional society and 3 industry representative groups. This spread of membership created a divergence of viewpoints with respect to objectives:

a) the short-term versus the long-term;

b) a focus on the precious metallic minerals related programs versus minerals and geology of the sedimentary basins, and

c) the role of the Geological Survey vis-à-vis the other institutions.

Pragmatism mandated a concentration on (a), the short-term, because survival of the mapping projects in Precambrian Geology was necessary to long-term progress of the Geological Survey, and on (b), the igneous-metamorphic geology-precious metals projects, because of the entry of the Canada-Saskatchewan Mineral Development Agreement and its energizing impact in this area. Additionally, response time would be shortest with respect to the needs of the many small operators for mineral prospecting-related geological information.

As a result of the committee's deliberations, the Geological Survey was advised to improve its public relations advertisements by articles in the mineral industry media. This was done with 2 articles in the « Prospect », paper of the Independent Mineral Developers Association. The committee, for its part, provided an effective lobby for projects pertinent to the developing gold play in northern Saskatchewan.

MANITOBA MINERAL EXPLORATION LIAISON COMMITTEE

A Mineral Exploration Liaison Committee similar to those now operating in other provinces has been established in order to facilitate a more formal dialogue with industry and to solicit comment on the appropriateness of initiatives under Sector A of the Canada-Manitoba Mineral Development Agreement (MDA). Invitations for representation were distributed to the Manitoba Mining Association, the Canadian Institute of Mining and Metallurgy-Winnipeg Branch, the Prospectors and Developers Association and the Manitoba-Saskatchewan branch of the Prospectors and Developers Association. On March 28, 1985, copies of the approved workplan for 1985/86 were sent to these organizations in order to brief them on the work to be undertaken in 1985. Throughout the remainder of the year the committee was kept informed on and was able to monitor activities under the MDA, as the work progressed.

The first formal meeting of the Mineral Exploration Liaison Committee was held on November 21st, 1985, to invite comment from Industry on the acceptability of the programming, as well as suggestions for new initiatives or modifications to the existing format.

A subsequent letter from the regional representative of the PDA to National President, PDA, endorsed the focus and scale of the programming and acknowledged the input of both Federal and Provincial agencies, indicating that "the program as a whole remains as planned and scheduled.....".

The 1986 annual Meeting with Industry in Winnipeg is currently scheduled for November 20th and 21st. The second meeting of the Mineral Exploration Liaison Committee will take place on or close to these dates.

ONTARIO GEOLOGICAL SURVEY TECHNICAL LIAISON COMMITTEE

In 1984 mining, exploration, geoscience and university associations were invited to nominate representatives to a Technical Liaison Committee which would assist in strengthening ongoing communication and relevance of Ontario Geological Survey (O.G.S.) programs. The Committee met for the first time in 1985 and meets twice a year. There are currently eight committee members:

J. Chivers
(W.T. Chatham Associates Ltd.)
Rep: Ontario Petroleum Institute

J.F. Church
(INCO Limited)
Rep: Ontario Mining Association

C.J. Hodgson
(Queen's University)
Rep: Council University Departments-Geology

I. Jennings
(Jennings Engineering)
Rep: Aggregate Producers Association, Ontario

R.H. McMillan
(Westmin Resources)
Rep: Canadian Institute Mining & Metallurgy

V.G. Milne
Director
Ontario Geological Survey

R.E. Van Tassell
(Dickenson Mines Ltd.)
Rep: Prospectors & Developers Association

R. Wallis
(Billiton Canada Ltd.)
Rep: Geological Association of Canada

The Committee reports to the Assistant Deputy Minister, Mines and Minerals Division, Ministry of Northern Development and Mines.

In the past advisory liaison and communication between the mineral industry, university community and the O.G.S. has been largely ad hoc in nature. Individual and temporary committee interactions with mineral industry and geoscience associations have, over the years,

provided valuable input to the development of operational initiatives in the O.G.S., but these temporary interactions do not provide for continuity, progressive understanding and well balanced advice in the broader perspective of programs.

The benefits anticipated from the Technical Liaison Committee are in improvement of:

— communication and co-operation,

— understanding of industry and research interests,

— O.G.S. program focus and new initiatives,

— advisory comment on program policy, strategy and budget, and

— evaluation of feedback on programs.

In seeking representation, technical relevance, broad communication and a group of practical size, the committee has been comprised of association representatives who can bring to the group broad-based, objective and technically focussed viewpoints. Committee meetings during the year are timed to provide input to the Survey's program planning and strategy development process.

The initial meetings have, in large part, involved development of background understanding of the Survey's current and immediate future program, and of recent changes in the organization. The Committee has provided valuable perspective in these areas and has already contributed strategically to new program initiatives being developed for 1986. It is expected that Ontario will benefit significantly in the long term from the Committee's influence upon the relevance of the Survey's programs.

COMITÉ CONSULTATIF DE LA DGEGM

MINISTÈRE DE L'ÉNERGIE ET DES RESSOURCES QUÉBEC

Historique et rôle

En 1983, la DGEGM s'est doté d'un Comité consultatif. Son rôle est de faire, au sous-ministre associé, les recommandations utiles pour l'élaboration de la politique d'exploration minérale de la DGEGM et de conseiller la DGEGM sur l'élaboration de ses programmes de recherche géologique et minérale au Québec. Le Comité consultatif agit comme liaison entre l'industrie, les universités et la DGEGM de façon à promouvoir des actions prioritaires.

Sa composition

Le Comité consultatif se compose d'au plus dix (10) personnes nommées pour un mandat n'excédant pas deux (2) ans par le ministre de l'Energie et des Ressources. Le mandat est renouvelable. Ces personnes, dont deux (2) proviennent de la DGEGM, six (6) de l'industrie et deux (2) du milieu universitaire, sont reconnues pour leur compétence dans tous les domaines de l'exploration minière au Québec.

Le comité actuel 1985-1986/1986-1987 est composé de:

M. André F. Laurin	Sous-ministre adjoint (MER)	Président
M. Jean-Louis Caty	Directeur, Rech. géol. (MER)	Secrétaire
M. Jean Boissonnault	Cambior	Val-d'Or
M. Guy Perrault	Ecole Polytechnique	Montréal
M. Michel Gauthier	Université du Québec	Montréal
M. Denis Simoneau	Soquem	Québec
M. Denis Francoeur	Explorations Noranda	Noranda

M. Roger Doucet	Minerais Lac Ltée	Malartic
M. T. Flanagan	Flanagan, McAdam Ltée	Toronto
M. Bernard Coulombe	J.M. Asbestos	Asbestos

Son fonctionnement
Le président et le secrétaire proviennent des deux membres de la DGEGM.

Le Comité consultatif tient au moins deux réunions par année à québec: l'une au printemps et l'autre à l'automne.

NEW BRUNSWICK INDUSTRY ADVISORY COMMITTEE

This committee was set up several years ago so that the spectrum of geoscience data users could have input in formulating provincial geoscience and mineral development programs and strategies.

The members represent the Mining and Mineral Exploration Industry, universities, the Prospectors and Developers Association and private consulting firms. The governement representatives are the assistant Deputy Minister (N.B. Mineral and Energy Resources), and the directors of the Geological Surveys and Mineral Development branches (Mineral Resources Division).

The committee was scheduled to meet once in November and again in the early part of the next year. The last meeting was held on November 26, 1985, in Fredericton. However, there was no follow-up meeting. The 1985 committee comprised A. Wayne Lockhart (consulting Geologist), B. Bourgoin (Durham Resources), O. Bonham (Rio Algom Exploration Inc.), P. Dimmell and T.G. Mersereau (N.B. Prospectors and Developers Association).

NOVA SCOTIA ADVISORY COMMITTEE ON GEOSCIENCE PROGRAMS

In Nova Scotia, liaison between the Department of Mines and Energy and external agencies was formalized in early 1986, in order to provide a structured review of geoscience programs on a regular basis. A broad spectrum of geoscience interests exists in Nova Scotia, represented by the exploration/mining community, both Provincial and Federal government agencies, a crown corporation (Nova Scotia Research Foundation) and six degree-granting institutions. Liaison between government agencies in Nova Scotia is maintained through mutual involvement in the Canada-Nova Scotia Mineral Development Agreement. The advisory committee therefore was structured to enhance links with the exploration/mining groups and with the academic community.

The Nova Scotia Chamber of Mineral Resources was invited to nominate two members to the Advisory Committee. The academic geoscience community was approached through the Atlantic Provincial Council on the Sciences (APICS) with similar request for two nominees. It was agreed that these four committee members, although representing their respective organizations, should be free to express their individual opinions rather than opinions or policies of the organizations.

The committee meets at least once and preferably twice per year with senior representatives of the Department. Meetings are chaired by the Director, Mineral Resources Division. The committee mandate is to become informed and to advise on a general basis. It does not attempt to manage programs or give specific management direction.

The committee files a confidential report with the Director of Mineral Resources with copies to APICS and the Chamber of Mineral Resources. The Department is expected to respond to the committee report.

Initial members of the Advisory Committee were, from APICS, Drs. M. Zentilli and S. Barr, and from the Chamber of Mineral Resources, Mr. J. Amireault and Mr. R. Mosher. One member from each organization will continue to serve in 1987 in order to maintain continuity and current familiarity with on-going programs.

The Advisory Committee on Geoscience Programs is relatively new and will no doubt evolve into an increasingly effective link between industry, governement and the academic sector. Initial discussions have stimulated significant changes and improvements in at least one major program. Nova Scotia looks forward to expanded communication of benefits to all concerned through the activities of the committee.

NEWFOUNDLAND AND LABRADOR TECHNICAL LIAISON COMMITTEE

The Technical Liaison Committee for the Mineral Development Division of the Newfoundland Department of Mines and Energy was formed late in 1984 and held its first meeting in February, 1985. The Committee consists of four members of the Newfoundland and Labrador Explorationists (NALE) and one representative of the Earth Science Department at Memorial University. Present members are Dr. Geoffrey Thurlow (B.P.-Selco), Mr. James Robertson (Kidd Creek Mines), Mr. Lewis Murphy (Murphy Corp.), Mr. Dan MacInnes (Noranda Exploration) and Mr. Toby Rivers (Memorial University).

The Committee's terms of reference are:

(1) to review the geoscientific programs of Mineral Development Division and recommend changes or additions which will maximize the usefulness of these programs to the exploration industry;

(2) to provide the Division with a continuing evaluation of its geoscientific programs, and to participate in formal evaluations which may be required for specific programs from time to time.

The Committee meets once annually and reports in writing to the Minister of Energy and Mines.

Both the Department and NALE feel that the Committee offers a valuable opportunity for industry input into the planning of government geoscientific programs. The Committee's recommendations that more emphasis be placed on gold, that 1:250 000 compilation maps be prepared, and that lithogeochemical studies of volcanic suites be undertaken, were all implemented in the Division's 1986 program. Action on other recommendations is being initiated or is under study.

SURVEY OF FEDERAL—PROVINCIAL MINERAL DEVELOPMENT AGREEMENTS

Province or Territory	Total $ Value of Agreement ($ million)	Cost Sharing Formula	Time Period	Delivery % Canada % Province	Major Components/Projects			Industry Involvement (e.g. Tech. Comm.)	Contact Person & Tel. No.
					Project Name	Budget ($,000's)	Delivery (Prov. or Canada)		
British Columbia	$10	50/50	1985-1990	96% B.C. 4% Can.	Geoscientific Surveys — mapping — geochemistry — industrial minerals investigations	6 650	90% B.C.	Industry Technical Liaison Committee advises on projects	G. McKillop (604) 387-5975
					Geoscience Data Systems — MINFILE update	450	94% B.C.		
					Market, Technical & Feasibility Studies	750	100% B.C.	Industry Geochemical Advisory Committee	
					Financial Assist. for Mine Development — Engineering Studies	1 620			
					Management, Public Info., Evaluation	530		Industrial Minerals Advisory Sub-Committee	
Saskatchewan	$6 380	N/A	1984-1989	50 Can. 50 Sask. Parallel Work Delivery	**Geoscience**	5 340	41.2 Can. 51.8 Sask.	Sask. Geological Liaison Committee	J. E. Christopher
					Geophysics	1 000	100 Can.		
					Mineral Deposits	500	100 Can.		
					Geochemistry	700	100 Can.		
					Gold Belt Geology	2 690	100 Sask.		
					Industrial Minerals	50	100 Sask.		
					Biogeochemistry	400	100 Sask.		
					Minerals Technology	400	100 Can.		
					Mineral Development	400	100 Can.		
					Public Information	240	79.2 Can. 20.8 Sask.		
Manitoba	24.7	60% Fed. 40% Prov.	1984-89	60% Can. 40% Man.	Sector A Geoscientific Activities	13 000	38.5% Man.	Mineral Exploration Liaison Committee	W. D. McRitchie (204) 945-6559
					Sector B Research & Technology	7 430	37.2% Man.	Mining Liaison Committee	
					Sector C Development Studies	1 770	50% Man.		
					Sector D Public Information, Evaluation and Administration	2 500	50% Man.		
Ontario	$30	50/50	1985-1990	63% Ont. 37% Can.	Geoscience Program Information Exchange	18 350	64% Ont. 100% Ont.	Program Planning Review with Tech. Liaison Comm. prior to work plans submission	R. Watson (416) 965-1546
					Productivity & Technology	3 550	100% Ont.	Discussion with industry groups prior to project proposals	
					Economic Development	4 500	96% Ont.	Ongoing discussion with industry groups	
					Public Information, Evaluation and Administration				

Province or Territory	Total $ Value of Agreement ($ million)	Cost Sharing Formula	Time Period	Delivery % Canada % Province	Major Components/Projects			Industry Involvement (e.g. Tech. Comm.)	Contact Person & Tel. No.
					Project Name	Budget ($,000's)	Delivery (Prov. or Canada)		
Québec	$100	50/50	1985-1990	96% Qué. 4% Can.	5 Volets				
					1. Activités géoscientifiques	34 750	Québec	—	J. L. Caty 643-1803
					2. Recherche et développement sur l'amiante	8 000	Québec-Canada		à determiner
					3. Infrastructure de développement *minéral*	42 000	Québec		A. Jean 643-4896
					4. Désenclavement de l'industrie québécoise du mineral de fer	15 000	Québec		G. Richard 643-4410
					5. Information au public	250	Québec		M. Lecours 643-1803
New Brunswick	$22.3	—	1984-1989	30% N.B. 60% Can.	GEOSCIENCE			—	ADM - R. R. Potter North - J. J. Davies Central - L. R. Fyffe South - A. A. *Ruitenberg* GSC - F. D. Anderson W. H. Poole
					Metallic Mineral Dep.	3 020	26% N.B.		
					Regional Geology	3 590	39% N.B.		
					Geochemistry	300	0% N.B.		
					Geophysics (Gravity Surv.)	2 110	11% N.B.		
					Surficial Geology and Till Geochemistry	1 900	0% N.B.		
					Geoscience Compilation	1 153	100% N.B.		
					Drill Hole Core Mgt.	300	100% N.B.		
					MINING & MINERALS TECH.				G. *Greer or* D. Barnett (506) 453-2206
					Ferric Chloride Leach Process	1 700	0% N.B.		
					Manganese Processing Eval.	200	0% N.B.		
					Evaluation of Aggregates	500	0% N.B.		
					Potash Mineralogy	200	0% N.B.		
					Backfill-Potash Mines	400	0% N.B.		
					Dewatering in Coal Min.	125	100% N.B.		
					Peat Geochemistry	150	100% N.B.		
					ECONOMIC DEVELOPMENT				G. Greer or D. Barnett
					Manganese Market Review	100	0% N.B.		
					Processing Opportunities	400	0% N.B.		
					Commodity Studies	850	30% N.B.		
					Resource Management Strategies	2 511	100% N.B.		
					Metallurgical Assist.-Small Firms	1 000	0% N.B.		
					PUBLIC INFORMATION, EVALUATION, ADMIN.				D. Carroll (506) 453-2206
					Public Awareness	117	100% N.B.		
					Prospecting Courses	181	100% N.B.		
					Evaluation, Administration	1 500	0% N.B.		
Nova Scotia	$26.945	60/40	1984-89	60% Can. 40% N.S.	GEOSCIENCE — Regional Surveys — Mineral Deposits — Metallogeny — Tectonics — Geochemistry — Pleistocene	14 507	62% Can. 38% N.S.	Technical Liaison Committee Reviews Programs	J. D. Keppie MDA Coord. (902) 424-4700
					MINERAL TECHNOLOGY — Commodity Studies — Minerals Testing	4 982	66% Can. 33% N.S.		
					DEVELOPMENT STUDIES — Market Studies — Inventory Files — Core Library	1 841	48% Can. 52% N.S.		
					MINERAL INVESTMENT STIMULATION PROGRAM (MISP)	1 600	80% Can. 20% N.S.		
					PUBLIC INFORMATION	1 215	37% Can. 63% N.S.		
					ADMINISTRATION	2 800	47% Can. 53% N.S.		

Province or Territory	Total $ Value of Agreement ($ million)	Cost Sharing Formula	Time Period	Delivery % Canada % Province	Major Components/Projects			Industry Involvement (e.g. Tech. Comm.)	Contact Person & Tel. No.
					Project Name	Budget ($,000's)	Delivery (Prov. or Canada)		
Newfoundland	$22	50/50	1984-1989	45% Nfld. 55% Can.	Geoscientific Surveys	16 400	52% Nfld.	Technical Liaison Committee (Indus. & Univers.) advises on projects	B. Greene (709) 576-2763
					Mining & Mineral Tech.	2 100	29% Nfld.		
					Economic Develop. Studies	1 500	17% Nfld.		
					Public Information, Evaluation and Administration	2 000	30% Nfld.		
Prince Edward Island	$0.3	80/20	1986-1989	100% P.E.I.	GEOSCIENCE — Onshore Aggregate Resources	290.6	100% P.E.I.	—	W. MacQuarrie (902) 892-1094
					— Public Information and Evaluation	9.4	100% P.E.I.		
Yukon	$3.9	90/10 Can./Yukon	1985-1990	100% Can.	1. Geological Mapping — 1:50K Mapping PROJECTS: 85/86 - 105 B 1, 2; 86/87 - 105 B 7, 8; 115 J 9, 10; 115 I 3, 5, 6	1 100	100% Can. (DIAND)	Yukon Chamber of Mines on Management and Tech. Advisory Committees	J. A. Morin (DIAND) (403) 667-3200
					2. Geochemistry — 1:250K Regional Geoch. Surveys: 85/86 - 105 C, D; 115 I, H; 105 B, F 86/87 - 115 O&N (E½); 115 J&K (E½); 115 G&F (E½);	2 200	100% Can. (G.S.C.)	Yukon Chamber of Mines on Management and Tech. Advisory Committees	A. Clark (EMR) (613) 995-9466
					3. Placer Mining — Research Projects Economic and Environmental 85/86 - 5 Projects 86/87 - 3 Projects	600	100% Can. (DIAND)	Klondike Placer Miners Association on Placer Advisory Committee	C. H. MacDonald (DIAND) (403) 667-3160
	MINERAL RESOURCES SUBAGREEMENT								
Yukon	$3	100% Can.	1986-1989	100% Yukon	Mining Industry Recovery — Financial Assistance for re-establishment of past producers	3 000	100% Yukon	—	J. Maissan (Government of Yukon) (403) 667-5462
	MINING INDUSTRY RECOVERY SUBAGREEMENT								

PROVINCIAL DAY AT THE PROSPECTORS AND DEVELOPERS ASSOCIATION CONVENTION

The Prospectors and Developers Association (PDA) Convention, held annually since 1932, traditionally featured a Provincial Day, in which Provincial Geological Surveys were invited to present papers reviewing the provincial exploration scene. Provincial Day was allowed to lapse in the mid-1970s, but was reactivated with a new format at the PDA's 1983 convention.

The new provincial contribution to the PDA convention consists of poster sessions and presentations. The provincial poster session is presented for the full three days of the convention, with each province or territory displaying the results of recent geoscientific work. One morning of the convention is devoted to presentation of papers by the provinces. These papers have a scientific thrust, dealing with the description of mineral deposits and their environments, and the role of geoscience in mineral exploration. Extended abstracts of proposed presentations are reviewed by a selection committee consisting of two provincial geologists, appointed by the Provincial Geologists Subcommittee, and one or two geologists appointed by the PDA Convention Program Committee.

The 1986 PDA convention was held from March 9 to March 12. All provinces and territories, with the exception of Prince Edward Island, participated in the provincial poster displays. Six provinces presented papers at the morning session, entitled "The Provincial Scene". Titles and authors of these presentations are given below:

— Precious Metals in New-Québec – D. Giovenazzo, M. Bélanger and T. Clark.

— New Perspectives on Granite-Related Mineral Deposits in Southern Nova Scotia – A.K. Chatterjee and P.S. Giles.

— Precious Metal-Bearing Deposits in Northern British Columbia: Examples and Future Developments – T. Schroeter.

— Gold Environments and Exploration Opportunities in New Brunswick – A.A. Ruitenberg and J.L. Davis.

— Platinum-Palladium Distribution and Petrology of the Ultramafic Part of the Bird River Complex, Manitoba – P. Theyer.

— A Comparison of Gold-Bearing Environments in Newfoundland, California and the Carolinas – C.F. O'Driscoll.

ANNUAL REVIEWS OF ACTIVITIES
PROVINCIAL AND FEDERAL GEOSCIENTIFIC ORGANIZATIONS

Province or Territory Location	Date(s) (No. of Days)	Time for Talks	Universities Involved?	Industry Involved?	Poster Session	Universities Involved?	Industry Involved?	Publication	[1]Energy Matters	[2]Other Topics	Comments
British Columbia Vancouver	27 Jan. 87 (1 of 3)	1 day	Yes	Yes B.C. & Yukon Chamber Annual Meeting	Yes	Yes	Yes	Yes - Geological Fieldwork - B.C. Mineral Exploration Review, 1986	Yes Coal, Geo-thermal	Yes	Part of "Cordilleran Geology and Exploration Roundup" 26 Jan. - GSC 27 Jan. - BCEMPR 28 Jan. - BC-YCM; DIAND-Yukon
Yukon Territory Whitehorse (DIAND)	29 Nov. 86 Whitehorse (1)	1 day	Yes	No	Yes	Yes	No	No	No	Yes	Mainly EDA and contract projects
	28 Jan. 87 Vancouver (1 of 3)	two 2-hour sessions	Yes	No	Yes	Yes	No	No	No	Yes	Part of "Cordilleran Geology and Exploration Round-Up" with BCEMPR BC-YCM, and GSC
Northwest Territories Yellowknife (DIAND)	1 - 4 Dec. 86 (3)	3 days	Yes	Yes	Concurrent Dec. 2, 3	Yes	Yes	Exploration, Mining and geology overview	Coal only	as required	Organized with NWT Chamber of Mines GSC involved. Also take part in "Cordilleran Geology and Exploration Round-Up", Vancouver
Alberta Edmonton	OPEN HOUSE TO BE SCHEDULED										
Saskatchewan Regina	19 Nov. 86 (1)	0.5 day	Yes	No	0.5 day	Yes	Yes	Summary of Investigations	Yes	Yes	Sask. Research Council involved, talks and poster displays
Manitoba Winnipeg	20,21 Nov. 86 (1.5)	1 day	Yes	No	1.5 days	Yes	No	Rept. of Field Activities	No	No	Contributions from GSC and University of Manitoba
Ontario Toronto	3,4 Dec. 86 (2)	2 days	Yes	Yes	Concurrent	Yes	Yes	3 Repts. of Activities	Yes	Yes	Research oriented; special symposium
Quebec Quebec City	2,3 Dec. 86 (2)	2 days	Yes	Yes	2 days	Yes	No	Rept. of Activities	No	No	Special publication platinum mineralization
New Brunswick Fredericton	17 Nov. 86 (1)	0.5 day	No	No	0.5 day	Yes	No	Yes (1986 Project Resumes)	Yes	Yes	GSC involved
Nova Scotia Halifax	19,20 Nov. 86 (1.5)	1 day	Yes	No	1 day	Yes	No	Yes Publication	Yes	Yes	GSC involved; coordinated with District 1 CIM Meeting, 20-22 Nov., Halifax
Newfoundland St. John's	6 Nov. 86 (1)	0.5 day	Yes	No	0.5 day	Yes	No	Yes	No	Yes	GSC involved
Prince Edward Island	NO OPEN HOUSE										
Geological Surv. Can. Ottawa	19 to 21 Jan.87 (2)	2.5 days	Yes	No	Concurrent	Yes	Yes	Yes (Current Research)	Yes	Yes	Provincial agencies Cooperative Programs

[1]Energy Matters: (e.g. oil, gas, coal, oil shales, peat)

[2]Other Topics: (e.g. administration, engineering, regulations, legislation, etc.)

NSDME Sept. 86

SURVEY OF HARD ROCK DRILL CORE PROGRAMS IN CANADA FISCAL YEAR 1985-86

PROVINCE	B.C. (1985)	ALBERTA	SASK.	MAN.	ONT.	QUE.	N.B.	N.S. (1985)	NFLD. & LAB.	P.E.I.	YUKON	N.W.T.
No. of Facilities	2	1	1	4	7	4	3	4	3	1	1	1
Staff Man-Days Work 1985-86	145	30	119.5	680	2,376	nil	300	800	700	–	95	107
Capital Cost 1985-1986	$0.2	nil	3.0	10.0	nil	9.0	400.0	nil	15.0	–	nil	58.0
Operating Cost 1985-86	$12.4	13.0	9.4	96.4	225.2	0.8	5.2	67.5	95.8	–	12.0	49.0
Core Collected or Delivered 1985-86	3,437*[2]	400	3,925	32,625	271,783	11,547	19,020	66,968	23,984	–	3,450	4,545
Core Reduction*[1]	nil	15 %	nil	5.5 %	2.5 %	50 %	nil	nil	nil	–	nil	nil
Use of Facilities (visits or persons) 1985-86	56 V (days)	4 V	28	23 V (62 days)	956 V	15 V	30 V	122 V	77 V	–	68 (persons)	52 V
Total Core in Storage (from all years)	169,135*[2]	19,259	57,725	211,848	515,039	111,953	196,000	353.500	176,372	1,298	105,000	57,042
Total Exploration Drilling 1985-86	5,897*[2]	5,000 (approx.)	211,784	153,716	282,250	1,000,000 (approx.)	18,970	34,291	30,441	–	75,000	123,415

*[1] Over last 8 years
*[2] Metres

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