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VOLUME ONE

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Publication annuelle du
Comité des Géologues Provinciaux

CONTENTS

1983

PROVINCIAL GEOLOGISTS JOURNAL
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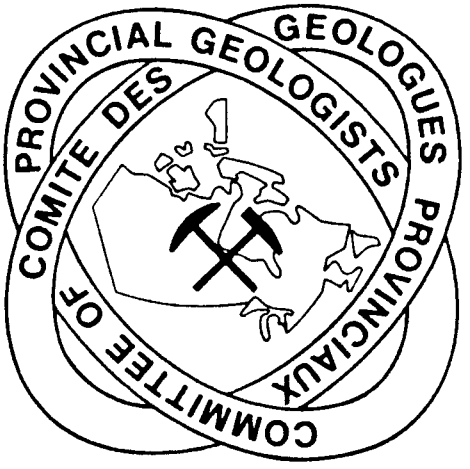


VOLUME I

PUBLICATION ANNUELLE DU
COMITÉ DES GÉOLOGUES PROVINCIAUX

PUBLISHED ANNUALLY BY
COMMITTEE OF PROVINCIAL GEOLOGISTS

FOREWORD

This is the first volume of the Provincial Geologists Journal. It is published by the Committee of Provincial Geologists and henceforth will be produced annually, each January.

In establishing the Provincial Geologists Journal, the Committee of Provincial Geologists is striving to meet a number of related objectives: to provide the Canadian geoscience community with a consolidated source reference on the nature and scope of activities in all of the provincial and territorial geological surveys in Canada; to furnish information on the ongoing work of the Committee of Provincial Geologists; and to provide a forum for the publication of feature articles on issues with which the provincial surveys are vitally concerned. The Journal is designed to complement, but not in any way replace, the publications which each of the member surveys produce independently (reports of activities, journal papers, etc.).

Compilation of the Provincial Geologists Journal is a cooperative undertaking, with each geological survey providing input on its own provincial organizational structure, expenditures, program highlights, publications, and, in this issue's feature article, perspectives on Mineral Land Use Planning. I would like to take this opportunity to further acknowledge the help of key individuals and institutions in drawing together the various components of the journal: Ivo Tyl, Alberta Energy and Natural Resources, for producing the organizational charts; Athol Sutherland Brown, B.C. Ministry of Energy, Mines and Petroleum Resources, for synthesizing the provincial geological survey expenditures; Ed Pye and Guy Kendrick, Ontario Geological Survey, for producing the sections on Geological Program Highlights and Geological Publications; Peter Giles, Nova Scotia Department of Mines and Energy, for compiling the calendar of open houses and public discussion forums, and Athol Sutherland Brown, B.C. Geological Branch, for editing and producing the feature article on Land Use Planning. The short lead article on the background and scope of the Committee of Provincial Geologists was also provided by Dr. Sutherland Brown, 1983 Chairman of the Committee. Overall responsibility for the compilation and production of the Provincial Geologists Journal rests with the Alberta Geological Survey. I am particularly grateful to Frank Tuck, Editor, Alberta Research Council, for managing virtually all aspects of the Journal's publication.

The Provincial Geologists Journal is available in each province and territory through the offices of the Chief Geologist, as per the listing of Provincial Geologists on the back cover. I would be very pleased to receive your comments and suggestions as to how the Journal might be improved in the future.

Grant D. Mossop, Alberta Geological Survey
Alberta Research Council, Edmonton
January, 1984

THE COMMITTEE

OF

PROVINCIAL GEOLOGISTS

THE COMMITTEE OF PROVINCIAL GEOLOGISTS

By A. Sutherland Brown
Chairman

The Committee of Provincial Geologists was created at the St. John's, Newfoundland, meeting of the Provincial Mines' Ministers in 1976. The Chief Geologists or equivalent of each Provincial Survey or Mineral Resources Divisions comprise the Committee and the Territories send participating observers. The committee although relatively young has already an established presence in the Canadian geoscience scene. It is an associate member of the Canadian Geoscience Council and it has led to the formation of a related body, the National Geological Surveys Committee, which deals exclusively with Federal/Provincial survey concerns. It is also having an impact on standardization, technology transfer, and exploration liaison.

OBJECTIVES

The detailed objectives of the Committee are as follows:

- Encourage disclosure of mineral exploration data through appropriate legislation.
- Promote standardization and simplification of provincial mining lands legislation and regulations.
- Promote improvement in provincial storage and retrieval capability of exploration and mineral deposit data.
- Ensure optimum availability of mineral resource lands with high potential for exploration and development.
- Monitor trends in exploration, identify the appropriate levels of exploration, and recommend measures to foster this adequate level of activity to maintain and enhance the relative contribution of the minerals industry to the economy.
- Foster research leading to improved efficiency and effectiveness of exploration and geoscience surveys.
- Identify measures to improve the government geoscience data base in support of mineral exploration.
- Provide information on provincial survey organization and activities as a basis for program planning.
- Provide a forum for discussion with GSC, University, and Industry to resolve problems in respect of geoscience surveys and initiate cooperative programs.
- Provide liaison with and/or representation to other geoscience groups in Canada on behalf of the Mines' Ministers.

OPERATION

The committee normally meets twice a year, before the Mines' Ministers Conference and the Prospectors and Developers Meeting. There is no secretariat so that work is spread out to staffs of all the surveys. Certain provinces have inherited regular roles in data assembly, review, and processing. The role of Secretary and Chairman rotate yearly. The Secretary is the Chief Geologist or equivalent of the province that is host to the Mines' Ministers Conference but takes office after the Conference. The following year he becomes Chairman.

OUTPUT

The Committee now routinely produces each year summaries useful to industry and ourselves including:

- Organization charts showing professional and support staff members and telephone numbers of senior personnel.

- Expenditure summaries for each survey.
- Schedules of open houses.
- Drill core storage reports.

The Committee has also sponsored symposia and produced special reports. A symposium was initiated and sponsored on Predictive Metallogeny at the GAC/MAC Annual Meeting in May 1982 in cooperation with the Mineral Deposit Division of GAC. This was done to encourage more open discussion in industry of methods of exploration planning and, in government, of resource assessment. This symposium was recently published by *Geoscience Canada,* thus completing the project and making it generally available.

An example of a recent special study is the review and summary of Mineral Land Use Planning in the provinces and territories published in this journal. The study includes a table showing the percentage of Crown land and of land alienation that excludes or restricts exploration. The Committee has been concerned that the growth of single use alienation presents a threat to the mineral industry in as much as the first parameter in the equation of mineral potential is the available surface area for exploration.

Some of the data produced by the Committee has been incorporated in the *Proceedings of the Mines' Ministers Conference* but this to some degree lacks timeliness and has restricted distribution. Other products have been and will continue to be published in *Geoscience Canada* and elsewhere. However, the Committee wished to make its data readily available in a cheap and timely manner on demand. As a result it has initiated the *Provincial Geologists Journal* to be published each January. The journal was suggested by Ontario but compilation and production will be the responsibility of Alberta. All provinces contribute photo-ready copy and some are responsible for compilation of specific sections.

LIAISON

The Committee has an important role in liaison both between the provinces, with the Federal Department of Energy, Mines and Resources, and with industry. Central to our role is an attempt to bring as much uniformity between provinces in geoscience and to some degree in mineral title as the diversity of the nation allows. We also hope that new technology will quickly be transferred between provinces and that we may move in concert in many future decisions.

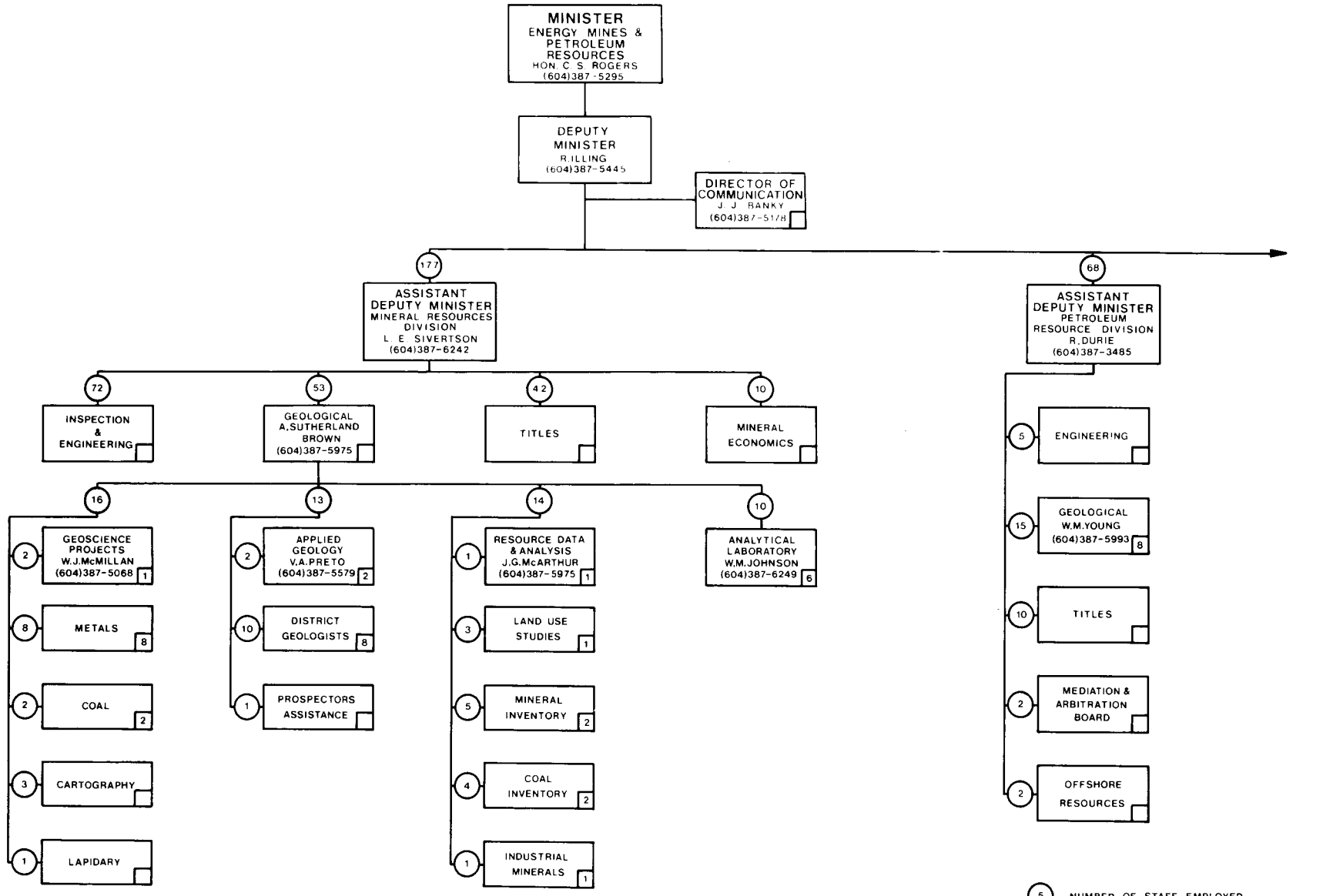
Liaison with Federal EMR is accomplished both through the CPG and also the National Geological Surveys Committee on subjects as diverse as Federal/Provincial agreements, exploration technology, and geoscience standards.

Cooperation and liaison with industry are an important aspect of the Committee's work. It has taken the form of meetings sponsored by the Committee with respresentatives of exploration and mining associations to consider the desirability and criteria for exploration drill core storage programs. More recently, initiatives of the Prospectors and Developers Association have resulted in excellent information exchange at their annual Conference including a session on provincial geoscience and a room displaying posters of recent work of all the provinces. The most recent aspect of cooperation has been the establishment of a Mineral Exploration Liaison Committee by Canadian exploration and mining associations principally to interface with the Committee of Provincial Geologists. This met with us on an *ad hoc* basis in March 1983 and as a formalized body at the Mines' Ministers Conference in Regina in September 1983. In addition to facilitating the provincial contribution at the Prospectors and Developers Association Conference, the new committee will meet with us to provide guidance on industry's needs and feedback on our projects. It will also support in a variety of ways provincial survey endeavours. In addition it will help establish technical liaison committees in each province that desires one for more direct input and feedback. These recent moves promise to provide provincial surveys with much better focus for their work in the future.

GEOSCIENCE ORGANIZATION CHARTS

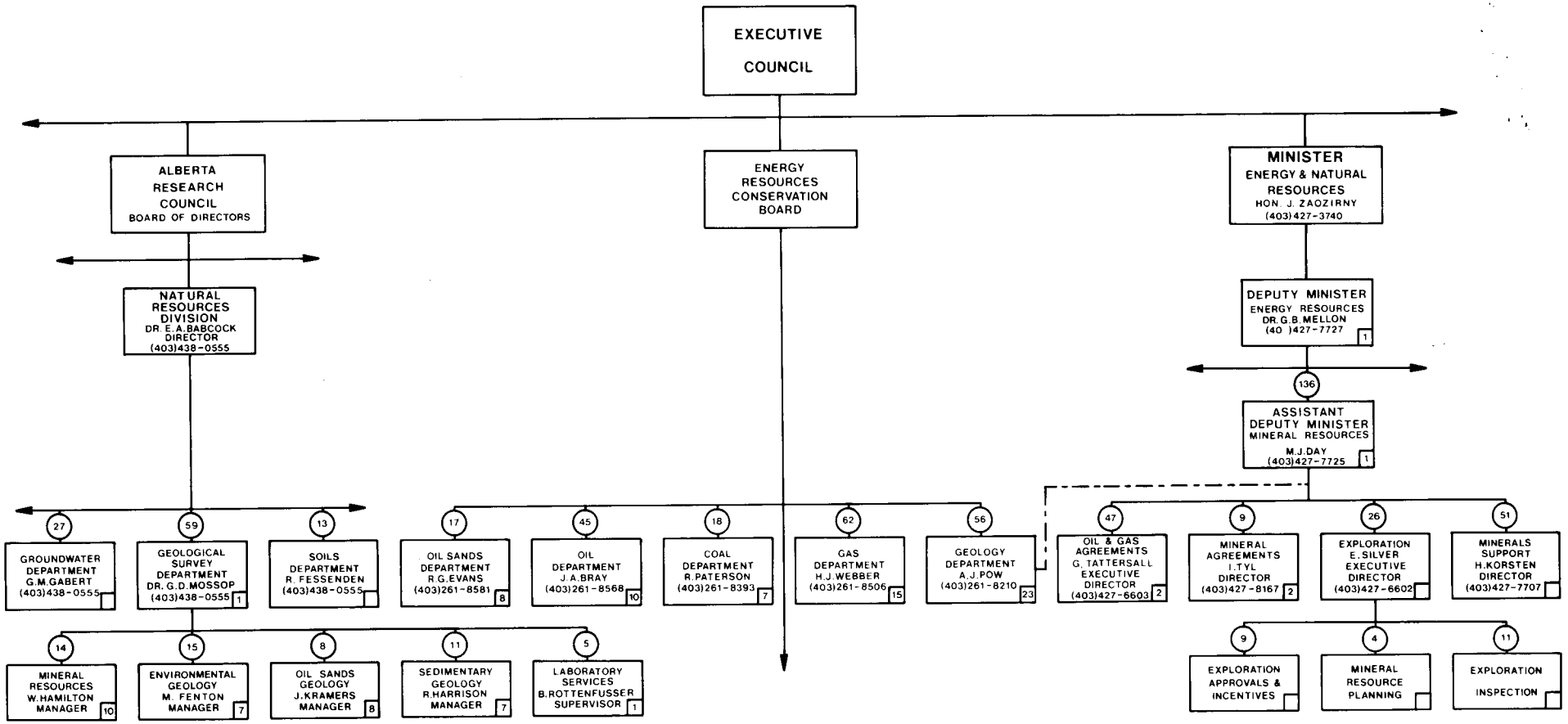
Each provincial and territorial government in Canada has developed its own organizational structure for conducting geoscientific survey and research work. Some provinces have what is formally called a Geological Survey (e.g. Ontario Geological Survey), but in most jurisdictions the main elements of the 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



NOVEMBER 1983

ALBERTA GEOSCIENCE ORGANIZATION CHART



ENR TELEX 037 3676
ARC TELEX 037 2147

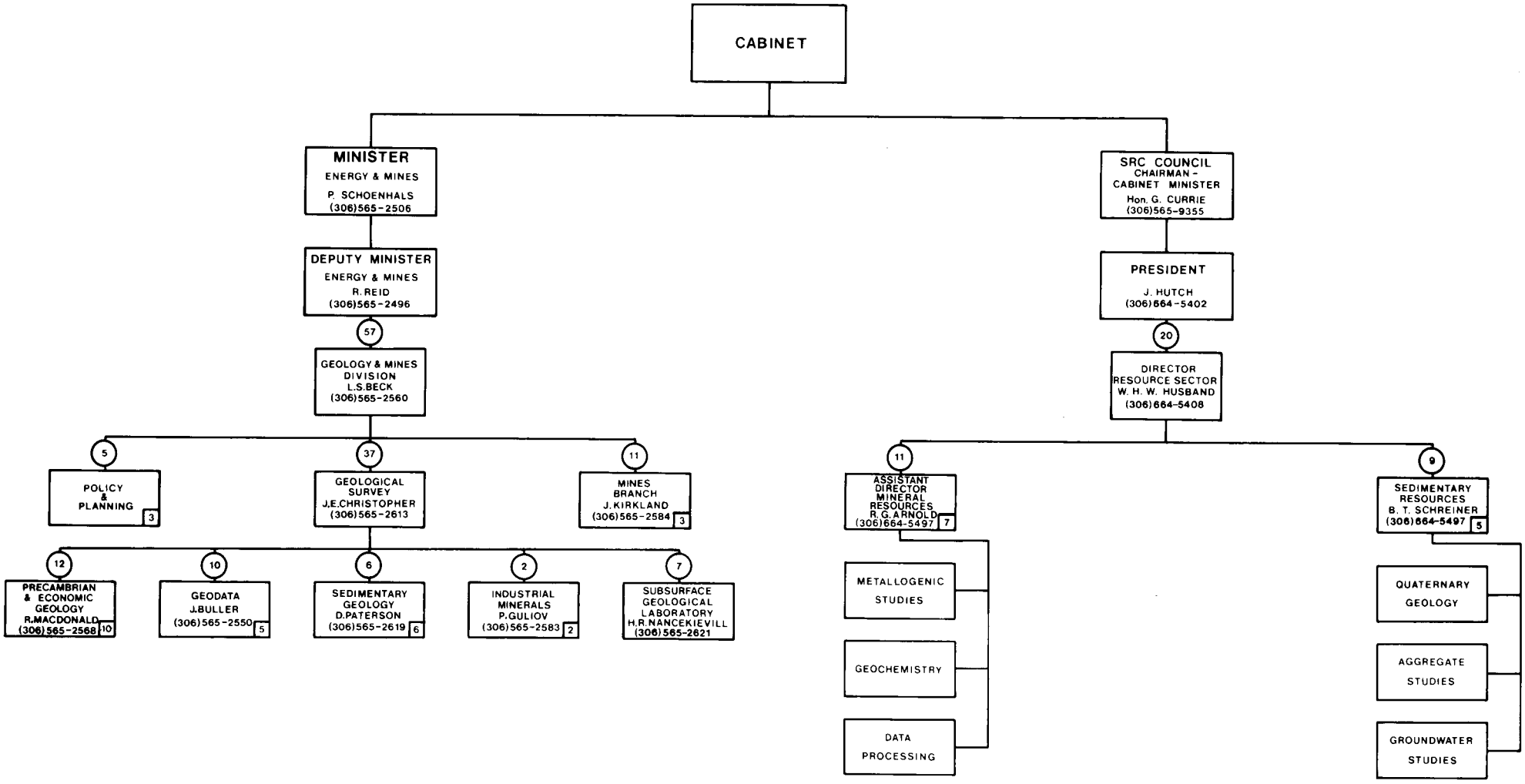
(5) NUMBER OF STAFF EMPLOYED (PROFESSIONAL, TECHNICAL AND CLERICAL)

[3] PROFESSIONAL (ENGINEERING AND GEOLOGY)

— — — ADVISORY SERVICES (GEOLOGY AND GEOPHYSICS)

NOVEMBER 1983

SASKATCHEWAN GEOSCIENCE ORGANIZATION CHART

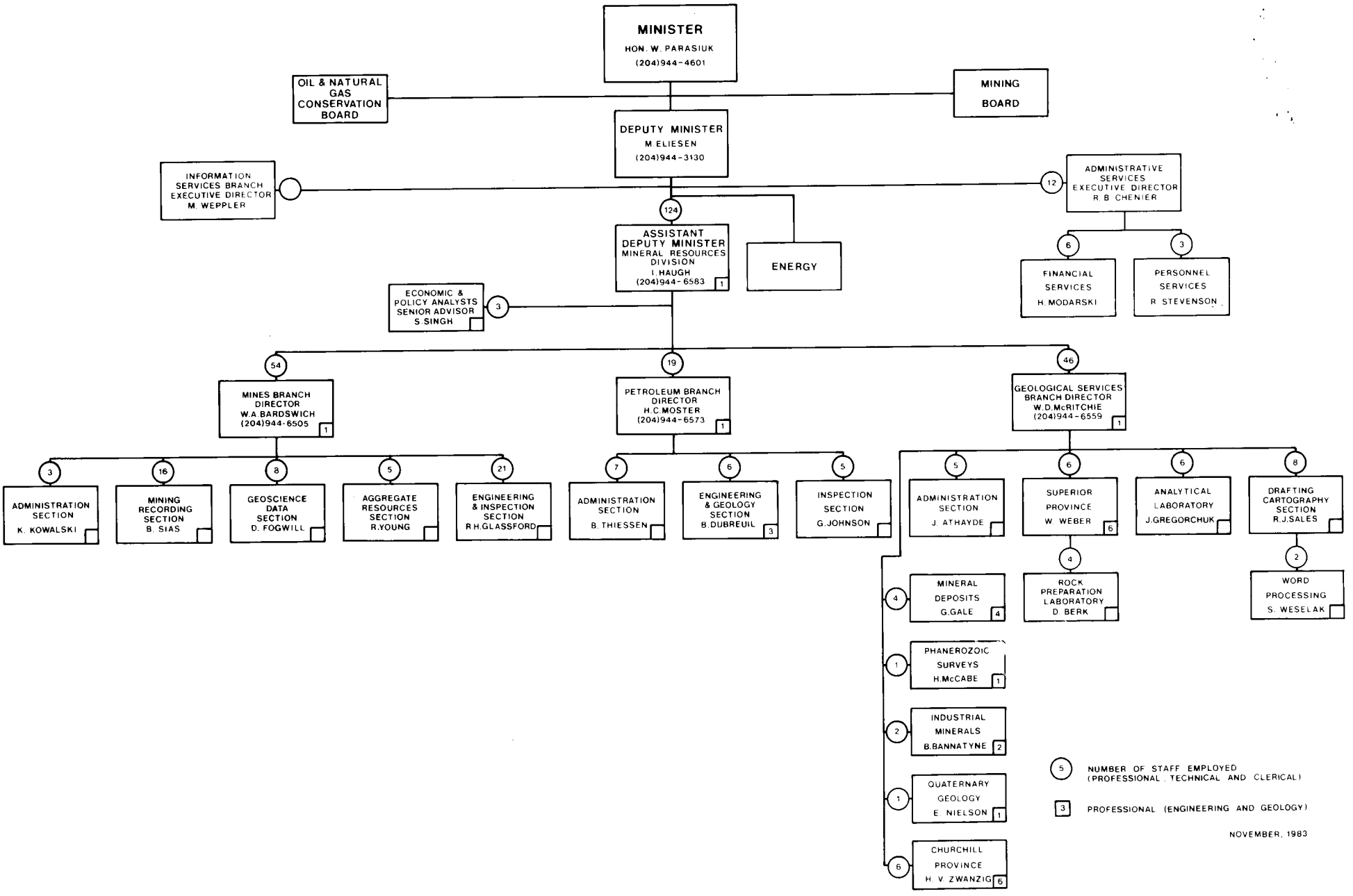


(5) NUMBER OF STAFF EMPLOYED (PROFESSIONAL, TECHNICAL AND CLERICAL)

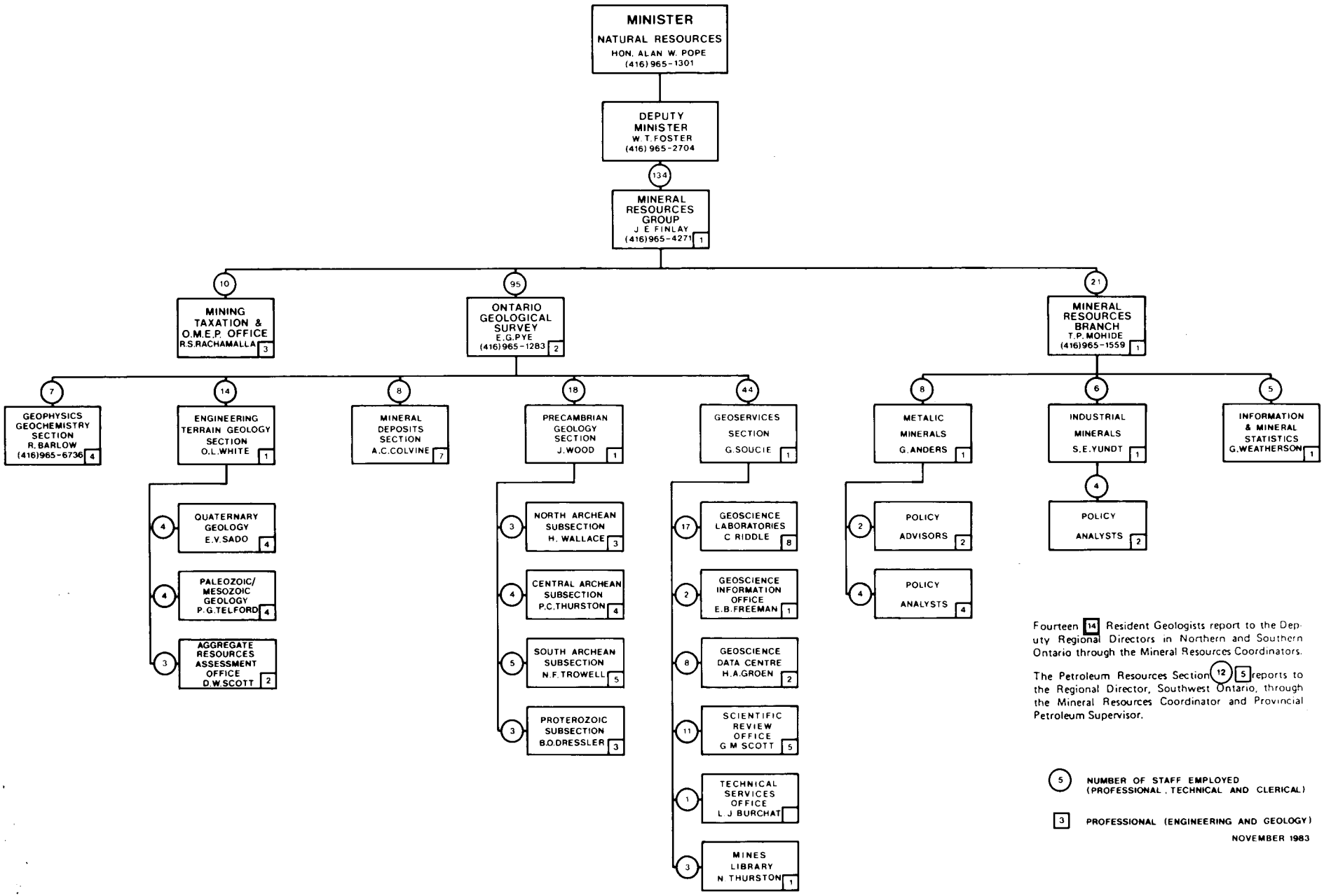
[3] PROFESSIONAL (ENGINEERING AND GEOLOGY)

NOVEMBER 1983

MANITOBA GEOSCIENCE ORGANIZATION CHART



ONTARIO GEOSCIENCE ORGANIZATION CHART



Fourteen [14] Resident Geologists report to the Deputy Regional Directors in Northern and Southern Ontario through the Mineral Resources Coordinators.

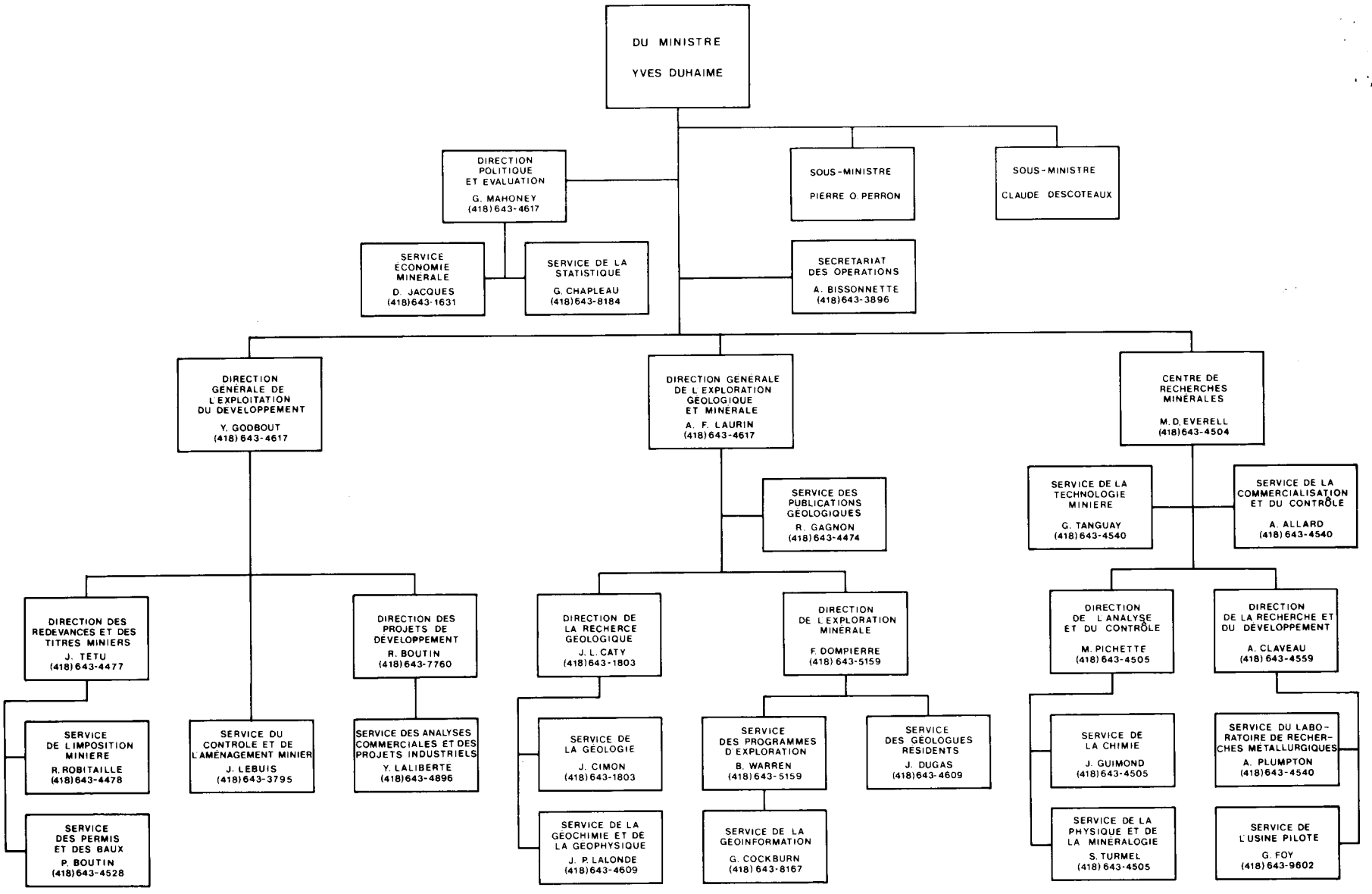
The Petroleum Resources Section (12) [5] reports to the Regional Director, Southwest Ontario, through the Mineral Resources Coordinator and Provincial Petroleum Supervisor.

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

[3] PROFESSIONAL (ENGINEERING AND GEOLOGY)

NOVEMBER 1983

ORGANIGRAMME GÉOSCIENCE DU QUÉBEC



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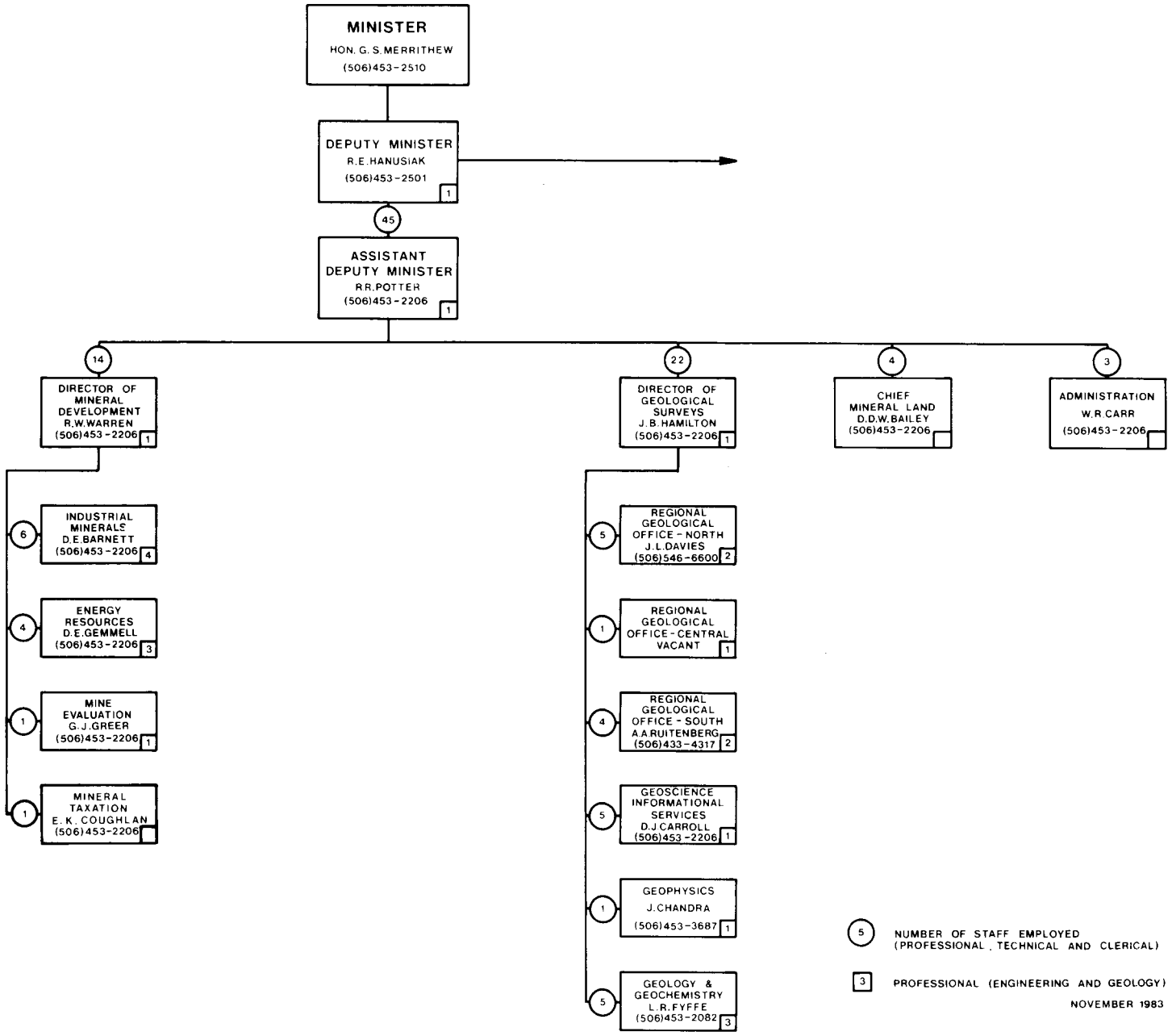
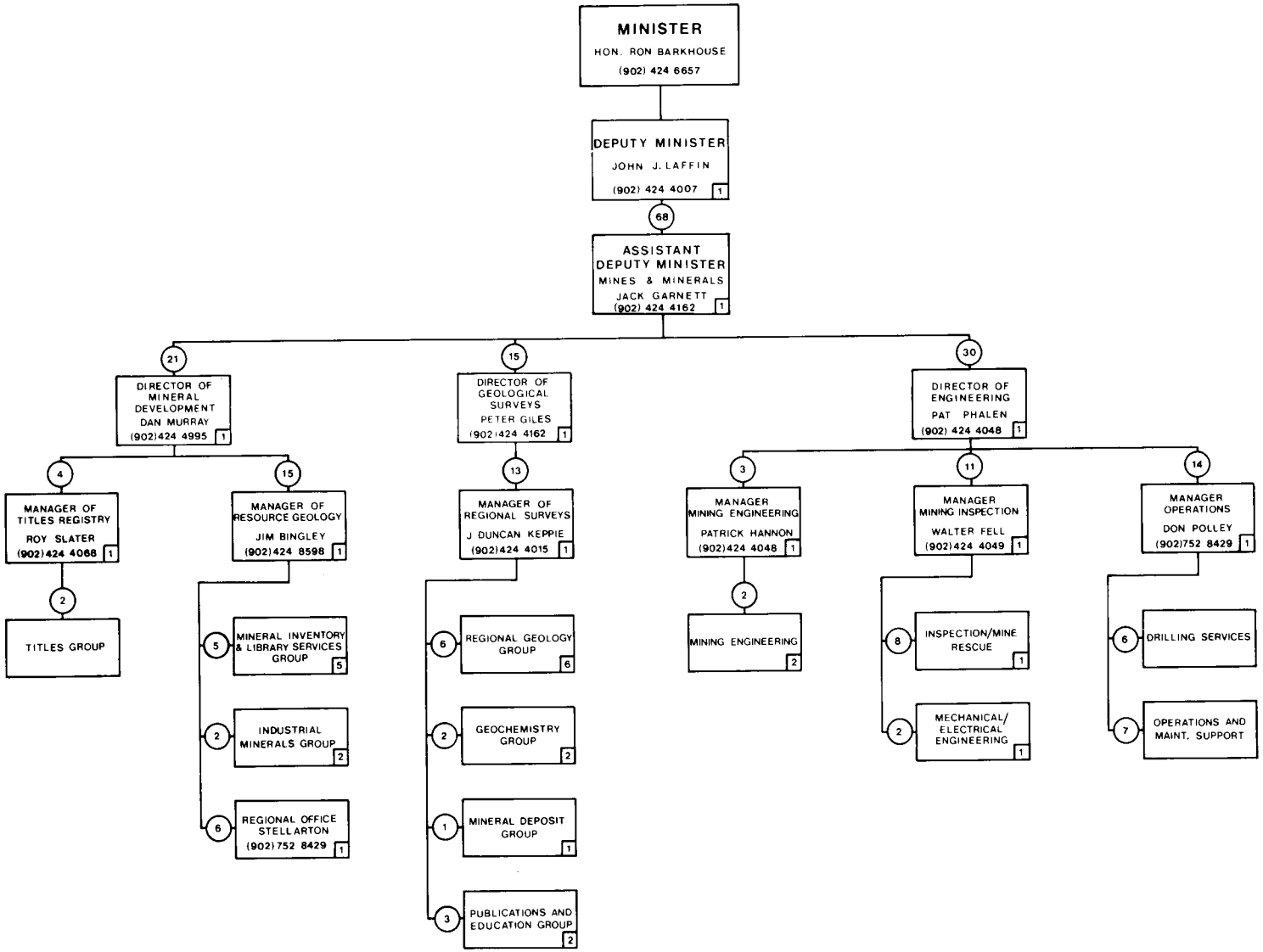
NEW BRUNSWICK GEOSCIENCE ORGANIZATION CHART



NOVA SCOTIA GEOSCIENCE ORGANIZATION CHART

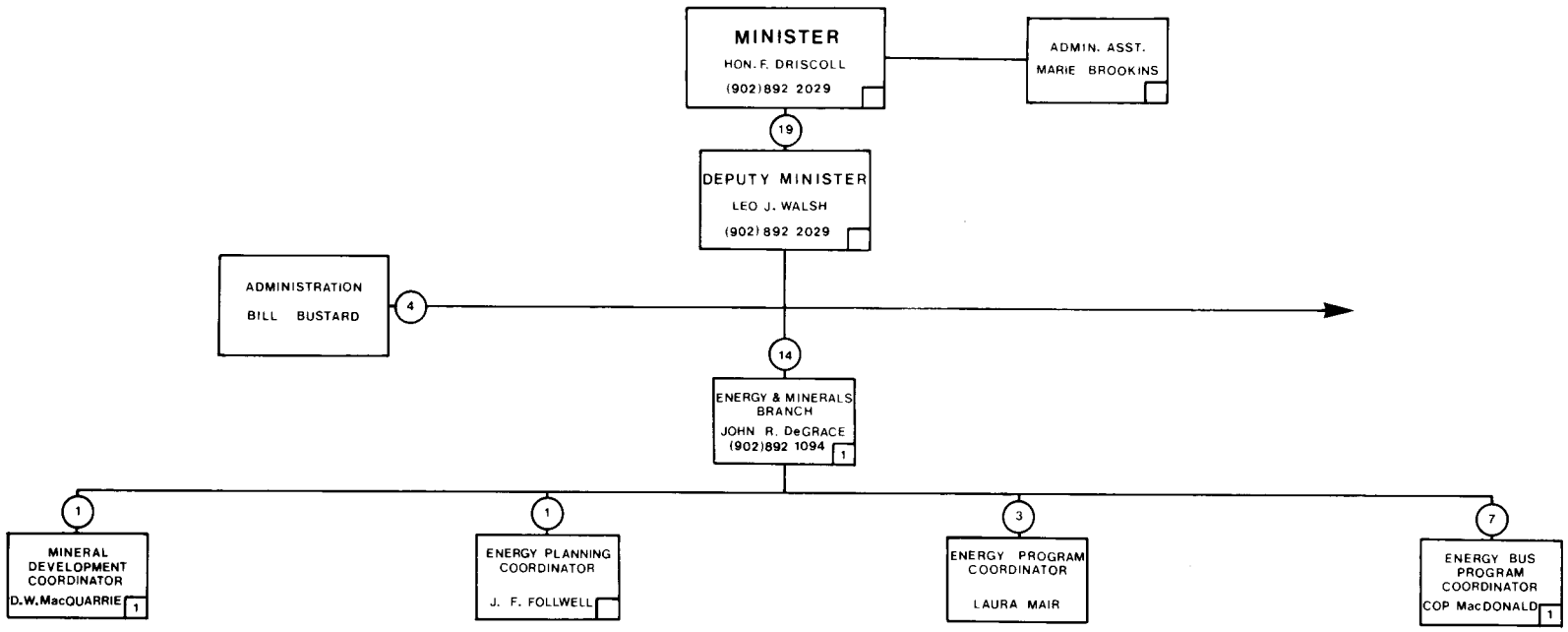


(5) NUMBER OF STAFF EMPLOYED (PROFESSIONAL, TECHNICAL AND CLERICAL)

[3] PROFESSIONAL (ENGINEERING AND GEOLOGY)

NOVEMBER 1983

PRINCE EDWARD ISLAND GEOSCIENCE ORGANIZATION CHART

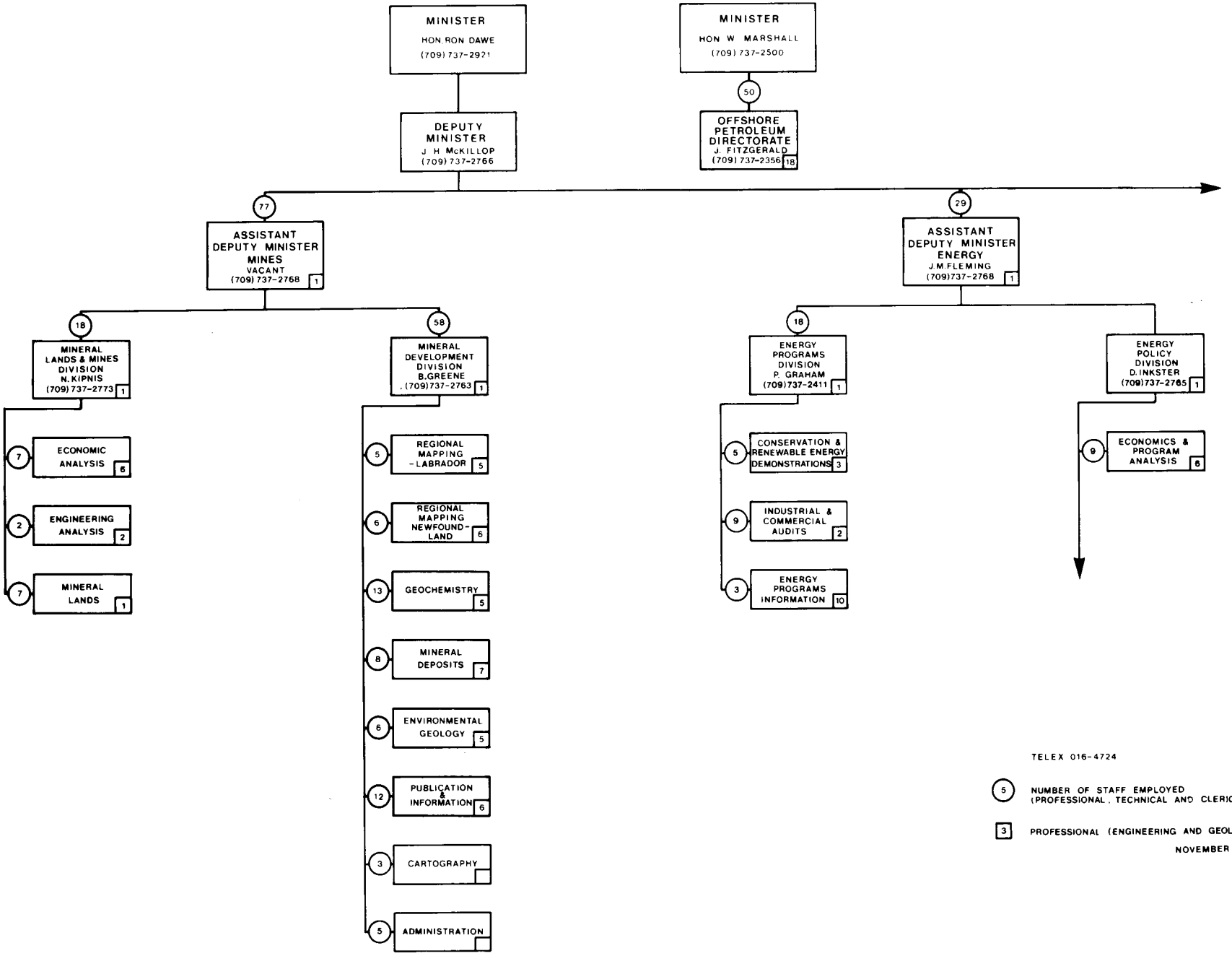


(5) NUMBER OF STAFF EMPLOYED (PROFESSIONAL TECHNICAL AND CLERICAL)

[3] PROFESSIONAL (ENGINEERING AND GEOLOGY)

NOVEMBER 1983

NEWFOUNDLAND GEOSCIENCE ORGANIZATION CHART



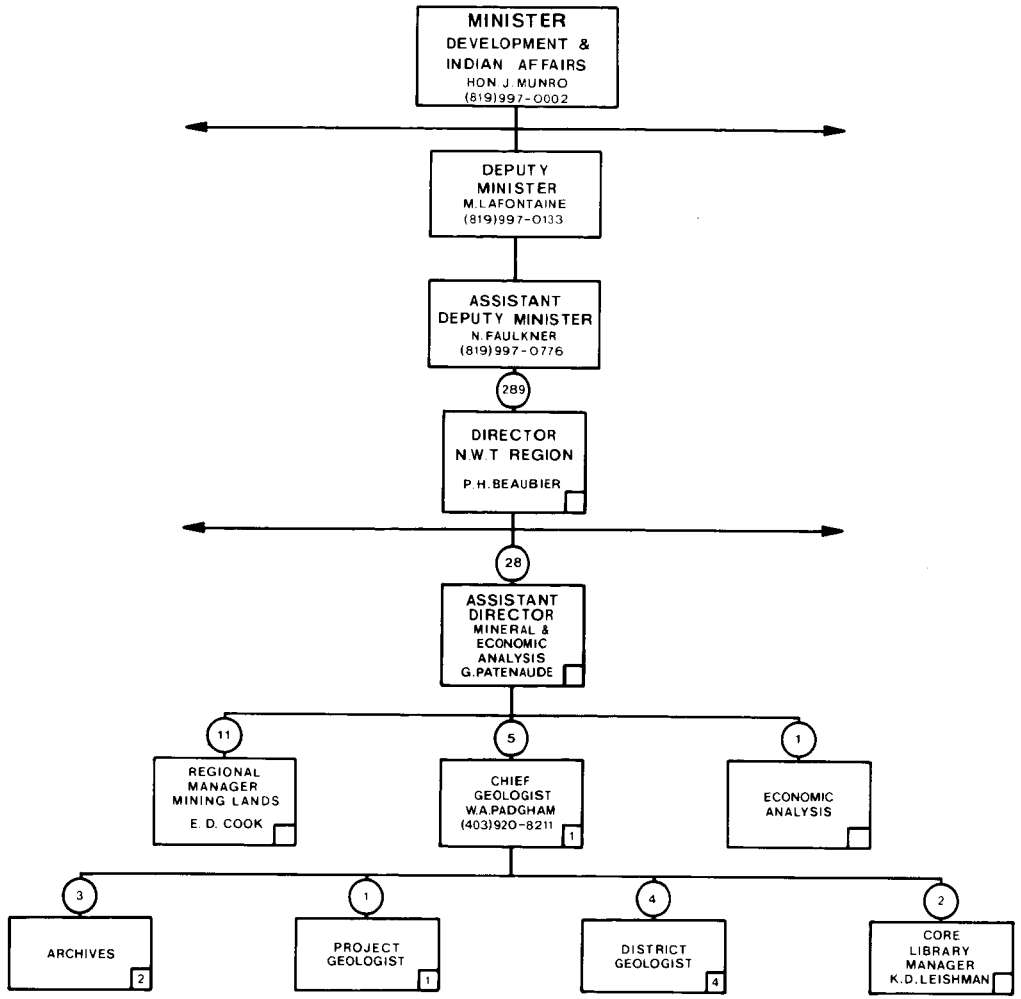
TELEX 016-4724

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

[3] PROFESSIONAL (ENGINEERING AND GEOLOGY)

NOVEMBER 1983

NORTHWEST TERRITORIES GEOSCIENCE ORGANIZATION CHART

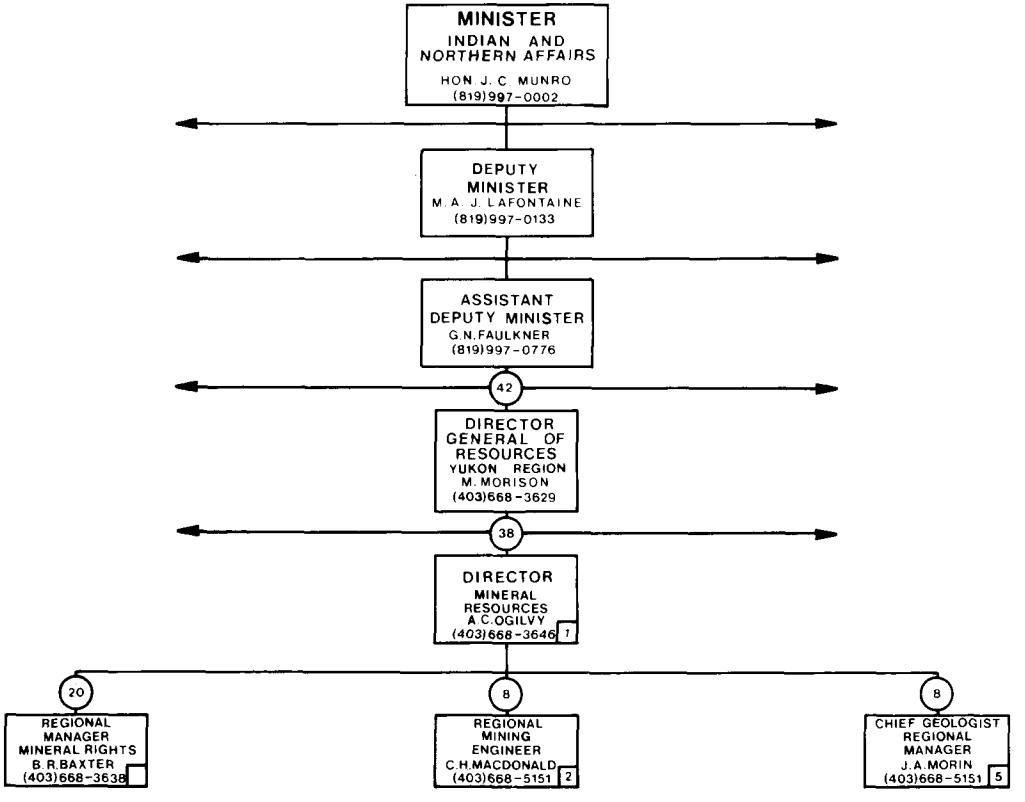


(5) NUMBER OF STAFF EMPLOYED (PROFESSIONAL, TECHNICAL AND CLERICAL)

[3] PROFESSIONAL (ENGINEERING AND GEOLOGY)

NOVEMBER 1983

YUKON GEOSCIENCE ORGANIZATION CHART



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

[3] PROFESSIONAL (ENGINEERING AND GEOLOGY)

NOVEMBER 1983

PROVINCIAL GEOLOGICAL SURVEY EXPENDITURES, 1982-83

Summary tables of expenditures of provincial surveys have been published in the Proceedings of the Mines Minister's Conference for four years and were available the year previous in the report of the Committee of Provincial Geologists. Attempts have been made to make them more truly comparable and complete. This year Yukon and Northwest Territories are included although the latter is not in the comon format. Previously the tables were composed of budget estimates by some provinces but now they represent expenditures.

Expenditures in 1982-83 compared to the year previous have increased significantly in Alberta and Nova Scotia, have remained similar or gone up slightly in Saskatchewan, Manitoba, Ontario, and Quebec, and have dropped in British Columbia, New Brunswick, and Newfoundland. Three provinces have surveys with major expenditures, Alberta, Ontario, and Quebec, whereas most of the others have similar expenditures in the range of $2 to $4 million per year.

PROVINCE: BRITISH COLUMBIA
1982-1983

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	1	2	-	78 718	-	74 013	152 731
Core Repositories	GB (MRD)	EMPR	1[2]	2	-	47 664	-	1 000	48 664
Geochemical Surveys:									
(1) Bedrock	GB (MRD)	EMPR	-	-	-	-	-	-	-
(2) Drainage	GB (MRD)	EMPR	-	-	-	-	-	-	-
(3) Soil	-	-	-	-	-	-	-	-	-
Geological Surveys, Bedrock:									
(1) Reconnaissance (>1:100 000)	-	-	-	-	-	-	-	-	-
(2) Detailed (>1:50 000)	GB (MRD)	EMPR	12	16	3	530 842	53 103	160 192	744 137
Geological Surveys, Surficial:									
(1) Reconnaissance (>1:100 000)	-	-	-	-	-	-	-	-	-
(2) Detailed (>1:50 000)	GB (MRD)	EMPR	1	1	-	44 616	-	15 953	60 569
Geophysical Surveys:									
(1) Airborne electromagnetic									
(2) Airborne magnetic									
(3) Ground magnetic									
(4) Gravity									
(5) Seismic									
(6) Radiometric									
Hydrogeological Surveys	OM	-	-	-	-	-	-	-	-
Education	GB (MRD)	EMPR	2	1	-	23 640	-	53 477	77 117
Laboratory Analysis	GB (MRD)	EMPR	1	10	1	276 935	28 979	97 505	403 419
Mineral Deposit Inventory and Analysis	GB (MRD)	EMPR	4	15.5	2	410 631	35 000	153 778	599 409
Oil and Gas Inventory and Analysis	GB (PRD)	EMPR	1	4	-	161 940	-	5 845	167 785
Publications	EMPR	EMPR	-	-	-	-	-	-	-
Resident Geologist's Office	GB (MRD)	EMPR	7	9	1.5	331 309	34 850	99 109	465 268
Subsurface Investigations	GB (PRD)	EMPR	2	8	-	201 252	-	19 499	220 751
Water Resource Inventory and Analysis	OM	-	-	-	-	-	-	-	-
Other:									
Prospectors' Assistance	GB (MRD)	EMPR	-	-	1	-	15 743	100 250	115 993
Research Grants	GB (MRD)	EMPR	-	-	-	-	-	-	-
TOTALS:									
GB (MRD)	-	-	-	**64.5**	**8.5**	**1 744 355**	**167 675**	**755 277**	**2 667 307**
GB (PRD)	-	-	-	**12**	-	**363 192**	-	**25 344**	**388 536**
Grand Total	-	-	-	**76.5**	**8.5**	**2 107 547**	**167 675**	**780 621**	**3 055 843**

[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

PROVINCE: ALBERTA
1982-1983

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	ARC	1	6.0	-	200 516	-	68 947
Core Repositories	ERCB/ARC	ERCB/AENR ARC	2	36.0	3	918 035	60 000	50 000
Geochemical Research/Surveys	ARC	ARC	3	1.0	-	72 347	-	10 170
Geological Surveys, Bedrock:								
(1) Reconnaissance (>1:100 000)	-	-	-	-	-	-	-	-
(2) Detailed (>1:50 000)	ARC	ARC	1	1.0	0.3	59 844	10 000	4 800
Geological Surveys, Surficial:								
(1) Reconnaissance (>1:10 000)	ARC/AENR	ARC/AENR AA	17	17.1	4.8	592 885	76 580	199 555
(2) Detailed (>1:50 000)	ARC	ARC	1	0.7	-	22 829	-	1 365
(3) Reclamation/Environmental Impact	ARC	LCRC/ARC AE/MM	3	9.3	1.5	295 933	24 800	451 075
Geophysical Surveys	-	-	-	-	-	-	-	-
Hydrogeological Surveys	ARC/AENR	ARC/AENR AE	5	9.6	1.5	405 366	31 000	170 850
Information and Education	ARC/ERCB	ERCB/ARC	2	4.0	0.3	166 556	5 400	12 600
Laboratory Analysis	ARC	AOSTRA/ARC	6	10.5	-	332 107	-	46 780
Mineral Deposit Inventory and Analysis	ARC/AENR	ARC/AENR	8	9.7	1.2	451 300	21 600	313 730
Energy Resource Inventory and Research:								
(1) Petroleum and Natural Gas	ERCB/AENA ARC	ERCB/AENR ARC	11	38.2	6.0	1 406 334	281 400	514 100
(2) Oil Sands	ARC/ERCB	ERCB/ARC AOSTRA	8	15.0	0.7	542 132	10 800	70 985
(3) Coal Geology	ARC	AENR/ARC	5	6.1	1.6	248 367	27 000	207 650
Stratigraphic Research	ERCB/ARC AENR	ERCB/AENR ARC	6	14.0	1.3	541 529	20 400	61 400
Other	-	-	-	-	-	-	-	-
TOTALS	**-**	**-**	**77**	**178.2**	**22.2**	**6 256 080**	**568 980**	**2 184 007**
Grand Total	**-**	**-**	**-**	**-**	**-**		**9 009 067**	

ARC - Alberta Research Council
AENR - Alberta Energy and Natural Resources
ERCB - Energy Resources Conservation Board
AA - Alberta Agriculture
LCRC - Land Conservation and Reclamation Council
MM - McIntyre Mines
AOSTRA - Alberta Oil Sands Technology and Research Authority
AE - Alberta Environment

PROVINCE: SASKATCHEWAN
1982-1983

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	4.0	-	136 000	18 000	102 000
Core Repositories	SGS	SGS	4	7.0	1.5	125 600	19 500	24 400
Geochemical Surveys:								
(1) Bedrock	-	-	-	-	-	-	-	-
(2) Drainage	-	-	-	-	-	-	-	-
(3) Vegetation	SGS	SGS	1	0.3	0.4	17 000	4 000	5 000
Geological Surveys, Bedrock:								
(1) Reconnaissance (1:100 000)	SGS	SGS	2	3.0	3.0	148 500	71 400	85 400
(2) Detailed (1:50 000)								
Geological Surveys, Surficial:								
(1) Reconnaissance (1:100 000)								
(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	1.0	-	37 000	-	15 000
Laboratory Analysis	SRC/UofR Carleton	SGS	3	-	-	-	-	35 000
Mineral Deposit Inventory and Analysis including Industrial Minerals	SGS	SGS	3	6.0	3.1	239 000	48 000	28 000
Oil and Gas Inventory and Analysis	SGS	SGS	1	7.0	1.0	162 000	18 000	50 000
Publications	SGS	SGS	-	-	-	-	-	75 000
Resident Geologist's Office	SGS	SGS	3	4.0	1.0	136 500	20 000	31 000
Subsurface Investigations	SGS	SGS	6	5.7	-	232 000	20 000	40 000
Water Resource Inventory and Analysis	-	-	-	-	-	-	-	-
Metallogenic Mineral Deposit Studies	SGS	SGS	2	2.0	2.0	85 000	43 000	60 000
TOTALS	-	-	-	**39.0**	**11.0**	**1 318 500**	**262 000**	**566 000**
Grand Total	-	-	-	-	-		**2 146 500**	

SGS - Saskatchewan Geological Survey
SRC - Saskatchewan Research Council
UofR - University of Regina

PROVINCE: MANITOBA
1982-1983

PROGRAMS	SURVEY/ RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS (OR FACILITIES)	PERMANENT SMY	CASUAL SMY	SALARIES PERMANENT $	SALARIES CASUAL/ TEMPORARY $	OPERATING EXPENDITURES $
Core Repositories								
Geochemical Surveys:								
(1) Bedrock								
(2) Drainage								
(3) Soil								
Geological Surveys, Bedrock:								
(1) Reconnaissance (1:100 000)	MRD	Man	1	2	1.16	56 300	18 000	31 100
(2) Detailed (1:50 000)	MRD	Man	6	8	3.23	280 400	43 600	92 800
(3) Phanerozoic	MRD	Man	2	1	.14	37 100	4 000	32 800
Geological Surveys, Surficial:								
(1) Reconnaissance (1:50 000)	-	-	-	-	-	-	-	-
(2) Detailed (1:50 000)	MRD	Man	5	6	.39	141 500	7 500	60 600
(3) Resource Management	GARTNER/ LEE	Man	1	-	-	-	-	64 000
Geophysical Surveys:								
(1) Airborne electromagnetic								
(2) Airborne magnetic, gradiometer	MRD	GSC/Man [1]	-	-	-	-	-	230 000
(3) Ground magnetic								
(4) Gravity								
(5) Seismic								
(6) Radiometric								
Hydrogeological Surveys								
Information and Education, Assessment Services	MRD	Man	3	4	-	153 400	-	62 800
Laboratory Analysis	MRD	Man	3	6	-	138 000	-	38 600
Mineral Deposit Inventory and Analysis	MRD	Man	5	4	2.0	136 500	29 400	102 800
Oil and Gas Inventory and Analysis	-	-	-	-	-	-	-	-
Publications	MRD	-	-	-	-	-	-	36 500
Resident Geologist's Office	-	-	-	-	-	-	-	-
Subsurface Investigations, Industrial Minerals Drilling and Management	MRD	Man	3	2	.31	60 400	8 800	20 400
Water Resource Inventory and Analysis	-	-	-	-	-	-	-	-
Other: Administration	-	-	-	-	-	-	-	75 000
Drafting	-	-	-	-	-	-	-	10 500
Uranium/Lead Isotope Analysis	MRD	GSC/Man	-	-	-	-	-	10 000
TOTALS	-	-	**29**	**33**	**6.39**	**1 004 000**	**111 000**	**868 000**
Grand Total	-	-	-	-	-		**1 983 000**	

[1] Vertical Airborne Gradiometer Surveys (Man.-GSC)

MRD - Mineral Resource Division, Department of Energy and Mines
GSC - Geological Survey of Canada
Man - Manitoba

PROVINCE: ONTARIO
1982-1983

PROGRAMS	FUNDING AGENCY	NO. OF PROJECTS	MAN-YEARS PERMANENT	MAN-YEARS CASUAL	SALARIES PERMANENT $	SALARIES CASUAL $	TCSSE $	TOTALS $
PRECAMBRIAN GEOLOGY								
Head Office	MNR	3	4	-				
Head Office	MNA/DREI	1	1	-				
Synoptic Mapping	MNR	2	2	2				
Special Mapping	MNR	4	2	4				
Special Mapping	MNA	2	2	1				
Special Mapping	MNR/DREI	2	-	5				
Detailed Mapping	MNR	5	5	5				
Detailed Mapping	MNR/MNA	1	1	1				
Detailed Mapping	MNR/DREI	2	-	4				
Detailed Mapping	MNA	2	-	3				
		25	**18**	**25**	**655 000**	**617 500**	**466 800**	**1 739 300**
ENGINEERING AND TERRAIN GEOLOGY								
Head Office	MNR	0	1	1				
Quaternary Mapping	MNR	3	2	1				
Quaternary Mapping	MNA	2	-	2				
Quaternary Mapping	MNA/DREI	1	1	1				
Quaternary Mapping	MAN/DREI	3	-	4				
Paleozoic Mapping	MNR	2	2	2				
Paleozoic Mapping	MNR/DREI	1	-	2				
Aggregate Assessment	MNR	6	2	3				
Hydrocarbon Energy Resources Program	MNR	4	2	-				
Surface - stress study	MNR	1	1	-				
		23	**11**	**16**	**351 000**	**423 200**	**246 900**	**1 021 100**
MINERAL DEPOSITS STUDIES								
Head Office	MNR	0	1	-				
Gold	MNR	5	2	6				
Gold/Base Metals	MNR	1	1	1				
Gold/Iron	MNR	1	1	1				
Copper	MNR	1	1	1				
Silver/Cobalt	MNR	1	0	2				
Industrial Minerals	MNR	1	1	1				
Industrial Minerals	MNR/DREI	1	-	2				
Industrial Minerals	MNA	2	0.5	-				
		13	**7.5**	**15**	**247 300**	**320 600**	**367 700**	**935 600**

PROVINCE: ONTARIO (Page 2)
1982-1983

PROGRAMS	FUNDING AGENCY	NO. OF PROJECTS	MAN-YEARS PERMANENT	MAN-YEARS CASUAL	SALARIES PERMANENT $	SALARIES CASUAL $	SALARIES TCSSE $	SALARIES TOTALS $
GEOPHYSICS/GEOCHEMISTRY								
Head Office	MNR	1	2	2				
Test Range	MNR	1	1	0.5				
Gravity	MNR	1	1	1				
Regional Geochemicsty	MNR	1	0.5	2				
Basal Till Survey	MNA/DREI	1	0.5	4				
Geochronology	MNR/MNA	1	-	0.5				
		6	**5**	**10**	**212 800**	**275 500**	**1 203 000**	**1 691 300**
GEOSERVICES								
Publications	MNR/MNA/DREI	-	11	10				
Laboratory	MNR/MNA/DREI	-	18	7				
Data Management	MNR/MNA	-	8	8				
Library	MNR	-	3	2				
Information & Education	MNR	-	2	2				
		-	**42**	**29**	**1 167 300**	**680 700**	**1 219 800**	**3 067 800**
RESIDENT GEOLOGISTS (8 Regions)	MNR/MNA/DREI		69	28	1 910 060	695 236	711 859	3 317 155
GEOSCHIECE RESEARCH GRANTS PROGRAM	MNR	21					500 000	500 000
EXPLORATION TECHNOLOGY DEVELOPMENT PROGRAM	BILD	17					984 000	984 000
CORE STORAGE	BILD	3	-	-			1 660 000	1 660 000
HYDROCARBON ENERGY RESOURCES PROGRAM	BILD	4	-	8	-	203 237	2 481 800	2 685 037
TOTALS					**4 543 460**	**3 188 973**	**9 841 859**	**17 574 292**

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

PROVINCE: QUEBEC
1982-1983

PROGRAMS	SURVEY/RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS	PERMANENT STAFF MAN-YEARS P-T-C	CASUAL STAFF* MAN-YEARS	BUDGET ALLOCATION* $
Core Repositories	DGEGM	MER	-	-	-	120 000
Geochemical Surveys:	DGEGM	-	-	-	-	-
(1) Bedrock	-	-	-	-	-	-
(2) Drainage	-	MER	2	3P-3T-3C	5.0	505 000
(3) Lakes	-	MER	1	1P	1.0	485 000
Geological Surveys (Bedrock)	DGEGM	MER	23	13P-3T-1C	40.0	2 600 000
Geological Surveys (Surficial)	DGEGM	MER	3	3P	4.0	270 000
Geophysical Surveys:						
(1) Airborne electromagnetic	DGEGM	MER	2	-	-	700 000
(2) Airborne magnetic	-	-	-	-	-	-
(3) Ground magnetic	-	-	-	-	-	-
(4) Gravity	-	MER	1	-	-	80 000
(5) Seismic	-	MER	1	-	-	75 000
Hydrogeological Surveys	-	-	-	-	-	-
Information and Education	DGEGM	MER	1	-	-	20 000
Laboratory Analysis	-	-	-	-	-	-
Mineral Deposit Inventory Analysis	DGEGM	MER	23	4P-1C	15.0	1 560 200
Exploration Program	DGEGM	MER	19	5P-2T-1C	8.0	2 883 300
Publications and Carthography	DGEGM	MER	-	8P-23T-12C	9.0	2 335 000
Resident Geologist's Office	DGEGM	MER	5	11P-4T-4C	4.0	1 065 000
Subsurface Investigations	DGEGM	MER	4	-	1.0	800 000
Joint Venture Agreement	DGEGM	MER	10	-	-	1 270 000
Other	DGEGM	MER	-	13P-1T-7C	6.0	1 128 000
TOTALS	-	-	**95**	**61P-36T-29C**	**93.0**	**15 896 500**

* Permanent and Casual staff salaries in budget allocations
P Professional
T Technical
C Clerical

DGEGM - Dir. Generale, Exploration Geol. et. Min.
MER - Ministere Energie et Ressources

PROVINCE: NEW BRUNSWICK
1982-1983

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 $	SALARIES SUMMER AUXILIARY $	OPERATING EXPENDITURES $
Core Repositories	DNR	NB/DREE	5	-	-	-	-	-	-	-
Geochemical Surveys:										
(1) Bedrock	-	-	-	-	-	-	-	-	-	-
(2) Drainage	PS/WMS	NB	2	-	-	-	-	-	-	55 000
(3) Soil	TAMS	NB	1	-	-	-	-	-	-	105 000
Geological Surveys, Bedrock:										
(1) Reconnaissance (1:100 000)	-	-	-	-	-	-	-	-	-	-
(2) Detailed (1:50 000)	DNR	NB/DREE	2	2	1	1	75 000	27 000	12 000	31 000
Geological Surveys, Surficial:										
(1) Reconnaissance (1:100 000)	-	-	-	-	-	-	-	-	-	-
(2) Detailed (1:50 000)	-	-	-	-	-	-	-	-	-	-
(3) Granular Resources	DNR	NB	2	2	-	0.6	51 000	-	10 000	25 000
Geophysical Surveys:										
(1) Airborne electromagnetic										
(2) Airborne magnetic										
(3) Ground magnetic										
(4) Gravity	DNR	NB	1	1	0.5	-	35 000	12 000	-	12 000
(5) Seismic	-	-	-	-	-	-	-	-	-	-
(6) Radiometric	-	-	-	-	-	-	-	-	-	-
Hydrogeological Surveys	-	-	-	-	-	-	-	-	-	-
Information and Education	DNR/AWL	NB	2	2	-	-	49 000	-	-	58 000
Laboratory Analysis	DNR	NB	2	2	-	0.3	31 000	-	5 000	17 000
Mineral Deposit Inventory and Analysis	DNR	NB	2	-	-	2	-	-	25 000	47 000
Coal Inventory and Analysis	Three-D	NB	1	-	-	-	-	-	-	13 000
Oil and Gas Inventory and Analysis	DNR	NB	1	1	-	0.6	34 000	-	10 000	15 000
Publications	DNR	NB	-	1	-	-	16 000	-	-	7 000
Chief Geologist's Office	DNR	NB	-	2	-	0.6	93 000	-	7 000	3 000
Resident Geologist's Office	DNR	NB	2	9	-	-	247 000	-	-	85 000
Subsurface Investigations	-	-	-	-	-	-	-	-	-	-
Peat Inventory	DNR	NB/DREE	3	-	4	-	-	-	-	60 000
Water Resource Inventory and Analysis	-	-	-	-	-	-	-	-	-	-
Other Metallurgical Studies and Promotion	DNR/RPC	NB/DREE	3	-	-	-	-	-	-	186 000
TOTALS	-	-	-	**22**	**5.5**	**5.1**	**631 000**	**39 000**	**69 000**	**719 000**
Grand Total	-	-	-	-	-	-			**1 458 000**	

DNR - Department of Natural Resources
RPC - New Brunswick Research and Productivity Council
AWL - A. Wayne Lockhart
Three-D - Three-D GeoConsultants Ltd.
PS - Precise Surveys Ltd.
WMS - Water Management Services Ltd.
TAMS - Terrain Analysis and Mapping Services Ltd.

PROVINCE: NOVA SCOTIA
1982-1983

PROGRAMS	SURVEY/ RESEARCH AGENCY	FUNDING AGENGY	NO. OF PROJECTS (OR FACILITIES)	PERMANENT STAFF MAN-YEARS	CASUAL STAFF MAN-YEARS	BUDGET ALLOCATIONS $
Core Repositories	NSDME	NSDME/GSC	2	2	1	275 000
Geochemical Surveys:	NSDME/GSC	NSDME/GSC	1	1	3	177 000
(1) Bedrock	-	-	-	-	-	-
(1) Drainage	-	-	-	-	-	-
(2) Soil	-	-	-	-	-	-
Geological Surveys, Bedrock:	NSDME/GSC	NSDME/GSC	4 NSDME	4	7	1 469 000
		NSDOD	1 GSC*	1	1.5	115 000
(1) Reconnaissance (>1:100 000)	-	-	-	-	-	-
(2) Detailed (>1:50 000)	-	-	-	-	-	-
Geological Surveys, Surficial:	NSDME/GSC	NSDME/GSC	2	1	3.5	253 000
(1) Reconnaissance (>1:100 000)	-	-	-	-	-	-
(2) Detailed (>1:50 000)	-	-	-	-	-	-
Geophysical Surveys:						
(1) Airborne radiometrics	GSC*	GSC	1	N/A	N/A	65 000
(2) Airborne magnetic (includes VLF-EM)	GSC*	GSC	1	N/A	N/A	292 000
(3) Ground magnetic	-	-	-	-	-	-
(4) Gravity	-	-	-	-	-	-
(5) Seismic	NSDME/GSC	NSDME/GSC NSDOD	1	-	-	30 000
Hydrogeological Surveys	-	-	-	-	-	-
Information and Education	NSDME	NSDME	1	1	-	31 000
Laboratory Analysis (included in budgets above)						
Mineral Deposit Inventory and Analysis	NSDME/GSC	NSDME/GSC	2	2	3	152 000
Coal and Peat	NSDME	NSDME/GSC NSDOD	3	7	5.4	722 000
Oil and Gas Inventory and Analysis	NSDME	NSDME	1	4	-	335 000
Publications	NSDME	NSDME	N/A	10	-	378 000
Resident Geologist's Office	NSDME	NSDME	N/A	11	-	564 000
Subsurface Investigations	NSDME	NSDME	N/A	12	-	497 000
Water Resource Inventory and Analysis	-	-	-	-	-	-
Other:						
(1) Gold, heap leaching	GSC*	GSC	1	N/A	-	30 000
(2) Gold tailings, treatment and recovery	GSC*	GSC	1	N/A	-	30 000
TOTALS	-	-	-	**56**	-	**5 415 000**

* Contribution to Canada-Nova Cooperative Mineral Program, GSC Program

NSDME - Nova Scotia Department of Mines and Energy
NSDOD - Nova Scotia Department of Development
GSC - Geological Survey of Canada

PROVINCE: NEWFOUNDLAND
1982-1983

PROGRAMS	SURVEY/ RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS (OR FACILITIES)	PERMANENT[1] SMY	CASUAL SMY	SALARIES PERMANENT $	SALARIES CONTRACT[1] $	CASUAL $	OPERATING EXPENDITURES $
Director's Office	NDME	NDME	-	7	2	157 800	-	12 000	19 400
Core Repositories	NDME	NDME/DREE DEMR	3	2	2	55 000	-	8 600	324 300 (includes 301 000 capital expend.)
Geochemical Surveys:									
(1) Bedrock	-	-	-	-	-	-	-	-	-
(2) Drainage	NDME	NDME/DREE DEMR	2	3	8	90 000	8 000	22 000	153 000
(3) Soil	-	-	-	-	-	-	-	-	-
Geological Surveys, Bedrock:									
(1) Reconnaissance (>1:100 000)	NDME	NDME/DREE DEMR	5	5	3	180 000	-	13 650	171 000
(2) Detailed (>1:50 000)	NDME	NDME/DREE DEMR	11	7	12	216 000	23 000	52 300	152 700
Geological Surveys, Surficial:									
(1) Reconnaissance (>1:100 000)	-	-	-	-	-	-	-	-	-
(2) Detailed (>1:50 000)	NDME	NDME	3	5	8	140 800	-	59 000	109 200
Geophysical Surveys:									
(1) Airborne electromagnetic									
(2) Airborne magnetic									
(3) Ground magnetic									
(4) Gravity									
(5) Seismic									
(6) Radiometric									
Hydrogeological Surveys									
Information and Education	NDME	NDME	-	-	-	-	-	-	-
Laboratory Analysis	NDME	NDME/DREE DEMR	1	8	2	184 000	-	6 000	40 000
Mineral Deposit Inventory and Analysis	NDME NDME	NDME/DREE DEMR	6	5	8	188 200	16 000	56 300	110 600
Publications	NDME	NDME/DREE DEMR	N/A	10	6	217 900	106 400	-	72 700
Resident Geologist's Office	-	-	-	-	-	-	-	-	-
Subsurface Investigations	-	-	-	-	-	-	-	-	-
Water Resource Inventory and Analysis	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
TOTALS	-	-	**31**	**52**	**51**	**1 429 700**	**153 400**	**229 850**	**1 152 900**
Grand Total	-	-	-	-	-			**2 965 850**	

[1] Includes long term temporary staff

NDME - Newfoundland Department of Mines and Energy
DREE - Department of Regional Economic Expansion
DEMR - Department of Energy, Mines and Resources, Canada

TERRITORY: NORTHWEST TERRITORIES
1982-1983

PROGRAMS	NO. OF PROJECTS	OPERATING BUDGET
Payroll		577 000[1]
O & M		479 000[1]
		1 056 000
INFORMATION PROCESSING AND DISTRIBUTION		
Core Library Operation		35 000
Assay Laboratory[2](Operation)		
Archives - information, data processing and verification (office aspects - including preparation maps and reports		446 000
Administration and Planning		28 600
		606 000
FIELD PROJECTS		
Professional Mapping Projects	8	50 700
Staff Mapping Projects	2	125 000
Projects Not Individually Costed		230 700
Core Collection		15 000
		421 400

[1]Includes 26 000 in salaries and 13 700 in O & M for printing provided outside our budget.
[2]This facility was closed as of 83.03.31. O & M funds ($50 000) will be used in increasing advice and assistance to mineral industry, particularly prospectors. Person Years are to be redirected into economic analysis.

TERRITORY: YUKON
1982-1983

PROGRAMS	SURVEY/ RESEARCH AGENCY	FUNDING AGENCY	NO. OF PROJECTS (OR FACILITIES)	SALARIES PERMANENT SMY	SALARIES CASUAL SMY	SALARIES PERMANENT $	SALARIES CASUAL/ TEMPORARY $	OPERATING EXPENDITURES $
Head Office (Administration, General Support)	INA	INA	1	2.5	-	68 000	-	85 000
Core Repositories	INA	INA	1	1	-	29 000	-	5 000
Geochemical Surveys:								
(1) Bedrock	-	-	-	-	-	-	-	-
(2) Drainage	-	-	-	-	-	-	-	-
(3) Soil	-	-	-	-	-	-	-	-
Geological Surveys, Bedrock:								
(1) Reconnaissance (1:100 000)	-	-	-	-	-	-	-	-
(2) Detailed (1:50 000)	INA	INA	1	1.5	.5	63 000	9 000	27 000
Geological Surveys, Surficial:								
(1) Reconnaissance (1:100 000)	-	-	-	-	-	-	-	-
(2) Detailed (1:50 000)	INA	INA	1	1.5	.5	61 000	9 000	13 000
Geophysical Surveys:								
(1) Airborne electromagnetic	-	-	-	-	-	-	-	-
(2) Airborne magnetic	-	-	-	-	-	-	-	-
(3) Ground magnetic	-	-	-	-	-	-	-	-
(4) Gravity	-	-	-	-	-	-	-	-
(5) Seismic	-	-	-	-	-	-	-	-
(6) Radiometric	-	-	-	-	-	-	-	-
Hydrogeological Surveys	-	-	-	-	-	-	-	-
Education	INA	INA	1	-	-	-	-	2 000
Laboratory Analysis	INA	INA	1	-	-	-	-	3 000
Mineral Deposit Inventory and Analysis	INA	INA	8	.5	3	30 000	94 000	90 000
Oil and Gas Inventory and Analysis	-	-	-	-	-	-	-	-
Publications	INA	INA	-	1	-	35 000	-	19 000
Resident Geologist's Office	-	-	-	-	-	-	-	-
Subsurface Investigations	-	-	-	-	-	-	-	-
Water Resource Inventory and Analysis	-	-	-	-	-	-	-	-
Other:								
Prospectors' Assistance	INA	MRD	-	-	-	-	-	30 000
Research Grants	-	-	-	-	-	-	-	-
TOTALS:								
Exploration and Geological Services Division, Yukon	-	-	-	8	4	**286 000**	**112 000**	**274 000**
Grand Total	-	-	-	-	-		**672 000**	

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

GEOLOGICAL PROGRAM

HIGHLIGHTS

PROVINCIAL AND TERRITORIAL

GEOLOGICAL SURVEYS

1982 – 1983

GEOLOGICAL BRANCH, MINERAL RESOURCES DIVISION
BRITISH COLUMBIA MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES

The year 1982-83 was one of conflicting tendencies and challenge for the Geological Branch. During the year, we virtually completed our restaffing after a major turnover the year before and just in advance of a hiring freeze and policy of budgetary restraint. Many projects had to be modified to accomplish the latter objective, nevertheless, a substantial field program was mounted. The major casualties were the regional geochemical survey and one project needing significant helicopter support.

FIELD WORK

Major projects include the following with locations shown on the figure and map numbers from *Geological Fieldwork, 1982* (Paper 1983-1):

1. HØY, T.: *Geology in the Vicinity of the Sullivan Deposit, Kimberley, British Columbia (82 F,G)*–This project was virtually completed. It has developed a better understanding of stratigraphic, structural, and tectonic setting and ore controls of the Sullivan and other clastic hosted, lead-zinc-silver deposits in the Purcell Supergroup of southeastern British Columbia and established a link between mineralization and synsedimentary faulting.
3. GRIEVE, D.A., and FRASER, JANINE M.: *Line Creek and Crown Mountain Areas, Elk Valley Coalfield (82 G/10,15)*–continues the detailed mapping of Kootenay Group coal measure and coal beds in southeastern British Columbia.
5. CHURCH, B.N., and SUESSER, U.: *Geology and Magnetostratigraphy of Miocene Basalts of the Okanagan Highlands, British Columbia (82 L/2,3)*–completes study of Tertiary basins and their resources by correlations of some covering basalts.
9. RAY, G.E.: *Carolin Mine–Coquihalla Gold Belt Project (92 H/6,11)*–continues the study of the geology and gold deposits in the vicinity of the major Hozameen fault.
13. ALLDRICK, D.J.: *The Mosquito Creek Mine, Cariboo Gold Belt (93 H/4)*–continues the study of the highly deformed host rocks and the deposits of a revived gold camp.
14. KOO, J.: *Telkwa Coalfield, West-Central British Columbia (93 L)*–with the advantage of a major exploration project, studies the resources, sedimentation, and structure of a Lower Cretaceous coal basin in central British Columbia.

16,17,18. PANTELEYEV, A., SCHROETER, T.G., and DIAKOW, L.J.–jointly studied the geology of epithermal precious metal deposits and their alteration in Lower Jurassic Toodoggone volcanic field of northern British Columbia and developed genetic models.

19. MACINTYRE, D.G.: *A Comparison of the Geologic Setting of Stratiform Massive Sulphide Deposits of the Gataga District with the Midway and Windy-Craggy Deposits, Northern British Columbia (94 F,L; 104 O/16; 114 P/12)*–genetic concepts of three different types of massive sulphide deposits.
23. ALLDRICK, D.J.: *Salmon River Project, Stewart, British Columbia (104 B/1)*–geological setting and metallogeny of a major segment of the Stewart precious metal mining district.
24. HORA, Z.D.: *Mapping of Silica Occurrences in British Columbia*–a geological and resource inventory of important silica sources in British Columbia.
25. NORTHCOTE, K.E., SMYTH, W.R., and SCHMITT, H.R.: *Recent Mineral Resource Assessment Studies in British Columbia*–principally office studies related to potential parks at Chilko Lake, Kakwa, Flourmills, and South Moresby Island.

Other smaller projects are reported along with the above in *Geological Fieldwork, 1982*.

In late 1981 the Branch was reviewed by an Advisory Committee consisting of Dr. Hugh C. Morris, Chairman, and Drs. A.E. Soregaroli, H.I. Greenwood, Grant Mossop, and Ward Neale. The final report was delivered in the summer of 1982 and has been a continuing guide even though the circumstances haved changed radically since.

Additional highlights include the following:

- Successful completion of 6th annual advanced mineral exploration course for prospectors.
- Operational start-up of coalfile computer resource information file.
- Establishing of land use coordinating office.
- Major involvement in planning and operation of land use policy workshop.
- Geochemical survey data release of three map sheets, Hope, Pemberton, Ashcroft, and major resulting exploration activity.
- Major involvement in planning, organization, and running of GAC/MAC/CGU conference-including production of guidebooks for field excursion and two short courses, one on lead/zinc deposits and one on coal petrography.
- Completion of two sets of assayers examination and certification.
- Participation in ongoing Canada/Japan coal liquefaction studies.
- Selection by Prospectors and Developers Association, Toronto, of a paper on exploration in British Columbia and mounting of a display promoting opportunities for exploration in British Columbia at conference.

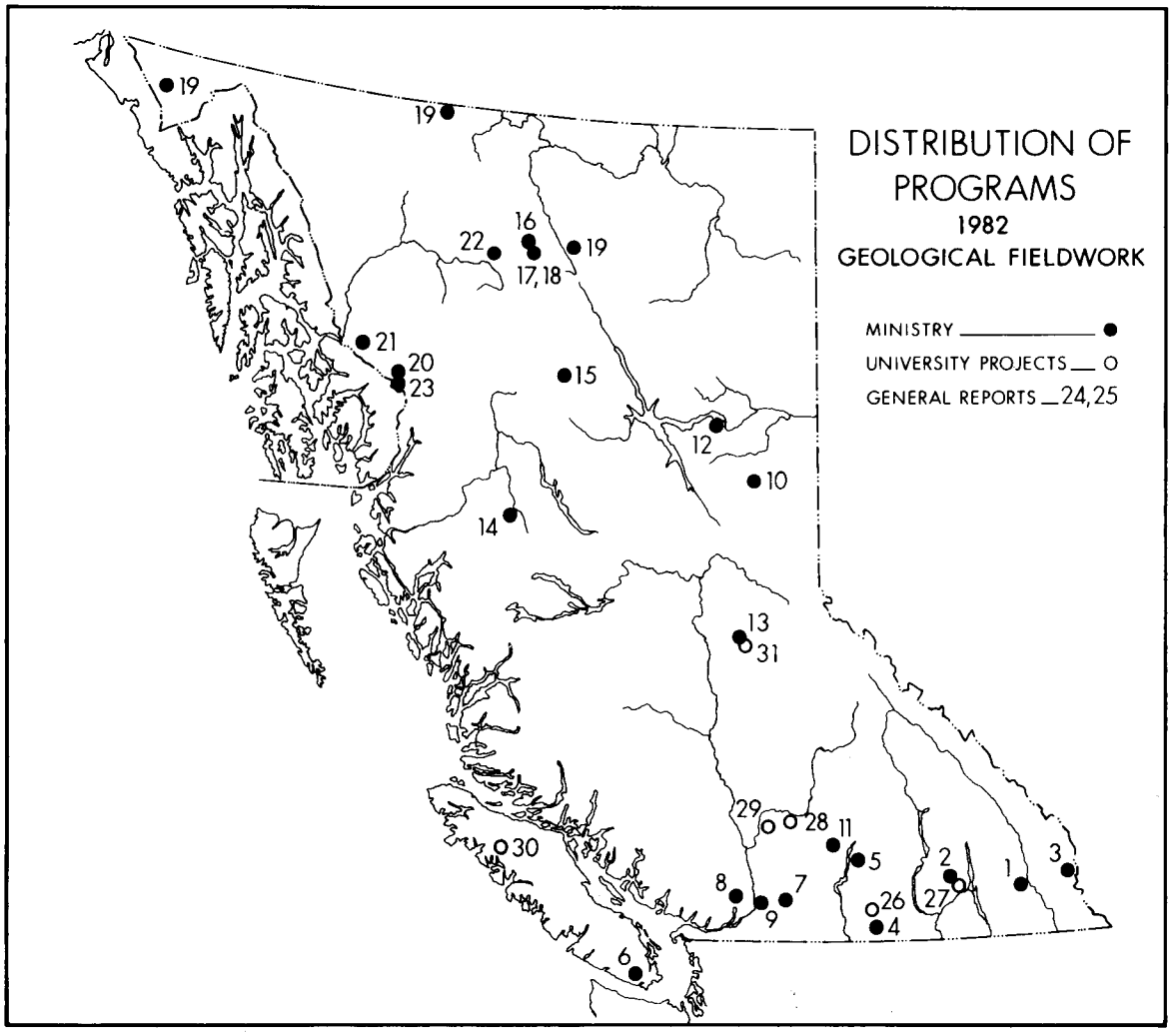


Figure 1· Distribution of programs·

ALBERTA GEOLOGICAL SURVEY
ALBERTA RESEARCH COUNCIL

The Alberta Geological Survey is organized into four sections—Oil Sands Geology, Sedimentary Geology, Mineral Resources and Environmental Geology. The following overview of 1983 highlights adheres to this fourfold organizational breakdown. Further information on any of the Survey's projects or operations may be obtained by reference to the cited publications or to the Alberta Geological Survey Annual Report of Investigations 1983.

OIL SANDS GEOLOGY

During 1983, regional scale investigations continued on all of the major oil sand and heavy oil deposits in the province. Each study has three essential components: (1) facies analysis and interpretation of depositional environments and paleogeography, in order to develop a predictive capability regarding the three-dimensional geometry of the reservoir sands and the intervening shales in the subsurface; (2) petrologic characterization of the reservoirs and the enclosing rocks, to determine geotechnical behaviour and assist with the physical and numerical modeling of the reservoirs; and (3) regional mapping of entire deposits (structural maps, isopachs, sand/shale ratio maps, bottom water maps, net pay maps, and so on) as a basis for judgments regarding reserves estimation, pilot plant siting, and in-situ process transferability.

Reconstruction of Mannville Group facies and depositional environments is now at advanced stages for a number of deposits. These include the Lower Mannville Gething and McMurray Formations in the Peace River and Athabasca Deposits, the Middle Mannville Glauconitic Sandstone of the Suffield area, and the Middle and Upper Mannville Formations in the Wabasca Oil Sands and in the Cold Lake-Lloydminster area. In the Subcrop Carbonate Trend, Grosmont Formation facies are now well defined and work is beginning on some of the bitumen-bearing Mississippian formations.

The second component of each deposit study encompasses the petrography and diagenesis of the oil sand's reservoirs and associated strata, using thin-section and scanning electron microscopy. Studies are complete for the Peace River Oil Sands and the Glauconitic reservoirs at Suffield. Important progress has also been made in some of the Lloydminster pools and in the Grosmont Formation dolomites.

Regional subsurface mapping of entire deposits, the third component of each oil sands study, is now relatively advanced for the Athabasca, Wabasca and Peace River Deposits. Publications of results for the northern portion of the Athabasca Deposit is anticipated for early 1984.

In addition to the regional studies, oil sands research geologists completed a number of site-specific studies relating to existing or proposed pilot plants in the Athabasca Deposit, Cold Lake Deposit and the Suffield block. Site selection work was also completed for the Underground Test Facility being developed by the Alberta Oil Sands Technology and Research Authority (AOSTRA). Researchers continue to provide valuable geological insight into the operations of specific field pilot plants, through involvement in AOSTRA/Industry Technical Advisory Committees. In the international arena, a study of the Sao Paulo State oil sands occurrences, Brazil, was completed for AOSTRA and Paulipetro, the government petroleum agency in Brazil. Investigations of a similar nature are being initiated on oil sands occurrences in Peru.

SEDIMENTARY GEOLOGY

Alberta Geological Survey research on coal is centred on the geology of Cretaceous and Tertiary coal measures in the Alberta plains. Emphasis is on the nature and origin of coal

seams at comparatively shallow depths, generally less than about 500 m, with potential for shallow mining or in-situ conversion. This year saw the completion of a five-year drilling and coring program to complement the database available from outcrop studies in the badlands and along the Red Deer River. The program is now in a position to finalize interpretations of depositional environments and facies associations in the Judith River Formation and the lower Horseshoe Canyon Formation. Work is complete on the upper Horseshoe Canyon Formation and is well underway in the Ardley coal zone of the Scollard Member.

Facies studies in coal are augmented by research in coal petrology and coal chemistry. Facilities for petrographic analysis of coals are now in place and work is beginning. The discovery of silicified peats in the Horseshoe Canyon Formation may provide a basis for more detailed insight into coalification processes in the Alberta Cretaceous.

In petroleum geology, research on the facies and petrology of the Elmworth reservoirs is now complete and emphasis has shifted to selected Triassic reservoirs in northwestern Alberta. In addition, regional subsurface studies are now well established for the Grosmont complex and for Devonian carbonate rocks in central Alberta, including the Beaverhill Lake, Woodbend and Winterburn Groups.

The paucity of preserved macrofossils in the Alberta Cretaceous means that the alternative paleontological disciplines of palynology and ichnology assume much greater importance, both as age indicators and as tools for sedimentological and paleoecological reconstruction. Specialist studies in palynology and ichnology play a central role in the Survey's facies work relating to oil sands, coal and petroleum resources. A highlight for 1983 was the completion of a major study on the Cenomanian microfloras of the Peace River area. The resulting bulletin complements two previously published monographs on Aptian and Albian strata in Alberta—Alberta Research Council Bulletins 15 and 28. A highlight in ichnology was the completion of a contract study of Hibernia cores for Mobil Oil Canada Ltd. and its partners. Ichnology is clearly a key to understanding some of the offshore east coast successions.

MINERAL RESOURCES

The most significant achievement of 1983 in this sector was the completion of province-wide inventories of all of Alberta's important mineral resources. With finalization of the Alberta Phosphate Survey, the inventory of Alberta's Ceramic Clays, and the Athabasca Basin Uranium study, virtually all of the important mineral commodities in the province have been characterized and mapped at reconnaissance scales. These include the industrial minerals—ceramic clays, bentonite, marl, limestone, dolomite, silica sand, salt, gypsum, dimension stone, phosphate and aggregate—as well as the metallic minerals—iron, uranium and lead-zinc. Some 74 person years of research have been involved. Planning, exploration and development activities relating to these resources can now be considered to be on a solid footing. Apart from the Aggregate Resource Inventory, which will not be complete until 1990, the only outstanding commodities still to be surveyed are sulphur, heavy minerals, zeolites and rare earths. Monitoring and maintaining assessment files for these and other minerals is considered appropriate for the short- and medium-term future. Emphasis will shift to area resource studies in specific urban and resource development centres and along transportation corridors.

Aggregate is one of Alberta's most important industrial mineral commodities. Sand and gravel represent the principal types of mineral aggregate, however, there are parts of the province in which this resource is becoming scarce. Haul distances of 50 km or more are not uncommon. The Alberta Geological Survey's Aggregate Inventory assesses known sand and gravel resources and explores for additional reserves, but also conducts research on the availability and potential of such alternate commodities as expandable clays and crushed stone.

Data on the amount, availability and aggregate potential of various materials are being incorporated into regional overview assessments, for use by municipalities and rural

jurisdictions concerned with planning and management of aggregate resources. The first such Aggregate Resource Development Document, for the Edmonton-Lloydminster region, will be complete in early 1984.

Aggregate mapping at 1:50 000 now covers 21 percent of the province, encompassing 82 percent of the population. The scope of the inventory project was broadened in 1983 to encompass assessment of the gold resources in Alberta rivers and in Quaternary/Recent gravel deposits.

For the Precambrian Shield of northeastern Alberta, the last of 37 geological maps are now complete in draft form. Synthesis reports are complete on the metamorphic and deformational history of the terrain. In addition, the past year has seen significant progress in the drawing together and interpretation of geochemical and geophysical data for the Shield.

In the Grande Cache coal field north of Jasper National Park, Lower Cretaceous coal measures are mined in a complex structural setting. Detailed analysis of the deformation in the region has given rise to a computer model for the down plunge projection of folds and better definition of coal seam geometry. Applications work by Smoky River Coal Limited (McIntyre Mines) has led to the definition of new reserves and renewed impetus to keep the mine open under an adapted mine plan.

ENVIRONMENTAL GEOLOGY

The Environmental Geology Section of the Alberta Geological Survey is concerned with: (1) the surficial geology and Quaternary stratigraphy of the province; and (2) reclamation, particularly as it relates to plains coal mines.

Quaternary studies of selected 1:250 000 map sheets comprise three elements: (1) surficial geology; (2) Quaternary stratigraphy; and (3) bedrock topography. The Sand River map sheet is now complete and work has reached an advanced stage in the Vermilion area to the south. These studies have given rise to the recognition of previously unknown types of glacial-thrust terrain, developed over very large areas. Data from the stratigraphic and bedrock topography components are being used in another Research Council study on the groundwater resources of the Cold Lake Oil Sands Deposits and by petroleum companies involved in developing the area.

Synthesis mapping of southern Alberta, from Latitude 49°N to 54°N and from the Saskatchewan border to the disturbed belt is now practically complete. The results, based on over 40 years of research and survey work in the area, will be released at 1:500 000 and 1:1 000 000 scale maps, to be ultimately appended to the northern boundary of the Quaternary map of the United States. The project has allowed for the recognition of three separate Laurentide ice lobes in the region and has given rise to a modified technique for glacial provenance studies utilizing pebble lithologies. A separate study of the Quaternary stratigraphy in the Medicine Hat-Lethbridge area, based on multiple till sequences exposed along infilled valleys of the preglacial South Saskatchewan River, is also near completion. The study on the Urban Geology of the Calgary area is in the final stages of publication preparation.

A new study this year is the investigation of highwall stability problems in the Highvale Mine at Wabamun. Alberta Geological Survey geologists, utilizing knowledge of glacial thrusting gleaned over a number of years of basic survey and research work, have been able to elucidate the reasons for acute instability in the mine and are now working directly with Transalta and consultants to mitigate the very costly problems.

In the reclamation field, the Plains Hydrology and Reclamation Project has entered the fifth and final year of its existing contract. The research is primarily funded by the Alberta Heritage Trust Fund, administered through the Reclamation Research Technical Advisory Committee. The project is targeted to develop a comprehensive understanding of the geology, hydrogeology and soils conditions in the area of the Battle River and Wabamun coal mines,

with a view to developing a predictive framework for the assessment of reclamation potential on a long term basis. Particular emphasis is placed on determining the impact of mining on water resources. The multifaceted results of the project have been synthesized into 25 draft reports, with others currently in preparation. Highlights of the detailed findings are contained in the Alberta Geological Survey Annual Report of Investigations 1983.

SASKATCHEWAN GEOLOGICAL SURVEY
SASKATCHEWAN DEPARTMENT OF ENERGY AND MINES

As part of the departmental reorganization, the Saskatchewan Geological Survey was re-structured into six sections under a Director and Assistant Director. The sections are Precambrian Mapping, Economic Geology, Sedimentary Research Geology, Industrial Minerals, Geodata and the Subsurface Geological Laboratory.

The work program of the Saskatchewan Geological Survey can be divided into three main functions:

- geological mapping and regional studies of rock systems in the province with the objectives of providing the geological framework for decisions in mineral exploration, mineral production and regulations with respect to royalties, leases, bonus payments to the Crown and incentives to industry.
- maintenance of geological consultative expertise on the petroleum, industrial and metallic mineral industries in the province.
- maintenance and management of geologic data files as required under the Mineral Disposition, Petroleum and Natural Gas and the Geophysical Exploration Regulations.

The Geological Survey also provides a forum for dialogue on the mineral resources of the province with the resource industries by the sponsorship of symposia through the Saskatchewan Geological Society, by the presentation of an Annual Open House meeting, and by individual consultations. The Fourth International Williston Basin Symposium attracted some 500 petroleum geologists from across the continent. Open House 1982 was attended by 200, mostly metallic mineral industry representatives from across Canada. Individual consultations by the geological staff on nonregulatory resource matters exceeded 1000. The individual geological projects of the Geological Survey as well as submissions from the Universities of Saskatchewan and Regina, as well as, the Saskatchewan Research Council are summarized in "Summary of investigations, 1982", Report MR 82-4: R. Macdonald, Ed.

PRECAMBRIAN MAPPING SECTION

The Precambrian Mapping Section produces reports, maps, bibliographies and data files on the regional geology, geochemistry and geophysics of the Precambrian region. Information is obtained by ongoing field mapping projects, and by compilation of data from other sources, including the Mineral Work Assessment File.

Bedrock geological mapping at 1:20 000 scale was conducted in the Hill Lake area as part of Project Beaverlodge—a program to regionally evaluate the Beaverlodge mining area for mineral prospects following closure of the Eldorado Mine. A start was also made on a general review and compilation of the geology in this area.

Work continued on the geology of the basement rocks underlying the Athabasca Sandstone basin. Two preliminary maps were produced at a scale of 1:250 000, on the basis of data mainly obtained from drilling for uranium by industry.

The program of 1:250 000 scale bedrock geology compilation maps was continued. Two preliminary map sheets were produced of the area east of the Athabasca Basin.

A program of isotopic age determinations by contract with Carleton University, now in its fifth year, is significantly contributing to the understanding of the geological framework and mineral deposit evolution in northern Saskatchewan. Another contract was awarded to the University of Regina to determine the geochemistry of potentially mineralized formations represented in the Hanson Lake area, near the significant Limestone Lake copper-zinc discovery.

The following reports were published or open-filed (OF) during the year: Gilboy (1982a, 1982b), Rees (1982), Scott (1981, 1982), and Stauffer *et al.* (1981).

ECONOMIC GEOLOGY SECTION

Mineral deposits in northern Saskatchewan are evaluated by the section through field and laboratory studies. A mineral deposits inventory and core collection are maintained and direct assistance to the mineral exploration industry is provided through the Regina office and field offices of the resident geologists at La Ronge, Uranium City and Creighton.

Northern Saskatchewan's most important metallic mineral resource, at present, is uranium, which is found in economic concentrations throughout the Athabasca Basin and in the historic mines of the Uranium City area. Geological mapping and geochemical sampling projects were carried out in the Uranium City area around Mickey Lake, and in the Nicholson Bay area to the south as well as within the Athabasca Basin at Dawn Lake and Cluff Lake.

Investigations of gold deposits were continued in the Flin Flon-Amisk Lake area, where several small past producers and some excellent future prospects are located. A copper-silver prospect at Dianne Lake, to the northwest of Uranium City, was also examined. A predominantly geochemical base metal project north of Flin Flon, was contracted to the University of Regina under an ongoing program of investigation of the chemistry of the volcanic rocks.

The resident geologists assist and monitor the activities of the mineral exploration industry in northern Saskatchewan. Core collection and mineral deposit investigations are also undertaken. The offices maintain files of current mineral claim maps, air photos, geological maps and reports and assessment work submissions for their respective districts.

The following were released: Harper (1982, 1983a, 1983b) and Thomas (1983).

SEDIMENTARY RESEARCH GEOLOGY

The section is responsible for geological studies of the sedimentary rock formations of Saskatchewan, especially in the context of the petroleum and natural gas fields, petroliferous trends, and areas with potential for new discoveries. By so doing, it maintains the expertise on these formations needed by the prospecting industry and departmental staff involved with land evaluation, oil reserve estimation and data management. Other aspects of its role include studies of formations impacting on mining operations in the potash mining district, in central Saskatchewan on their potential for lead-zinc deposits and in northern Saskatchewan on the Athabasca Sandstone formation in the context of uranium phosphate and gold.

The work program of the section was supplemented by M.Sc. projects sponsored at the Universities of Regina and Windsor. Topics of study were on the Mississippian oil fields of southeastern Saskatchewan and the Mesozoic natural gas bearing rocks of western Saskatchewan respectively.

The following reports were released:

Report 150—F. SIMPSON: *Sedimentology, palaeoecology and economic geology of Lower Colorado (Cretaceous) strata of west-central Saskatchewan.*

Report 194—C.E. DUNN: *The Middle Devonian Dawson Bay Formation and its relationship to the Prairie Evaporite in the Saskatoon Potash Mining District.*

INDUSTRIAL MINERALS SECTION

This section undertakes field and laboratory investigations related to the assessment and development of the province's industrial mineral resources.

Research work on the potash beds continued during the fiscal year. Much of the work was concentrated on the origin, diagenetic history, chemistry, mineralogy and physical aspects of geological features which affect ore grade and mine stability.

The inventory of peatland was continued by sampling on selected major peatlands within 60 km of La Ronge. The investigation emphasized the fuel potential of the region. A report on the peatlands examined from 1978 to 1982 was in an advanced stage of preparation.

The Buffalo Narrows Fuel Peat Demonstration Project, funded under the Federal/Provincial Conservation and Renewables Agreement, continued during the fiscal year. Two production fields, each about one hectare, were cleared and prepared for sod peat production. Approximately eight tonnes of fuel peat were produced late in the season. Approximately 15 percent of the fuel, supplemented by imported fuel peat of nearly identical quality, was used for heating three homes and the Municipal garage in Buffalo Narrows during the winter of 1982-83. A reduction in funding resulted in termination of the project.

The following report was published: Fuzesy (1982).

MINERAL RESOURCES DIVISION
MANITOBA DEPARTMENT OF ENERGY AND MINES

SUMMARY

In 1983, 15 parties were engaged in Geological Mapping and Minerals Investigations, and four in Aggregate Resource Appraisals. An intensified core retrieval program was facilitated through job creation initiatives in the spring of the year.

The principal focus of programming continued to be the Lynn Lake district where there is an urgent need to find new ore deposits that could sustain the existing communities and mining infrastructure.

Activities conducted by the Provincial Geological Services Branch were substantially augmented by ground and airborne surveys mounted by the Geological Survey of Canada under the umbrella of the cost-shared Canada-Manitoba Interim Agreement (1983/85), signed June 17, 1983. During the 2-year period of the Agreement, Canada and the province will direct approximately one million dollars of operational expenditures to geoscientific, geophysical, geochemical and mineral deposit oriented survey activities in the Lynn Lake district to complement and assist in targetting mineral exploration in that area.

Much of the initial groundwork in the Lynn Lake greenstone terrain has been completed by the province during the period 1976-82 as a result of which 1:50 000 scale geological maps are now available for the entire area south of Latitude 57°N. In 1983, geological mapping was completed for the Brochet-Big Sand Lake granitoid and gneissic terrain to the immediate north of Lynn Lake.

Mineral deposit studies in the greenstone belt focused on geological settings deemed favourable for base and precious metal occurrences. Stratabound gold mineralization of probable exhalative origin at the Agassiz deposit is now known to occur within a sequence of sulphide-bearing rocks that include ultramafics, metasediments and oxide iron formation. This sequence has been followed from west of Agassiz to north of Arbour Lake where similar mineralization has been identified. Sporadic occurrences of gold mineralization have been identified at this stratigraphic level over a strike length of 15 km, and this sequence is known from regional geological studies and geophysical signatures (INPUT®, gradiometer and total field magnetic surveys) to extend for a further 20 km east of Arbour Lake.

Geochemical studies included lithogeochemistry of host rocks to selected base metal deposits, alteration studies around the Agassiz deposit and biogeochemical studies over several other gold deposits. Samples of spruce trees, Labrador tea and humus material were collected at several localities in the Lynn Lake district and initial results showing gold, antimony and arsenic anomalies downslope (north) of the Agassiz mineralized zone, point to the potential usefulness of this technique in this sparsely exposed terrain. Samples collected from the Lynn Lake Rhyolitic Complex in 1982 were analyzed to determine if geochemical alteration haloes existed adjacent to the known sulphide mineralization.

Till sampling, initiated in 1982, was augmented by an additional 255 holes dug in the Agassiz deposit-Minton Lake area in order to locate down-ice dispersion of heavy minerals from ore deposits buried beneath the overburden. Quaternary stratigraphic investigations continued in the area, and biogeochemical sampling was augmented by 40 samples taken from frozen peat in the sphagnum bog south of the Agassiz mineralized zone.

The Geological Survey of Canada undertook Regional Lake Sediment Surveys of the Granville Lake area providing a sample density of one per 7 km^2 in the north over the greenstone terrain. Water samples obtained during the survey were analyzed in part by the Manitoba Department of Environment to investigate the impact of acid rain on this sector of the province.

Airborne gradiometer surveys were extended east from the 1982 test site, to encompass a 1500 km^2 area including Barrington Lake. This completes the vertical gradient magnetic coverage for the entire east-trending segment of the greenstone belt from Lynn Lake to Longitude 100°W. The results of earlier surveys covering the Flin Flon-Snow Lake region and a test site over Lynn Lake were released on June 30, 1983 as GSC Open File Reports 936 and 937. Ground EMP measurements were made at selected sites in coordination with Sherritt Gordon Mines Ltd.

Regional Surficial mapping was also undertaken by the GSC to provide background information for the analysis of the lake sediment surveys and to add a regional perspective to the basal till studies undertaken by the province.

Although geological mapping of the Churchill Province in Manitoba is well advanced, there continues to be an acute lack of baseline isotopic data that can be used to confirm the Proterozoic/Hudsonian age of the supracrustal assemblages. To address this need, the Provincial Geological Services Branch and Geological Survey of Canada have embarked upon a uranium/lead zircon dating program which this year focused on the volcanic and intrusive units of the Lynn Lake and Flin Flon belts and the selection of samples amenable to zircon concentration.

Detailed 1:20 000 scale geological mapping in the Flin Flon-Schist Lake area completed the intial coverage assigned for this project, defined the stratigraphic setting of the Flin Flon ore deposit, and established important new guidelines for future exploration in the area.

In the Lobstick Narrows area, detailed structural and stratigraphic investigations laid the foundation for more regional mapping—on the south flank of the Kisseynew belt—which will be of critical importance in targetting the search for stratiform base metals, tungsten and gold mineralization from Kisseynew to File Lakes.

At Cross Lake, geological mapping, conducted in conjunction with the rare element enriched pegmatite investigation and vanadium, titanium and anorthosite evaluation, succeeded in establishing a sound stratigraphic and structural framework for the area as a reference base for future work scheduled for this district. More regional mapping completed coverage for the Lawford and Walker Lakes area and documented in detail barren greenstone occurrences on northeast Cross Lake and unique sapphirine mineral occurrences on Sipiwesk Lake. No pegmatites of economic significance were encountered in this area. However, investigations conducted at Cross Lake in cooperation with the Department of Earth Sciences, University of Manitoba, established an intrusive history for the belt, confirmed the regional zonation of pegmatite minerals, and pointed to the eastern group of pegmatites as

being the most fractionated and economically significant segment of the rare element enriched pegmatite field.

On Island Lake, activities were restricted to completing the mapping of the entire western half of the greenstone belt. Mineralized zones were encountered in siliceous metasediments and are associated with felsic intrusives near Henderson Island.

In southeastern Manitoba, gold oriented mineral deposit investigations, conducted in the Wallace Lake-Bisset District, were augmented by geochemical sampling in the San Antonio Mine. Underground mapping resulted in a re-interpretation of the factors controlling the occurrence of gold-bearing quartz veins and suggested the mine "package" constitutes a volcanogenic (exhalative?) association of felsic and mafic tuffs (with only minor diabase), with good strike length, and on the surface, zones to the east, that may not have received appropriate attention. A similar stratigraphic control to mineralizaton is indicated for the iron formation, carbonates, and associated "paragabbros" and metasediments that extend the north flank of the Rice Lake Greenstone Belt from Siderock Lake to at least the Jeep deposit.

The second phase of the platinum metal group evaluation of the Bird River Sill was concluded with the cutting of a 400 m slice across the intrusion. Detailed stratigraphic mapping of the sill has outlined lower dendritic and layered units which remain to be sampled.

The evaluation of the chromite deposits in the Bird River Sill focused on the "Chrome" and "Page" properties, and entailed a detailed stratigraphic analysis of the intrusion and sampling of all chrome-bearing units. The mapping indicated a 60 m wide zone containing a total of 26 chromite-bearing layers which can be grouped into six zones each with diagnostic characteristics that are consistent along strike lengths of over 1.5 km and possibly up to 4 km. Detailed analysis of individual chromites, chromitite seams and intervening host rock is continuing at the Department of Earth Sciences, University of Manitoba.

The evaluation of the lead-zinc potential of Paleozoic rocks continues with geochemical analysis of drill core and basal till sampling of selected profiles in the Interlake area.

Industrial Minerals investigations entailed mapping of dolomite outcrops and quarries in the central Interlake and Wekusko-The Pas area, providing additional data on the vast resources of dolomite in the province. A report on potash deposits in southwestern Manitoba was completed and indicated reserves approaching one billion tonnes grading better than 18% K_2O as sylvite.

The stratigraphic mapping and core hole program for 1983 involved a total of 24 core holes and and five separate projects. A single hole was drilled in the City of Winnipeg area to aid in evaluating groundwater hydrogeology in the vicinity of an abandoned sanitary landfill site; this hole also provided data for the limestone and dolomite resources studies. Three holes were drilled in the Green Oak area to ground-truth a reflection seismic profile run by the Geological Survey of Canada in 1982, in the vicinity of an anomalous Precambrian high. A single drill hole in the Dolly Bay area of Lake Manitoba tested the Elm Point limestone beds to determine the quality of the high-calcium limestone deposits and the structural control for distribution of limestone and dolomite beds in the area. Five holes were located in the Lake St. Martin area to aid in interpretation of the complex structures of the crater fill in this probable meteorite impact feature. Finally, 14 holes were drilled in the general Simonhouse Lake-Wekusko Lake area to determine the nature of Precambrian basement rocks in this area of thin Paleozoic sedimentary cover, and specifically to ground-truth a number of anomalies outlined by recent Federal-Provincial airborne gradiometer surveys. Ground magnetometer profiles were run to pinpoint drill targets. Phanerozoic core from these holes also provided data for the dolomite resources study and structural and stratigraphic Phanerozoic studies.

In the late fall, Branch personnel commenced a car-borne radiation survey of southeastern Manitoba to obtain measurements of background radiation from bedrock sources. Results of this survey are required by the Environmental Management Services Branch as part of their program to evaluate the sources and levels of radiation in ground waters from the Powerview-West Hawk area.

Several field tours were conducted in various parts of the province for the benefit of company geologists, and geologists from the GSC, the latter engaged in compilation work for the Canadian contribution to the Decade of North American Geology Publications.

Branch programming was again augmented by the cooperative research activities of NASA, and by isotopic work conducted by the universities of Manitoba, Windsor, Alberta, the Royal Ontario Musuem, and GSC programs in various sectors of the province.

ONTARIO MINISTRY OF NATURAL RESOURCES, MINERAL RESOURCES GROUP

ONTARIO GEOLOGICAL SURVEY

The goal of the Ontario Geological Survey and the Ministry's Regional Geological Programs is to stimulate exploration for, and facilitate sound planning in all matters related to mineral and all other earth resources by providing an inventory and analysis of the geology and mineral deposits of Ontario. In fiscal 1982-1983, the Ministry carried out 55 field projects in various parts of the province, and supported 22 applied research projects by Ontario universities, as well as 17 exploration technology development projects by the service sector of Ontario's mineral industry. Program Highlights are detailed below.

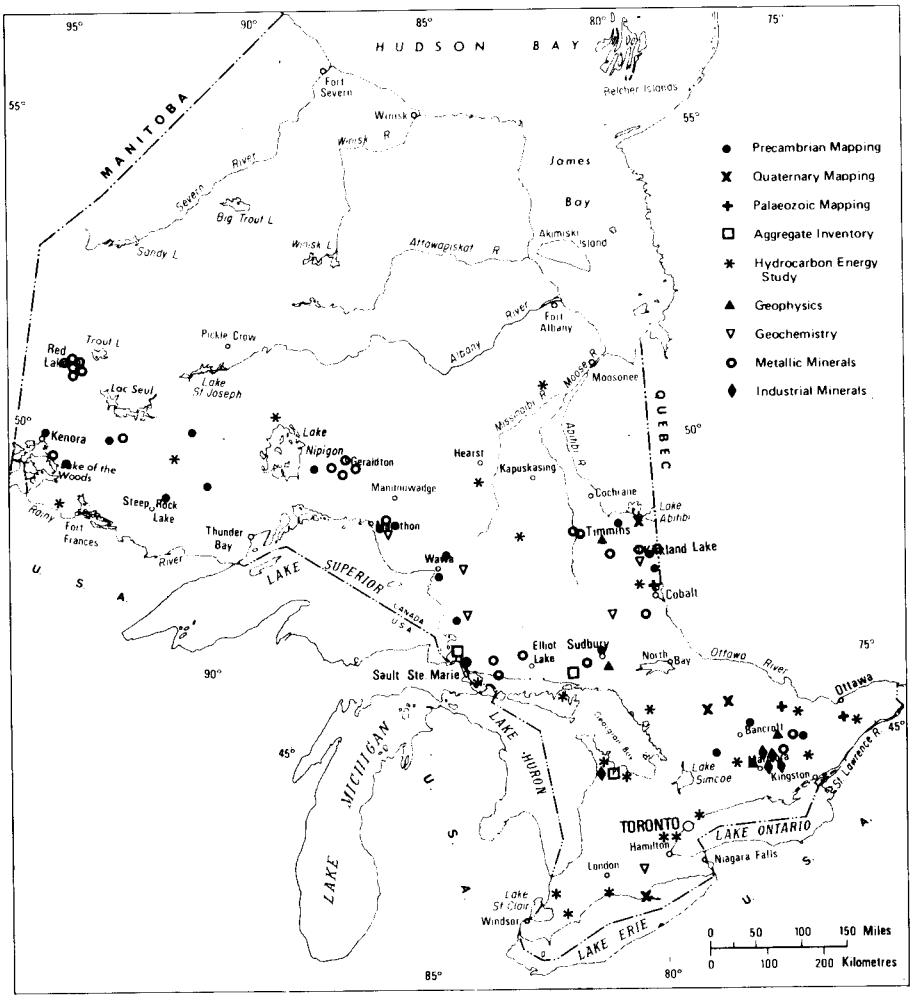


Figure 1 Distribution and type of programs in Ontario.

PRECAMBRIAN SECTION

Geological mapping was carried out by the Ontario Geological Survey in Superior, Southern, and Grenville Provinces by 21 field parties: 11 were directed towards detailed mapping at a scale of 1:15 840 for a total coverage of 2500 km^2; 1 involved reconnaissance mapping at a scale of 1:50 000; 6 were geared towards solving specific problems, and 3 were devoted to developing regional syntheses.

In the Red Lake area, Uchi Subprovince, mapping coupled with geochronology studies has demonstrated that the gold mineralization in this famous mining camp is stratigraphically controlled, albeit on a crude scale. Recognition of alteration zones and strata-parallel faults have helped to elucidate the chemical and tectonic controls that played important roles in localizing the gold mineralization.

Reconnaissance mapping of the Late Precambrian 'Nipigon Plate' identified the presence of felsic subvolcanic and volcanic rocks and a suite of predominantly ultramafic intrusions, thus enhancing the potential of this area for possible copper, nickel, chrome, and platinum mineralization. The extensive diabase sills in this area were found to have been emplaced from diabase cone sheets and dikes.

In the Wawa area, east of Hemlo, extensive areas of carbonate and chloritoid alteration were mapped. Coupled with an increasingly better understanding of the stratigraphy by detailed mapping and geochronology studies, a highly favourable environment for gold and base-metal mineralization is suggested.

An initial study of individual diabase dikes and dike swarms indicate that they show regional variations which can be used to unravel and elucidate the tectonomagmatic history of the Shield. Attendant flow direction studies could have direct economic implications in, for example, locating the source of the silver and cobalt mineralization associated with the Nipissing sills.

Recognition of stromatolites in dolomitic marbles of the Grenville Province should prove to be a powerful future tool in reconstructing paleoenvironments and paleogeography. Specifically, they may be used to identify 'ocean-edge environments' where potential ore-forming elements could be supplied to the sedimentary basin.

ENGINEERING AND TERRAIN GEOLOGY

The 1982/83 activities of the Engineering and Terrain Geology Section, Ontario Geological Survey, involved the regional mapping of the Quaternary geology in selected areas of both northern and southern Ontario and of the Paleozoic rocks in southeastern Ontario and the Sault Ste. Marie-St. Joseph Island area. Inventory and assessment programmes continued for sand and gravel and crushed stone in the "designated" townships of southern Ontario, and for oil shales in southwestern Ontario. Similar programmes were initiated for peat and lignite deposits. Special projects such as Quaternary synoptic mapping and subsidence associated with salt mining were completed.

Quaternary Geology

Six basic mapping (1:50 000 scale) and 3 special studies of glacial and post glacial deposits were conducted in 1982/83. Mapping of the Port Burwell and Long Point map areas, where the high bluffs along much of the Lake Erie shoreline provide good opportunities for detailed stratigraphic studies, was begun. In cooperation with the Ontario Centre for Remote Sensing, remote sensing techniques were evaluated for locating surface and near surface mineral aggregates in the Woodstock area.

Mapping of some 11 000 km^2 within the Algonquin Provincial Park was begun. Emphasis was placed on the determination of the Quaternary history, sediment distribution, and landforms with the intent of providing much direct input into the Park's interpretative program.

A special study on the sedimentology and provenance of esker sediments in the Kirkland Lake

area was initiated. Not only were several kimberlite boulders discovered during this project, but the local interest generated therein saw several other kimberlite boulders reported by local prospectors and others.

Other current projects include the mapping of some 10 000 km^2 of shallow drift covered terrain in eastern Ontario; the mapping of St. Joseph Island; and mapping in the Timmins area.

A regional compilation of Quaternary data, leading to the production of a 1:1 000 000 Quaternary map of the entire province, was initiated.

Paleozoic Geology

The program of 1:50 000 scale mapping of the Paleozoic geology of the province continued in 1982/83 with mapping Ordovician strata of the Ottawa-St. Lawrence Lowland and examining Paleozoic rocks of the Sault Ste. Marie and St. Joseph Island area. As well as refining the Ordovician stratigraphy of the region, the eastern Ontario mapping generated new data and new interpretations of the structural geology of the Ottawa area which have attracted the attention of Ontario Hydro, AECL, and other groups interested in the past, present, and future tectonic history. Also during 1982, a study of subsidence problems associated with the Devonian Sylvania Sandstone of the Windsor area was completed.

Aggregate Resources Inventory Program

Field work was conducted in 20 southern Ontario townships during the 1982/83 field season in order to assess the sand and gravel resource potential of these municipalities. Field work included examination of all potential deposits, and pits and quarries, as well as select geophysical surveys and auger drilling. A special project was also undertaken jointly with the staff of the Niagara District Office. Here, a large commercial drill rig was utilized to delineate the extent and depth of suitable aggregate material as well as to better understand the mode of deposition of the aggregate in a large ice-contact deposit. By the end of fiscal 1982/83, 67 Aggregate Resources Inventory Papers (A.R.I.P.) were published with 40 reports in progress.

Hydrocarbon Energy Resources Program

The 1982/83 fiscal year witnessed the second year of a 5-year Hydrocarbon Energy Resources Program (H.E.R.P.) which involves studies of peat, lignite, oil shale, and conventional oil and gas. The program is being funded by the Ontario Board of Industrial Leadership (BILD). Peatland inventories were conducted by private sector consultants in 4 areas (Armstrong, Hearst, Peterborough, and Pembroke), covering some 35 000 km^2. A field party led by W. Shotyk carried out a peat geochemistry study in northeastern Ontario, and the Ontario Centre for Remote Sensing tested the application of satellite-assisted mapping of peatlands. The Oil Shale Assessment Project involved the drilling of 25 shallow boreholes (<75 m each) into the Devonian Marcellus and Kettle Point Formations and 7 deep boreholes to the Precambrian basement of southern Ontario. One of the latter, drilled near Sarnia, provided the first complete core of the entire Paleozoic sequence of southwestern Ontario. During 1983, 7 reconnaissance boreholes (totalling 865 m of drilling) were completed in the Moose River Basin, James Bay Lowland, for the Lignite Assessment Project. Several previously unknown lignite deposits were encountered. Known and potential oil reserves in 18 deposits in southwestern Ontario were evaluated for the oil and gas component of the Program.

MINERAL DEPOSITS SECTION

The Mineral Deposits Section of the Ontario Geological Survey further developed its program during 1982/83 to meet its 3 main objectives: 1) to document the geology of mineral deposits in Ontario; 2) to provide mineral resource information for use in government planning; 3) to investigate practical applications of research to mineral exploration and bridge the applied technology gap between academia and the exploration industry. The limited resources of the section were supplemented through contracts and cooperative work

with other geologists in government and universities; nevertheless, focus of efforts was necessary to ensure significant achievements in specific program components.

Half of the Section's resources were directed towards investigation of Archean lode gold deposits. Five principal studies were conducted, including a geological data file of the Abitibi Belt, an investigation of the association of gold deposits with felsic intrusions (Abitibi), iron formations (Geraldton), and alteration (Red Lake), and an areal metallogenetic study (Mine Centre). Several subsidiary studies were also conducted. A major publication documenting this work was prepared for release in April 1983.

The remainder of the work was directed to specific investigations in other areas or commodities. A study of possible Archean porphyry deposits neared completion. Three projects were carried out in the Huronian Supergroup to investigate the paleoplacer gold potential, indicated by earlier metallogenetic studies; encouragement from this work has aroused considerable exploration interest. Increasing coordination between mineral deposit studies, including talc, graphite and mica, in the Grenville Province and the industrial minerals studies are leading to a new area of program emphasis which will be further developed.

GEOPHYSICS/GEOCHEMISTRY SECTION

During the 1982 summer season, survey activity by the Ontario Geological Survey continued on the Night Hawk geophysical test range near Timmins, Ontario. The gravity interpretation project was continued this year and was based on previous data covering the Cobalt Embayment-Grenville Front Area. A chapter on magnetics and gravity interpretation is currently being prepared for a Special Volume on the Geology and Mineral Deposits of the Sudbury Structure. A contract to test-fly a commercial aeromagnetic gradiometer system in 1983 has been awarded to Kenting Earth Sciences Limited. An 11 000 line mile airborne survey has been initiated as part of the Black River-Matheson program.

Data obtained over a 3-year period under the Kirkland Lake regional basal till project are being computerized with the objective of producing multi-parameter, geochemical trend maps for displaying down ice dispersion trains in the lower till units and combining this information with mineralogical data from the same horizons. Research in the Wawa area on acidic precipitation is continuing, and now includes some 50 lakes where lake sediment cores have been subjected to limnological, paleonological, and geochemical analysis.

Age dating projects in the North Trout Lake and Red Lake areas are approaching completion, and several new studies in the Southern Province have been initiated. Newly developed U-Pb zircon dating techniques now allow ages to be measured within a precision range of ± 1 to ± 3 Ma in many cases.

REGIONAL AND RESIDENT GEOLOGISTS

Regional and resident geologists of the Ministry maintained 14 offices to provide a strong active technical consultative service. Although the biggest part of staff time was devoted to the mining and exploration industry in the provision of information on the geology and mineral deposits of Ontario, a significant contribution was made to the strategic land use guidelines system, the province's resource management planning tool.

Consultative services were provided in a number of ways. A library of reports submitted for assessment work credit, and of numerous journals and scientific reports, was maintained by each office for public use. Staff made numerous property inspection visits and conducted field trips for government, industry, and university groups.

A program of core collection was started, in anticipation of the province's drill core library system. Several offices continued the production of geoscience data folio maps; these are documents summarizing, as completely as possible, exploration data for specific areas covered by that office.

A number of inventories and scientific investigations were initiated or continued, in cooperation with the Ontario Geological Survey. Some of these included a building stone

inventory of northwestern Ontario; inventories of industrial mineral deposits in central and eastern Ontario; gold deposits studies; stable isotope studies; examination of the potential for placer-type gold deposits in Huronian rocks; and research related to petroleum deposits.

GEOSERVICES SECTION

Geoscience Data Centre

Compilation and computerization of mineral deposit data by the Geoscience Data Centre, Ontario Geological Survey, was continued at 2 levels of detail, i.e. in-depth for gold and shallow for other deposits. Mineral Deposit Inventory files now total 5500.

Newly released Mineral Resources Group publications, and industry exploration (mostly assessment work) reports were indexed and added to both the in-house database and the national GEOSCAN bibliographic file, which now totals 14 700 Ontario Geological Survey entries for Ontario.

Implementation of a province-wide file, index, and microfilm system to improve accessibility to exploration (mostly assessment work) reports was completed for the Sault Ste. Marie, Resident Geologist's office, and was initiated for the Sudbury office.

The installation of a 3270 IBM compatible terminal greatly improved the speed and ease of data entry, program development, and editing of files on the Ontario government's IBM mainframe.

The annual supplement to Miscellaneous Paper MP 77, Index to Publications by the Mineral Resources Group, and the annual microfiche issue of Open File Report OFR 5333, Index to Data in Exploration Reports, were published.

Geoscience Laboratories

The Geoscience Laboratories of the Ontario Geological Survey provide analytical and mineralogical expertise in support of the programs of the Ontario Geological Survey and to meet the obligations to prospectors and developers detailed in The Mining Act (Ontario). To meet this goal, the Laboratories provide a wide range of mineralogical and elemental analyses; keep pace with developments in methods of rock and mineral analysis, mineralogy, and data management; and anticipate or respond to demands for new or improved procedures and develop these accordingly. Research and development work is performed as a component of routine activities by all scientific and most technical staff.

In 1982/83, a method was developed for the determination of the rare earth elements in geological materials. This method involves a novel combination of techniques and allows 'chondrite plots' to be produced for most rock-types of interest. A High Performance Liquid Chromatography (HPLC) unit interfaced with a multi-channel 'simultaneous' Inductively Coupled argon Plasma (ICP) Optical Emission Spectrometer (OES) enables a solution sample to be run on the ICP-OES system whilst separation (preconcentration) of the element(s) of interest (the rare earths) is taking place. Thus, it is possible to determine the rare earth elements free from most interferents, and also to monitor the chromatographic separation so that optimum conditions are maintained.

An automated colorimetric method was completed for the determination of fluoride in silicate rock; the determination limit is 40 ppm. An automated hydride-generation/atomic absorption method also was developed for the determination of selenium in geological materials; the determination limit is 50 ppb in rocks.

Scientific Review Office

The Scientific Review Office of the Ontario Geological Survey is planning to change its present publishing methods to a "Demand Publishing" system based on laser printing, computerized typesetting and page layout, and computerized graphics for illustrations and maps. All work will be done on microcomputers in a local area network. The major benefit of the system will be: reduced production costs due to computerization of previously manual

tasks; demand printing of publications so that only the immediate demand for each publication is met; and the computerization of map production.

Mines Library

The Mines Library of the Ontario Geological Survey is dedicated to providing a complete information and reference service to industry and Ministry personnel on geology and mineral deposits useful to improving our understanding and development potential of the Ontario landmass. New aquisitions continued during the year, and holdings now include 3000 texts and reference books, 20 000 geological and geophysical maps, 250 scientific journals, and more than 25 000 government reports.

ONTARIO GEOSCIENCE RESEARCH GRANTS PROGRAM

In 1982/83, the Ontario Geoscience Research Grants Program, administered by the Ontario Geological Survey, awarded 22 grants totalling $499,973 to 7 Ontario universities. The grants finance mission-oriented provincial research that will provide new geoscience data, concepts, and techniques to the mining industry to help reduce the high risks inherent in exploration and eventually lead to the discovery of valuable mineral deposits, and to governments to aid mineral resource evaluation and land use planning. The projects must also be closely integrated with, but not duplicate the activities of the Ontario Geological Survey.

The following universities received awards: Brock (1), $20,440; Carleton (2), $37,622; McMaster (1), $45,000; Toronto (9), $203,344; Western (3), $81,723; Windsor (2), $37,740; and Waterloo (4), $71,004.

Progress reports by OGRF recipients were presented at the annual OGS Geoscience Research Seminar on December 8 and 9, 1982, along with OGS and Exploration Technology Development Fund project highlights. Grant recipient Keith Bell of Carleton Unversity drew considerable attention when describing his new geochemical method of uranium prospecting, as did Ian Campbell of the University of Toronto when speaking about his new method of using trace elements for discrimination of copper-zinc-mineralized volcanic rocks. It was very good news when the Honourable Alan W. Pope announced in his introductory remarks that Cabinet had decided to renew the Program for an additional 5 years.

EXPLORATION TECHNOLOGY DEVELOPMENT PROGRAM

In 1982-83, the Exploration Technology Development Program of the Ontario Geological Survey began its second year of promoting 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. This Program is sponsored by the Ontario Government's Board of Industrial Leadership and Development (BILD).

This year's program supported 17 project activities to 16 Ontario companies, with a budget expenditure of $984,000.

Completed projects in 1982-83 include the characterization of electrical properties of metallic mineral deposits by Phoenix Geophysics; testing of analytical instrumentation for field determinations of tin and tungsten by Scintrex Limited; the development of a high sensitivity portable/base station magnetometer based on Overhauser effect by Gem Systems Incorporated; modification of the Geotech III frequency helicopter electrogmagnetic system into a 4 frequency system having a lower frequency of 380 Hz. by Geotech Limited; the development of a portable helium detector by alphaNUCLEAR Company; the optimization of vibratory coring drill performance for improved overburden sampling by C.W. Archibald Limited; aeromagnetic gradient characterization of altered volcanics by Questor Surveys Limited; the development of a microprocessor-based receiver for the Dighem airborne EM system; and the development of a continuous reading 2 station very low frequency electromagnetic system with solid state data memory by Herz Industries Limited.

Ontario Geoscience Research Grant Recipients 1982-1983

GRANT NUMBER	PRINCIPAL APPLICANT	UNIVERSITY	TITLE
57	R.F. Mereu	Western	A Microearthquake Survey of the Gobles Oil Field Area of Southwestern Ontario
80	I.H. Campbell	Toronto	Rare Earth Elements in Felsic Volcanic Rocks Associated with Cu-Zn Massive Sulphide Mineralization
92	J.E. Gale	Waterloo	Impact of Groundwater on Surface and Subsurface Mining Activities in the Niagara Escarpment
100	A.D. Edgar	Western	Petrology, Geochemistry, and Economic Potential of the Nipissing Gabbro
105	K. Bell	Carleton	Latter-Stage Decay Products of ^{222}Rn—Use in Radioactive Waste Management and Uranium Exploration
106	A.J. Naldrett	Toronto	Platinum Group Elements in Layered Intrusions
107	D.H. Watkinson	Carleton	Platinum Group Elements in Alkaline Rocks of Northwestern Ontario
112	P.P. Hudec	Windsor	Petrographic Number Re-Evaluation
113	T.C. Kenney	Toronto	Field Investigation of Factors Controlling Changes of Groundwater Pressure in Clay Slopes
114	J.F. Barker	Waterloo	Source, Correlation, and Thermal Maturation History of Hydrocarbon Deposits of Southern Ontario
118	D.W. Strangway	Toronto	Surface Electromagnetic Mapping in Selected Positions of Northern Ontario
127*	J.P. Greenhouse	Waterloo	Gravity Survey of the Upper Dundas Buried Valley
128*	R.N. Farvolden	Waterloo	Subsurface Quaternary Stratigraphy Using Borehole Geophysics
131*	U. Brand	Brock	Source Rock Geochemistry of Pleistocene Tills of Southern Ontario
132*	J.H. Crocket	McMaster	Genesis of Precambrian Iron Formations—Links with Base and Precious Metal Mineralization
134*	W.S. Fyfe and D. Long	Western/ Laurentian	Stratigraphy and Geochemistry of Northern Ontario Carbonaceous Deposits: Onakawana Lignites and James Bay Peats
136*	A.D. Miall	Toronto	Rock Geochemistry as a Placer Exploration Tool
138*	F.J. Wicks	Toronto	Mineralogy and Geochemistry of the Chrysotile Asbestos Deposits of Ontario
140*	J.C. Van Loon	Toronto	Direct Trace Elemental Analysis of Solid Samples by Techniques of Atomic Spectrometry
143*	D.T.A. Symons	Windsor	Analysis of Aeromagnetic Anomalies over Algoman-Type Iron Formations
145*	R.N. Edwards	Toronto	Cross-Hole Magnetometric Resistivity
146*	A.J. Naldrett	Toronto	Contamination and Genesis of the Sudbury Ores

*New OGRF projects initiated in fiscal 1982-1983.

SPECIAL PROJECTS

PROGRAM	DESCRIPTION	FUNDING AGENCY	NUMBER OF PROJECTS	MAN YEARS		BUDGET IN $1000's		
				GEOL.	ASSTS	SALARIES	TCSSE	TOTAL
Southeastern Ontario Geological Survey	Integrated program of Precambrian, Paleozoic, Quaternary Mapping, Metallic and Industrial Mineral Deposits Studies, Aggregate Assessment, Peat Study, Terrain Evaluation & Gradiometer Survey	MNR/ DREI	8	7.5	11	526	434	960
Kirkland Lake Initiative Program	Five year program of Precambrian & Quaternary Mapping, Gold and Uranium Studies, Basal Till Survey & E.M. & Magnetic Surveys	MNA/ DREI	3	2	6	495	160	655
Northern Ontario Geological Survey	A multi-year program to augment the geoscience data base and stimulate mineral exploration and development in Northern Ontario	MNA	5	4	4	135	219	354
Northern Industrial Minerals Study	Five year program to encourage development of industrial minerals production in Northern Ontario	MNA	3	0.5	—	31	142	173
Operation Black River—Matheson	A multi-year program of geological, geophysical and geochemical surveys and mineral deposit inventory and characterization studies	MNR/ MNA	2	1	2.5	87	267	354
Northern Ontario Rural Development Agreement	Community based geological surveys to complete the geoscience data base in a number of specific areas of high mineral potential and support of small scale projects utilizing the available natural resources in rural areas	MNA	2	2	3	80	105	185

CORE STORAGE PROGRAM

In 1982-83, construction on 3 Ministry core libraries in Kirkland Lake, Timmins, and Sault Ste. Marie was planned. The Kirkland Lake and Timmins Library will house 600 000 feet of drill core with the Sault Ste. Marie library having a capacity of 450 000 feet. Each facility will be equipped with a diamond saw to cut and prepare core. Public inspection rooms will be equipped with microscopes for closer examination of core with computerization for easy reference. Each library will provide a core librarian to aid retrieval. Completion and installation of these core libraries is anticipated for late 1983 with an opening to the public in January 1984.

Future core library construction is intended for Bancroft and Tweed in 1983-84, and subsequently at Sudbury, Thunder Bay, and other northwest Ontario centres.

DIRECTION GÉNÉRALE DE L'EXPLORATION GÉOLOGIQUE ET MINÉRALE

MINISTERE DE L'ENERGIE ET DES RESSOURCES, GOUVERNEMENT DU QUÉBEC

L'année financière 1983-84 fut marquée par un accroissement substantiel des activités d'acquisition de connaissances géologiques par la DGEGM. Cette croissance résulte en grande partie de l'atteinte du rythme de croisière des plans quinquennaux de la Fosse du Labrador et de la Gaspésie.

Ainsi la DGEGM a consacré 13 072 000$ au volet "acquisition de connaissances" dont 9 505 800$ en frais reliés directement aux opérations de terrain dans les différentes régions du Québec.

Abitibi-Témiscamingue 2 901 600

Gaspésie—Bas Saint-Laurent 2 968 900

Fosses du Labrador et de l'Ungava 2 430 300

Estrie—Beauce—Québec 435 300

Côte Nord 563 600

Outaouais 206 100

ABITIBI-TÉMISCAMINGUE

La DGEGM a mis de l'avant en 1983-84 seize (16) projets de levés géologiques et gîtologiques dans cette région dont les faits saillants étaient le parachèvement des projets de synthèse dan les régions de Val d'Or, Capisisit-Desmaraisville et Troilus-Frotet.

Des deux projets de géophysique, l'un était la continuation des levés INPUT dans la région de Troilus-Frotet, et l'autre marquait le début d'une étude des grands axes conducteurs dans la région de Chibougamau.

L'année 1983-84 marque aussi la fin des programmes d'exploration de la DGEGM dans cette région (4 projets).

GASPÉSIE—BAS SAINT-LAURENT

La DGEGM avait 39 projets distincts dans cette région. Les 26 projets de levés géologiques (cartographie, stratigraphie, structure, dépôts meubles) et les levés gîtologiques visaient à augmenter considérablement l'information de base afin de produire une synthèse géologique du secteur. Un projet de géochimie des sédiments de ruisseaux visait à terminer la couverture de la Gaspésie dans ce domaine. De plus la DGEGM avait 12 projets de programmes d'exploration qui, l'an prochain, seront intégrés aux projets de levés géologiques et gîtologiques.

FOSSES DU LABRADOR ET DE L'UNGAVA

L'année 1983-84 marque le retour en force des équipes de la DGEGM dans ce secteur. Les faits saillants étaient les trois grands projets de cartographie au 1:50 000 dans les territoires de Cap-Smith, de la rivière Georges et du Lac Brisson; les numbreuses études gîtologiques (6) des indices de Cu, Pb, Zn, Ni, Mn, de la Fosse du Labrador; la poursuite des levés géochimiques de sédiments de fonds de lacs (Rivières Baleine et Caniapiscau) et le début d'une campagne de levés électromagnétiques aéroportés.

ESTRIE—BEAUCE—QUÉBEC

Dans cette région, les travaux ont porté surtout sur des levés géologiques: 4 projets de stratigraphie et de structure et 3 projets d'études gîtologiques (Montauban, Pb, Zn de la plateforme).

CÔTE NORD

L'année 1983-84 a permis de terminer la cartographie géologique à grande échelle de ce territoire. Les autres projets de la DGEGM dans ce secteur portaient sur la tourbe, la pierre de taille et une étude gîtologique des indices de Co Ni dans la région de Gagnon. De plus un levé géochimique de sédiments de fonds de lac fut effectué dans la Groupe de Wakeham à l'est de Havre Saint-Pierre.

OUTAOUAIS

Les deux projets de la DGEGM dans ce secteur portaient sur le marbre et le graphite dans la région de la Gatineau.

Les résultats préliminaires de l'ensemble de ces travaux seront rendus publiques dans la mesure du possible lors du Séminaire d'information les 23 et 24 novembre prochains.

MINERAL RESOURCES DIVISION
NEW BRUNSWICK DEPARTMENT OF NATURAL RESOURCES

Geoscientific and related activities of the Mineral Resources Division were carried out at a somewhat reduced level in 1982-83. During the preceding decade, an average of about 1.5 million dollars was spent annually in New Brunswick on government-sponsored geoscientific work. In 1982-83 this average spending was cut in half to about $700 000. The reduction can be directly attributed to the termination of federal-provincial mineral development agreements in 1982—agreements that had been in effect since 1970.

The Division's activities were concentrated in five major fields. These include 1. Geological mapping, 2. Regional silt and till sampling, 3. Gravity surveying, 4. Mineral potential evaluation, and 5. Process and mining research.

GEOLOGICAL MAPPING

Bedrock mapping was carried out in the northwestern part of the province (21 O/7) at 1:50 000 scale and at 1:20 000 scale in the Bathurst-Newcastle camp (09). This mapping is part of a continuing programme in which it is hoped to have the entire province (exclusive of the Central Carboniferous platform and the Moncton Basin) mapped at 1:50 000 scale by 1990. Surficial geological mapping, including soil and till sampling as well as limited bedrock mapping, was carried out in the 21 O/7, 21 O/16 and 21 O/2 areas. This work was directed towards the evaluation of granular aggregate resources, forest site classification and mineral potential of the areas cited.

REGIONAL SILT AND TILL SAMPLING

Geochemical sampling was carried out in the panhandle area of Madawaska County, and the samples analyzed for 10 metallic elements as well as uranium. The results are expected to be available to the public in early spring, 1984.

GRAVITY SURVEYING

Gravity surveys are being undertaken between Kings Landing and Magaguadavic Lake in the 21 G/14 and 21 G/15 area. Nine hundred and fifty-eight new gravity stations were established in the area underlain by the eastern flank of the Pokiok Batholith. An additional 500 stations will be established next field season before the final report wil be prepared. The purpose of this work is to locate possible additional targets containing Lake George antimony-type deposits.

MINERAL POTENTIAL EVALUATION

Several projects designed to evaluate the potential for specific mineral commodities in the province were continued. These included a limestone resource inventory, oil shale potential study, peatlands inventory, a stratigraphic and structural study of the tin-tungsten-bearing rocks of the Mount Pleasant caldera, and an economic evaluation of the gold-bearing rocks of the Bay of Fundy coastal zone.

PROCESS AND MINING RESEARCH

Two process research projects were carried out under contract by the New Brunswick Research and Productivity Council. These were part of an ongoing study to determine the economic viability of New Brunswick oil shale deposits. The work involved fluidized bed combustion tests using New Brunswick coal and oil shale and retorting of oil shale. A third contract research study involving potash pillar stability was carried out by John D. Smith Engineering Associates Ltd.

Additional work included geological and geophysical investigations of the Miramichi earthquake area, a digital mapping pilot project, presentation of prospecting courses and the contribution of New Brunswick stratigraphic nomenclature to the Atlantic volume of the CSPG Lexicon of Stratigraphic Names.

GEOSCIENTIFIC SURVEYS

NOVA SCOTIA DEPARTMENT OF MINES AND ENERGY

INTRODUCTION

The Geological Surveys Division is responsible for the achievement of improved understanding of the geology and mineral resources of the province through its own investigations and through analysis of private sector activities. Information generated by Divisional activities, supplemented by resource data generated through the efforts of the Mineral Development and Energy Resources Divisions, is disseminated through the publication of maps and reports intended to assist in the optimal realization of the province's mineral potential.

PROGRAM HIGHLIGHTS

Programs undertaken in 1982-1983 were largely cost-shared by the Nova Scotia Department of Mines and Energy and Canada Energy, Mines, and Resources under the terms of the Canada-Nova Scotia Mineral Development Agreement 1981-1984 signed in December 1981.

Coincident with a high level of exploration activity in Nova Scotia's former gold districts, the Geological Survey of Canada and the Nova Scotia Department of Mines and Energy undertook concurrent but discrete surveys in the Eastern Shore area. The programs, with active participation by staff and students from several universities, were designed to provide greater insight into factors controlling the distribution and origin of gold deposits in the Meguma Group. The combined map areas were surveyed by Canada Energy, Mines, and Resources using the high sensitivity aeromagnetic gradiometer as an aid to both public and private sector activities. Ground-based gradiometer surveys were also applied as an aid to detailed mapping of the Meguma Group.

Exploration geochemistry was continued in northern Nova Scotia and in Cape Breton Island. Both stream sediments and lake-bottom sediments were sampled, the latter in southeastern Cape Breton Island. The project was directed by the Province's senior geochemist, but was otherwise funded entirely by Canada Energy, Mines, and Resources.

The Provincial Pleistocene geologist, with funding provided by Canada Energy, Mines, and Resources, continued a regional program of surficial mapping and till geochemistry in

northern mainland Nova Scotia. A detailed study of surficial deposits in the Forest Hill gold district was undertaken to determine possible application of till geochemistry to gold exploration.

Carboniferous strata in the Sydney Basin of Cape Breton Island have been mapped in detail in an effort to assess the total mineral potential of this major coal basin. The contiguous Glengarry Basin, in which Carboniferous rocks host the Yava lead deposit, the Pine Brook barite deposit, and the former Kaizer celestite mine at Loch Lomand, was also mapped in detail. Sedimentary rocks of Carboniferous age have traditionally formed the cornerstone of Nova Scotia's mineral industry, and will continue to be the focus of major survey activities.

Surveys undertaken in Nova Scotia by Canada Energy, Mines, and Resources under the Canada-Nova Scotia Mineral Development Agreement include geological mapping in part of the Antigonish Highlands, in the Tatamagouche Syncline of northern Nova Scotia, and selected areas in southwestern Nova Scotia.

In addition to survey activities, Nova Scotia continued to maintain a comprehensive inventory of mineral resource data, and has expanded its core library facilities in Stellarton. Studies of aggregate resources, silica sand and clay, in part funded through the Mineral Development Agreement, were conducted in selected areas. An inventory of coal and peat resources continued as a major thrust of the Energy Resources Division.

Nova Scotia looks forward optimistically to continued growth in the mining sector of the provincial economy. Survey activities will continue to encourage and assist the private sector in the coming year.

MINERAL DEVELOPMENT DIVISION
NEWFOUNDLAND DEPARTMENT OF MINES AND ENERGY

During the 1982-1983 fiscal year, the Mineral Development Division continued programs in geological mapping, geochemistry, mineral deposit studies, Quaternary mapping and information services. Many of these programs were carried out under a new two-year cooperative minerals program with the Federal Department of Energy, Mines and Resources.

Geological mapping was carried out at the 1:50 000 scale in insular Newfoundland and the 1:100 000 scale in Labrador. Recent (post-1970) mapping at these scales is now available for 36% of insular Newfoundland and for 30% of Labrador. During the 1982 field season six mapping projects were carried out in insular Newfoundland (Figure 1) and five in Labrador (Figure 2). Mapping on the island resulted in a reinterpretation of metasedimentary rocks and gneisses along the south coast as metamorphosed Ordovician strata, rather than as a Precambrian basement complex, and in the extension of the stratigraphic-tectonic framework developed in northeastern Newfoundland into previously poorly known areas along the south coast. The stratigraphy established for the Cambro-Ordovician sequences on the west coast of the island was further refined and extended southward along the carbonate belt.

Mapping in Labrador concentrated on the northern part of Grenville Province and established that much of the high grade metamorphism and granitoid plutonism in that area resulted from a circa 1650 Ma orogenic event, rather than the Grenvillian Orogeny; the Grenvillian is associated with structural reworking and a moderate metamorphic overprint of this lower Proterozoic belt, but generally appears to be a much less intense and widespread event than previously envisaged. New projects along the boundary between the Churchill and Nain Provinces in northern Labrador redefined this boundary, defined the extent of very old (>3000 Ma) Archean crust and established that much of Churchill Province near the boundary consists of reworked Archean rocks.

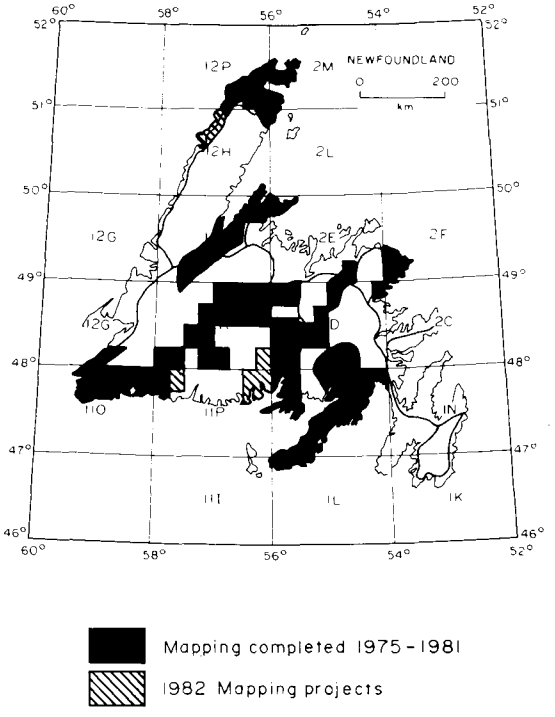


Figure 1 Geological Mapping, Newfoundland.

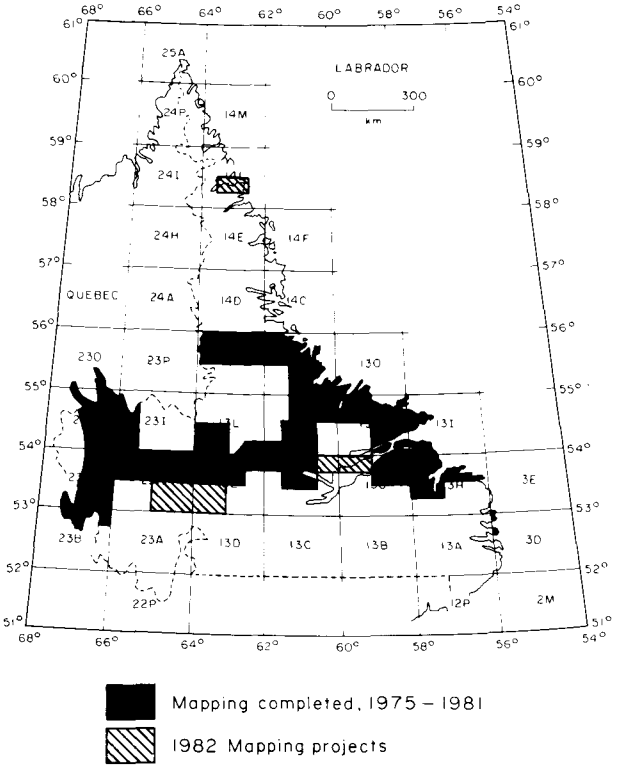


Figure 2 Geological Mapping, Labrador.

The Geochemistry Section released the results of a 1981 lake sediment sampling program in northwestern Newfoundland early in 1982. This completes the sampling phase of the regional lake sediment program on the island, a program which was begun in 1973. Further work in this program will involve the compilation of a geochemical atlas at the 1:1 000 000 scale, and the expansion of the element suite determined on the lake sediments (currently Cu, Pb, Zn, Co, Ni, Ag, Mo, U, F, Mn, Fe and LOI) to include Cd, Ba, Sn, W, As, and other elements in selected areas.

Regional lake sediment sampling in Labrador, interrupted by the end of the Federal-Provincial Uranium Reconnaissance Program in 1979, was reinstated in 1982, under the cooperative minerals program with Energy, Mines and Resources Canada. Lake waters and sediments were sampled from an area of 50 000 km^2 in southwestern Labrador (Figure 3) with an average sample density of 1 per 13 km^2 under a contract supervised by the Geological Survey of Canada. The sediment samples were analyzed for U, Cu, Pb, Zn, Co, Ni, Ag, Mo, Mn, Fe, F, As, Hg and LOI, and water samples for U, F and pH.

Early in 1982 a computer unit was established within the Geochemistry Section, to help meet the data processing needs of the scientific staff of Mineral Development Division. The unit is developing computer-supported systems for the compilation and management of resource data in the areas of lake sediment geochemistry, lithogeochemistry, metallogeny and mineral aggregate inventory.

The Mineral Deposits Section continued its programs of metallogenic studies, industrial mineral assessment and mineral occurrence inventory. The assessment of the mineral potential of clastic sedimentary basins in insular Newfoundland, which was initiated in 1981 in Notre Dame Bay, was continued in shale basins on the Avalon Peninsula and in western Newfoundland, where lake sediment geochemistry had revealed anomalous base metal values. A second major metallogenic study was started in western Notre Dame Bay, with the objective of more closely defining the geologic setting of volcanogenic sulphide occurrences there.

The major emphasis in industrial mineral assessment in 1982 was on barite; an initial examination of known occurrences was carried out and new occurrences were located. The mineral occurrence inventory program is a two part project, comprising a manual mini-report on each mineral occurrence in the province, and a computerized mineral index. In 1982 the manual file was completed for approximately 80% of the island of Newfoundland.

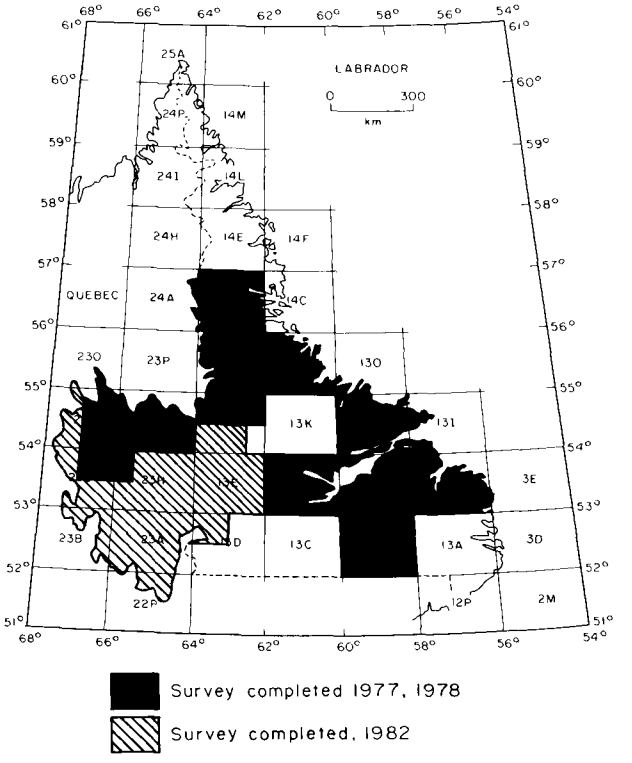


Figure 3 Regional Geochemical Surveys, Labrador.

The Environmental Geology Section continued programs in surficial mapping and aggregate resource assessment. Surficial mapping continued in the central volcanic belt of Newfoundland, to provide information on glacial dispersal of rock materials as an aid to mineral exploration; three regional pulses of ice movement have been identified in this area. A detailed surficial mapping project was conducted in the Waterford River basin near St. John's, in cooperation with the Department of Environment, as an aid to hydrologic studies aimed at tracing the effects of urban expansion on stream water quantity and quality. Quaternary mapping and till geochemistry analyses were completed in the Deer Lake area, where mineralized boulders had been located. Three regional phases of ice movement were also identified in this area.

Aggregate resource assessment proceeded on two fronts, one regional, involving compilation and computerization of data gathered in regional aggregate studies since 1975, the other detailed, aimed at identifying areas of high quality aggregate resources within municipal and other planning areas, and ensuring that use of these resources is incorporated into municipal plans. Twelve municipal planning areas were examined during the 1982 field season.

One of the major highlights of the year for the Publications and Information Section was the publication of the first in a series of geological memoirs, summarizing the results of major, long-term geological mapping projects; the first memoir, by Ian Knight, described the

geology of the Bay St. George Carboniferous basin in western Newfoundland. The memoir is accompanied by a colored map, the first of a series to be produced by our cartographic unit.

The Section also added drill core storage libraries at Pasadena and Goose Bay to the existing facility at St. John's, bringing the total drill core storage capacity to some 320 000 m.

This Section also handles all aspects of Information for the Mines Branch. Sales of publications, open files, and copies of assessment reports were comparable to the previous year despite a drop of about 25% in industry exploration activity. More and more of the information requests are now filled with microfiche as about 75% of our assessment files are available in that form. To provide bibliographic access to these files, the section continued to contribute to GEOSCAN, the national geoscientific database.

GEOLOGY DIVISION

DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT, NORTHWEST TERRITORIES

The Geology Division of the Northern Affairs Branch (DIAND) conducted extensive field programs during 1983. Northern Affairs administers the non-renewable resources sector on Canada Lands, which are mainly north of 60° north latitude. The NWT Geology Division, mainly through the efforts of four District Geologists, monitors mineral exploration in approximately one third of Canada's land mass. In 1983 this resulted in one or more visits to over 100 exploration projects, 12 producing mines, 10 milling plants and a dozen prospectors.

Technical advice and geological information was provided mainly by the staff of the Archives Section and our eight geologists. In excess of 1000 geological queries were answered. The C.S. Lord Core Library provided material and facilities to approximately 50 users, mainly locally based groups and visiting government and university researchers.

The 30 field studies financially supported by the Geology Division were spread from the high Arctic (Baffin and Prince of Wales Islands) to Norman Wells and Fort Smith. Expediting service was provided out of Yellowknife for 10 Geological Survey of Canada field crews and 22 university sponsored projects supported by the Geology Division.

In the Keewatin, P.J. Laporte (District Geologist) mapped in the Judge Sissons-Schultz Lake area where Urangesellschaft have a large unconformity-related uranium deposit projected for production sometime in the next decade. Laporte also collected water samples around operating drill rigs as part of a study designed to provide base line data on health hazards, unique to uranium exploration. Professor J.A. Donaldson of Carleton University continued a study of regoliths along unconformities that have been targets for uranium exploration.

In the Arctic Islands, W.A. Gibbins (District Geologist), examined ultramafic rocks near the coast of Prince of Wales Island for carving stone. This is part of a long term project to find carvable stone for the Inuit carving industry which has a gross market of 10 to 12 million dollars a year. A University of Alberta student (F.W. Nentwich) conducted field research on the Cape Crawford Formation on Northern Brodeur Peninsula (Baffin Island). The results of this will be a Ph.D. thesis and new insights into the Paleozoic of the eastern part of the Arctic Platform.

In the Cordillera, I. Muir, University of Ottawa, studied a Middle-Devonian sequence comprising Hume, Hare Indian, Ramparts and Canol Formations that form a shale platform/basin margin/basin sequence.

Two university projects and a joint Geological Survey-NAP mapping project were completed in part of the Churchill Structural Province northeast of Fort Smith. L. Patterson (University

of Alberta) mapped high grade metamorphic rocks in the Tsu Lake area. Geochemical and isotope studies to assist in interpreting the genesis and dating these rocks are underway. L. Aspler completed a project designed to unravel the stratigraphy and structure of the Nonacho group supracrustal rocks within the mid-Proterozoic (Paleo-Helikian?) Nonacho Basin. New 1:50 000 scale maps of the basin will be available in 1984 and a Ph.D thesis on these strata is nearing completion. N. Culshaw (GSC) led a NAP Geology Division mapping crew in the Rutledge Lake Area where Ni-Cu sulphide showings were discovered in 1982. A preliminary map showing the relationships of the granulite/upper amphibolite facies rocks of this complex area will be available in the near future.

Professor D. Smith (University of Alberta) began a study of the mineralogy and chemistry of the Thor Lake rare-metal-bearing alkaline intrusive complex that lies just north of Hearne Channel on Great Slave Lake. The parameters of this study have not yet been defined. R. Meintzer (University of Manitoba) completed the field work component of an evaluation of the petrology, geochemistry and genesis of the rare-metal-bearing pegmatite dikes and related granites in the Yellowknife Supracrustal Basin.

Nine field projects are underway in or adjacent to the Yellowknife Volcanic Belt, host to the Con and Giant Goldmines. H. Helmstaedt (Queen's University) is re-evaluating existing geological maps of the belt and preparing a new unified set of detailed maps (1:15 000 scale?) and as well a new set of 1:50 000 scale maps of Yellowknife Bay, Prosperous Lake and Quyta Lake areas (NTS 85 J/8, 9, 16). W.K. Fyson (University of Ottawa) continued a long term project to unravel the complex structural History of the Slave Structural Province particularly the supracrustal component, the Yellowknife Supergroup. G. Bailey (Queen's University) began a study of the Jackson Lake Formation, probably the youngest sedimentary unit in the Yellowknife Volcanic Belt. J.A. Brophy (NAP, Geology) continued detailed mapping of a small area of complex volcanic rocks that represent a lower part of the Kam Formation. W.A. Padgham reassessed exposures believed to represent the topmost part of that formation, the Giant Section, just east of the Giant Mine Plant. He also explored parts of the West Mirage Islands previously identified as representatives of the basaltic Kam Formation, but now considered part of the overlying Banting Formation which is considerably more felsic. A.M. Goodwin (University of Toronto) began a geochemical study of Slave Province volcanic rocks by studying and sampling the Kam Formation of the Yellowknife Volcanic Belt.

G. Yeo (NAP Project Geologist), headed a large field crew that completed reconnaissance in the Quyta Lake Area, which contains the northern end of the Yellowknife Volcanic Belt and more felsic outliers, such as the Clan Lake volcanic pile, whose relationship to the Yellowknife Belt is of considerable interest. Yeo also mapped part of the Reid-Hidden Lake area, proposed site of a territorial wilderness park or preserve and locale of numerous gold and rare metal properties.

Farther from Yellowknife in the Slave Province, R.St.J. Lambert (University of Alberta) sampled volcanic belts in the southeastern part of the province to further an assessment of the geochemical evolution of Archean crust.

G. Yeo (NAP Geology), assisted by a crew of 6 graduate and 4 undergraduate students, mapped most of the west half of the Hepburn Island Area (NTS 76 M). Preliminary maps for 76 M/3, 4, 5, 6 and 12 will be released early in 1984. In the same general area W.A. Padgham, V. Jackson and B. Fischer completed a reconnaissance of the Anialuk River Granite gneiss, host to the Arcadia gold quartz veins. G. Yeo, J. Crux and C. Relf mapped the Canoe Lake Volcanics (76 M/13) in detail. This will be the basis of a B.Sc. thesis for Relf at Queen's University. Additional field work is planned in the Anialuk River granite gneiss and adjacent parts of the Hepburn Island area in 1984.

Assistance was given to geological work by other parties in six areas of the Bear Structural Province. J. Patterson (GSC and Virginia Polytech) was assisted in studies in the East Arm of Slave Lake and in the western part of the Goulburn Group of the Kilohegok Basin. K. Pelletier

(NAP Geology) began mapping the Ellington Lake Area (86 F/3) concentrating on the supracrustal succession. Farther north, S. Bowring (University of Kansas) continued studies in the Adam, Benoit, Dumas, Kamut Lakes area along the Wopmay suture. He collected copious volumes of material for zircon dating, part of a joint project to date the development of the Wopmay Orogen. K. Munro (Carleton University) worked from Bowring's camp to map volcanics in the Dumas Group. Prof. D. St-Onge (Terrain Sciences, GSC and University of Ottawa) studied the surficial geology of Glacial Lake coppermine and with A. Mercier (University of Ottawa) the glacial deposits of the Richardson River Valley. A crew of American researchers including Neil Irvine of the United States Geological Survey, and other United States University personnel were assisted in a study of the Muskox Intrusion.

A bald eagle research project led by Professor R. McLelland of the University of Montana was assisted for the third and final year. This project tracks eagles from their fall fishing grounds on the Snake River to their wintering area in various parts of the western United States and to their nesting sites. Geology became involved when aircraft were found necessary to trace the eagles' tail-borne radio transmitters because they had flown into the roadless northern areas beyond the range of automobile-borne tracking devices.

EXPLORATION AND GEOLOGICAL SERVICES DIVISION, YUKON DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT

ACTIVITIES

The 1982 Whitehorse Geoscience Forum was held December 6-8, 1982. All geologists on staff presented papers to an audience of about 170 geologists, prospectors and interested lay people.

Basic prospecting courses in Mayo and Watson Lake were conducted during the winter of 82-83 and all geologists on staff contributed to the running of basic and advanced prospecting courses in Whitehorse.

PERMANENT STAFF

The Geology Division staff includes 5 geologists, an office manager, a core librarian and a secretary. Numerous projects were undertaken by the Division in 1982, both by permanent and term staff members and also on a contract basis by individuals associated with universities.

Jim Morin, Chief Geologist and Regional Manager of the Division, continued his investigations of continental volcanic rocks in western Yukon and precious metal occurrences throughout Yukon.

Mineral Geologist Grant Abbott continued his investigations of the structure and stratigraphy of the Macmillan Pass area in eastern Yukon. A large part of his fieldwork involved active consultations with industry workers in the area concerning how their rocks more or less fitted into the regional picture that he has developed. The Macmillan Pass area is host to several stratiform base-metal shale-hosted deposits and a major tungsten skarn deposit, and as such, the geological picture Grant is developing is much needed. Grant also studied structure in the Clinton Creek asbestos mine area west of Dawson.

Steve Morison joined the permanent staff in January 1982 as a Placer Geologist, along with Staff Geologists Pat Watson and Kate Grapes. Steve's responsibilities include placer, coal, and surficial geology along with industrial minerals. His background demonstrates expertise in surficial geology, much of it with the Geological Survey of Canada in Yukon. The placer gravels in the drainage basin of Clear Creek were his main study this year.

Staff Geologist, Pat Watson is responsible for evaluating assessment reports and summarizing exploration work in the Whitehorse and Watson Lake Mining Districts. Her field activities in 1982 mainly involved geological mapping of the Pattison Pluton in the Dawson Range.

Staff Geologist, Kate Grapes is responsible for maintaining and updating mineral occurrence-claim maps along with exploration work summaries for the Mayo and Dawson Mining Districts. Her field activities were divided in 2 - first working in the shales of the Macmillan Pass area with Grant Abbott and later with Steve Morison describing surficial sections in the Clear Creek area.

CASUAL/TERM STAFF

Fieldwork of several geologists was supported in full or in part by DIAND contracts—R. Debicki, P. Reid, G. Lowey, M. Smith, G. Lynch and D. Emond.

Geologist, Ruth Debicki spent the field season studying Yukon placer mining operations. She produced a report on these covering the period 1978-1982 that will be released in late 1983. The extensive data, text, map and photo documentation provides a much needed base reference volume for the Yukon placer mining industry.

Pam Reid completed her fieldwork on a Triassic bioherm at Lime Peak east of the south end of Lake Laberge. Her research work towards a Ph.D degree is being conducted at the University of Miami and her fieldwork is supported by a DIAND research contract. She extrapolated her study in 1982 to an Upper Triassic bioherm at Hill 4308 in the Laberge map area.

Grant Lowey continued his fieldwork towards a Ph.D at University of Calgary on the sedimentology of Eocene conglomerates in western Yukon Crystalline Terrane. These areas of fluvial coarse clastic accumulations are of economic interest because of their gold, coal, and uranium potential.

Monica Smith completed another of several season's fieldwork in the continental volcanic rocks of Late Cretaceous to Paleocene age at Mount Skukum, southwest of Whitehorse. These rocks consist of an andesitic stratovolcanic facies intruded by rhyolitic plugs and dikes with possibly related rhyolitic ash flows. Fractures in the volcanic and nearby basement rocks are host to epithermal precious metal-bearing quartz-carbonate veins. Her research work is being conducted at the University of Manitoba.

Diane Emond completed her fieldwork on the EPD stanniferous breccia on the eastern side of the McQuesten River. The chlorite-tourmaline-cassiterite breccia is hosted in quartz-chlorite schists and amphibolite and is within the thermal aureole of a granitic plug. This style of mineralization is becoming more recognized as being important for tin and tungsten in the May area. Part of her fieldwork was supported by Billiton Canada Limited and her research work towards a M.Sc. degree is being done at Carleton University.

Greg Lynch completed his fieldwork involving the mapping and sampling of the Pattison Pluton which forms the basis of his B.Sc. thesis at the University of Ottawa. Thesis advisor, Calvin Pride, participated in the field and laboratory research follow-up on these rocks. Major textural variations, abundant miarolitic cavities, and a copper-molybdenum showing make this pluton an excellent example of a high level felsic magma chamber that may be related to copper-molybdenum porphyry type mineralization in this part of Yukon Crystalline Terrane.

GEOLOGICAL PUBLICATIONS

PROVINCIAL AND TERRITORIAL SURVEYS

1982 – 1983

BRITISH COLUMBIA

PUBLISHED OUTPUT 1982-1983

Bulletin 64: *Porphyry copper and molybdenum deposits, west-central British Columbia,* by N.C. CARTER.

Paper 1982-1: *Geological fieldwork, 1981* - a record of the geological field program in 1981.

Paper 1983-3: *Correlation of lower Cretaceous coal measures of Peace River, B.C.,* by P.McL. DUFF and R.D. GILCHRIST.

PRELIMINARY MAPS AND NOTES

48 *Geology of the Kamloops group near Kamloops (92 I NE),* by T. EWING. (1:50 000)

49 *Geology of the Moyie Lake area, Purcell Mountains, southeastern British Columbia (82 G W),* by T. HØY and L. DIAKOW. (1:50 000)

50 *Geology of the Akie River, Ba-Pb-Zn mineral district 94 F/1, 2,* by D.G. MACINTYRE (1:50 000)

MAPS

- *Geology of the Unuk River-Salmon River-Anyox area (NTS 103 O, P, & 104 A, B)* by E.W. GROVE, three coloured maps and sections, scale 1:100 000.
- *Faults, tectonic belts and thermal springs of the Canadian Cordillera,* a transparent overlay for geological map of B.C., scale 1:2 000 000.

REGIONAL GEOCHEMICAL SURVEYS

B.C. RGS-7, Hope, NTS 92 H

_____ RGS-8, Merritt, NTS 92 I

_____ RGS-9, Pemberton, NTS 92 J

Maps and data regularly updated in the following series are available:

Mineral Inventory Maps (issued as ozalid prints) - show location and commodities of all known mineral deposits.

Mineral Assessment Report Index Maps - show the location and number of reports accepted for assessment credit by the Ministry.

MINFILE - a revised and updated output of MINFILE made available during 1981.

Main papers published in external refereed and technical journals and for technical meetings in 1982 include the following:

HØY, T.: *The Purcell supergroup in southeastern British Columbia: sedimentation, tectonics and stratiform lead-zinc deposits, in* R.W. HUTCHINSON, C.D. SPENCE and J.M. FRANKLIN, editors, Geological Association of Canada Special Paper 25, p.127-147.

_____: *Stratigraphic and structural setting of stratabound lead-zinc deposits in southeastern British Columbia,* Canadian Institute Mining Bulletin, Volume 75, p.114-134.

MACINTYRE, D.G.: *Geological setting of recently discovered stratiform barite-sulphide deposits in northeast British Columbia,* Canadian Institute Mining Bulletin, Volume 75, p.99-113.

MCMILLAN, W.J.: *Behavior of uranium, thorium and other trace elements during evolution of the Guichon Creek batholith, British Columbia, in* Uranium in Granites, Y.T. MAURICE, editor, Geological Survey of Canada, paper 81-23, p.49-54.

ALBERTA GEOLOGICAL SURVEY

PUBLICATIONS 1983

FENTON, M.M., and ANDRIASHEK, L.D. In press. *Quaternary stratigraphy and surficial geology. Sand River map sheet, NTS 73 L.* Alberta Research Council, Bulletin.

FLACH, P.D. In press. *Oil sands geology—Athabasca Deposit north.* Alberta Research Council, Bulletin.

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LANGENBERG, C.W. 1983. *Polyphase deformation in the Canadian Shield of northeastern Alberta.* Alberta Research Council, Bulletin 45.

MACDONALD, D.E. In press. *Geology and resource potential of phosphates in Alberta.* Alberta Research Council, Earth Science Report.

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WILSON, J.A. In press. *The geology of the Athabasca Group in Alberta.* Alberta Research Council, Earth Science Report.

OPEN FILE REPORTS

BOON, J.A., and HITCHON, B. 1983. *Application of fluid-rock reaction studies to in-situ recovery from oil sand deposits, Alberta, Canada—III. Additional data on an experimental-statistical study of water-bitumen-shale-reactions.* Alberta Research Council, Open File Report 1983-01.

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MAPS

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_____ Leader of field trip in Kirkland Lake area for Carleton University and University of California at Santa Barbara, *Komatiitic and tholeiitic lavas—sampling program*. July 26-29, 1982.

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CONFERENCES ATTENDED BY MEMBERS OF STAFF

April 14-16, 1982—18th Forum on Geology of Industrial Minerals, Bloomington, Indiana.

April 22-23, 1982—Finnish Peat Symposium, Trade Commission for Finland, Harbour Castle Hotel, Toronto.

May 14-20, 1982—G.S.C.-M.A.C. Annual Meeting, Winnipeg, Manitoba.

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DP 82-11: *Région du lac Inconnu, district de Chibougamau*—C. PICARD

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DP 82-13: *District du lac Thomelet, district de Chibougamau*—F. CHARTRAND

DP 82-14: *Gîtologie des indices de cuivre du lac Musset, Fosse du Labrador*—B. BRASSARD

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LIST OF PUBLICATIONS, 1982 and 1983

MEMOIR 1: *Geology of the Carboniferous Bay St. George Subbasin, western Newfoundland,* by IAN KNIGHT. Includes Map 82-1(colored) and illustrations. Report, 358p.

REPORT 82-1: *Current Research.* Contains technical reports on 1981 field and office projects of the Mineral Development Division. C.F. O'DRISCOLL and R.V. GIBBONS (Editors).

REPORT 82-2: *Geology of the Gabbro Lake and McKay River map areas (23 H/11 and 23 H/12), Labrador,* by T. RIVERS. Report plus two (1:50 000) 2-color maps.

REPORT 82-3: *Preliminary conodont biostratigraphy and correlation of Lower to Middle Ordovician carbonates of the St. George Group, Great Northern Peninsula, Newfoundland,* by SVEND STOUGE.

REPORT 82-4: *Geology of the Gander Lake (2 D/15) and Gander River (2 E/2) areas, Newfoundland,* by FRANK BLACKWOOD.

REPORT 82-5: *Geology of the Wolf Mountain (12 A/2W) and Burnt Pond (12 A/3E) map areas, Newfoundland,* by W.L. DICKSON.

REPORT 82-6: *Geology of the Flowers River-Notakwanon River area, Labrador (Parts of N.T.S. areas 13 M and 13 N),* by J.D. HILL (includes 2 colored 1:100 000 scale geology maps). Report, 140p.

REPORT 82-7: *Geology of the Kaipokok Bay-Big River area, Central Mineral Belt, Labrador,* by C.F. GOWER, M.J. FLANAGAN, A. KERR, and D.G. BAILEY. Report (77p.) plus 2-color geology map (1:100 000).

REPORT 82-8: *Geology and mineral potential of south-central Newfoundland,* by S.P. COLMAN-SADD and H.S. SWINDEN.

REPORT 83-1: *Current Research.* Contains technical reports on 1982 field and office projects of the Mineral Development Division. Compiled and edited by M.J. MURRAY, P.D. SAUNDERS, W.D. BOYCE, and R.V. GIBBONS. Report 228p.

REPORT 83-2: *Inventory of aggregate resources in Newfoundland and Labrador—Report and index maps* by F.T. KIRBY, R.J. RICKETTS, and D.G. VANDERVEER. (To accompany aggregate resource Map Series, 1:250 000—Open Files Nfld. 1287 and Lab. 602).

Aggregate Resource Maps to accompany this report are:

Open File Nfld. 1287

83-01 Trepassey, 1 K
83-02 St. Lawrence, 1 L
83-03 Port aux Basques, 11 O
83-04 Burgeo, 11 P & 11 I
83-05 Belleoram, 1 M
83-06 St. John's, 1 N
83-07 Bonavista, 2 C
83-08 Gander Lake, 2 D
83-09 Red Indian Lake, 12 A
83-10 Stephenville, 12 B
83-11 Bay of Islands, 12 G
83-12 Sandy Lake, 12 H
83-13 Botwood, 2 E
83-14 Wesleyville, 2 F
83-15 Port Saunders, 12 I
83-16 Blanc-Sablon, 12 P
83-17 St. Anthony, 2 M

Open File Lab. 602

83-18 Minipi Lake, 13 C
83-19 Lac Joseph, 23 A
83-20 Opocopa Lake, 23 B
83-21 Shabogamo Lake, 23 G
83-22 Osokmanuan Lake, 23 H
83-23 Winokapau Lake, 13 E
83-24 Goose Bay, 13F
83-25 Rigolet, 13 J
83-26 Snegamook Lake, 13 K
83-27 Kasheshibaw Lake, 13 L
83-28 Shefferville, 23 J
83-29 Makkovik, 13 O

REPORT 83-3: *Fossils of northwestern Newfoundland and southeastern Labrador—conodonts and trilobites,* by SVEND STOUGE and W. DOUGLAS BOYCE.

REPORT 83-4: *Geology of the King George IV Lake map area (N.T.S. 12 A/4), Newfoundland,* by B.F. KEAN. (Includes 1:50 000 scale geology map plus cross-section). Report, 67p.

REPORT 83-5: *Geology of the Baine Harbour (1 M/7) and Point Enregee (1 M/6) map areas, southeastern Newfoundland,* by S.J. O'BRIEN and S.W. TAYLOR. (Includes two 1:50 000 scale geology maps plus a cross-section).

REPORT 83-6: *Geology, geochemistry and mineral potential of the Ackley Granite and parts of the north west Brook and eastern Meelpaeg Complexes, southeast Newfoundland (Parts of map areas 1 M/10, 11, 14, 15, 16; 2 D/1, 2, 3, and 7),* by W.L. DICKSON. (Includes 1:100 000 scale geology map). Report, 130p.

REPORT 83-7: *Geology of the Grandys Lake map area (11 O/15), Newfoundland.* Part I by LESLEY CHORLTON, Part II by IAN KNIGHT. Includes 1:50 000 scale geology map and cross-section. Report, 125p.

LABRADOR MINERAL OCCURRENCE MAPS

Map 8336 13 K, *Snegamook Lake* (1:250 000) (Printed)

Map 8337 13 K/5, *Wuchusk Lake* (1:50 000) (Printed)

Map 8347 Parts of 13 J and 13 O, *Kaipokok Bay-Big River* (1:100 000) (Printed)

NEWFOUNDLAND GEOLOGY MAPS

Map 821, *Geology of the Carboniferous Bay St. George Subbasin, Newfoundland (parts of 11 O and 12 B).* Compiled by IAN KNIGHT, 1979. 1:125 000. Full color map with cross-sections.

Map 822, *Geology of the Baie Verte Peninsula, Newfoundland (parts of 12 H, 12 I and 2 E).* Compiled by JAMES HIBBARD, 1980. Full color map with legend and cross-section. 1:100 000.

Map 827, *Geology of the Carboniferous Deer Lake Basin (parts of 12 H and 12 A), Newfoundland,* by R.S. HYDE (1981). 1:100 000 (colored).

Map 829, *Victoria Lake map area (12 A/6), Newfoundland,* by B.F. KEAN, 1975, 1976, and revised 1980. 1:50 000.

Map 8252, *Blanc-Sablon/St. Anthony (parts of 12 P and 2 M), Newfoundland,* compiled by W.R. SMYTH, 1982. 1:250 000.

Map 8253, *Port Saunders (parts of 12 I and 2 L), Newfoundland,* compiled by W.R. SMYTH, 1982. 1:250 000.

Map 8254, *Sandy Lake (12 H), Newfoundland,* compiled by W.R. SMYTH and Y. MARTINEAU, 1982. 1:250 000.

Map 8258, *Peter Snout (11 P/13), Newfoundland,* by S.J. O'BRIEN, 1982. 1:50 000.

Map 8259, *West Gander Rivers (2 D/11W), Newfoundland,* by S.P. COLMAN-SADD, 1982. 1:50 000.

Map 8260, *Cold Spring Pond (12 A/1E), Newfoundland,* by S.P. COLMAN-SADD, 1982. 1:50 000.

Map 8261, *Facheux Bay (11 P/9), Newfoundland,* by R.F. BLACKWOOD, 1982. 1:50 000.

Map 8268, *St. Julien's (2 M/4), Newfoundland,* by SVEND STOUGE, 1983. 1:50 000. Map with accompanying notes.

Map 8269, *Salmon River (12 P/1), Great Northern Peninsula, Newfoundland,* by SVEND STOUGE, 1983. 1:50 000. Map with accompanying notes.

Map 8270, *Dead Wolf Pond (2 D/10), Newfoundland,* by R.F. BLACKWOOD, 1980; with L. GREEN, 1981. 1:50,000.

Map 8271, *Great Gull Lake (2 D/6), Newfoundland,* by R.F. BLACKWOOD and L. GREEN, 1981. 1:50 000. Map with accompanying notes.

LABRADOR GEOLOGY MAPS

Map 823 and Map 824, *Geology of the Central Mineral Belt, Labrador.* (Map 823 of areas 13 K/9, 10, 15, and 16, and Map 824 of areas 13 K/2, 3, 6, and 7). Compiled by A.B. RYAN, 1979. 1:100 000 (2 full-color maps plus cross-sections).

Map 825 and Map 826, *Geology of the south-central Labrador Trough, Labrador.* (Map 825 covers parts of areas 23 I, 23 J, and 23 O; Map 826 covers parts of areas 23 I and 23 J). Compiled by R.J. WARDLE, 1981. 1:100 000 (2 full-color maps plus 1 legend plus cross-sections).

Map 8210, *Geology southeast of Michikamau Lake (13 E/13, 14), Central Labrador,* by G.A.G. NUNN, 1982. 1:100 000. (Map with accompanying notes).

Descriptive notes and geological maps of the *Grand Lake area, Labrador,* by BRUCE RYAN, TIM NEALE, and JARYL McGUIRE, 1980. 1:100 000.

Map 8264 Cape Caribou River area (13 F/10)
Map 8265 Beaver River area (13 F/11)
Map 8266 Mount Sawyer area (13 F/14)
Map 8267 Mount Elizabeth area (13 F/15)

Map 8330, *Metchin River (13 E/11), Labrador,* by A. THOMAS, V. JACKSON, and G. FINN (1980). 1:100 000.

Map 8330A. This map contains the information on Map 8330 plus geochemical sample locations.

Map 8331, *Letitia Lake-Wapustan Lake area, Labrador (13 L/1, 13 K/4, and parts of 13 L/2 and 13 L/8),* by A. THOMAS and D. HIBBS (1978 and 1979); in part compiled from Brummer and Mann (1961), Curtis and Currie (1981) and Emslie *et al.* (1978). 1:100 000.

Map 8331A. This map contains the information on Map 8331 plus geochemical sample locations.

Map 8332, *Hope Lake-Disappointment Lake area, Labrador (13 E/9, 10, 15, and 16),* by A. THOMAS, V. JACKSON, and G. FINN (1980); in part compiled from Curtis and Currie (1981) and Emslie *et al.* (1978). 1:100 000.

Map 8332A. This map contains the information on Map 8332 plus geochemical sample locations.

Map 8333, *Mountaineer Lakes-East Red Wine Mountains area (13 F/12, 13), Labrador,* by A. THOMAS, V. JACKSON, and G. FINN (1980). 1:100 000.

Map 8333A. This map contains the information on Map 8333 plus geochemical sample locations.

Descriptive notes and geological maps of the *Makkovik Subprovince between Kaipokok Bay and Bay of Islands, Labrador,* by A.B. RYAN, A. KAY, and I.F. ERMANOVICS, 1981. 1:50 000.

Map 8338 Post Hill 13 J/13E
Map 8339 Post Hill 13 J/13W
Map 8340 Bay of Islands 13 O/4E
Map 8341 Bay of Islands 13 O/4W

Map 8342, *Rigolet (part of 13 J), Labrador,* by C.F. GOWER, 1979; and C.F. GOWER, N. NOEL, and R.T. GILLESPIE, 1980. 1:100 000.

Map 8343, *Groswater Bay area (parts of 13 J and 13 I), Labrador,* by C.F. GOWER, 1979, and C.F. GOWER, N. NOEL, and R.T. GILLESPIE, 1980. 1:100 000.

Map 8344, *English River area (part of 13 G), Labrador,* by N. NOEL, R.T. GILLESPIE, and C.F. GOWER, 1980; and C.F. GOWER and G. FINN, 1981. 1:100 000.

Map 8345, *Sandwich Bay area (part of 13 H),* Labrador, by C.F. GOWER, N. NOEL, and R.T. GILLESPIE, 1980; and C.F. GOWER, G. FINN, and V. OWEN, 1981. 1:100 000.

Map 8346, *Table Bay area (part of 13 H), Labrador,* by V. OWEN, C.F. GOWER, and G. FINN, 1981. 1:100 000.

NEWFOUNDLAND OPEN FILES

2 D (127) BLACKWOOD, R.F., and GREEN, L. 1982. This open file consists of approximately 100 whole rock analyses of granite collected systematically from the Middle Ridge and related plutons (2 D/6, 2 D/10, 2 D/11) during 1981. Sample location map at scale of 1:100 000 on a geological base. Computer printouts of: 1) Field data (two listings); 2) Major elements (SiO_2, Al_2O_3, Fe_2O_3, FeO, MgO, CaO, Na_2O, K_2O, TiO_2, MnO, P_2O_5, LOI, Total). 3) Minor elements (Li, Be, Fe, V, Cr, Ni, Cu, Zn, Sn, Rb, Sr, W, Ag, Mo, Ba, Pb, U); 4) Calculations of normative minerals.

12 H (734) BUTLER, A.J., and DAVENPORT, P.H., 1982. *Lake sediment geochemical survey of Sandy Lake map area (12 H), 1981.* This open file includes 11 single element distribution maps (one for each of Cu, Pb, Zn, Co, Ni, Ag, Mn, Fe, Mo, F, U), an L.O.I. map, plus a sample location map (maps at scale of 1:250 000 on a geological base). Also included is a report containing a description of the work and summary statistics. A microfiche copy of the data listing is also included; printed copies of this listing are available on request at extra cost. Microfiche copies of the maps are also available.

Nfld. 1255 DAVENPORT, P.H., BUTLER, A.J., WAGENBAUER, H.A., and RILEY, C.A. 1982. *Compilation geochemical maps of lake sediment data at 1:1 000 000 scale, Newfoundland.* This open file comprises a set of maps on clear transparent overlays of compilations of data from all the areas covered by lake sediment surveys up to 1980. These are single element maps for Cu, Pb, Zn, Co, Ni, Ag, Mo, F, U, Mn, Fe. Each data symbol represents the mean concentration at the centre of a 7 x 7 km cell. Also included are maps showing the mean L.O.I. content of each cell, and the number of sample sites in each cell from which each cell mean was computed. A set of notes is included which describes the preparation of the compilation maps. This release of preliminary maps will be followed in about 12 months by a set of maps showing complete geochemical coverage for the island with the incorporation of the results from samples collected in 1981 from northwestern Newfoundland.

Nfld. 1281 TOMLIN, S.L. 1982. *Potential of the Mount Peyton Batholith as a source of granite as dimension and memorial stone (parts of 2 D and 2 E).*

12 I (147) *Port Saunders map area 12 I,* Nfld. (1258) *St. Anthony map area 12 P and 2 M. Lake sediment geochemical survey of northwestern Newfoundland, 1981,* by BUTLER, A.J. and DAVENPORT, P.H. 1982. Each open file includes 11 single element distribution maps (one for each of Cu, Pb, Zn, Co, Ni, Ag, Mn, Fe, Mo, F, U), a L.O.I. (loss on ignition) map, plus a sample location map. Each map is at a scale of 1:250 000 with a geological base. Accompanying these maps will be a report containing a description of the work and summary statistics for the information available for the Port Saunders (12I (147)) map area and the St. Anthony (Nfld. (1258)) map area. A microfiche copy of the data listing will also be included; printed copies of this listing will be available on request at extra cost. Microfiche copies of the maps will also be available.

1 M (203) DICKSON, W.L., and HOWSE, A.F. 1982. *Geochemistry of whole rock and stream sediment samples from two mineralized areas of the Ackley Granite: Rencontre Lake molybdenite and Anesty Hill molybdenite-tin prospects.* Major and trace elements from new samples of fresh and altered rocks from the Anesty Hill area, and U, Mo, W, Sn from trench and stream sediment samples at Rencontre Lake are presented. Brief summary of geology and mineral potential is given. This Open File comprises a brief geological summary, tables of chemical analyses and five sample location maps on a geological base.

Nfld. 1302 DAVENPORT, P.H., and BUTLER, A.J. 1982. *Tungsten in lake sediment over granitoid rocks of south-central Newfoundland—a pilot study.* Tungsten data from lake sediment collected in 1977 over granitoid rocks in parts of N.T.S. areas 1 M/13, 2 D/4, 11 P/9, 11 P/10, 11 P/15, 11 P/16, 12 A/1, and 12 A/2. This Open File comprises a plot of tungsten values on a 1:250 000 scale topographic base, a brief report describing the analytical method used, interelement correlations and summary statistics, and a data listing.

Nfld. 1300 and Lab. 607 ENVIRONMENTAL GEOLOGY SECTION. 1982a. These open file maps outline zones of potential for aggregate resources within a 6 km wide corridor along all transportation routes in Newfoundland and Labrador. The maps also include the locations of pits and quarries as well as the locations and types of samples (sand, gravel, silt, clay, glacial till, rocks) collected during field surveys. The maps provide an index to geotechnical and other related data collected during field and laboratory testing (e.g. particle size analyses, lithologic analyses, petrographic numbers, landform and stratigraphic data, etc.); these data are also available upon request. The map data are available on microfiche or as 1:50 000 scale blueline copies.

Nfld. 1267 and Lab. 598 ENVIRONMENTAL GEOLOGY SECTION. 1982b. These open files consists of site maps and field maps from all surficial and glacial mapping and aggregate resource mapping project areas. These are raw data in both note and map format and is available only in microfiche format.

Nfld. (1315) VANDERVEER, D.G. 1982. *Aggregate—the often maligned and often forgotten industrial mineral.* (20p.)

Nfld. (1316) *Humber Arm North (stream sediment geochemistry).* MEYER, J.R., BUTLER, A.J., and DAVENPORT, P.H. 1982. The sampled area is located northwest of Corner Brook, western Newfoundland. The survey covers approximately 175 km between Middle Arm and Goose Arm to the north, and Humber Arm to the south, including parts of NTS sheets 12 A/13, 12 B/16, 12 G/1, and 12 H/4. The underlying sandstone-siltstone-shale sequence is part of the allochthonous Humber Arm supergroup of Cambrian age. Lake sediment geochemistry indicates localized Zn, Pb, and Cu anomalies. Samples were analyzed for Zn, Pb, Ni, Cu, Ag, Co, Cd, Fe, F, Mn, and L.O.I. This open file contains 9 single element maps (no Ag), a loss-on-ignition map, 5 regression maps (residual Co and Ni, after regression with Fe; residual Pb, Zn, and Cd after regression with Mn and L.O.I.), a sample location map and a brief report.

1 K (19) *Avalon South (stream sediment geochemistry).* MEYER, J.R., BUTLER, A.J., and DAVENPORT, P.H. 1982. The sampled area is located on the Avalon Peninsula. This survey covers approximately 160 km^2 located on NTS map sheet 1 K/14, northwest of Route 10 between Portugal Cove South and Capahayden. The underlying fine grained clastic sediments belong to the Conception Group of Hadrynian age, and Pb, Zn, and Co anomalies are indicated by lake sediment geochemistry. The survey also includes an area of 5 km^2, south of Fermeuse

Harbour (on NTS map sheet 1 K/15), underlain by a sandstone-shale sequence of the Hadrynian St. John's Group. Samples were analyzed for Zn, Pb, Ni, Cu, Ag, Co, Cd, Fe, F, Mn, and L.O.I. This open file contains 8 single element maps (no F, or Ag), a loss-on-ignition map, 4 regression maps (residual Zn, Ni, Co and Cd, after regression with Mn, a sample location map and a brief report.

1 N (440) *Avalon North (stream sediment geochemistry).* MEYER, J.R., BUTLER, A.J., and DAVENPORT, P.H. 1982. The sampled area is located on the Avalon Peninsula. This survey covers approximately 150 km² located on NTS map sheets 1 N/11 and 1 N/14. The area is underlain mainly by thinly interbedded siltstone and black shale of the Hadrynian Carbonear Formation. A regional Zn anomaly is indicated by lake sediment geochemistry, along with Pb and Ag anomalies of lesser areal extent.Samples were analyzed for Zn, Pb, Ni, Cu, Ag, Co, Cd, Fe, F, Mn, and L.O.I. This open file contains 9 single element maps (no F), a loss-on-ignition map, 4 regression maps (residual Zn, Ni, Co and Cd, after regression with Mn), a sample location map and a brief report.

Nfld. (1317) *Lithogeochemistry of Mid-Ordovician cherts and shales of central Newfoundland.* DEAN, P.L., and MEYER, J.R. 1982. This release presents the results of lithogeochemical sampling of Mid-Ordovician (Caradocian) cherts and shales of Central Newfoundland. Twenty-four sections were mapped in detail and 995 chip samples were collected from 1500 m of strata. Sample intervals were 3 metres in unmineralized sections and 1 metre in sections containing one or more intervals with an estimated 5% or greater sulphide mineralization. Continuous sampling was carried out across massive banded sulphides. Sedimentological, structural and paleontological data were collected throughout the mapping program. All data have been coded and entered into computer files for comparison with the analytical results. All samples were analyzed for Ba, V, Cu, Zn, Ni, Ag, Pb, Co, U, F, H_2O, S, Co_2, SiO_2, Al_2O_3, Fe(total), MgO, CaO, Na_2O, K_2O, TiO_2, MnO, P_2O_5, L.O.I. This file consists of: a computer printout of all analytical and field data, basic statistics for each section and for the complete data set, descriptions and location maps for each section, and detailed lithologic drafts for each section at a scale of 1:100.

Nfld. (1318) *Gamma-ray spectrometry survey south coast, Newfoundland, 1982.* Airborne gamma-ray spectrometric survey results obtained by the GSC were released as the following Geophysical Series Maps:

36611(9)G NTS 11 P/9, part of 1 M/12 Facheux Bay
36611(10)G NTS 11 P/10 La Hune
36611(11)G NTS 11 P/11 Ramea
36611(14)G NTS 11 P/14 White Bear River
36611(15)G NTS 11 P/15 Dolland Brook
36611(16)G NTS 11 P/16, part of 1 M/13 D'Espoir Brook
35112(1)G NTS 12 A/1, part of 2 D/4 Cold Spring Pond
35112(2)G NTS 12 A/2 Wolf Mountain
35112(3)G NTS 12 A/3 Burnt Pond

Results are compiled at 1:50 000 scale as contour maps. Stacked profiles for each flight line are at 1:100 000 scale.

LABRADOR OPEN FILES

13 E/7 (40) JACKSON, V., and FINN, G. 1982. *Geology, petrography and petrochemistry of granulite rocks from Wilson Lake, Labrador (13 E/7),* 1981.

The following four open files relate to data acquired under the Canada-Newfoundland cooperative minerals program, 1982-1984, as part of the National Geochemical Reconnaissance surveys.

13 E (41) (G.S.C. Open File 901)—N.T.S. survey area 13 E
LAB (613) (G.S.C. Open File 902)—N.T.S. survey area 22 P, 23 A, 23 B
LAB (614) (G.S.C. Open File 903)—N.T.S. survey area 23 G, 23 H
LAB (615) (G.S.C. Open File 904)—N.T.S. survey area 23 I, 23 J, 23 O

The 1982 survey area, including areas covered in 1978 for NTS 23 G, H, I, J—G.S.C. Open File 560, covers approximately 80 000 km² at an average sample density of one sample per 13 km². Lake sediments were analyzed for Zn, Cu, Pb, Ni, Co, Ag, Mn, As, Mo, Fe, Hg, U, F, Cd, V and loss-on-ignition to estimate organic carbon content. Lake waters were analyzed for U, F and pH. Each Open File consists of 19 geochemical maps, one sample location map and text of field observations and analytical and statistical data.

GEOSCAN NEWFOUNDLAND PRODUCTS

GEOSCAN Newfoundland and Labrador National Topographical System Index. Last update, February, 1982, contains N.T.S. locations as keywords to bibliographical reference of indexed Newfoundland Mineral Development Division geofiles and indexed Federal Energy, Mines and Resources files, e.g. Geological Survey of Canada and Earth Physics Branch.

GEOSCAN Newfoundland and Labrador Keyword Index. Last update, February, 1982, contains various keywords to the same bibliographic references as above. Keywords used include some geographical area names, journal names, some formalized names of rock units, some methods names (e.g. magnetic surveys), some geological terms (e.g. tectonics), some mineral and element names, confidential files.

GEOSCAN Newfoundland and Labrador Author Index. Last update, February, 1982, contains authors, personal, corporate, and institutional, to the same bibliographic references as above.

GEOSCAN Newfoundland and Labrador Drill Hole Index. Last update, February, 1982, contains keywords, DRILL HOLES, DRILL HOLE LOGS, and DRILL HOLE SECTIONS, to the same bibliographic references as above.

OPEN ASSESSMENT FILES ON MICROFICHE

N.T.S. area 1 K—18 open files consisting of a total of 26 microfiche duplicates (also includes an index list).

N.T.S. area 1 L—55 open files consisting of a total of 88 microfiche duplicates (also includes an index list). This is a preliminary release of only those open files that have been checked and which produced top quality microfiche.

N.T.S. area 1 M—90 open files consisting of a total of 120 microfiche duplicates (also includes an index list). This is a preliminary release of only those open files that have been checked and which produced top quality microfiche.

N.T.S. area 1 N—223 open files consisting of a total of 295 microfiche duplicates (also includes an index list). This is a preliminary release of only those open files that have been checked and which produced top quality microfiche.

N.T.S. area 2 C—40 open files consisting of a total of 42 microfiche duplicates (also includes an index list). This is a preliminary release of only those open files that have been checked and which produced top quality microfiche.

N.T.S. area 2 F—11 open files consisting of a total of 15 microfiche duplicates (also includes an index list). This is a preliminary release of only those open files that have been checked and which produced top quality microfiche.

N.T.S. area 2 L—4 open files consisting of a total of 4 microfiche duplicates (also includes an index list). This is a preliminary release of only those open files that have been checked and which produced top quality microfiche.

N.T.S. area 2 M—26 open files consisting of a total of 31 microfiche duplicates (also includes an index list). This is a preliminary release of only those open files that have been checked and which produced top quality microfiche.

N.T.S. area 2 D—48 open files consisting of a total of 67 microfiche duplicates (also includes an index list). This is a preliminary release of only those open files that have been checked and which produced top quality microfiche.

N.T.S. area 2 E—253 open files consisting of a total of 384 microfiche duplicates (also includes an index list). This is a preliminary release of only those open files that have been checked and which produced top quality microfiche.

N.T.S. areas 11 O, 11 P, and 12 A. This release consists of 11 O (47 open files consisting of 65 microfiche duplicates), 11 P (48 open files consisting of 57 microfiche duplicates), and 12 A (162 open files consisting of 274 microfiche duplicates). This is a preliminary release of only those open files that have been checked and which produced top quality microfiche.

N.T.S. areas 12 B, 12 G, 12 I, and 12 P. This release consists of 12 B (168 open files consisting of 227 microfiche duplicates, 12 G (46 open files consisting of 64 microfiche duplicates), 12 I (68 open files consisting of 89 microfiche duplicates) and 12 P (29 open files consisting of 45 microfiche duplicates). An index list is included for each area. This is a preliminary release involving only those open files that have been checked and which produced top quality microfiche.

N.T.S. area 12 H—257 open files consisting of a total of 362 microfiche duplicates (also includes index list). This is a preliminary release of only those open files that have been checked and which produced top quality microfiche.

NFLD. General Series (Part 1)—This release consists of 226 open files consisting of a total of 303 microfiche duplicates (also includes an index list). There are over 1300 open geofiles in the Newfoundland General Series. This release involves only those files within the first 400 that have been checked and which produced good quality microfiche. These files consist of assessment reports and other documents of a regional nature on the geology and mineral resources of insular Newfoundland.

UPDATED MINERAL OCCURRENCE DESCRIPTIONS ON MICROFICHE

N.T.S. area 2 E—20 microfiche duplicates.

N.T.S. area 12 B—10 microfiche duplicates.

N.T.S. area 14 C—6 microfiche duplicates.

NORTHWEST TERRITORIES

MINERAL INDUSTRY REPORTS

These describe exploration of Mineral Properties and Mining developments in the NWT during the year noted.

EGS 1983-2: *1978, Northwest Territories;* by J.A. GOODWIN, P.J. LAPORTE, C.C. LORD, W.A. GIBBINS, J.B. SEATON, and W.A. PADGHAM, published March 1983.

EGS 1983-9: *Mineral industry report, 1979. Mining and mineral exploration in the Northwest Territories during 1979 (December 7, 1983);* by J.A. BROPHY, W.A. GIBBINS, P.J. LAPORTE, C.C. LORD, W.A. PADGHAM, and J.B. SEATON.

Mineral industry report, 1980-81; in preparation, expected May, 1984.

A yearly Overview of Mining, Mineral Exploration, and as of 1983, Geology Division (NAP) supported geological research is published each December.

OPEN FILE RELEASES OF MAPS AND GEOLOGICAL REPORTS DURING 1982 AND 1983

EGS 1982-1: *Preliminary geology maps of Kamut and Adams Lakes area in the north central Wopmay Orogen, District of Mackenzie, N.W.T. 86 K/8, 9, scale 1:25 000;* by S.A. BOWRING.

EGS 1982-3: *Preliminary Geology map of Taltheilei Narrows-Point Busse area 75 L/12, scale 1:14 000;* by KAREN S. PELLETIER.

EGS 1982-4: *Geology of Keskarrah Bay area, Slave Structural Province, District of Mackenzie, 86 H/6, 7 N.W.T.;* by VALERIE JACKSON, 1 map.

EGS 1982-5: *Geology of the east side of Yellowknife Bay, 85 J/8, 9 scale 1:10 000;* by R.M. EASTON, C. ELLIS, H. HELMSTAEDT, V. JACKSON, B. O'HEARN, and M. DEAN, 3 maps and notes.

EGS 1982-6: *Geology of the Typhoon Point map area, High Lake Greenstone Belt, District of Mackenzie, N.W.T. 76 M/10, 76 M/15 (south half), scale 1:31 680;* by R.M. Easton *et al.*

EGS 1982-7: *Preliminary geology compilation of the Hepburn Island map area, 76 M scale 1:125 000;* by R.M. EASTON.

EGS 1983-1: *Proposed mineral exploration activity, District of Keewatin, scale 1:1 000 000;* by P.J. LAPORTE.

EGS 1983-3: *A compilation of isotopic dates for the Slave-Structural Province;* report by R.M. EASTON.

EGS 1983-4: *Geology of the Rankin Inlet area, NTS 55 K;* by P.J. LAPORTE, S.K. FRAPE, and S.R. LEGGETT, 4 maps and a 50 page report.

EGS 1983-5: *Geology of a volcanic pile at Clan Lake, NTS 85 I/13, scale 1:10 000;* by E. HURDLE.

EGS 1983-6: *Revision of 1982-7* (available for viewing December 8/83; for purchase early 1984).

EGS 1983-7: *Quyta Lake, 1:50 000 scale preliminary geological map of southern half of 85 J/16* (available for viewing December 8/83; for purchase early 1984).

EGS 1983-8: *James River, Geological maps at a scale of 1:50 000 of 6 parts of the Hepburn Island area (76 M/3, 4, 5, 6, 12, and 13)* (available for viewing December 8/83; for purchase early 1984).

EGS 1983-10: *A Layperson's Geological Guide to the Long Lake Park Hike Trail.* Designed for the non-geologist and illustrated with maps and sections, this report is an introduction to the geology of Long Lake Park (NTS 85 J/8) and a geological guide to a 4 km park trail that traverses the lower part of the Kam Formation.

EXTERNAL PUBLICATIONS

GIBBINS, WALTER A. 1982. *Mining developments, mineral inventory, and metallogenetic models; Arctic regions, Northwest Territories, Canada.* A reprint from Arctic Geology and Geophysics, edited by A.F. Embry and H.R. Balkwill, Canadian Society of Petroleum Geologists.

YUKON TERRITORY

LIST OF PUBLICATIONS, SEPTEMBER 82 TO SEPTEMBER 83

INDIAN AND NORTHERN AFFAIRS, CANADA. 1982. *Yukon exploration and geology, 1981.* Exploration and Geological Services Division, Whitehorse, 281p.

_____ 1983. *Yukon exploration and geology, 1982.* Exploration and Geological Services Division, Whitehorse, 259p.

MAPS AND OPEN FILE REPORTS

ABBOTT, J.G. 1983. *Geology of the Macmillan fold belts (3 maps, 1:50 000, part of 105 O SE and 105 P SW).* Indian and Northern Affairs, Canada. Exploration and Geological Services Division, Whitehorse.

EXTERNAL PUBLICATIONS

MORISON, S., MCKENNA, K., and DAVIES, S. 1983. *Soils and surficial geology, Southern Lakes project area (6, 1:100 000 scale maps; 105 C and 105 D).* Yukon Territorial Government Department of Renewable Resources, Whitehorse.

ABSTRACTS OF PAPERS PRESENTED AT CONFERENCES

ABBOTT, J.G. 1983. *Possible mid-Paleozoic faults near barite and metaliferous barite deposits, Macmillan Pass, Yukon.* Abstract p.A1 *in* G.A.C., M.A.C., and C.G.U. Joint Annual Meeting, Program with Abstracts, Volume 8, Victoria 1983.

MORIN, J.A. 1983. *Environments of hypogene precious metal deposition in Yukon.* Abstract, p.A48 *in* G.A.C., M.A.C., and C.G.U. Joint Annual Meeting, Program with Abstracts, Volume 8, Victoria 1983.

PUBLICATIONS

ADDENDA FOR SASKATCHEWAN

PAPERS PUBLISHED AND IN PRESS, SEPTEMBER 1983 - OCTOBER 1984,

Papers published or submitted for publication in other journals are:

GEOCHEMISTRY

Uranium biogechemistry; a bibliography and report on the state of the art: by C.E. Dunn, and John Elk and Jan Byman of the Swedish Geological Survey. Publishing agency will be the Swedish Geological Survey.

SEDIMENTARY GEOLOGY

The Geological Survey provided the editorial management of the Saskatchewan Geological Society volume for the Fourth International Williston Basin Symposium of October, 1982. Papers contributed to the volume by staff are:

a. *Geology of the Middle Devonian Dawson Bay Formation in the northern part of the Williston basin* by C.E. Dunn.

b. *Petrolology of potash ore in the Esterhazy member of the Middle Devonian Prairie Evaporite in southeastern Saskatchewan* by L.M. Fuzesy.

c. *Reservoir properties. Depositional environments and diagenesis of the Mississippian Midale Beds, Midale Field, Southeastern Saskatchewan* by J. Kaldi.

Papers presented and published by the Potash 83, Potash Technology Sympsium, Saskatoon, Saskatchewan, 1983, Pergamon Press. N.Y.; are:

a. *The Dawson Bay Formation and its relationship to the underlying Prairie Evaporite in the Saskatchewan Area. Saskatchewan* by C.E. Dunn.

b. *Petrology of potash ore in the Middle Devonian Prairie Evaporite. Saskatchewan* by L.M. Fuzesy.

ECONOMIC GEOLOGY

Geology of the crystalline basement. NEA/IAEA Athabasca Test Area, by T.I. Sibbald, p.1-14, *in* Uranium Exploration in Athabasca Basin Saskatchewan, Canada, Ed. E.M. Cameron, Geological Survey of Canada, Paper 82-11, 1983.

Public discussions of Geoscience programs
Provincial and national geoscientific organizations

Province or Territory Location	Date(s) (No. of Days)	Time for Talks	Universities Involved?	Industry Involved?	Poster Session	University Involved?	Industry Involved?	Publication	[1]Energy Matters	[2]Other Topics	Comments
British Columbia Vancouver	26 Jan. 1984 (1 of 3)	1 day	No	Yes B.C. Yukon Chamber Annual Meeting	Yes	No	YesNo	Geological Fieldwork, 1983	Yes Coal Geothermal	Yes	held biennially: 3 related days Jan. 25 — GSC Jan. 26 — BCEMPR Jan. 27 — BCYCM
Yukon Territory Whitehorse	5, 6, 7 Dec. 83 (3)	3 days	Yes	Yes	Yes	Yes	Yes	Yes CIM Special Volume	No	No	Mineral Deposits of *Northern Cordillera* — CIM, MDD, DIAND, sponsors; GSC involved
Northwest Territories Yellowknife	8, 9 Dec. 83 (2)	2 days	Yes	Yes	Concurrent	Yes	Yes	Yes	*Coal* only	?	*organized with* NWT Chamber of Mines GSC involved
Alberta Edmonton	Held biennially — No open house 1983										
Saskatchewan Regina	17 Nov. 83 (1)	0.5 day	Yes	No	0.5 day	Yes	No	Rept. of Activities	Yes	No	Sask. Research Council involved, talks and poster displays
Manitoba Winnipeg	16 Nov. 83 (1)	0.5 day	Yes	No	1 day	Yes	No	Rept. of Activities	No	No	GSC involved; indepth talks in p.m.
Ontario *Toronto*	6, 7 Dec. 83 (2)	2 days	Yes	Yes	Concurrent	Yes	Yes	3 Repts. of Activities	Yes	Yes	research oriented; special symposium
Quebec Quebec City	23, 24 Nov. 83 (2)	2 half days	Yes	No	2 half days	Yes	No	Rept. of Activities	No	No	
New Brunswick Fredericton	29 Nov. 83 (1)	0.5 day	Yes	No	0.5 day	Yes	No	Yes (Ann. Rept.)	Yes	Yes	GSC involved
Nova Scotia Halifax	Nov. 30 - Dec. 1 83 (1.5)	1 day	Yes	No	0.5 day	Yes	No	Yes (Newsletter)	Yes	Yes	GSC involved
Newfoundland St. John's	3 Nov. 83 (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	18, 19 Jan. 84 (2)	2 days	Yes	No	Concurrent	Yes	Yes	Yes (Current Research)	Yes	Yes	Provincial agencies Cooperative Programs
Bedford Inst. Ocean Dartmouth	30 May - 4 June 83 (6)	no formal lectures	No	No	Public Displays	No	No	No	Yes	Yes	

MINERAL LAND USE PLANNING
IN THE
CANADIAN PROVINCES AND TERRITORIES

MINERAL LAND USE PLANNING
IN THE
CANADIAN PROVINCES AND TERRITORIES

INTRODUCTORY REVIEW

The committee of Provincial Geologists have each prepared a summary of current land use planning impacts on exploration for mineral resources in their respective Provinces. The twelve reports vary in their approach and detail. Some of the more common and underlying aspects are discussed.

In the Provinces and Territories ownership of minerals in the majority of cases is vested in the Crown with development administered under various Acts to ensure orderly and responsible management. Similarly, land use planning is also a Provincial or Territorial responsibility. In recent years as land use issues have intensified, planning approaches across the country have evolved that can be characterized as ranging from *ad hoc* to coordinated. An example of the former is British Columbia where four Ministries administer 21 distinct planning processes; while an example of the latter is Alberta where a single Resource Evaluation and Planning Division was formed to coordinate integrated land use planning. In Manitoba an Interdepartmental Planning Board resolves specific land use conflicts. In the Northwest Territories regulation of land use, rather than land use planning, has been the main priority.

The Federal and Provincial Park systems are the major source of single-use land designation that prohibit acquisition of title to minerals (*see* accompanying table). Federal lands, municipalities, ecological reserves, wildlife sanctuaries, private lands, and special management areas account for a smaller, although still significant portion of land permanently withdrawn from exploration. Total land withdrawn from exploration or with significant restrictions currently exceeds 533 872 km^2. Lands with various additional restrictions are less well defined but are indicated as exceeding 525 000 km^2. The accompanying table lists for each Province and Territory the approximate area of land alienated or restricted from exploration.

New land use planning programs often culminate in recommendations for single-use designations or restrictions which may be prohibitive to mineral development. These types of recommendations have occurred in some instances despite inadequate knowledge of the area's mineral endowment.

The land base available for exploration and development in some Provinces is shrinking at an alarming rate. Notable exceptions to this trend are Quebec, Newfoundland, and Saskatchewan.

Several Provinces, notably Ontario, British Columbia, and Newfoundland have ongoing regional mineral evaluation programs that produce a data base which is designed to assist rational land use planning. Information is presented on maps that outline areas of low or indeterminate mineral potential to high mineral potential. These maps require periodic revision to incorporate new geological concepts and mineral deposit data. Other Provinces such as New Brunswick and Manitoba have carried out mineral resource evaluations for specific planning areas as required.

Most Provinces have developed or are currently developing policy documents addressing mineral resources and land use. This is seen as a positive and necessary step toward increasing awareness of the requirements for subsurface resources when planning for surface land use.

SUMMARY OF LAND STATUS IN CANADA
RELATIVE TO MINERAL EXPLORATION AND MINING

PROVINCE (Area–km^2)	LAND ALIENATED OR WITH SIGNIFICANT RESTRICTIONS	VARIOUS ADDITIONAL RESTRICTIONS	CROWN LAND	
			FEDERAL*	PROVINCIAL
Alberta 661 000 km^2	9% 59 490 km^2	7% 46 270 km^2	9%	63%
British Columbia 948 600 km^2	10.5% 99 300 km^2	4.7% 45 000 km^2	0.5%	90%
Manitoba 643 560 km^2	13.5% 86 464 km^2	15.5% 100 416 km^2	0.5%	75%
New Brunswick 73 000 km^2	5.8% 4 234 km^2	2.16% 1 577 km^2	3%	43%
Newfound and Labrador 404 519 km^2	0.7% 2 832 km^2	n.d.	n.d.	90%
Nova Scotia 56 711 km^2	8.9% 5 016 km^2	7.6% 4 291 km^2	9%	28%
Northwest Territories 3 379 684 km^2	3.9% 132 060 km^2	9% 303 830 km^2	99+%	-----
Ontario 1 056 278 km^2	5.39% 56 933 km^2	1.43% 15 104 km^2	0.2%	87%
Prince Edward Island 5 660 km^2	1.0% 59 km^2	90.1% 5 100 km^2	0.4%	<10%
Quebec 1 540 509 km^2	1% 15 405 km^2	n.d.	1%	93%
Saskatchewan 650 000 km^2	1.7% 10 800 km^2	0.6% 4 000 km^2	-----	~35%
Yukon Territory 482 515 km^2	12.7% 61 279 km^2	n.d.	99%	-----
TOTAL (% of Canada) 9 902 036 km^2	5.4% 533 872 km^2	5.3% + 525 588+ km^2		

n.d. – data insufficient, not submitted or not applicable.

*Mostly National parks and National defence property, reservations in Provinces.

MINERAL RESOURCES AND LAND USE PLANNING IN BRITISH COLUMBIA

1. RESOURCES, METHODS, AND APPROACHES

Creation of Mineral Deposit Land Use maps at a scale of 1:250 000 began in 1975 using a simple five-fold hierarchical subdivision of mineral potential to parallel the capability surveys conducted on renewable resources initiated by the Canada Land Inventory. To date, the whole of the Cordillera in British Columbia is covered but most maps need revision. Nevertheless, these maps have been a mainstay of our response to land use planning. The figure is an example of part of a map and legend.

Also at a scale of 1:250 000 is a Mineral Inventory Map Series showing location and commodity of all known occurrences through to deposits. The data base for this series is now available on microfiche. Information from Mineral Claim Assessment Reports filed annually is also available after one year of confidentiality, for use in planning programs.

A number of 1:2 000 000 maps have also been produced. Included are Provincial compilations titled *Metallic Mineral Potential of British Columbia, Mines and Major Prospects,* and *Land Alienated from Mining.* They are used as base for other maps. The latter is currently in need of considerable revision.

2. STAFF

For the last three years the work load related to planning program responses has taken all the time of the expanding staff. Earlier this year the Mineral Land Use Office (part of the Resource Data and Analysis Section of the Geological Branch) was re-organized to facilitate a more efficient interdepartmental and regional/headquarters liaison on land use matters. Staff at present include:

Land Use Specialist
Land Use Coordinator
2.5 man years in auxiliary, technical, and clerical assistants

In addition, District Geologists and Mines Inspectors (totalling 22) devote 10 to 15 per cent of their time to land use matters.

3. NEW INITIATIVES 81/82

3.1 Ministry Land Use Committee (MLUC) – includes all operational Divisions – Energy, Mineral Resources, and Petroleum Resources. Twice monthly meetings, chaired by Assistant Deputy Minister. The committee deals mainly with policy and strategy.

3.2 Land Use Coordinating Committee (LUCC) – membership mainly from Mineral Resources and Petroleum Resources. Committee deals with site specific studies, provides for their direction and coordination. (Rotating Chairmanship)

3.3 Land Use Policy document for Ministry recently completed (a product of MLUC). The main thrusts of the document are:

(i) to identify the challenges/difficulties inherent to the management of energy, mineral, and petroleum resources.

(ii) To ensure that the maximum land area is available for exploration and that development may proceed on viable discoveries.

(iii) To ensure that exploration proceeds in a manner such that negative impacts on other resource values are minimized.

(iv) To define need for resource inventory/assessment prior to alienation from exploration.

(v) To confirm commitment to multiple/sequential land use philosophy (working with other ministries is implicit to this philosophy).

(vi) To evaluate Provincial energy needs and provide guidelines for efficient energy usage.

3.4 Strategy Paper arising out of Policy is also underway. In addition, a two-volume *Land Use Handbook* is forthcoming.

4. SITUATION IN BRITISH COLUMBIA

The Land Use Planning picture in British Columbia can be summed up in four words: extensive, diverse, complex, and uncoordinated. Types of land use planning and approximate number of each are listed as follows:

Regional Districts – T.P.C.
Regional Plan, 5 to 10
Crown Land Plans, 25+
Official Settlement Plans, 5 to 10
Watershed Plans, 10 to 15
Park Proposals, 15
Recreation Capacility Studies – Skiing, 5 to 10
Ecological Reserves, 15 to 40
Agricultural Land Reserves
Land Referrals – EMPR Concerns, 100+
Land Referrals – Mineral Reserves, 40
Wildlife Management Areas, 10
Recreation Corridors (Trails)

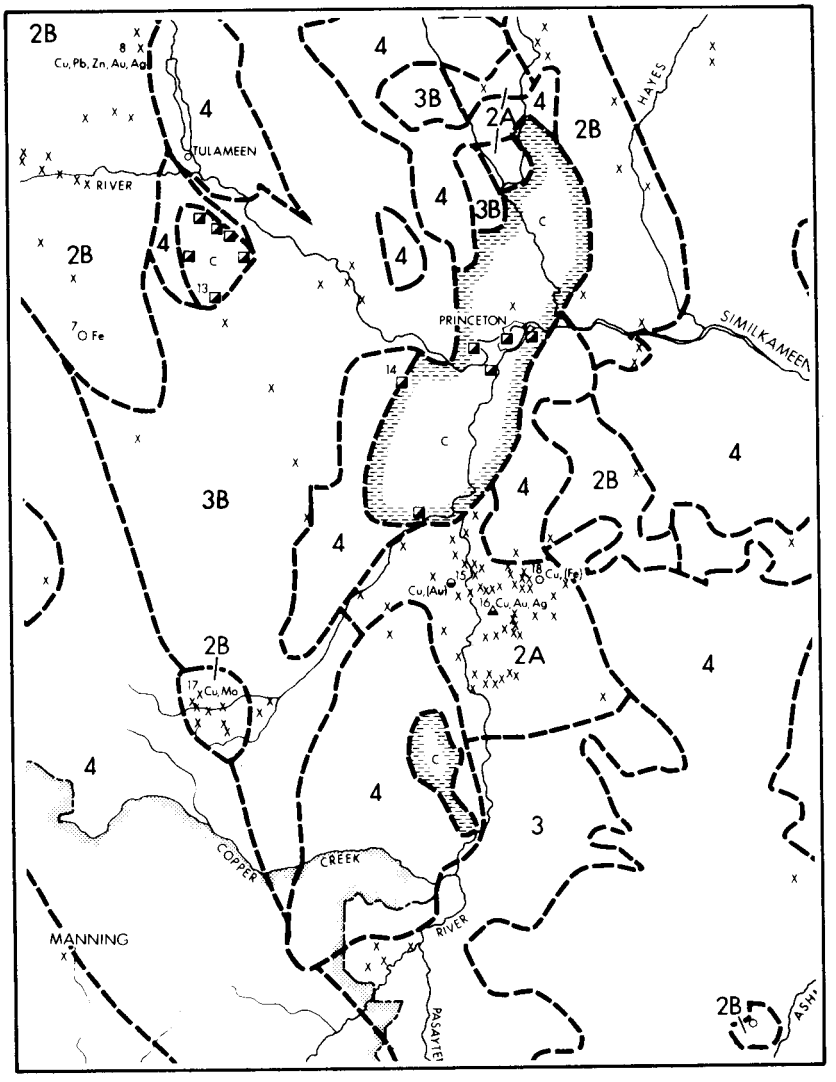
In early 1982 almost 4.5 million hectares under various programs required Ministry of Energy, Mines and Petroleum Resources resource evaluation. Since mid-1983 a major reduction in planning intensity has occurred. Currently Ministry of Forests, Ministry of Lands, Parks and Housing, Ministry of Environment, and Ministry of Municipal Affairs exercise various mandates to plan future use of the land base, resulting in hierarchical, often uncoordinated proposals to alienate or restrict land from mineral exploration/development to which the Ministry of Energy, Mines and Petroleum Resources must respond. Volume and degree of controversy of land use issues often exceed Ministry ability to research, survey, interpret and respond with valid data. A comprehensive temporary reserve request against mineral claim staking often accompanies the outset of a planning program. Recommendations of major interagency/public resource studies are referred for decision to Cabinet interministry Environment Land Use Committee (ELUC). The Mineral Industry is becoming increasingly more active in planning programs allowing public input.

5. GUIDELINES PROCESS

Major resource development such as coal and metal mining are planned in a rational manner such that regional, environmental, social, and economic impacts and governmental and public concerns are assessed and managed prior to final decisions on development being made. A four-stage process with intermediate review processes exists:

SUMMARY OF ALL PROVINCIAL PARKS
TO DECEMBER 31, 1982

CLASSIFICATION		Total Area *hectares*
Class 'A'	289	2 855 365
Class 'B'	6	1 343 885
Class 'C'	45	1 348
Total Parks	340	4 200 598
Recreation Areas	30	230 494
Wilderness Conservancies	1	131 523
Total Parks, Recreation Areas, and Wilderness Conservancies	371	4 562 615
Nature Conservancey Areas		
In Class 'B' Parks	5	426 536
In Class 'A' Parks	2	230 562
Total	7	657 098



Province of British Columbia

Ministry of Energy, Mines and Petroleum Resources

AREA CLASS

1 — Area containing orebodies in production or about to go into production; geologic environment highly favourable; area of intensive exploration.

- 1A – large deposits known or probable
- 1B – medium deposits known or probable
- 1C – small deposits known or probable

2 — Some deposits known; type of occurrence and geological environment favourable; some exploration at advanced stages; continued exploration.

- 2A – large deposits possible
- 2B – medium deposits possible
- 2C – small deposits possible

3 — No significant deposits known; geological environment favourable; present and future exploration likely.

- 3A – large deposits possible
- 3B – medium deposits possible
- 3C – small deposits possible

4 — Some indication of mineral potential; geological status indeterminate at present; exploration possible.

5 — No indication of mineral potential; exploration unlikely.

D — Sand, gravel, clay, alluvium, till, or drift which cover areas of varied mineral potential.

LOCATION AND SIZE

Small	Medium	Large	
⊙ 2	◒ 5	● 8	Mineral deposit of known significance. Number refers to descriptive notes.
△	▲	▲	Former mine. Known reserves depleted.
	X6		Location of mineral deposit of unknown or minor significance. A few deposits are numbered and described in notes.

STAGE 1: Preliminary Project Assessment - data analysis, monitoring programs, issue identification.

STAGE 2: Detailed Assessment – site specific assessments, alternative proposals.

STAGE 3: Operational Plans and Approval Applications – plans, permits, monitoring program design.

STAGE 4: Implementation of continuing Monitoring Programs.

6. AREA DATA

Area of British Columbia (94 860 045 hectares)

Land with Restrictions for Mineral Exploration or Development

	hectares	*per cent*
Urban settlements – 140 municipalities	several million	
Provincial parks, recreation and wilderness areas	4 635 000	4.9
National parks	450 760	0.48
Ecological reserves	135 932	0.14
Agriculture land reserves	4 700 000	4.95
		~10.5

Lands with Potential Restrictions

	hectares	*per cent*
*Lakes and permanent snow/ice cover	~3 000 000	~3.0
Electrical transmission corridors	unknown but significant	----
Current planning program areas (estimate)	1 500 000	1.5
	~4 500 000	~4.7

*Some overlap with parks.

Total land with real or imposed restrictions or potential restrictions approximately 14 362 000 hectares or 15.0 per cent of Provincial land base.

MINERAL LAND USE PLANNING IN ALBERTA

Alberta encompasses approximately 661 000 km^2 (163 million acres), of which over 9 per cent is federal Crown land (National Parks, National Defence Ranges, Indian Reserves) and over 63 per cent is provincial Crown land (provincial parks, forestry reserves, etc.). The remaining 28 per cent is owned privately. Provincial mineral jurisdiction includes the provincial Crown land and approximately three quarters of the mineral rights under privately owned lands.

The Government of Alberta is responsible for the development of all the Province's resources, both renewable and non-renewable. A number of Alberta government departments and agencies have jurisdiction over various resources, with a lead role being taken by the Department of Energy and Natural Resources (ENR). The resources administered by ENR include energy and other minerals, forestry, public lands, fish, and wildlife. Other departments have responsibility for such resources as agriculture, tourism, and recreation and parks.

Because resource responsibilities are widespread among a number of departments and agencies, a coordinating body was required. Thus in 1978 the Resource Evaluation and Planning Division (REAP) was formed within ENR to coordinate integrated land use planning and provide a consultation service. On mineral matters, REAP works closely with the Mineral Resources Division of ENR, as well as the Alberta government departments of Economic Development, Municipal Affairs, Transportation, Environment, and Tourism and Small Business, and such government agencies as the Energy Resources Conservation Board.

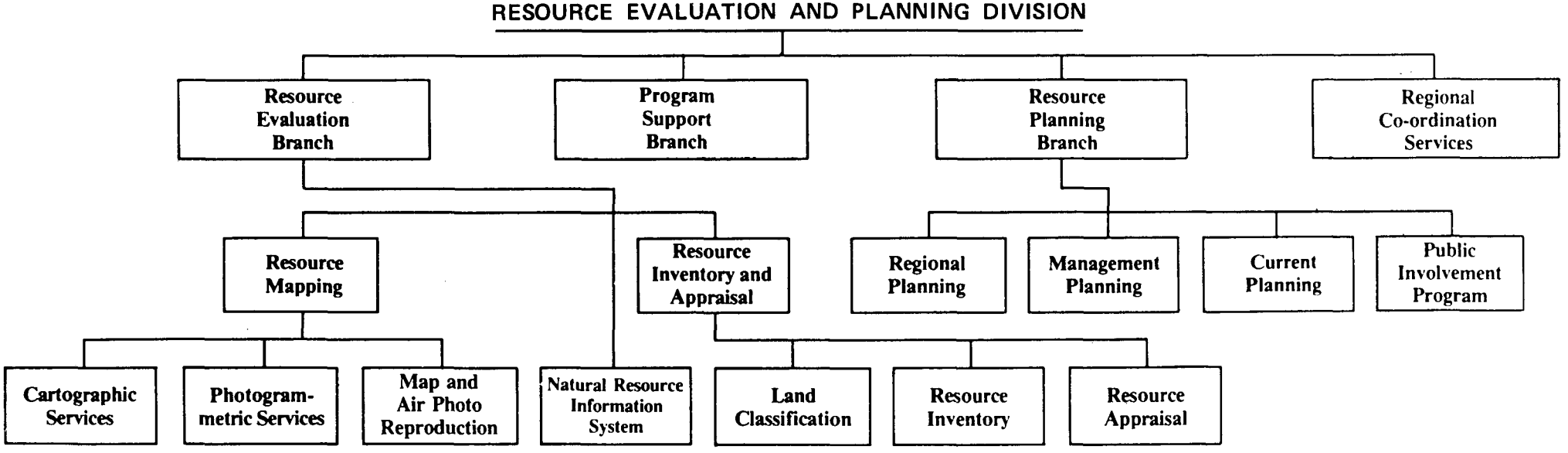
REAP employes 174 professional and semi-professional people in the Edmonton head office, and a further six people in four regional offices. Budget for 1982/83 is $13 million. The attached organization chart indicates branch roles, and reporting lines.

Two major policy documents have been produced with defined boundaries of restrictions for mineral exploration and development. A *Policy for Resource Management of the Eastern Slopes* was first issued in 1978. It states the development objective of the entire Rocky Mountains eastern slopes areas. A *Coal Development Policy for Alberta* was issued in 1976. It states how development of coal will be administered, wherever it might be located. No quantitative evaluation of mineral reserves restricted from mineral exploration and development was undertaken during the planning process of the above policies, both of which are now being updated.

These two policy documents have formed the basis for more detailed integrated management plans for specific regions, two of which are completed, and 15 more are in progress. Outside the geographic areas defined in the two policy statements, land use planning is based on a number of statutes and regulations and is performed on a referral basis within ENR, or interdepartmentally.

The major implementation components of land use planning for minerals are the regulatory processes for the disposition of Crown mineral rights, exploration, and development approvals. Interdepartmental referral is used prior to a disposition of rights or exploration or development approvals, which can result in refusal to proceed in disposition or approvals, or restrictions being placed on exploration or development activity. Regulatory processes are basically identical for Crown or freehold minerals.

Where a Crown minerals lessee is prohibited through planning process from further exploration and development, the lessee is compensated for actual expenses, adjusted by a simple interest factor, as described in the *Mineral Rights Compensation Regulation, 1978*. Approximately $5 million has been paid to numerous lessees since that time (mainly holders of coal rights), for leases within the areas of the Eastern Slopes of the Rocky Mountains.


RESOURCE EVALUATION AND PLANNING DIVISION
Resource Evaluation Branch
Program Support Branch
Resource Planning Branch
Regional Co-ordination Services
Resource Mapping
Resource Inventory and Appraisal
Regional Planning
Management Planning
Current Planning
Public Involvement Program
Cartographic Services
Photogram-metric Services
Map and Air Photo Reproduction
Natural Resource Information System
Land Classification
Resource Inventory
Resource Appraisal

SUMMARY OF MINERAL LAND USE PLANNING IN SASKATCHEWAN

The Province has an area of approximately 650 000 km^2. The northern one-third is underlain by the Precambrian Shield and is all Crown land. Less than 1 per cent, comprising wilderness areas and Indian reserves, is restricted from staking. For the past two years there has been a moratorium on staking and exploration in the La Ronge Provincial Park (about 4 000 km^2) pending the completion of a land use study by the government. It is likely that the area will be re-opened for staking and exploration with certain restrictions.

South of the Precambrian Shield the land is a mix of Crown and freehold. Less than 2 per cent of the area, comprising National parks, Provincial parks, and Indian reserves, is excluded from staking.

MINERAL LAND USE PLANNING IN MANITOBA

There are approximately 54.9 million hectares of land in Manitoba, of which some 13.8 million hectares are privately owned. The remaining 41.1 million hectares are Crown land, of which nearly 0.3 million hectares are in National parks, Indian reserves, etc., and 40.2 million hectares under the jurisdiction of the Province.

Most provincial Crown lands are unsurveyed and unsuitable for cultivation. The Department of Agriculture administers agricultural Crown land leases and permits, but nearly all other surface leases and all Crown land sales are administered by the Lands Branch of the Department of Natural Resources. Underground mineral and petroleum leases are administered by the Mineral Resources Division of the Department of Energy and Mines.

Overall guidelines on land utilization and disposition of lands are established at a Ministerial level by the Provincial Land Use Committee (PLUC). Specific conflicts or issues are referred to the Interdepartmental Planning Board (IPB) for review and recommendations.

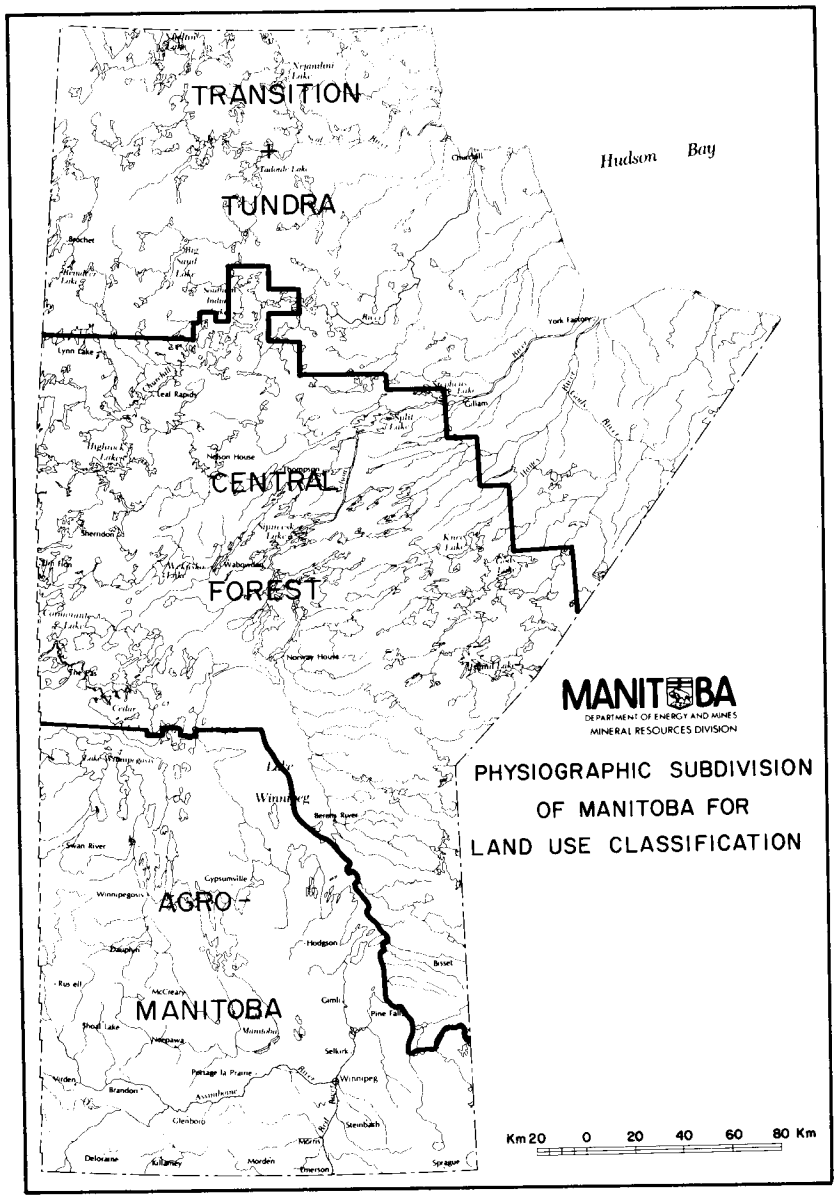
Mining and quarrying land use concerns are addressed in *The Mines Act* (M160) and for nonmetallic minerals in *Manitoba Regulation MR226/76,* and thirteen policies contained within *Manitoba Regulation MR217/80* which is administered by the Department of Municipal Affairs. The Crown Land Classification Committee is responsible for the ongoing administration and recommendation of Crown land use and policy in Agro-Manitoba. The Committee prepares *Provincial Crown Land Use Classification Plans* for approval by PLUC.

Elsewhere in the Province, Crown land classifications and Interim Management Guidelines are being developed by the Department of Natural Resources for consideration by other IPB Departments and/or agencies. Natural Resources recommend detailed, operational planning be undertaken at the regional level by a Resource Planning Committee with guidance from the Resource Allocation Working Group per the project area terms of reference.

Additional restrictions covering specific areas are outlined in the *Parks Branch Master Plans,* and in the Clean Environment Commission's *Water Purity Standards* recommendations, and for Wildlife Management areas. Specific environmental concerns are reviewed by the Manitoba Environmental Assessment Review Agency which reports to IPB. Hydro developments are reviewed at a senior technical level by The Lake Winnipeg, Churchill & Nelson Rivers Advisory Board which reports to IPB.

	Total	Crown	Private/ Federal/ Municipal	Water
Manitoba	642 560*	455 680 (71%)	86 464 (13.5%)	100 416 (15.5%)
Transition and Tundra	224 512 (35%)	198 400 (88%)	10 (0.4%)	26 102 (11.6%)
Central Forest	242 176 (38%)	201 984 (83.5%)	1 280 (0.5%)	38 912 (16%)
Agro-Manitoba	175 872 (27%)	55 040 (31%)	83 456 (47.5%)	37 376 (21.5%)

*All measurements in km^2.



Mineral capability maps have been prepared on a request-specific basis to address Parks Branch, Municipal and Environmental concerns in the Whiteshell, Thompson L.G.D., and Grass River Provincial Parks area, respectively. On a more general basis sand and gravel potential has been determined for a number of areas and the massive sulphide potential has been determined for the entire Precambrian Shield (*Economic Geology Report ER79–1*).

Individual surface lease applications are reviewed by all Departments prior to issuance. Potential mineral-related conflicts are screened on a daily basis by Mines, and Geological Services Branch staff.

Resource evaluation programs including geological and geophysical investigations have been implemented in several districts targeted for potential wilderness, park, or hydro use.

MINERAL LAND USE PLANNING IN ONTARIO

AREA FACTS

In Ontario 87 per cent of the land and water base is Crown land managed for the people of the Province by the Ministry of Natural Resources.

By April 1981, 6.30 per cent of Crown land was not available for use as mining lands because it was withdrawn from claim staking[1]; additional to this are Federal parks (0.17 per cent), and park reserves on which staking is allowed although restrictions make it unfavourable for mining (0.35 per cent)[2].

These facts are summarized below; the total is 6.82 per cent* of the Province.

PERMANENT WITHDRAWALS	% OF TOTAL PROVINCE AREA
Provincial Parks	4.53
Federal Parks	0.17
LANDS 'ON HOLD'	
(a) Park Reserves (Staking Barred)	0.34
(b) Special Management Tracts	0.07
(c) Under Litigation	1.16
(d) Private Lands Purchased	0.20
(e) Park Reserves (Staking Allowed)	0.35
	6.82 (6.65*)

SINGLE USE ALIENATION

The Provincial (4.53 per cent) and Federal parks and Provincial parks reserves (0.86 per cent) together comprise 5.39 per cent; these are effectively areas of single use alienation.

ASSESSMENT OF MINERAL ENDOWMENT

The Precambrian Shield, about two-thirds of the Province (64 per cent), is covered by mineral potential maps at a scale of 1:250 000. Of the remaining 36 per cent, which is underlain by Paleozoic rocks, an estimated 20 per cent in the Hudson's Bay Lowlands will hopefully be assessed by the end of 1982; the 16 per cent which comprises densely populated Southern Ontario requires detailed evaluation.

In rough terms, 36 per cent of the Province is unassessed, 21 per cent is assessed but of unknown value, 26 per cent has low potential, 13 per cent moderate potential, and 4.0 per cent high potential.

Eighty-three per cent of provincial mineral revenues ($4.7 billion in 1980) comes from this 4 per cent of the land base.

[1] *Withdrawal of Crown Lands from Staking:* A Review, Ministry of Natural Resources Land Management Branch, April 1981.
[2] *Directory of Mineral Exploration Potentials in Parks Administered Areas,* Planning Section, Parks and Recreational Areas Branch, MNR, March 1980.
*Ontario figure 6.65 per cent – incorrect addition.

At present provincial parks and reserves which comprise 5.2 per cent of the land base do not greatly affect mineral lands, barring a few exceptional cases (Lake Superior Provincial Park). Only 2.9 per cent of the 64 per cent which is Precambrian Shield is parkland. It is distributed over the various categories of mineral potential as follows:

MINERAL POTENTIAL RATING	% OF PROVINCE	% IN PARKLAND
High	4	0.08
Moderate	13	0.18
Least	26	2.67
Unknown	21	-----
Unassessed	36	2.3
TOTAL	100	5.2

FUTURE PARKLANDS AND THE STRATEGIC LAND USE PLAN

The Minister of Natural Resources intends to have completed a draft plan for the Province by December 1982.

Part of this requires that a system of parks be outlined, to fulfill the policy of the Outdoor Recreation Branch which was approved by Cabinet in 1978. There are specific targets attached to the objectives of the Systems plan, and these together dictate the number and size of parklands needed, and therefore the land area that will be required to fulfill the objectives.

AREA OF PARKLANDS PROPOSED

The draft proposal for Ontario suggests doubling the area of lands held as Provincial parks to about 10 per cent of the Province. Most of the increased area will fall within the Precambrian Shield.

PLANIFICATION DE L'UTILISATION DU TERRIROIRE ET RESSOURCES MINIÈRES AU QUÉBEC

SITUATION GÉNÉRALE

L'utilisation du territoire pour les fins de l'industrie minière au Québec ne pose pas de problémes majeurs, vu qu'il est rare que différents utilisateurs du sol soient en compétition dans les régions minières. Une très

faible proportion due territorie québécois est utilisée à des fins exclusives où l'exploration minière n'est pas permise:

Parcs du Canada et du Québec, Réserves écologiques, sanctuaires d'oiseaux, Arrondissements naturels	1%
Territoire accessible à l'exploration minière	99%

Sur les terres de la Couronne qui représentent environ 93% du territoire québécois, j'aimerais retenir votre attention sur les territoires de la Baie James et du Nord Québécois qui ont fait l'objet de conventions avec les autochtones (Cris, Inuits, Naskapis), en vertu desquelles les droits aux minéraux continuent d'être sous la responsabilité du Québec. Toute-fois, certaines dispositions particulières sont prévues pour les terres de catégorie 1 correspondant aux villages de ces communautés et à leurs environs immédiats.

Pour les terres privées qui représentent environ 7% du territoire québécois, certaines concessions de terre faites avant 1911 incluient des droits de mine avec les droits de surface. Ces droits étaient très peu actifs en raison de l'accès difficile aux droits miniers de ces terres, de recherches sur les propriétaires de ces droits et des négociations avec ceux-ci. Afin de rendre les terres privées concernées davantage accessibles à l'exploration, le Gouvernement du Québec a adopté en juin 1982 une Loi sur la révocation de ces droits de mine.

PLANIFICATION DE L'UTILISATION DU TERRITOIRE

En général, la planification de l'utilisation de territoire tient compte des ressources minières. Si l'on fait exception des droits acquis historiquement, les nouveaux projets visant à soustraire certaines parties du territorie à l'exploration minière font l'objet d'études et de présentations de mémoires à un Comité inter-ministériel permanent de l'aménagement du Territoire qui soumet ses recommandations à la décision du Conseil des Ministres.

Les principaux organismes qui ont le pouvoir de présenter de tels projets en vertu de leur Loi sont:

- Hydro-Québec — Pour les aménagements hydrauliques
- Ministère du Loisir, de la Chasse et de la Peche — Pour les parcs
- Ministère des Affaires culturelles — Pour les arrondissements naturels
- Ministère de l'Environnement — Pour les réserves écologiques

D'autres ministères, tels que le ministère de l'Environnement et le ministère de l'Agriculture, des Pêcheries et de l'Alimentation ont des pouvoirs spéciaux relafits à la protection de la qualité de l'environnement et du territoire agricole.

En vertu de la Loi sur la qualité de l'environnement, les projets d'exploitation minière sur l'ensemble du territoire du Québec doivent être soumis à l'approbation du ministère de l'Environnement qui exige, à cet effet, des études d'impact sur les différentes utilisations du territoire et peut refuser les projects d'exploitation, s'ils ne conviennent pas à ces normes.

En vertu de la Loi sur la protection du territoire agricole, on doit obtenir la permission de la Commission de la protection du territoire agricole avant d'utiliser des terres agricoles à des fins d'exploitation minière dans les zones agricoles. Ces zones agricoles correspondent de façon générale aux propriétés privées. Les terres déjà utilisées à des fins d'exploitation minière ont été exclues de ces zones.

Il faut retenir que les dispositions de la Loi sur la qualité de l'environnement et de la Loi sur la protection du territoire agricole et leurs règlements permettent aux ministères concernés d'intervenir seulement à l'étape de la mise en exploitation des ressources minières et non de l'exploration. Ceci permet de limiter au minimum les conflits entre les différents utilisateurs du territoire.

CONCLUSION

L'ensemble des lois et règlements du Québec permet à l'industrie minière de faire valoir ses priorités vis-à-vis les autres utilisateurs du territoire et les processus de décision semblent équitables aux différentes parties impliquées. Si le comité désire davantge d'information sur des questions particulières, nous ferons les recherches nécessaires pour répondre à ses besoins.

MINERAL LAND USE PLANNING IN NEW BRUNSWICK

The ownership of the mineral resources of the Province of New Brunswick are vested in the Crown (with some exceptions), and the Department of Natural Resources is responsible for the management of these resources through the *Mining Act, Petroleum and Natural Gas Act, Quarriable Substances Act, Ownership of Minerals Act, Underground Storage Act,* and the *Pipeline Act.* The owership of certain minerals on about 4 per cent of privately held lands is unknown or in question.

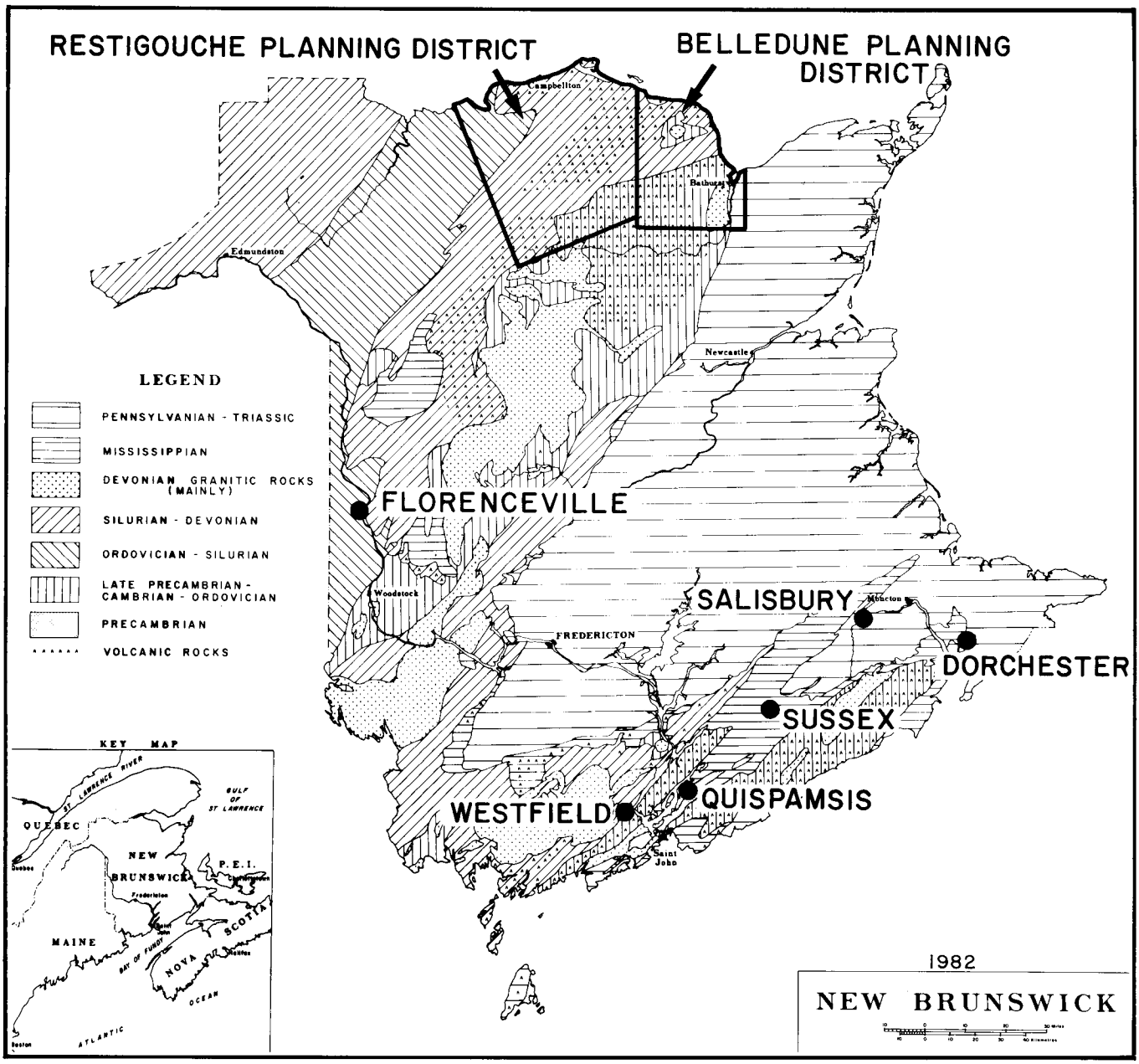
Privately held lands constitute about 54 per cent of the Province of New Brunswick, whereas Crown lands make up about 43 per cent of the total area.

Approximately 500 000 hectares (5.8 per cent) of the total 7 300 000 in the Province have been alienated from exploration (but not in all cases from mining) through the presence of military lands, parks, Indian reserves, ecological reserves, urban development, areas of special grants, and transportation corridors.

No formalized land use planning policies are in place in the Province at present, although an interdepartmental committee is now studying the matter. It is anticipated that recommendations will be forthcoming from this committee that will form a basis for the establishment of future planning policies.

In the broad sense, land use planning currently takes place but it generally takes place in an *ad hoc* and uncoordinated manner. Informal liaison occurs between groups involved in planning—groups including, for example, the Departments of Natural Resources, Municipal Affairs, Environment, Transportation, N. B. Power, Regional and Urban Planning Commissions. This liaison is usually carried out on an interpersonal basis. The entire process has generally been reactive rather than creative.

The Department of Natural Resources has been involved in two significant mineral resource potential studies in the northern part of the Province (*see* figure) and produces, on a regular basis, reports on the bedrock, surficial, and environmental geology of small municipalities. Our Department is also involved in soils and surficial geological studies in forest site classification areas.



MINERAL LAND USE ISSUES AND PLANNING IN NOVA SCOTIA

Land use planning has been carried out in Nova Scotia on a formal basis since 1976 when a Deputy Ministers' Committee on Land Use was set up within the Provincial Government. Under this Deputy Ministers' Committee is a working group composed of senior officials from 12 Departments who deal with all major land use issues within the Province.

Although the Department of Mines and Energy does not have mineral potential or mineral land use maps for the whole Province, commodity maps have been completed for industrial minerals, metallic minerals, and aggregate resources which are used extensively for land use planning. Also a metallogenic map of Nova Scotia was produced in 1983 which has defined areas of high mineral potential throughout the Province.

The following is a breakdown of the land area in Nova Scotia:

	HECTARES	ACRES
TOTAL AREA	5 671 083	14 013 248
Bras d'Or Lakes	108 082	267,072
Lakes and Streams	267 991	662,208

LAND OWNERS	HECTARES	% OF TOTAL AREA MINUS BRAS D'OR LAKES
Provincial Crown Land	1 558 000	28.0
Private or Municipal	3 504 000	63.0
Federal Crown Land		
Parks	481 797	8.6
Department of National Defence	9 149	0.2
Indian Reserves	10 690	0.2
Total	501 663	9.0
TOTAL	5 563 636	100.0

	HECTARES	% OF TOTAL AREA MINUS BRAS D'OR LAKES
Uranium Closure	189 526	3.4
Water Supply Watersheds	239 579	4.3

Before exploration can be carried out in Nova Scotia, the exploration companies must first get permission of the landowner, this also includes Provincial Crown land which is controlled by the Department of Lands and Forests.

Some of the current issues and constraints on mineral lands are as follows:

URANIUM CLOSURES – A moratorium was placed on all uranium exploration in the Province in October 1981. As a result of this moratorium, a large portion of the ground staked for uranium at that time was closed.

WATER SUPPLY WATERSHEDS – Mineral staking is allowed on water supply watershed areas but is monitored by the Department of the Environment. There has been some public pressure and some pressure within Government to stop mineral staking in these areas.

FEDERAL CROWN LAND – There is no mineral staking on Federal Crown land which includes National parks, Department of National Defense land, and Indian reserves.

MINERAL LAND USE PLANNING IN PRINCE EDWARD ISLAND

The *Mineral Resources Act* of 1978 specifies that 'All minerals existing or which may be found within, upon or under lands in the province are vested in the Crown in right of the province' (S. 2). Specifically excluded as minerals under the Act are stone, sand, gravel, peat, gypsum, limestone, oil and gas, and oil shales. The Province still retains mineral rights in the National park area and has not yet arranged to turn them over to the Federal government.

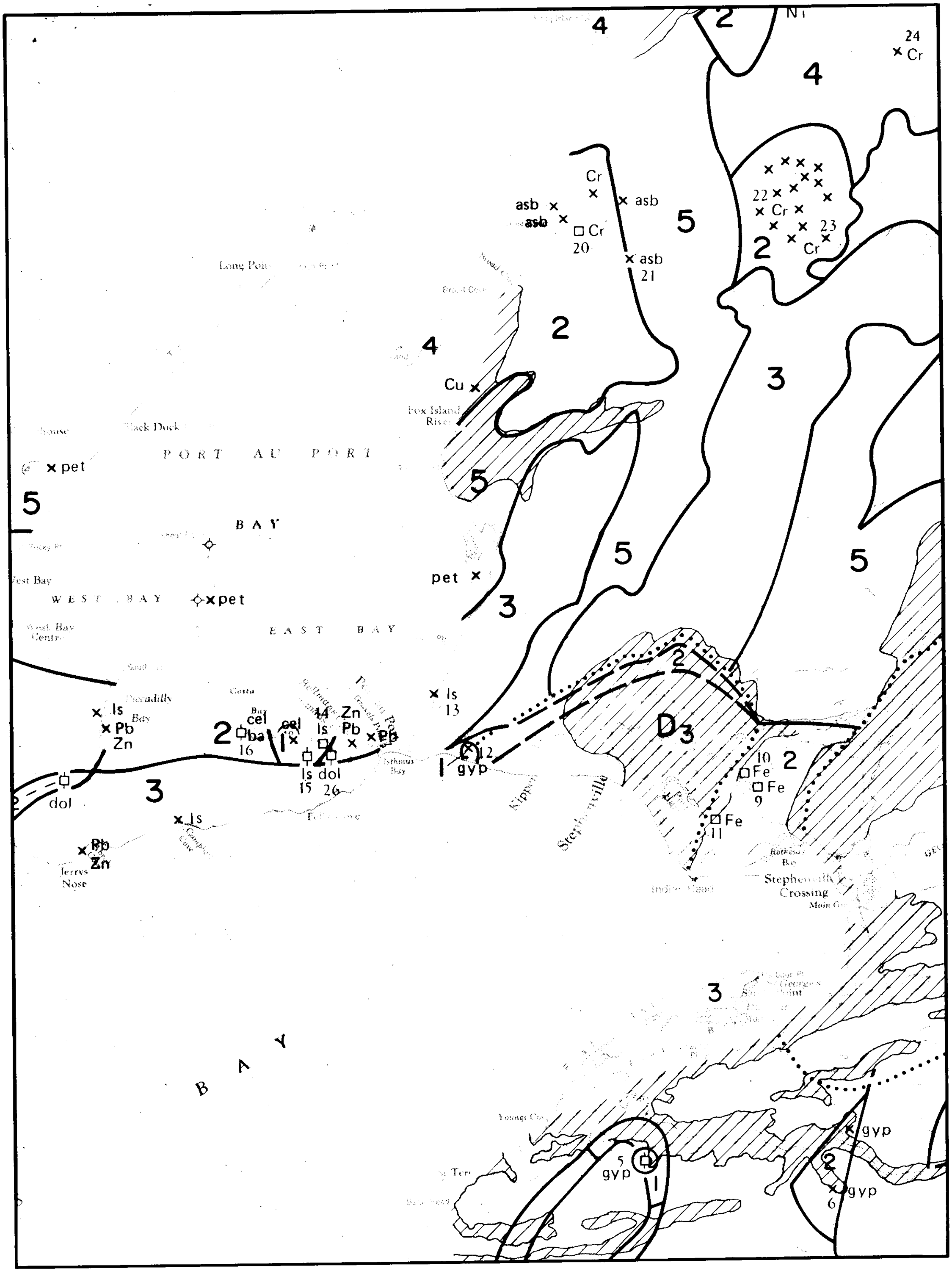
Lands alientated from mineral exploration include the National park and Provincial parks. Beyond that, most of the Province must be considered has having 'additional restrictions' in that over 90 per cent of the surface area of Prince Edward Island is privately owned, controlled by municipalities, or rights of way of various sorts. The proportions of alienated or otherwise restricted lands are summarized as follows:

CATEGORY	AREA km^2	PERCENTAGE OF TOTAL 5 660 km^2
Provincial Parks (Active and Reserved)	3.34	0.61
National Park	24.6	0.43
Private Land, Municipalities, Rights of Way	± 5 100	±90

Because of the high percentage of private ownership on Prince Edward Island, land use planning is, as often as not, a matter of arbitration by the provincial Land Use Commission, although individual communities may form planning boards and adopt land use regulations for application within their boundaries. Overall planning is the responsibility of the Planning Branch, Department of Transportation and Public Works. Because Prince Edward Island has never had a mine, or even a major discovery, mineral resource considerations have not entered into the planning process here. Nevertheless, because the Island is so well-settled, accommodating mineral development would be more a matter of finding a way to allow mining without detrimental effects on local agriculture than it would involve building 'roads to resources' or otherwise opening up territory to exploration.

SUMMARY OF LAND USE PLANNING IN NEWFOUNDLAND AND LABRADOR

Area of Province	404 519 km^2
% of Province Crown Land	90% (remainder — mineral rights held under long-term concession agreements)
% of Province in Which Mineral Exploration Is Not Permitted	0.7% (1/150)
Mineral Capabilities Maps	Program begun in 1977, lapsed 1978–1980, given renewed impetus in 1981. The figure is an example of part of a map and its legend.



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LEGEND

AREA CLASS

1	Area containing mineral deposits in production and mineral deposits with known reserves or depleted reserves; geologic environment highly favorable.
2	Some significant deposits known; type of occurrence and geologic environment favorable
3	No significant deposits known; geologic environment moderately favorable
4	Some indication of mineral potential but geologic environment generally unfavorable or unknown
5	No indication of mineral potential; geologic environment unfavorable
———	Boundary of mineral potential area
D_3	Surficial deposits which obscure the bedrock geology; subscript indicates likely subsurface mineral potential

LOCATION, TYPE AND SIZE OF DEPOSITS

Numbers adjacent to symbols on the map refer to the descriptive notes

Metallic mineral deposit known to be significant (Large, Medium, Small)

Industrial mineral deposit known to be significant

Coal exposure known to be significant

Maximum extent of coal-bearing formations (surface and subsurface) where considered economically significant

Hole drilled for petroleum or natural gas (oil well, gas well, abandoned)

Area having potential for petroleum or natural gas

Mineral deposit currently in production (type symbol circled)

Previously exploited mineral deposit (metallic, industrial or fossil fuel); known reserves depleted or presently uneconomic

× Location of mineral deposit (metallic, industrial or fossil fuel); significance minor or unknown. Only selected occurrences are entered on this map; for comprehensive coverage, see Nfld. Dept. of Mines and Energy, Min. Dev. Div. Map No. 79-123

Surficial deposits that may be economically exploitable generally for local use.

Five categories (area classes):

1. Area containing mineral deposits with proven reserves; favourable geology
2. Some significant deposits; favourable geology
3. No significant deposits; favourable geology
4. Some indication of mineral potential, but geologic environment generally unfavourable or unknown
5. No indication of mineral potential; geologic environment unfavourable

General Situation

Province has recently (1980) passed a *Wilderness & Ecological Reserves Act* which provides for review by government departments and public hearings prior to establishment of reserves. Three ecological reserves and one wilderness area have so far been submitted for departmental review; these proposals are presently being revised in the light of that review. No reserves have yet been established under the new Act.

LAND USE PLANNING IN THE NORTHWEST TERRITORIES

A land use planning section is now being put together by the Northern Development Program of DIAND. At present there is no indication of how lands containing mineral wealth will be treated by this planning group. The first problems to be addressed are who is to have input and leverage on land use planning. We are not at the stage yet of knowing how to ensure that access to our mineral heritage is not impeded.

For the past 12 years regulation of land and water use has been the main priority. We now have a reasonably clear set of requirements in these areas, which are as follows:

1. CANADA MINING REGULATIONS CONTROL MINERALS DISPOSITION

Mineral rights are acquired through staking on the ground. A prospecting license is required to stake claims. A claim is 500 metres square (1,500 feet square). Block staking of as many as 50 claims per block is permitted.

Exclusive rights to prospect in an area may be obtained by applying for a Prospecting Permit.

After prescribed time periods the permit can be relinquished and/or converted into claims staked in the normal way. Permits expire in 3 years if south of 68 degrees north, and 5 years if further north.

2. LAND USE PERMITS

Small crews, 2 or 3 persons, do not need permits. Larger crews do. Small fuel caches do not need permits (4 000 litres), larger ones do. Small operations in nonsensitive areas may be given a B class permit which takes about 10 days. A class permits take closer to 40 days.

Land use regulations are strictly enforced and camp clean up, empty fuel barrel removal, and proper garbage disposal is required **whether or not** a land use permit has been issued!

3. WATER USE AUTHORITIES

Practically all drilling and large camps require a water use authorization. This is also closely regulated. Permanent water use or disposal operations require a license.

4. STATUS OF LANDS IN NORTHWEST TERRITORIES

Most of the land in the Northwest Territories is Crown land, controlled by the Northern Affairs Program of DIAND. Some lands have been turned over to Territorial Administration (Commissioner's land). Such lands are those surrounding settlements. The largest block is probably around Yellowknife.

No change in mineral rights deposition has resulted because these rights were retained by the Crown.

At present roughly 7 500 km^2 have been proscribed from prospecting/staking as National parks. Reserves for parks cover 41 060 km^2.

The Thelon Game Sanctuary is 29 020 km^2 and the Polar Bear Pass IBP site 3 000 km^2. Prospecting and staking are prohibited in both sanctuaries.

Bird Sanctuaries comprise 109 716 km^2. Access to most of these is permitted but, though land within Migratory Bird Sanctuaries is controlled by DIAND, Canadian Wildlife Service has authority over birds and their habitat. Thus two permits are required for land use within sanctuaries, a standard land use permit and a Migratory Bird Sanctuary (MBS) permit. CWS is represented on the Land Use Advisory Committee but is the only agency concerned with issuance of MBS permits. These are dispensed after informal negotiations between the applicant and the chief CWS representative in the Northwest Territories. An MBS permit specifies the conditons of use, for example, the type of equipment that may be used, access routes to the sanctuary, and time limitations. The MBS permit system attempts to regulate and minimize the damage to migratory birds and their habitat from resource exploration and development. MBS permits are not issued for land use activities during the nesting period for geese. The Mining Recorders advise they are unlikely to accept claims staked in Bird Sanctuaries unless a CWS permit has been issued to the stakers.

Access to the Bylot Island Sanctuary is especially difficult to obtain and staking of mineral claims within its 10 500 km^2 area is not permitted.

The total area thus alienated from staking in the Northwest Territories at present is 132 060 km^2, 13.2 million hectares.

In addition 317 964 km^2 of IBP sites have been identified in the Northwest Territories. As 130 368 km^2 of these are in National parks, sanctuaries, or park reserves and 3 000 km^2 (of the Polar Bear Pass site) has been removed from staking only 184 596 km^2 of these sites would receive additional 'protection', if and when that is decided on.

The table following summarizes the areas within the various categories described and compares it to lands whose mineral rights have been taken up.

LAND DISPOSITION IN NORTHWEST TERRITORIES

Type	Area km^2	% of NWT
National Parks[1]	77 500	9.29
Park Reserves[2]	41 060	1.21
Proposed Park Reserves[3]	29 020	0.86
Bird Sanctuaries		
Restricted[4]	99 216	2.93
Where Staking Has Not Been Accepted	10 500	0.31
IBP Site (No Staking Possible)	3 000	0.09
IPB Sites (Not In Any Of The Above Areas)	184 596	3.6
Mineral Claims	43 318	1.28
Prospecting Permits (Maximum Level)[5]	40 000	1.18
Areas Held For Oil and Gas Under Exploration Agreements[6]		
Land Areas	100 000	3.0
Marine Areas	400 000	12.0
Oil and Gas Leases – 21-Year Oil and Gas Leases Production Units (Norman Wells and Pointed Mountain)	32 000	0.95

[1] National parks do not now exist in the Northwest Territories – but Nahanni and Auyuittuq 'National Park Reserves' have been established with all the Legislative protection of a National park and will be established as such when native land claims are settled.

[2] 'Park Reserves' are areas in which claim staking (etc.) is proscribed by Order-in-Council pending a decision on whether or not they will, all or in part, become a 'National Park Reserve' as in [1].

[3] These areas have been identified but there has not yet been any move to proscribe staking (etc.) within them.

[4] Mineral claims will be accepted for recording in Bird Sanctuaries only if the staker can show a permit from CWS to enter the sanctuary during the time the claim was staked.

[5] Could decline significantly in a few years as permits expire and are not replaced.

[6] Conversion of pre-1983 exploration rights to exploration agreements is not yet complete so that these figures are estimates.

SUMMARY

	Area km^2
Lands Reserved (No Staking)	132 060
Land Under Limited Restriction (Claims Can Be Staked and Worked)	303 830
Mineral Exploration Areas	83 318
Oil and Gas Exploration Areas	532 000

SOURCES

IPB Sites – Northern Ecological Sites.

National Parks/Bird Sanctuaries – Land Use Programs in Canada, Northwest Territories – Environment Canada.

Claims and Prospecting Permits – Mining Recorder's Office, Yellowknife.

Oil and Gas – Licenses and Exploration Agreements; Director, Oil and Gas Management and Major Projects, DIAND, Ottawa.

MINERAL LAND USE PLANNING IN YUKON TERRITORY

Greater than 99 per cent of the Yukon Territory's 482 515 km^2 is federally controlled. The remainder, mainly around various communities, is controlled by the Territorial Government (YTG). Under the Federal *Territorial Lands Act* (revised 1977), these Federal Crown lands are under the control of the Department of Indian Affairs and Northern Development (DIAND). Approximately 4.6 per cent of the Yukon Territory is withdrawn from mineral exploration as National parks. In addition, a 1978 moratorium does not allow new mineral exploration in an area north of the Porcupine River totalling approximately 8.1 per cent of the Territory. Although no other lands are presently withdrawn from staking, both the CYI (representing Yukon natives) and COPE (representing NWT natives) have submitted land claims covering various parts of the Yukon which have yet to be resolved, and which could affect future mining operations in the Territory.

Federal Land Use Regulations apply to all Crown lands, except those areas covered by valid mineral claims or leases, as the *Territorial Lands Act* does not have precedence over the *Yukon Quartz Mining Act* or the *Yukon Placer Mining Act.* Anything done in the normal course of prospecting, staking, or locating a mineral claim that does not involve the use of equipment or material that requires a permit, is also exempt. Two types of land use permits are issued, based on such things as the number of man-days in a campsite, the size of a fuel cache, the type of equipment used, and so on. A Class B permit is required for 100 to 400 man-days by more than two people, 4 000 to 80 000 litres of fuel, a 1 to 10-tonne vehicle, 50 to 150 kilograms of explosives in a 30-day period, drilling equipment weighing between 500 kilograms and 2.5 tonnes (excluding rods, bits, etc.), trails greater than 1.5 metres wide but less than 4 hectares in total area, and so on. No permit is required if these specifications are not met, and a Class A permit is required if they are exceeded. The Land Use Advisory Committee (Federal and Territorial representatives) may be consulted before a permit is issued to address specific concerns expressed by the individual departments. If there are major environmental concerns with a given proposed project, it may be referred to the Yukon-based Regional Environmental Review Committee (RERC), or beyond to the Ottawa-based Federal Environmental Assessment Review Office (FEARO) for more detailed studies. Dredging and Coal Regulations and permitting procedures are defined under the *Territorial Lands Act.* Separate permits are also required for harvesting timber, quarrying rock or granular material, and burning brush and debris, on all lands.

If water is to be used for drilling, sluicing, waste disposal, etc., a Water Authorization or License is required under the *Northern Inland Waters Act,* and on all lands, both on and off mineral claims. The Water Board, consisting of members from YTG, DIAND, and the public, handles water issues considered significant by the DIAND Water Resources Division. This gives the public an opportunity to strongly influence decisions that are often critical to industry's operation in the Territory.

Since land use regulations do not apply on mineral claims, the majority of land use permits issued to mining companies are for access routes to claims. River and stream crossings are of special concern to the Federal Fisheries Department. The modification of water quality due to sediment or chemicals from placer operations, mine tailings, or stream crossings has become a major issue in recent months between the operators and the regulators. New placer guidelines are presently being devised.

A system of Land Use Planning for the Yukon Territory is presently being planned, by Policy and Planning Sections in Ottawa, but at this time, most planning is of a reactive nature only. No systematic, current resource inventory and land use data coverage is available for the Territory. In April 1979 a *Land Use Resource and Inventory Atlas* prepared for YTG by F. F. Slaney and Company Limited was released. This consists of a series of 1:250 000 maps covering the entire Territory and an extensive bibliography. Each NTS sheet is represented by up to 23 maps detailing study topics such as: bedrock geology, quaternary geoscience, industrial surficial, land status, economic minerals, oil and gas, forestry, archeology, fisheries, tourism-recreation, wildlife, and archeological sites. On these various maps, items such as study areas,

test stations, mineral occurrences, subsurface dispositions, mining leases, titled and reserved ground, proposed parks and reserves, and block land transfers are located. Unfortunately, this data base has not been updated since the original report was prepared and so has become obsolete in many areas.

In addition, the Geological Survey of Canada is preparing *An Assessment of Mineral and Fuel Resource Potential of Yukon Territory.* This will consist of five 1:1 000 000 maps of the Territory, with a geological base taken from GSC Map 1505A, Tectonic Assemblage Map of the Canadian Cordillera and adjacent parts of the United States of America, 1981. The five maps cover: (1) mineral deposits and assessment domains, Yukon Territory, (2) Placer gold creeks and rivers, Yukon Territory, (3) coal-bearing formations, Yukon Territory, (4) principal oil and gas prospect areas, Yukon Territory, and (5) summary of mineral assessment ratings, Yukon Territory.

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