PROJECT ANNEX No. 14

Between the:

EARTH SCIENCES SECTOR, Department of Natural Resources, Canada (hereinafter referred to as "ESS"),

and the:

U.S. GEOLOGICAL SURVEY of the Department of the Interior, United States of America (hereinafter referred to as "USGS"),

concerning:

Canada-US Project on Disaster Reduction using GEOSS Principles
(hereinafter referred to as the "Project")

Authority: This is a Project Annex (hereinafter referred to as "PA") to the Memorandum of Cooperation signed on April 9th 1999, and the Letter of Exchange signed February 13th and March 10th, 2004, between the Earth Sciences Sector of the Department of Natural Resources, Canada, and the U.S. Geological Survey of the Department of the Interior of the United States of America, hereinafter referred to as the "Parties". This PA is approved in accordance with Article VI of the Memorandum of Cooperation.

Correspondents and Responsible Senior Managers:
USGS: Chip Groat, Director, United States Geological Survey, Department of the Interior
ESS: Irwin Itzkovitch, Assistant Deputy Minister, Earth Sciences Sector, Natural Resources Canada

Background: The international Group on Earth Observations (GEO) initiative provides a significant opportunity for the global community to improve the collection and use of Earth observation information to address problems across a wide range of issues of importance to society.

As part of the US/Canadian contribution to GEO, and building on a long-standing and successful Memorandum of Understanding between the United States Geological Survey and the Geological Survey of Canada, Natural Resources Canada, we have begun an initiative within the GEO framework to permit the seamless sharing of hazard-related information across the border through common standards and interoperable systems. The initiative focuses primarily on projects contributing to natural hazard reduction in trans-border regions, but will lead to better integration of hazard information over all of North America and beyond.

Scope: Natural hazards do not recognize political boundaries. Ensuring that the exchange of Earth observation information to reduce hazards is made as free and unencumbered as possible is not only good economic sense, reducing duplication of effort and inefficiencies of translation or interpretation, but is also a vital component of our strategy to continually strive to improve the safety and security of all our citizens. The goal of the Project is to demonstrate, through greater cross border collaboration and under the principles of GEOSS that citizens of both our countries can benefit from increased interoperability of our resources and networks. This will help to ensure that science and technology are being effectively used to address priority issues. The Project will also aim at assessing end-user requirements and developing required tools; this includes strengthening links between our national geospatial infrastructures.

Assumptions and Constraints:

1. The Project will involve collaboration primarily between Canadian and U.S. government organizations, including Natural Resources Canada and the U.S. Geological Survey.

2. The focus of the Project, within the GEOSS "societal benefit areas", will be disaster reduction, with an emphasis on all-hazards alerts and notifications.

3. The Project will be reported at the GEO-I meeting, May 3-4, 2005.

4. The Project will adhere to GEOSS principles, including GEOSS architecture and open standards.
   (See Appendix 1)

Work Plan

1. **Standard format for alerts and notifications.**

   Alert and notification messages are generated from the detection of various types of natural hazards, including earthquakes, landslides, volcanoes, and geomagnetic storms. A standard format for such messages, already being demonstrated for severe weather and tsunami, will be applied in the U.S./Canada trans-border area of the Pacific coast. This standard format will facilitate communication over a variety of media, such as telephone, radio, and television, as well as the Internet. Map products can also be produced more readily from messages in standard formats.

2. **Exchange of real time data from seismograph stations on both sides of the border**

   Real-time data exchange has improved the timeliness and accuracy of automatic earthquake locations in border areas, both in the British Columbia–Washington region and in the New England–Eastern Canada region. Expanding this effort would permit better and faster alerts to be sent to emergency managers and infrastructure operators, who could then take appropriate action to protect the public and "lifeline" structures such as dams, railways, and power plants.

3. **Integration of felt-intensity data gathered on a common basis**

   Felt-intensity reports are important for understanding how earthquake ground shaking varies with distance from the earthquake epicentre. This is a key input into the seismic provisions of national building codes, the implementation of which is a key mitigation strategy against earthquakes. Independent web-based systems used within Canada and US have different criteria for assigning intensity. This has made integration of intensity results for earthquakes felt on both sides of the border a difficult and time-consuming, manual process. The recent, magnitude 5.3 earthquake in Charlevoix, Quebec (6th March 2005), which was felt as far as Montreal and Boston, provided insight into the potential benefits of an integrated system.

4. **Automated real-time provision of seismic and tide-gauge data for tsunami alerting**

   The Parties will collaborate towards improving their west-coast systems to ensure robust, automatic, real-time sharing of seismic data to detect large earthquakes. Through existing collaborations with Department of Fisheries and Oceans in Canada and NOAA in the US, this seismic data can be combined with sea level data to estimate tsunami wave arrival times and amplitudes. This would improve the ability to issue tsunami alerts for the entire western coast of North America in an efficient, common and timely basis.

5. **Integrated Spatial Data Infrastructures.**

   Building on previous agreements between our countries the Parties will strengthen the linkages between their respective National Geospatial infrastructure programs. Under the umbrella of the GEO partnership, the Parties will continue to explore and expand our commonalities, including Technology and Framework development for an integrated Spatial Data Handling component in the hazards reduction efforts.

Funding Arrangements: Unless otherwise mutually agreed to in writing by the Parties, both Parties will contribute their own resources (personnel and funding) to the Project carried out under this PA and will therefore be responsible for their own expenses incurred as a result.

Intellectual Property: As per the "Agreement on the Allocation of Intellectual Property Rights, Interests and Royalties for Intellectual Property Created or Furnished under Certain Scientific and Technological Cooperative Research Activities" between the Government of Canada and the Government of the United States of February 4, 1997, Parties to this PA shall retain existing intellectual property that they bring to the Project. Intellectual property arising as a result of the Project carried out under this PA shall be jointly owned by both Parties. Products produced under the Project can be used, reproduced, modified, distributed and sublicensed by both Parties without any obligation or payment to the other Party.

Publications: All publications and announcements in connection to the Project carried out under this PA shall be made in the spirit of collaboration, with participation from both Parties, and will properly acknowledge the role (including co-authorship where appropriate) and contribution of the Parties.

It is also important to register the semantics of shared data elements so that any system designer can determine in a precise way the exact meaning of data occurring at service interfaces between components. The standard ISO/IEC 11179, Information Technology--Metadata Registries, provides guidance on representing data semantics in a common registry.

Many Earth Observation catalogues that require interoperability at the search service have adopted the international standard used for catalogue search (ISO 23950 Protocol for Information Search and Retrieval). This search service is interoperable with the broadest range of information resources and services, including libraries and information services worldwide as well as the Clearinghouse catalogues supported across the Global Spatial Data Infrastructure now implemented in more than 50 countries. This standard search service also has demonstrated interoperability with services registries using either an ebXML metadata model or UDDI (Universal Description, Discovery, and Integration).

Data and information resources and services in GEOSS typically include references to specific places on the Earth. Interfaces to discover and use these geospatial data and services are agreed upon through the various Spatial Data Infrastructure initiatives. These include the ISO 23950 search service interface standard, as well as a range of ISO standards covering documentation and representation, and place codes. The standard for geospatial metadata is ISO 19115: Geographic Information--Metadata. This standard facilitates the exchange and integration of data and information by giving a standard description of the identification, extent, quality, spatial and temporal scheme, spatial reference and distribution specifics of geospatial data. [...]

GEOSS interoperability arrangements are to be based on the view of complex systems as assemblies of components that interoperate primarily by passing structured messages over network communication services. By expressing interface interoperability specifications as standard service definitions, GEOSS system interfaces assure verifiable and scaleable interoperability, whether among components within a complex system or among discrete systems.

Warranty: USGS and ESS make no representation or warranty respecting the products arising from this PA, either expressly or implied by law or otherwise, including but not limited to, implied warranties or conditions of merchantability or fitness for a particular purpose.

General Provisions: All questions related to this PA arising during its term will be settled by the Parties by mutual agreement.

Duration and Termination: This PA will remain in effect until June 30th, 2006 at which time it may be extended by the mutual written agreement of the Parties. Either Party may, by giving the other Party thirty (30) days written notice, terminate this agreement. Changes or modifications to this PA shall be in writing and signed by the Parties. Each Party shall immediately, upon termination, return the other Party's papers, materials, or other property held for the purpose of carrying out the Project.

Accepted on behalf of USGS:

Accepted on behalf of ESS:

Signatures were removed for privacy

Chip Groat
Director
United States Geological Survey
Department of the Interior

May 4, 2005
Date

Irwin Itzkovitch
Assistant Deputy Minister
Earth Sciences Sector
Natural Resources Canada

May 4/05
Date

Appendix 1: GEOSS Architecture Guidance

The negotiated text of the GEOSS 10-Year Implementation Plan notes some of the requirements on contributed systems ("5.3 Architecture and Interoperability", page 7):

> The success of GEOSS will depend on data and information providers accepting and implementing a set of interoperability arrangements, including technical specifications for collecting, processing, storing, and disseminating shared data, metadata, and products. GEOSS interoperability will be based on non-proprietary standards, with preference to formal international standards. Interoperability will be focused on interfaces, defining only how system components interface with each other and thereby minimizing any impact on affected systems other than where such affected systems have interfaces to the shared architecture.
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> For those observations and products contributed and shared, GEOSS implementation will facilitate their recording and storage in clearly defined formats, with metadata and quality indications to enable search, retrieval, and archiving as accessible data sets. [...]
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> To enable implementation of the GEOSS architecture, GEOSS will draw on existing Spatial Data Infrastructure (SDI) components as institutional and technical precedents in areas such as geodetic reference frames, common geographic data, and standard protocols. GEO Members and Participating Organizations and their contributions will be catalogued in a publicly accessible, network-distributed clearinghouse maintained collectively under GEOSS. The catalogue will itself be subject to GEOSS interoperability specifications, including the standard search service and geospatial services.

Further details regarding interoperability are provided in the GEOSS 10-Year Implementation Plan Reference Document (Section 5, "Architecture of a System of Systems"):

> In common with Spatial Data Infrastructures and services-oriented information architectures, GEOSS system components are to be interfaced with each other through interoperability specifications based on open, international standards.[...]
>
> A key consideration is that GEOSS catalogues data and services with sufficient metadata information so that users can find what they need and gain access as appropriate. [...] Users searching GEOSS catalogues will find descriptions of GEO Members and Participating Organizations and the components they support, leading directly to whatever information is needed to access the specific data or service in a harmonized way, independent of the specific provider. In this sense, the interoperable GEOSS catalogues form the foundation of a more general 'clearinghouse'. GEOSS data resources can be fully described in context, and data access can be facilitated through descriptions of other useful analysis tools, user guides, data policies, and services. Many examples of such clearinghouse facilities already exist in the realm of Earth Observation and networked information systems generally, and many of these already employ interoperable interfaces. [...]
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> GEOSS service definitions are to specify precisely the syntax and semantics of all data elements exchanged at the service interface, and fully describe how systems interact at the interface. At present, the systems interoperating in GEOSS should use any one of four open standard ways to describe service interfaces: CORBA, Common Object Request Broker Architecture; WSDL, Web Services Definition Language; ebXML, electronic business Extensible Markup Language, or UML, Unified Modeling Language.
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> Systems interoperating in GEOSS agree to avoid non-standard data syntaxes in favor of well-known and precisely defined syntaxes for data traversing system interfaces. The international standard ASN.1 (Abstract Syntax Notation) and the industry standard XML (Extensible Markup Language) are examples of robust and generalized data syntaxes, and these are themselves inter-convertible.