Natural Resources Canada | Ressources naturelles Canada

# EARTH SCIENCES SECTOR



## Business Plan 2002/2005

Canada

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# Message from the Assistant Deputy Minister

I am pleased to introduce the 2002–05 Business Plan for the Earth Sciences Sector (ESS).

The Sector's programs are an essential component of the science and technology (S&T) Canadians need to make informed economic, social and environmental decisions. ESS makes a fundamental contribution to the quality of life of Canadians through innovations in geoscience and geomatics.

ESS's vision is to be, and be recognized to be, a leader in the development, deployment and integration of S&T into policy and decision-making by Natural Resources Canada, the federal and provincial governments, industry and other stakeholders.

ESS strives to be a high-performance, issues-driven organization, known for excellence, recognized as an employer of choice, aligned with government priorities and linked to other parts of Canada's innovation system.

The plan demonstrates the Sector's commitment to alignment, linkages and excellence – the three principles essential to maximize the performance of S&T organizations.

The key priority over the planning period is to contribute to the quality of life through sustainable resource development, using innovations in geomatics and geoscience that benefit current and future generations of Canadians.

Partnership is vital to the way that ESS delivers its programs. The Sector works with a variety of partners – governments, business, educational institutions and individual Canadians – to help them meet the challenges of competing in a faster-paced, technology-driven world economy. Canadian geomatics and geoscience companies are leaders in the global marketplace, and Canadian knowledge, technology and innovation are recognized and used throughout the world. ESS not only uses its expertise and global connections to help Canadian businesses expand internationally, but it also provides S&T assistance to humanitarian projects in developing countries.

**Irwin Itzkovitch, Ph.D.**

*Assistant Deputy Minister*
*Earth Sciences Sector*

# 1.0 Introduction

THE EARTH SCIENCES SECTOR (ESS) OF NATURAL RESOURCES CANADA (NRCAN) IS A WORLD LEADER IN GEOSCIENCE AND GEOMATICS. THE SECTOR WORKS IN PARTNERSHIP WITH GOVERNMENTS AT ALL LEVELS AND WITH CANADIAN BUSINESS AND UNIVERSITIES TO PROVIDE THE KNOWLEDGE AND EXPERTISE CANADIANS NEED TO UNDERSTAND CANADA'S LANDMASS, MANAGE THIS COUNTRY'S RICH NATURAL RESOURCES AND CONTRIBUTE TO THE WELL-BEING OF PRESENT AND FUTURE GENERATIONS.

Section 2 of this plan describes the environment that shapes the Sector's business, while Section 3 outlines the Sector's key issues and the programs over the next three years through which the Sector will deliver science and technology (S&T)[1] services and products along with results. This business plan also contains information on linkages with partners and stakeholders and an organization chart for ESS.

## People Are Our Strength

The success of any organization is related to its ability to attract, retain and develop its human resources. ESS's culture is one of cooperation, teamwork, shared values and ethics, and empowered action. To ensure that ESS is, and is seen to be, an employer of choice, the Sector is committed to creating and maintaining a knowledgeable, diverse, innovative and representative work force by effective development, recruitment and retention of its human resources.

The Sector encourages employees to expand their skills through training and development, continuous learning activities, assignments and special projects.

## Sustaining a Quality Organization

ESS continues to embrace the principles and concepts of quality service delivery as part of the Government of Canada's Quality Service Initiative. High quality is demonstrated by the Sector's staff, many of whom are internationally respected for their work and dedication, and by International Organization of Standardization (ISO) certification of various ESS organizations whose standards set the bar for quality worldwide.

[1]S&T activities are required for the generation, dissemination or initial application of new S&T knowledge. The central activity is research and development (R&D) – creative work undertaken on a systematic basis to increase the stock of scientific and technological knowledge and to use this knowledge in new applications. In addition, there are a number of activities closely related to R&D, that are termed related scientific activities (RSA), such as scientific data collection, information services, testing and standardization, feasibility studies and education support.

# 2.0 The Environment That Shapes Our Business

NRCAN HAS A LEGISLATED MANDATE TO PROMOTE THE SUSTAINABLE DEVELOPMENT OF CANADA'S NATURAL RESOURCES SO AS TO MEET THE NEEDS OF PRESENT GENERATIONS OF CANADIANS WITHOUT COMPROMISING THE QUALITY OF LIFE FOR FUTURE GENERATIONS.

NRCan has identified four strategic directions, under the theme "A Sustainability Agenda for the 21st Century." They derive from the department's targeted strategic outcomes, from consultations with stakeholders in preparing NRCan's 2001–02 Sustainable Development Strategy and from priorities established by the Government of Canada. They encompass four mutually reinforcing and complementary pillars as follows:

- creating and sharing knowledge to allow balanced decisions on Canada's landmass and resources and enhanced security;
- strengthening the economic performance of Canada's natural resources sector through innovation;
- advancing excellence in resource stewardship; and
- turning the potential of the resources sector into new social and economic opportunities for all Canadian communities.

### ESS's Strategy

- Have and maintain a highly motivated, innovative and focused staff;
- Have a balanced S&T portfolio;
- Do the right S&T and do it at the right time;
- Own only what you must; influence all you can; and
- Use the best resources wherever they exist through the use of internal and external networks, partnerships and alliances.

ESS is an S&T organization that does R&D, as well as RSA, such as the establishment of survey systems as the basis for property rights infrastructure, topographic maps, and data collection from space. Its roles and responsibilities touch upon issues, many of them horizontal, throughout NRCan and the government. Through its programs, activities and professional relationships with partners, including government, academia, industry and other stakeholders, the Sector is a key contributor to innovation in Canada.

ESS recognizes that providing the right S&T at the right time is paramount to sound policy and decision making. To that end, ESS strives to ensure that its research and related scientific activities:

- support government priorities and the Minister's mandate;
- are issues-, outputs- and outcomes-driven and at the same time are integrated into long-term planning and policy;
- have a wide degree of buy-in from stakeholders and users;
- have a reasonable probability of technical, policy and economic success; and
- are in phase with stakeholders' timetables.

The Sector contributes to a large number of government-wide priorities through its provision of S&T knowledge, services, technologies and human resources training.

Sustainable development is the cornerstone of Canadians' quality of life in the present and the future. The Sector provides essential information to make scientifically-sound decisions regarding the sustainable development of Canada's natural resources.

ESS is a flexible and responsive organization. It ensures its activities are relevant by maintaining an ongoing watch on government priorities. For example, ESS reviews and assesses the priorities described in the Speech from the Throne and other documents, identifies issues applicable

to its mandate, and develops and implements timely, relevant programs. As a result, ESS programs not only address such priorities as sustainable development, but are also attuned to issues involving health and well-being, the environment and the economy that can benefit from the application of geospatial (both geomatic and geoscience) information.

Not only does the Sector maintain a watch on current government issues and priorities, but it is also constantly looking for changes in long-term government direction and policies, to position itself as a major contributor to the identification of issues and priorities, and to provide the necessary information and solutions to support sound advice in the resolution of these issues and priorities.

## 2.1 ISSUES

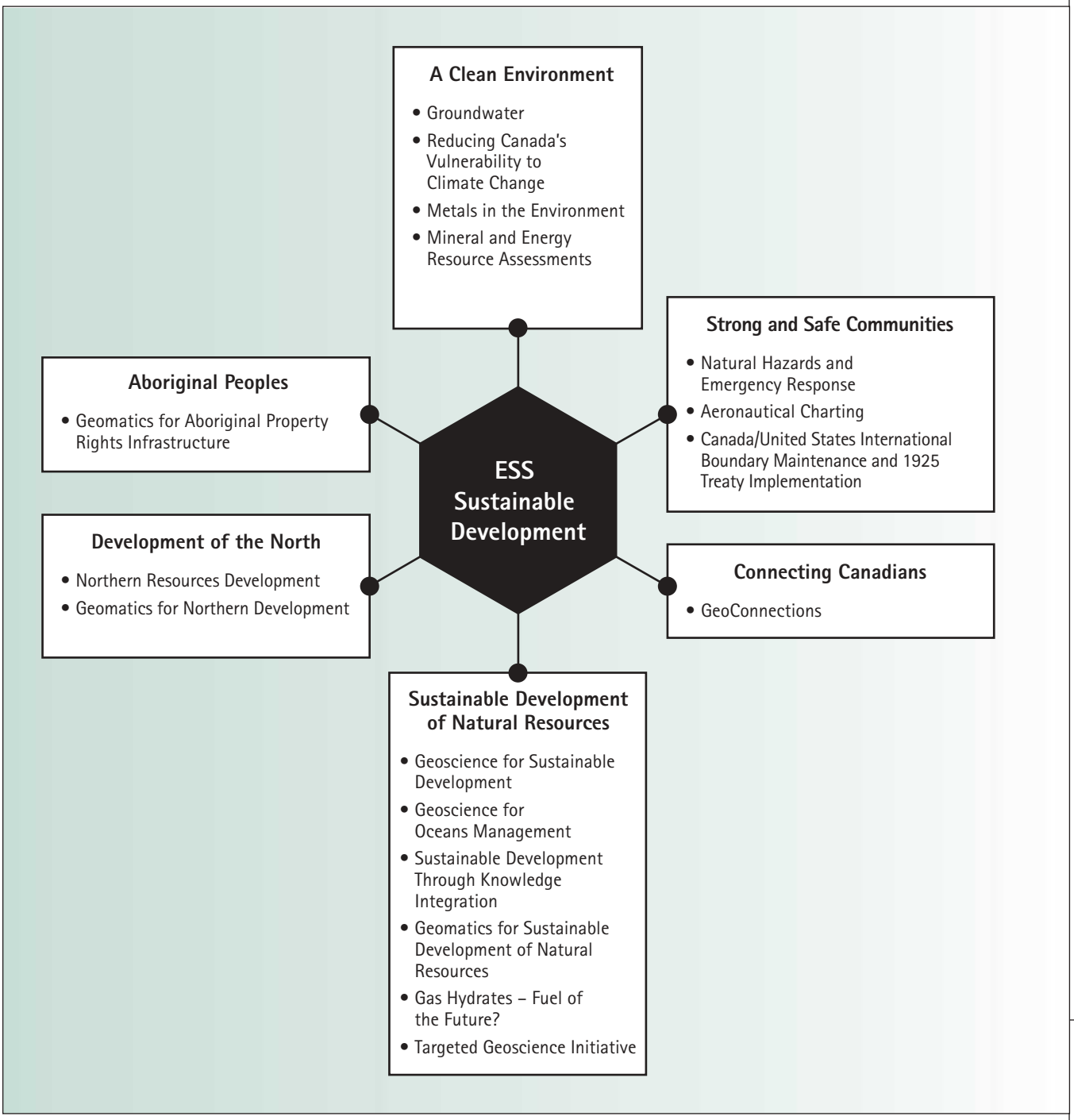
For the current three-year planning period, the Sector will deliver programs to address the following six priority issues:

- A Clean Environment
- Strong and Safe Communities
- Connecting Canadians
- Sustainable Development of Natural Resources
- Development of the North
- Aboriginal Peoples

In addition, there are a number of other issues of importance to Canadians such as innovation, and trade and investment, to which Sector programs contribute.

Section 3 describes business plan priorities for 2002–05 by issues, programs and outputs. Outcomes over the longer term are also provided.

Figure 1: Earth Sciences Sector Programs Contribute to Priority Issues



# 3.0 Priorities by Issue, Programs and Results

ESS PRIORITIES OVER THE 2002-2005 PLANNING PERIOD ARE DESCRIBED BELOW BY ISSUE, PROGRAM AND OUTPUTS. OUTCOMES OVER THE LONGER PERIOD ARE ALSO INCLUDED. FOR EACH ISSUE IDENTIFIED AS A PRIORITY, SPECIFIC SECTOR PROGRAMS THAT CONTRIBUTE TO ADDRESSING THE ISSUE ARE OUTLINED. THE ESS ORGANIZATION DELIVERING THE PROGRAM IS INDICATED IN BRACKETS FOLLOWING THE PROGRAM NAME AS FOLLOWS: GEOMATICS CANADA (GC) OR GEOLOGICAL SURVEY OF CANADA (GSC). KEY QUESTIONS CANADIANS ASK ABOUT THE ISSUES ARE INCLUDED TO PROVIDE THE CONTEXT FOR EACH PROGRAM. IN ADDITION, PROGRAM RESULTS ARE DESCRIBED AS MEASURES OF PROGRESS (OUTPUTS) AND EXPECTED RESULTS FOR CANADIANS (OUTCOMES).

## 3.1 ISSUE: A CLEAN ENVIRONMENT

### Groundwater (GSC/GC)

Major Canadian groundwater aquifers will be mapped and research undertaken on aquifer dynamics to help ensure clean and sustainable groundwater and to fill gaps in knowledge of groundwater resources in Canada in partnership with other federal departments, the provinces and territories, and other stakeholders.

Priorities for geoscience, identified through national consultations that led to the Canadian Framework for Collaboration in Groundwater, include the development of a Canadian inventory of groundwater resources and assessing regional aquifer dynamics (recharge and discharge, estimation of sustainable yield and quantification of vulnerability).

Notional ESS funding over three years is $12.8 M.

*Outputs*

- National database of aquifers and groundwater characteristics
- 20% of key regional aquifers mapped by 2005

**A Key Question Canadians Ask:**

How do we ensure that we have access to a lasting, abundant supply of clean water?

*Outcomes*

- Governments use hydrogeological information to assess the quality and sustainability of key aquifers
- Municipalities use information on aquifers-at-risk to make water and waste management decisions

## Reducing Canada's Vulnerability to Climate Change (GSC/GC)

This program has two major components:

- providing leadership for a national, intergovernmental program on impacts and adaptation, and
- providing some of the research expertise to carry out that program, e.g., monitoring networks, impact assessments, and site analyses with adaptation options.

Key activities will include: assessing regional landscape response to climate change; developing national reconstructions of ancient environments and climates for selected time intervals; undertaking as many as three or four case studies at key sites, with partners, projecting potential impacts and proposing adaptation options; and developing higher resolution carbon flux data sets and ecosystem responses.

Notional ESS funding over three years is $20.8 M.

*Outputs*

- Digital libraries of landscape sensitivity (20 map sheets)
- Calibrated models of landscape response in key regions
- National report on Canada's vulnerability to climate change

### Key Questions Canadians Ask:

As the climate changes, what will happen, and what can we do about it?

Which regions are most at risk?

*Outcomes*

- Canadians are better able to adapt to impacts of climate change
- Geoscience data are used in estimating the cost of climate change and to inform debate about new Kyoto targets

## Metals in the Environment (MITE) (GSC)

The MITE program will study the natural and anthropogenic (man-made) variations of metals in the environment and the related geochemical processes that control entry of these metals into water and food chains.

Key activities will include: geochemical studies of weathering and transport of metals, particularly cadmium, mercury, lead and arsenic; improved methods for source apportionment and recognition of natural historical trends; method development in analysis of chemical, mineralogical and physical properties of surface materials; development of policy linkages to facilitate decision-making aimed at providing a clean environment; and development of a conceptual model for establishing geochemical baselines, with U.S. and Mexican partners.

**A Key Question Canadians Ask:**

Do metals in the environment pose a risk to our well-being?

Notional ESS funding over three years is $1.2 M.

*Outputs*

- Online publications of geochemical variations in the environment and processes controlling that variation
- Procedures to differentiate anthropogenic from natural sources of elements

*Outcomes*

- Informed risk assessments (e.g., *Canadian Environmental Protection Act*)
- Increased expert and public awareness of importance of natural sources of metals in the environment and the related geochemical processes

## Mineral and Energy Resource Assessments (MERA)* (GSC)

At the request of federal government agencies responsible for land-use designations, the MERA program will provide resource assessments to ensure that the economic and strategic significance of mineral and energy resource potential is duly considered in the process of establishing national parks, Marine Protected Areas or other special designations that restrict mineral or energy development on Northern Canada Lands (Yukon, Northwest Territories, Nunavut and offshore lands).

The Canadian Environmental Assessment Act requires the inclusion of geoscience expertise in the review of projects undergoing an Environmental Assessment. The requisite geoscience expertise will be provided upon demand to ensure appropriate reviews of external projects at any level (screenings, comprehensive study, mediation, or panels).

Notional ESS funding over three years is $0.9 M.

**MERA is an existing, integral part of the National Policy on Creation of Park Lands (1980).*

### *Outputs*

- Published mineral and energy resource assessments of areas proposed for national parks in territories, and environmental assessments for projects that require it

### *Outcomes*

- Informed land-use decisions and environmentally-sound development

### A Key Question Canadians Ask:

How do we ensure that natural resource development does not harm the environment and that appropriate land-use decisions are made?

## 3.2 ISSUE: STRONG AND SAFE COMMUNITIES

### Natural Hazards and Emergency Response (GSC/GC)

Hazards are a factor in planning and development decisions for all levels of government, as well as for industry. Mitigation measures and capacity for rapid response can reduce loss of life and property.

This program's objective is to provide geoscience and geomatic information and knowledge to support disaster mitigation and emergency response activities in Canada.

Key activities include: natural hazard assessment, monitoring and process research; development of an urban seismic network; development of geospatial data bases and tools to support disaster management decisions; priority access to satellite data: modernized emergency mapping response and preparatory work that could lead to the initiation and development of a Canada Disaster Management Information System.

**Key Questions Canadians Ask:**

In the event of a disaster, will the emergency response be adequate?

What is being done to minimize risk due to natural hazards?

Notional ESS funding over three years is $49.2 M.

*Outputs*

- Advanced earthquake monitoring and space weather services
- Detailed hazard assessments for 25% of the population that is at high risk
- Models of landslide behaviour suitable for risk assessment by 2004
- Custom emergency maps and images in response to complex crisis events and emergencies (e.g., floods)

*Outcomes*

- Decreased losses from earthquakes, tsunamis, landslides, magnetic storms and volcanic eruptions
- Enhanced disaster response preparedness in population centres and critical infrastructure at highest risk

## Aeronautical Charting (GC)

This program provides Canada's official aeronautical charts and publications to the Department of National Defense and civil aviation clients.

Notional ESS funding over three years is $23.7 M.

### *Outputs*

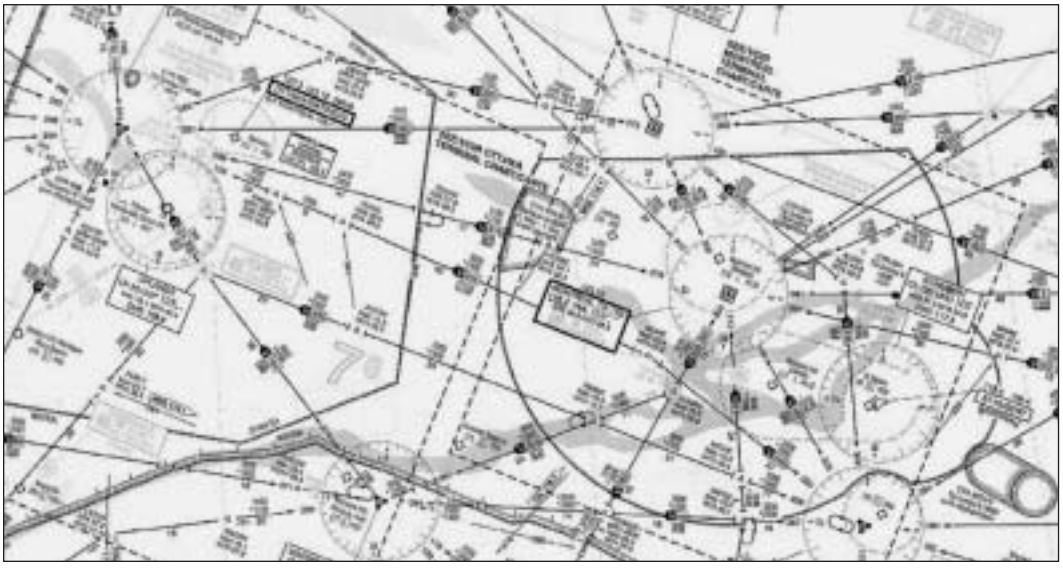
- Charts in support of Visual Flight Rules navigation, such as World Aeronautical Charts, Visual Navigation Charts and Terminal Area Charts
- Charts supporting Instrument Flight Rules operations such as Enroute Low and High Altitude charts, Terminal Area Charts and the Canada Air Pilot (instrument approach procedures)
- Other publications such as the Canada Flight Supplement, the Water Aerodrome Supplement, the Designated Airspace Handbook, the Canadian Aeronautical Charting database and various Air Traffic Controller Charts, and planning and plotting charts

### A Key Question Canadians Ask:

Is it safe to fly over Canada?

### *Outcomes*

- Provision of aeronautical charts for the safety and efficiency of civil and military air navigation in Canada
- Safety of the flying public and of every community over which air traffic flies



## Canada/United States International Boundary Maintenance and 1925 Treaty Implementation (GC)

The main activity of this program is to maintain the Canada-United States boundary in an effective state of demarcation. This is done by inspecting it regularly; repairing, relocating or rebuilding damaged monuments or buoys; keeping the vista cleared; and erecting new boundary markers at locations such as new road crossings. The program strives to maintain an average 15-year boundary maintenance cycle. Key activities also include regulation of "works" within the vista, providing advice to government on disputed areas and precise locations at any point along the boundary, and reporting annually to both governments.

Notional ESS funding over three years is $2.5 M.

### A Key Question Canadians Ask:

Do we know the boundaries of our country, and can we exert sovereignty over them?

*Outputs*

- Annual boundary maintenance of not less than 300 km of boundary line and vista
- A Joint Annual Report submitted to Canada's Minister of Foreign Affairs and the United States Secretary of State

*Outcomes*

- Progress towards an international boundary line that supports the effective enforcement of customs, immigration, national security and other laws in Canada and the United States of America, as defined by the treaties that govern the Commission's activities

## 3.3 ISSUE: CONNECTING CANADIANS

### GeoConnections (GC)

This program delivers geospatial information to Canadians to foster knowledge about Canada, to enable better policy and business decisions, and to advance Canada as a world-class leader in developing and using innovative on-line content and services.

A primary focus is on external partnerships and leverage, while maintaining current program delivery mechanisms. Standard information management approaches, procedures and data licensing approaches will be used to ensure consistent and coordinated data/information delivery to key target audiences (citizens; scientists/experts and private/value-added sector; and all levels of government partners). All activities will utilize and contribute to the success of the Canadian Geospatial Data Infrastructure.

Notional ESS funding over three years is $52.5 M.

*Outputs*

- Support and training for the connection of data custodians and GeoConnections partners
- Authoritative national mapping on issues of interest to citizens, and standardized thematic and framework data to support effective decisions and policy options
- Development of enabling infrastructure to support better decisions and policies by broad user communities
- Harmonized information management policy and licensing regimes and approaches

*Outcomes*

- Scientists, governments and the private sector use and contribute to the enabling infrastructure
- Citizens can view national mapping of key Canadian issues of interest to them
- Canada is internationally recognized as a leader in using and managing geospatial data, and firms are exporting the technologies
- Users access data through standard, consistent licensing and procedures

**A Key Question Canadians Ask:**

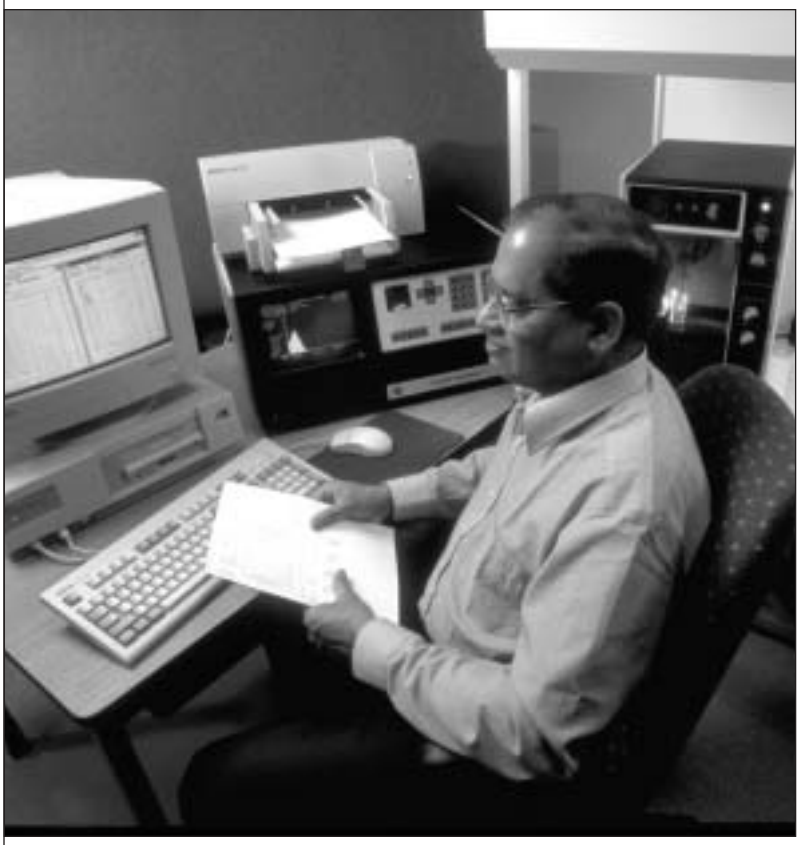
Can I access government and other sources of geospatially-referenced information via the Internet?

## 3.4 ISSUE: SUSTAINABLE DEVELOPMENT OF NATURAL RESOURCES

### Geoscience for Sustainable Development (GSC)

This program will improve the geoscience information for key areas with sustainable development relevance. It will involve the consolidation of existing geoscience data to enable synthesis work and to identify gaps in knowledge; develop partnerships to facilitate the delivery of a proposed new mapping initiative (Cooperative Geological Mapping Strategy); and encourage informed sustainable development decision-making through the provision of Internet access to current data.

Notional ESS funding over three years is $37.5 M.



*Outputs*

- Meet Government On-Line commitments for Internet access to information
- Integrated synthesis studies for key areas with sustainable development relevance
- Assessment and prioritization of knowledge gaps to be addressed by the Cooperative Geological Mapping Strategy

*Outcomes*

- Geoscience knowledge base that will result in attracting exploration investment
- Effective sustainable development decision-making based on ESS information

**Key Question Canadians Ask:**

Will Canada continue to attract investment in the increasingly competitive global exploration and development market?

## Geoscience for Oceans Management (GSC)

The Geoscience for Oceans Management program will deliver sea floor mapping capacity in the offshore to provide a knowledge base suitable for making decisions under the *Oceans Act*. This type of work is acknowledged as a fundamental part of a Canadian integrated oceans management framework, including Marine Protected Areas and Large Ocean Management Areas plans. The lack of an adequate knowledge base would compromise decision-making, with potentially deleterious effects for the management of offshore lands.

The program will participate in surveys to map areas of highest priority for integrated oceans management in Canada (SeaMap pilot program), including targeted resource surveys of strategic mineral deposits. The Department of Fisheries and Oceans is an important partner, providing advice, ship time, resources and researchers to complement the GSC Program.

Notional ESS funding over three years is $25.0 M.

### A Key Question Canadians Ask:

Are we protecting and managing our oceans properly?

*Outputs*

- All seafloor geoscience data accessible digitally, with 25% of the data incorporated in revised digital map products
- New map database and interpretive reports for high-priority areas
- National sea floor mapping strategy developed with federal partners

*Outcomes*

- Products used to plan installation of sea floor infrastructure and for the resolution of conflicts regarding sea floor use
- Ocean management decisions will balance competing demands of renewable and non-renewable resources with conservation

## Sustainable Development Through Knowledge Integration (GSC/GC)

This program will develop a knowledge system and tools to integrate ESS information for enhanced decision-making on sustainable development issues. It will enable clients to make use of information and knowledge in a broad multidisciplinary context. This program is an essential component in moving ESS's research and information and knowledge assets into the decision support environments of government, industry and the general public.

The initial focus of the program will be land cover, land-use change and drought monitoring. This program builds on information foundations such as the Atlas of Canada and the Canadian Geoscience Knowledge Network, and will include a wide range of data sources, including earth observation imagery, map and ground data.

Notional ESS funding over three years is $19.6 M.

### A Key Question Canadians Ask:

What innovative approaches, such as geospatial models, can we use to make better decisions?

*Outputs*

- Integrating geomatics data to strengthen sustainable development indicators, initially related to land-use, land-use change and drought, that will be used to model and assess change as a measure of sustainable development practices
- Development of tools for integrating information for modeling and forecasting as input into decision-making
- Development of an industrial capacity to deliver goods and services through technology transfer to industry
- Partnership/collaborations with universities throughout the program resulting in highly qualified university graduates

*Outcomes*

- Geospatial (geomatics and geoscience) information and models used by federal and provincial governments in decision-making related to sustainable development
- Increased sales of related products and services by Canadian industry
- Increased Canadian influence in international programs (such as the European Union Global Monitoring for Environment and Security, and the United States Geological Survey Gap Analysis Program) through leadership in sustainable development issues & technology

## Geomatics for Sustainable Development of Natural Resources (GC)

This program will provide consistent, reliable, high quality, accurate geomatics information, including well-defined property rights, to ensure that ESS clients and stakeholders have the capacity to make efficient and effective decisions on sustainable development issues at the national and/or community level. This information will include an appropriate mix of paper and digital maps, earth observation imagery (basic & value-added) and the tools and methodologies for extracting and integrating ESS data. Consistent improvements will be made to the reliability and use of the information, incorporating new sources of data where applicable and moving toward integration with other reference sources within ESS and NRCan.

### A Key Question Canadians Ask:

What geospatial information is required in support of sustainable development of natural resources?

The transitional year 2002-03 will be used to refine the program outputs through stakeholder and client consultations. The program will lead to the identification of future geospatial needs and gaps to ensure the right mix of geospatial information is developed for sustainable development applications.

Notional ESS funding over three years is $53.3 M.

### *Outputs (2002-03 transition year)*

- Appropriate techniques and methodologies for improved characterization and integration of geospatial information to support sustainable development
- Unrestricted access to key topographic data layers, including maintenance of the national road network and the addition of the hydrographic layer
- Geographic names, digital elevation models, Landsat 7 ortho-images and National Topographic Database information available on a priority basis
- Provision of the Canada Lands Survey System and surveys in the fulfillment of legislated activities, on national trust lands and the offshore, in the context of sustainable development
- Provision of the Canadian Spatial Reference System for geospatial knowledge

*Outcomes*

- ESS digital geospatial data acknowledged as a definitive and essential source of information for sustainable development decisions
- More efficient decision-making by communities, industry and sustainable development policy organizations through increased access to, and use of, ESS geospatial data
- Peaceful and unimpeded land-based economic development through the well-defined extent of property interests

## Gas Hydrates — Fuel of the Future? (GSC)

This program will contribute to the development of gas hydrates as an unconventional energy source as a means to ensure a secure supply of energy. It will identify the gaps in scientific and technological knowledge required for the sustainable development of this resource for all areas in Canada that host large gas hydrate deposits — located mainly in the high Arctic and in offshore areas, at water depths greater than 800 metres.

The key activity will be the continuation of a multi-partnered international project to assess production potential in the Mallik gas hydrate field in the Mackenzie Delta, through the linking of engineering, technology, policy and geoscience. Capitalizing on this opportunity to attract external funding, knowledge of the potential for gas hydrates to effect a change in Canada's energy mix will be acquired.

Notional ESS funding over three years is $7.1 M.

*Outputs*

- Reports outlining properties of gas hydrates that control production at Mallik
- Reports on geological and geophysical characteristics of gas hydrates and host strata in the Mackenzie Delta and off Vancouver Island
- Definition of basic characteristics of Mallik gas hydrates, their host strata and geophysical characteristics

**A Key Question Canadians Ask:**

Will we have sufficient and reasonably priced energy to meet our needs?

## Targeted Geoscience Initiative (TGI) (GSC)

TGI is an existing, three-year program that provides integrated geoscience mapping to underpin private sector exploration for new mineral resources, delivered in clear partnership agreements with provincial and territorial geo-surveys. It responds to the recommendations to Canada's Mines Ministers by a 1999 industry-led Task Force. The current minerals-oriented projects will be completed by the program termination in March 2003.

Notional ESS funding over one year is $8.7 M.

### *Outcomes*

- Recognition of gas hydrates as a potential environmentally-friendly energy source influencing policy development
- Industry engaged in assessment potential of gas hydrates as a resource
- Canada recognized as a leader in gas hydrates research

### *Outputs*

- Enhanced integrated geoscience knowledge for 27 areas of high mineral potential across Canada
- Canadian Geoscience Knowledge Network (CGKN) Metadata Catalogue

**A Key Question Canadians Ask:**

Will new mineral deposits be found to maintain or increase mining-related jobs?

*Outcomes*

- New private sector investment in mineral exploration in 50% of TGI project areas
- Effective exploration based on access to geoscience information as enabled by CGKN

## 3.5 ISSUE: DEVELOPMENT OF THE NORTH

### Northern Resources Development (GSC)

This program contributes to the development of the North (i.e. north of the southern limit of discontinuous permafrost) and its communities by: providing geoscience maps and knowledge to stimulate resource exploration, underpin infrastructure and land-use planning and capacity building by local communities.

Notional ESS funding over three years is $59.8 M.

*Outputs*

- Extensive digital northern geoscience data acquisition and compilations in high-priority areas covering 20% of the North
- Incorporation of geophysics and remotely-sensed data to develop new, multi-thematic digital geoscience models for 20% of the North

**A Key Question Canadians Ask:**

How can northern communities attain economic self-sufficiency and social stability?

- Assessment of northern energy and mineral potential in a geographic framework over 25% of the North

*Outcomes*

- New northern mineral and hydrocarbon prospects are identified
- Increase of 50% in investment in northern resource exploration and development
- Increased number of northern students enrolled in geoscience programs
- Community participation in the use of geoscience for resource development and land-use planning

## Geomatics for Northern Development (GC)

This program will support development and investment in the North in a sustainable manner by providing reliable and consistent geospatial information and well-defined property rights, thereby developing capacity in northern governments and communities. The program will lead to a broadly-adapted suite of geospatial information recognised as critical to making decisions.

The transitional year 2002-03 will be used to deliver on commitments, and for identifying future outputs based on client/stakeholder consultations by December 31, 2002.

### A Key Question Canadians Ask:

Do northern governments and communities have appropriate access to reference systems and modern technology for managing their lands?

Notional ESS funding over three years is $46.5 M.

*Outputs*

- Advanced techniques and methodologies for improved characterisation and integration of a full range of geospatial information to support northerners' unique needs and technology capacity
- Base geographic data, and technological environment adapted to northern requirements
- Fundamental geospatial information and value-added integrated databases based on national reference frames compatible with global standards, adapted to reflect specific northern requirements
- Earth observation imagery to address unique scales and coverage for capacity development in the North

- Land survey activities in support of property rights in northern Canada, both legislated and mandated
- A GC-coordinated strategy and project plan for northern development based on clients/stakeholders consultations

*Outcomes*

- Better quality and efficiency in decision-making through access and use of adapted geospatial products and services by northern communities and leading organisations
- 5% increase in investment by private companies in development of natural resources and infrastructure attributable to the availability of geospatial information
- Peaceful and unimpeded land-based economic development through the well-defined extent of property interests

## 3.6 ISSUE: ABORIGINAL PEOPLES

### Geomatics for Aboriginal Property Rights Infrastructure (GC)

This program provides a cadastral framework as the base upon which the Government of Canada and others with interests in Canada Lands, including approximately 600,000 Canadians (many of them Aboriginal) living on some 2,600 First Nations Reserves, can locate, transfer or develop those interests. As well, this program is a fundamental element of the First Nations devolution process resulting from implementation of negotiated devolution agreements such as self-government, comprehensive land claims, treaty land entitlement, and legislated and administrative agreements. This program contributes to the economic and social success of Aboriginal people by delivering and promoting a robust, reliable and flexible property rights infrastructure.

Notional ESS funding over three years is $51.3 M.

### *Outputs*

- Comprehensive survey system standards, instructions, guidelines and quality monitoring
- Progress towards implementation of comprehensive, specific land claims programs through activities related to devolution, partnership agreements, surveys and related work
- Management of the Canada Lands Survey System, which includes a well-defined survey framework, unambiguous land descriptions, recorded legal survey plans and digital cadastral databases

### *Outcomes*

- Increased effectiveness and self-sufficiency of Aboriginal land and resource management; investment in land development; economic development; and social and environmental benefits
- Sustainable community development and stimulation of local economies through capacity building, and jobs as a result of legislated implementation activities

**A Key Question Canadians Ask:**

What property rights information is required to support Aboriginal land and resource management?

# 4.0 Who and What We Are

The Earth Sciences Sector comprises:

- Geomatics Canada, which provides spatial positioning, legal surveys, maps, remotely-sensed data and geographically-referenced information describing the Canadian landmass and offshore territory;
- the Geological Survey of Canada, Canada's national agency for geoscience information and research, which builds and maintains a comprehensive geoscience knowledge base about Canada's landmass and offshore territory;
- the Polar Continental Shelf Project, which operates a logistics support network for scientists conducting a wide variety of research in the Canadian Arctic; and
- ESS Corporate Services, which support the Sector's and Department's activities.

The Sector has a strong presence across Canada, with regional offices in every province and territory except New Brunswick, Prince Edward Island, and Newfoundland and Labrador.

## 4.1 GEOMATICS CANADA

Geomatics Canada (GC) is recognized internationally for providing world-class geomatic information using sophisticated technology. GC delivers quality products and services that describe the Canadian landmass in the form of surveys, maps, remotely-sensed data and geographically referenced information. Geomatic information—in-depth knowledge of the earth, its landmasses and its resources—is essential in a wide range of applications, from emergency response systems to crop management to resource development planning. GC programs are delivered through the Geodetic Survey Division, Legal Surveys Division and International Boundary Commission, Canada Centre for Remote Sensing, Mapping Services Branch and the GeoConnections Secretariat.

The Geodetic Survey Division establishes, maintains and improves the Canadian Spatial Reference System and facilitates access to this national standard in accordance with evolving client needs and advances in technology.

The Legal Surveys Division, under the Canada Lands Surveys Act and other legislation, is responsible for the Canada Lands Survey System and leads the Geomatics for Aboriginal Property Rights Infrastructure Program. The International Boundary Commission, also housed in this Division, has responsibility for the International Boundary Maintenance and 1925 Treaty Implementation Program and executes it in partnership with its American counterpart.

The Canada Centre for Remote Sensing provides a national service for receiving, processing, archiving and disseminating remotely-sensed space-based data for Canada and, with the public and private sectors, develops remote-sensing technology and applications.

The Mapping Services Branch acquires, manages and disseminates topographic and toponymic (geographic name) information for the Canadian landmass and is also responsible for the Aeronautical Charting Program.

The GeoConnections Secretariat coordinates the partnership initiative that makes geospatial data and services accessible to all Canadians through the Internet. Under the GeoConnections Program, governments work with the private sector and academia to expand the range of geospatial applications and services.

For more information about Geomatics Canada, see **http://www.geocan.nrcan.gc.ca/**.

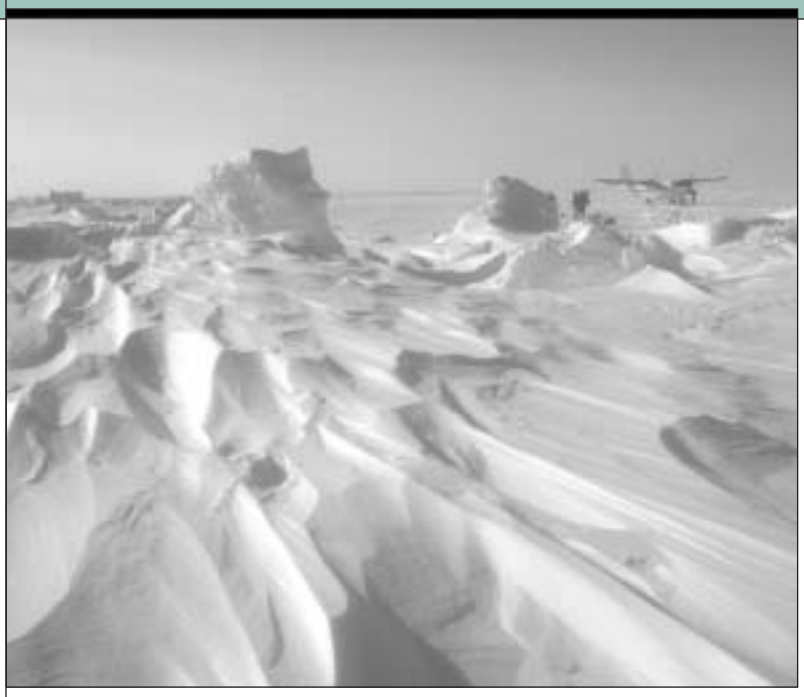
## 4.2 GEOLOGICAL SURVEY OF CANADA

The Geological Survey of Canada (GSC) delivers geoscientific knowledge of Canada's landmass and offshore to serve the needs of Canadians, including the private sector and various levels of government.

The GSC consists of the Minerals and Regional Geoscience Branch and the Sedimentary and Marine Geoscience Branch. The Minerals and Regional Geoscience Branch includes three divisions: the Continental Geoscience Division and the Mineral Resources Division which are located in Ottawa, and the GSC Pacific with offices in Sidney and Vancouver (British Columbia), as well as in Ottawa. The Sedimentary and Marine Geoscience Branch consists of four divisions: the Terrain Sciences Division (Ottawa), GSC Atlantic (Dartmouth), GSC Quebec (Sainte-Foy) and GSC Calgary. The GSC also manages the Canada-Nunavut geoscience office in Iqaluit on behalf of its partners – DIAND and Nunavut Department of Sustainable Development.

The GSC provides knowledge about the geology of the Canadian landmass and offshore through partnerships with the academic, government and private sectors. This knowledge informs decisions related to the sustainable development of Canada's mineral, energy and groundwater resources, environmental stewardship, and issues of public health and safety. The understanding of the regional geological framework of Canada is integral to the promotion of exploration for, and discovery of new resources.

Working with other federal agencies, GSC's ocean mapping activities promote sound offshore infrastructure development and protection of marine habitat, and support Canadian territorial interests under the Law of the Sea. GSC expertise is also used in understanding natural hazards and geological processes that affect the environment. The GSC operates Canada's seismograph network which is essential to managing the risks posed by earthquakes and also underpins Canada's commitments to monitoring nuclear explosions under the Comprehensive Test Ban Treaty. Similarly, the geomagnetic network provides advance warning of magnetic storms and supports research on the impact of magnetic fields on energy transmission systems. GSC is the lead federal agency in a new initiative to reduce the significant losses resulting from landslides each year in Canada. Research on the impacts of the changing climate on coast lines, permafrost and groundwater resources will assist Canadians in adapting to this challenge.



For more information about the Geological Survey of Canada, see **http://www.nrcan.gc.ca/gsc/**.

## 4.3 POLAR CONTINENTAL SHELF PROJECT

The Polar Continental Shelf Project provides coordinated logistics support and advice to the Canadian government, independent and university groups and, on a cost-recovery basis, to industry and those groups from outside Canada undertaking scientific research in the Canadian Arctic.

The knowledge gained by scientists supported by the Polar Continental Shelf Project has helped Canada establish claims to offshore hydrocarbon and mineral resources, identify safe shipping routes into northern communities, establish protected national wildlife areas and migratory bird sanctuaries, identify sources of pollution and effects on the northern food chain, and preserve the traditional knowledge of the North's Aboriginal inhabitants.

For more information about the Polar Continental Shelf Project, see **http://polar.nrcan.gc.ca/**.

## 4.4 ESS CORPORATE SERVICES

The Sector's Policy, Planning and Coordination Division provides corporate support to ESS and NRCan in the areas of policy analysis and development, strategic planning and reporting, and coordination.

The ESS Info Division provides leadership and a central focus for the information functions of the Sector. It provides library services through the Earth Sciences Information Centre (ESIC), which maintains a comprehensive collection of geoscience information for the use of all Canadians. It also publishes and distributes the GSC's scientific output.

Management and Administrative Services Division delivers human resource planning, administrative and financial services to the Sector, as well as providing logistical support for field projects.

The Sector's International Division uses ESS skill bases to assist developing countries, and in doing so, creates opportunities to promote Canadian expertise. It also coordinates efforts and monitors issues related to trade and investment and provides leadership in ESS business practices.

ESS Communications provides strategic advice and services that support ESS's public relations activities and its internal communications.

# 5.0 Ensuring Program Effectiveness Through External Advice

THE SECTOR BENEFITS FROM ADVICE FROM A WIDE RANGE OF GROUPS, AT VARIOUS LEVELS. ESS ADVISORY BODIES INCLUDE PROGRAM-SPECIFIC AND AD-HOC COMMITTEES, AS WELL AS STANDING COMMITTEES AND RELATED EXTERNAL COMMITTEES. SOME EXAMPLES OF THESE ADVISORY BODIES INCLUDE THE NATIONAL GEOLOGICAL SURVEYS COMMITTEE, THE GEOCONNECTIONS MANAGEMENT BOARD, THE CANADIAN COUNCIL ON GEOMATICS, THE ADVISORY BOARD TO THE POLAR CONTINENTAL SHELF PROJECT, THE MINISTER'S NATIONAL ADVISORY BOARD ON EARTH SCIENCES (MNABES) AND THE COUNCIL OF SCIENCE AND TECHNOLOGY ADVISORS (CSTA).

In 2000, CSTA issued a report entitled *Building Excellence in Science and Technology (BEST): The Federal Roles in Performing Science and Technology*. The report highlighted three principles – alignment, linkages and excellence – that allow S&T organizations to optimize benefits from their efforts. In response to the BEST report, ESS has developed its S&T strategy based on leadership, alignment, linkages, excellence and importance of people in the organization. The Sector's S&T programs, as defined by an issues- outputs- and outcomes-driven agenda, also take BEST principles into account in determining priorities and resource allocations.

In April 2002 the Minister approved changes to the MNABES mandate and structure so as to provide him with better strategic advice. These modifications will enable members of MNABES to focus on providing strategic Sector-wide advice to the Minister on direction and priorities for ESS, as well as to respond to specific requests from the Minister. Advice to ESS management on specific programs will now be dealt with by separate technical advisory committees. These modifications are in keeping with the BEST report, which recommended that S&T advisory bodies to federal science-based departments take a more active role in planning and evaluation.

# 6.0 PARTNERSHIPS

ESS DELIVERS MANY OF ITS PROGRAMS THROUGH PARTNERSHIPS WITH OTHER GOVERNMENTS, ACADEMIA, INDUSTRY AND STAKEHOLDERS, FORMING A STRONG S&T-ORIENTED EARTH SCIENCES NETWORK. ESS FOCUSES ON THOSE ACTIVITIES IT IS BEST SUITED TO PERFORM EFFECTIVELY AND EFFICIENTLY. THUS, ESS CONTRIBUTES TO THE FOUNDATION OF S&T KNOWLEDGE AND INFORMATION, AND AT THE SAME TIME FOSTERS AND FACILITATES CONTRIBUTIONS FROM PARTNERS IN S&T INNOVATION. THE SECTOR'S EXPERTISE AND STRONG LINKAGES WITH THE BROADER S&T COMMUNITY IS A WINNING COMBINATION THAT HELPS ENSURE THAT THE RIGHT S&T IS BEING PROVIDED AT THE RIGHT TIME TO MEET THE NEEDS OF NRCAN, THE GOVERNMENT OF CANADA, THE PRIVATE SECTOR AND THE CANADIAN PUBLIC. THIS APPROACH ENSURES INCREASED EFFICIENCY AND REDUCED DUPLICATION OF EFFORT.

## 6.1 PRIVATE SECTOR

Geospatial information has a wide range of applications, from emergency response to crop management and resource development. The Sector's geoscience and geomatic knowledge and skills provide Canadian companies with the information and tools they need to compete internationally and to take advantage of global opportunities presented by an increasingly technology-driven economy.

Canadian geomatics and geoscience industries produce high-quality products and services in demand throughout the world. To support these industries, ESS makes its expertise available on both a collaborative and cost-recovery basis. In the case of collaborative projects, it works closely with partners, sharing costs and expertise on projects of mutual interest. In addition, the Sector awards contracts for more than $35 million to industry annually for such things as map products, cadastral surveys, geophysical and geochemical surveys, aircraft fuel, printing and publishing.

Through such collaboration, Canada's geomatics and geoscience industries have achieved an international reputation for leadership, demonstrated by numerous successful partnerships with members of the global geomatics and geoscience community. ESS staff are also directly involved in many international projects, ranging from the Mallik Gas Hydrate Project in the Mackenzie Delta, (a collaborative research project between the governments of Japan, Germany, India, the United States and Canada, Canadian and Japanese oil companies and the International Continental Drilling Program); to the establishment of a national geomatics program in the Republic of Tunisia; to supplying knowledge and expertise in aid of humanitarian projects, such as a land-mine detection project in Mozambique.

## 6.2 ALLIANCES

Strategic alliances with other provincial and territorial governments and First Nations are critical to the Sector's ability to carry out its responsibilities. The partnership between the federal and territorial governments in

establishing the Canada Nunavut Geoscience Office is an excellent example of this strategic approach to national issues. Also, as a key player in the National Geological Surveys Committee (a federal, provincial and territorial consultative body), NRCan is in the process of renewing the Intergovernmental Geoscience Accord with the provinces and the territories. Progress on signing the Canadian Geomatics Accord with provincial and territorial governments has been excellent, with nine signatures as of June 2002. Another example of effective partnership is the Targeted Geoscience Initiative (TGI), a three-year, $5 million-per-year initiative to stimulate new investment in mineral exploration in Canada. ESS implemented TGI in partnership with provincial and territorial geological surveys, industry and academia.

The Sector is also a member of the Interagency Committee on Geomatics, and the Canadian Council on Geomatics, working with other federal and provincial agencies to build the Canadian Geospatial Data Infrastructure (CGDI). Once completed, CGDI will form a national network providing consistent and effective access to geographical information maintained by public agencies across Canada.

## 6.3 UNIVERSITIES

Linkages between ESS and Canadian universities have always been an important aspect of the Sector's R&D program. These linkages are aimed at maximizing the use of resources to meet national needs for earth science knowledge and expertise, and developing a sufficient supply of graduates in disciplines of interest to ESS and the Canadian earth sciences community.

ESS establishes and maintains close links with Canadian universities in a number of ways. An excellent example of this linkage is the relationship between the GSC-Quebec and the Institut national de la recherche scientifique (INRS). Together they have formed a unique government-university partnership whose work contributes to issues related to ground water, climate change and mineral and energy resources. Another form of linkage is through direct expenditures such as: contracts for acquiring goods and services; grants and contributions; collaborative research projects involving universities and other partners; logistical support; targeted research programs; the ESS Postgraduate Scholarship Supplement to increase financial support to graduate students; the Geomatics Canada Scholarship Program; hosting visiting and Post-Doctoral Fellows in ESS laboratories; and student employment.

Another way in which ESS supports this relationship is through in-kind contributions, such as: time spent by staff in adjunct professor positions (in 2001, 88 ESS research scientists have the status of adjunct professor at a total of 23 Canadian universities, some in more than one university); sharing of laboratory equipment, data and knowledge; delivery of lectures and seminars by both ESS and universities; supervision of graduate students (in 2001, 132 graduate students from 26 different universities were being supervised); participation on committees; joint publications; staff exchanges; and shared access to data, collections and samples.

These interactions lay the foundation for strong ESS–university partnerships and enable the Sector and Canadian universities to maximize their intellectual and operational resources. ESS will continue to strengthen its all-important relationship with Canadian universities over the three-year planning period.

# 7.0 Earth Sciences Sector Funding

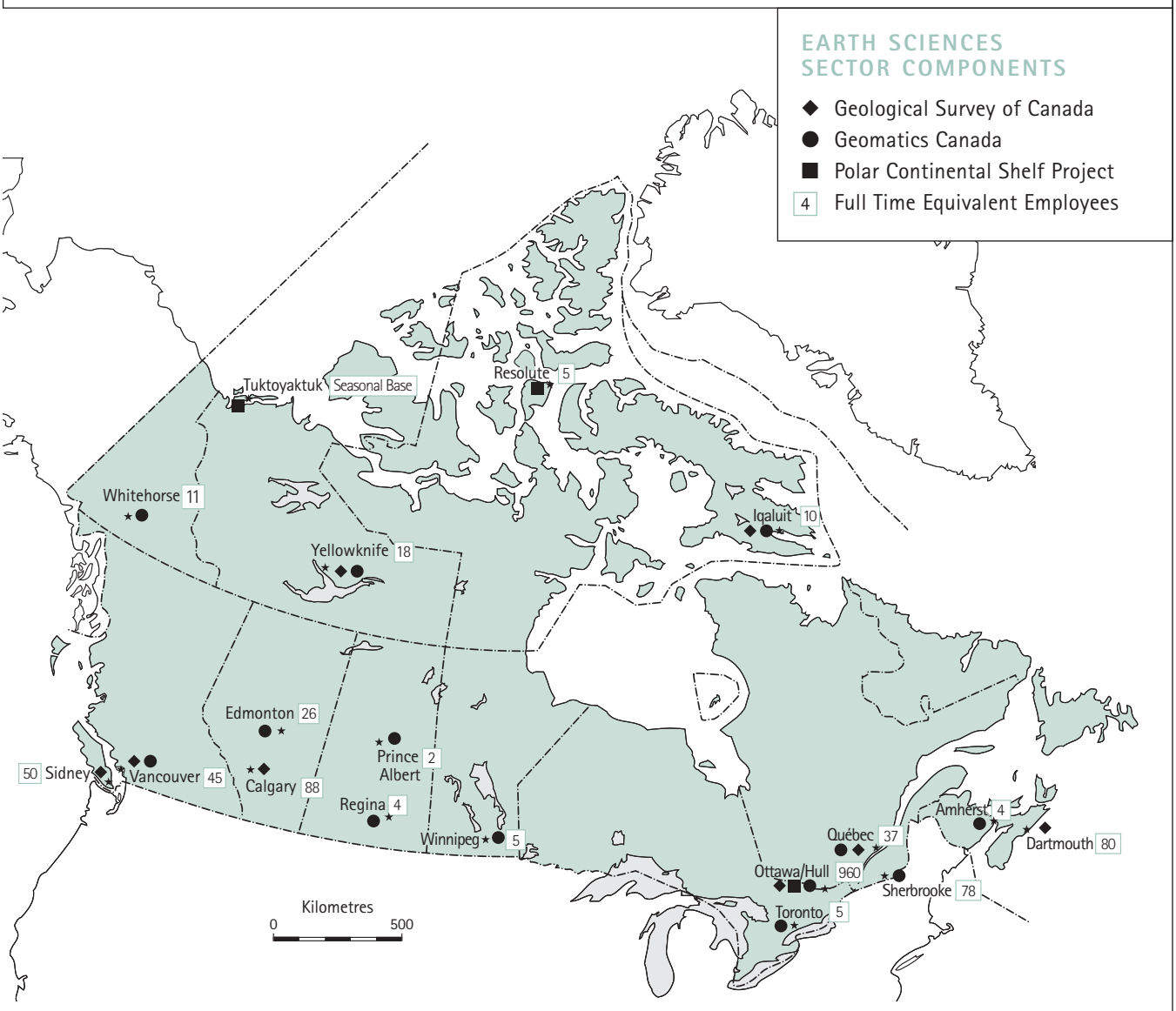
## APPROPRIATION FUNDING BY MAJOR CATEGORY OF EXPENDITURE

| | 2002–03 ($000) | 2003–04 ($000) | 2004–05 ($000) |
|---|---|---|---|
| Salaries (1,426 Full Time Equivalent Employees in 2002–03) | 82,149 | 81,791 | 81,547 |
| Employee Benefit Plan | 16,428 | 16,357 | 16,308 |
| Operating and capital expenditures | 70,816 | 66,815 | 55,907 |
| Grants and contributions | 9,604 | 10,459 | 6,524 |
| **TOTAL ($000)** | **178,997** | **175,422** | **160,286** |

## FUNDING BY MAJOR COMPONENT

| | 2002–03 ($000) | 2003–04 ($000) | 2004–05 ($000) |
|---|---|---|---|
| Geomatics Canada | 80,608 | 82,109 | 68,334 |
| Geological Survey of Canada | 74,100 | 69,681 | 68,471 |
| Polar Continental Shelf Project | 3,609 | 3,609 | 3,609 |
| ESS Corporate Services | 20,680 | 20,023 | 19,872 |
| **Total ($000)** | **178,997** | **175,422** | **160,286** |

# 8.0 Earth Sciences Sector Across Canada



# 9.0 Key Earth Sciences Sector Contacts

**Assistant Deputy Minister's Office**
580 Booth Street, 14th Floor
Ottawa, Ontario K1A 0E4
Telephone: (613) 992-9983
Fax: (613) 992-8874

**Earth Sciences Information Centre**
601 Booth Street, 3rd Floor
Ottawa, Ontario K1A 0E8
Telephone: (613) 996-3919
Fax: (613) 943-8742

**Mapping Services Branch**
615 Booth Street, 7th Floor
Ottawa, Ontario K1A 0E9
Telephone: (613) 947-0793
Fax: (613) 995-2000

**Geodetic Survey Division**
615 Booth Street, 4th Floor
Ottawa, Ontario K1A 0E9
Telephone: (613) 992-4282
Fax: (613) 947-3602

**Canada Centre for Remote Sensing**
588 Booth Street, 3rd Floor
Ottawa, Ontario K1A 0Y7
Telephone: (613) 947-1222
Fax: (613) 947-1382

**Legal Surveys Division and International Boundary Commission**
615 Booth Street, 5th Floor
Ottawa, Ontario K1A 0E9
Telephone: (613) 995-4341
Fax: (613) 992-1122

**Sedimentary and Marine Geoscience Branch**
601 Booth Street, 2nd Floor
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Telephone: (613) 995-2340
Fax: (613) 996-6575

**Minerals and Regional Geoscience Branch**
601 Booth Street, 2nd Floor
Ottawa, Ontario K1A 0E8
Telephone: (613) 995-4093
Fax: (613) 996-6575

**Polar Continental Shelf Project**
615 Booth Street, 4th Floor
Ottawa, Ontario K1A 0E9
Telephone: (613) 947-1601
Fax: (613) 947-1611

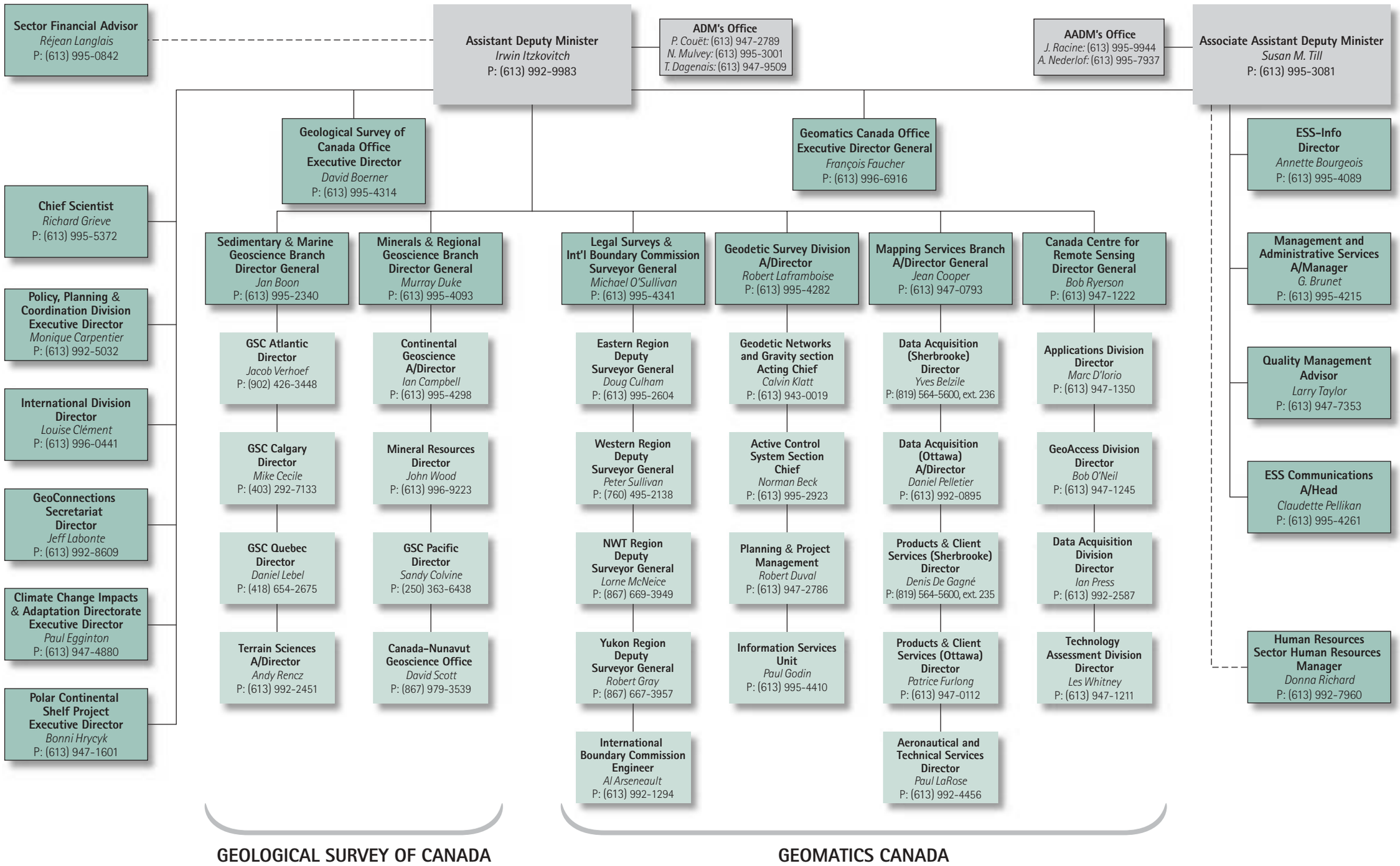
**International Division**
615 Booth Street, 5th Floor
Ottawa, Ontario K1A 0E9
Telephone: (613) 996-0441
Fax: (613) 995-8737

**GeoConnections Secretariat**
615 Booth Street, 6th Floor
Ottawa, Ontario K1A 0E9
Telephone: (613) 992-8609
Fax: (613) 947-2410

**Climate Change Impacts and Adaptation Directorate**
601 Booth Street, 1st Floor
Ottawa, Ontario K1A 0E8
Telephone: (613) 947-4880
Fax: (613) 992-0190

**For further contact information consult our web page at: www.nrcan-rncan.gc.ca/ess/**

# 10.0 Earth Sciences Sector – Organization Chart



# EARTH SCIENCES SECTOR

## Vision

ESS will be, and be recognized to be, a leader in the development, deployment and integration of science and technology into policy and decision-making by NRCan, the federal and provincial governments, industry and other stakeholders.

## Strategy

- Have and maintain a highly motivated innovative and focused staff;
- Have a balanced S&T portfolio;
- Do the right S&T and do it at the right time;
- Own only what you must; influence all you can; and
- Use the best resource where ever they exist through the use of internal and external networks, partnerships and alliances.

## Implementation

ESS will be a high performance, issues, outputs and outcomes driven organization, aligned with government priorities, linked with other parts of Canada's innovation system, and known for excellence in everything it does making it the employer of choice.