GeoNOVA Initiative - 5 Year Strategy
Trends & Technology Workshops

Overview of Workshops Make-up Session

Presented by Terry Tarle – February 14th, 2002

Sierra Systems

Full Service IT Consulting Firm

- Information technology based business solutions
- Management & technology consulting
- System integration & delivery
  - package implementation
  - custom development
- Technology management

Sierra Systems

Sierra Systems

- Locations:
  - Calgary
  - Dallas
  - Edmonton
  - Halifax
  - Los Angeles
  - Olympia
  - Orange County
  - Ottawa
  - San Diego
  - Seattle
  - Toronto
  - Vancouver
  - Victoria
  - Washington, DC
- 900 Employees
- Canadian Company

Sierra Systems

Client Services

INDUSTRIES

eGovernment   Health   Justice   Utilities   Telecommunications   Financial Services/Insurance

SOLUTIONS

Customer Relationship Management
Supply Chain Management
Application Integration
Enterprise Systems
eCommerce

Partners

Spatial Solutions
Document Management Solutions

SERVICES

Project Management

| Strategic Thinking | Systems Development | Solutions Integration | Infrastructure and Hosting |

Transition Management

Sierra Systems

Sierra Systems – Spatial IT

- Strategic Spatial IT Management/Technology Consulting
- Spatial Data Standards and Modeling
- Spatial IT Design and Development
- Spatial IT System Implementation
- Quality Assurance of Spatial Data

Sierra Systems

Spatial IT Projects

Parks Canada – Internet Access to Geospatial Data
British Columbia – LUCO Program Reviews;
British Columbia Ministry of Environment – Tantalis Initiative;
British Columbia Ministry of Forests – INCOSADA Initiative
British Columbia Ministry of Sustainable Resource
   Image Compression Product Selection Review;
   Digital Image Management
Alberta Environment – Strategic Planning;
Alberta Environment – Air Photo Records System;
Alberta Municipal Affairs – Municipal Infrastructure
Columbia Basin Trust – Basin Information Network (BIN) GeoPortal;
City of Edmonton – Spatial Land Information Management Initiative.

Spatial IT Projects – Halifax

- Assistance with Technical Requirements for Registry 2000
- Business Planning Facilitation for Nova Scotia Geomatics Centre
- Facilitation for Provincial Discount Agreement / Provincial Technology License process
- GeoNOVA Initiative – 5 Year Strategy
- Revenue Expense Projections for the Nova Scotia Topographic Database
- Technical Architecture for Geospatial Data Dissemination

Sierra Systems People

- Robin Mullin
  - 18 years in the geomatics business
  - Extensive experience in land records applications
  - Managed projects with diverse groups of municipal, regional, provincial, inter-provincial and federal representatives
  - Focus on GIS and GIS enabled applications
  - Business Process Re-engineering
  - Facilitation and management consulting
- Terry Tarle
  - Leads Sierra Systems specialty Spatial IT services for North America
  - 20 years experience in Geomatics, Surveying, Mapping and GIS
  - Comprehensive understanding of all aspects of spatial information data and systems with special expertise in spatial data modelling
  - Expert in spatial data standards, and is currently a member of the ISO TC 211 committee on spatial data standards representing Canadian users & TAP.
  - Recent work in the implementation of a geospatial metadata management system and linkages to the CGDI under the GeoConnections Program.
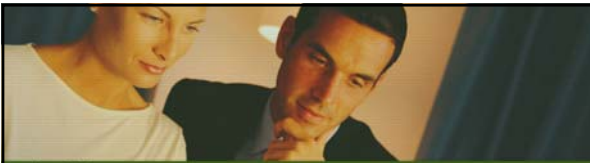
Technology Trends

Technology Trends

- GIS Technology Maturing – Merging with IT
- New Spatial Technology from GIS & Database Vendors (SDE, Oracle Spatial, Informix, etc.)
- New Internet Map Server Products Enabling "Geo-Portals"
  - ESRI ArcIMS
  - Intergraph GeoMedia Web Map Enterprise
  - AutoDesk MapGuide
  - Mapinfo MapExtreme

Technology Trends (cont.)

- Emerging National & International Standards
  - ISO TC211
  - OGC
  - FGDC
  - GeoConnections
- Emerging Wireless / Location Based Technology
- New GPS Services (Real Time Corrections)

Technology Trends – Wireless GIS & GPS

- Anywhere, Anytime Mobile Computing
- Real Time Positioning in Vehicles and PDAs
  - GM On-Star in over 1 M Vehicles
- Microbrowser (wireless) Access to Web & Back Office
- Cellular Infrastructure for Locating Mobile Users
  - Ericson, Alcatel, US Wireless, Cell-Loc, Cambridge & Cell-Loc

Technology Trends – Wireless GIS & GPS

- **3G Cellular Standards in Europe – Coming to NA**
  - Support Wider Bandwidth – Faster, More Data
  - Needs 4 X more Towers
- **Satellite Links for LBS Getting Cheaper & Faster**
- **Mid-Air Messaging Coming to the Internet**
  - Will be able to leave a message "at a location" (Virtually)
  - HP has Prototype Running in Bristol Lab in UK

Location Based GIS – Connected Modes

- **Direct Wireless Connection to Web / Enterprise Database**
- **Require Wireless "Signal in the Air" & Card**
- **Problem in Remote Areas where no Cell or other Wireless Coverage**

Location Based GIS – Disconnected Modes

- **Data / Application is Cached on PDA**
- **Does not Require Continued Wireless Connection to Web / Database**
- **Field Captured Info & Updates re-synced when Connected**
- **Or Red Line Info Integrated after QA**

More on New GPS Technology

- **Canadian Differential GPS ($3 M)**
  - Accuracy: 1 –2 Metres (Claimed)
  - Cost: $1,200 per Receiver
  - Comm. Link: M-Sat
  - Operational: Trial Tests in April, 2002
  - Problem In Treed or Built Up Areas (Loses Signal)
  - Designed for Coverage in Canada
  - Connection to GPS Unit (Provides real time Corrections)

More on New GPS Technology

- **US FAA Wide Area Augmentation System $3 B)**
  - Accuracy: 7 Metres (Claimed)
  - Cost: Free (Standard with most New GPS Units)
  - Comm. Link: GPS Channel (Don't Need Comm. Antenna)
  - Operational:
    - 1999 "Signal in the Air" for Marine etc.
    - FAA Certification for Flight Approaches etc.2003
  - Problem in Treed Areas (Designed for Aircraft)
  - Coverage not as Good in Canada

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6 Main LBS Application Areas

- **Finding Things** (E911, Travel Directions, etc.)
- **CRM** (Sales, etc.)
- **Asset Management** (Outage Management, Work Permits, Inspections)
- **Field Force Automation** (Meter Reading, Delivery Services, Fleet Management)
- **Location Based Billing** (Parking, Theatre, Restaurant)
- **Entertainment** (Golf, Car Rallies, New Games**)**

"Reality – What A Concept"

- **Challenges & Limitations**
  - Staying Connected (Urban & Rural)
  - Wireless Coverage
  - Need Corrected GPS to Capture Location of New Facilities in Real Time
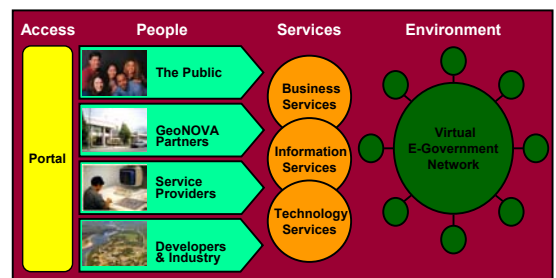 - Re-sync to Database is a Challenge (Long Transaction)

GeoPortals – Concepts & Realities

What is a GeoPortal?

- **Map-based Portal**
- **Portal Provides One Window Web Access to:**
  - Information
  - Services
  - Technology
- **GeoPortal Uses Map / Location to Access Information & Services**
- **Example NRCan's GeoConnections**

GeoPortal Conceptual Model

The Need for GeoPortals

Drivers & Industry Trends

- **"Do More with Less" - Mantra of Government**
- **Increase Demand for Data Sharing & Exchange**
- **Increased Expectation for Info & Services on the Web.**
- **Spatial Data Used to Link & Integrate Disparate Info.**
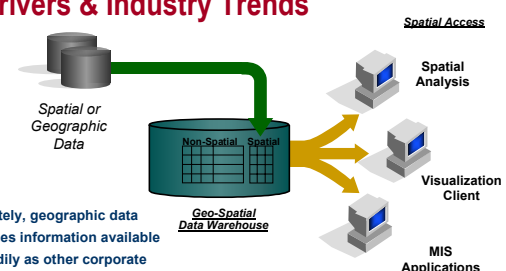
Drivers & Industry Trends

- **Pressure for Interoperability Standards.**
- **Push for Metadata Standards for Web "Discovery"**
- **New WEB Mapping Technology**
  - (MapGuide, ArcIMS, GeoMedia Web Map, MapExtreme)
- **Technology no Longer a Limitation – Data, Organizational & Policy Issues are Greatest Barrier**

Drivers & Industry Trends

Spatial Access

Spatial Analysis

Visualization Client

MIS Applications

Spatial or Geographic Data

Non-Spatial   Spatial

Geo-Spatial Data Warehouse

Ultimately, geographic data becomes information available as readily as other corporate information.

Demand from 3 Broad Sectors….

Resource & Land Management
- ✓ Parks & Recreation
- ✓ Environmental Management
- ✓ Land Development
- ✓ Land Registry
- ✓ Land Use Planning
- ✓ Agriculture
- ✓ Forestry
- ✓ Fish & Wildlife
- ✓ Exploration

Spatial Data Backbone

Community Info & Services
- ✓ Virtual City Hall
- ✓ Hospitality Services
- ✓ Health Services
- ✓ Justice
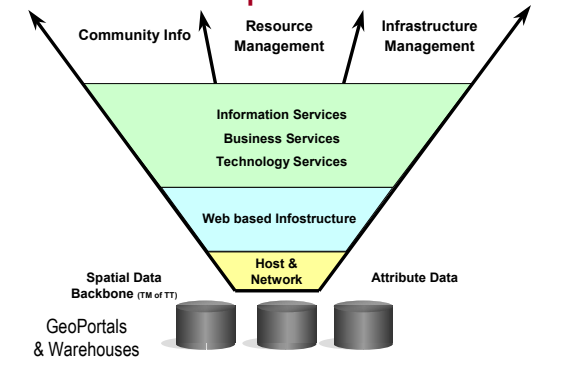- ✓ Emer Services (911)
- ✓ Social Services (211)
- ✓ Town Planning

Infrastructure Management
- ✓ Sewer & Water
- ✓ Transportation
- ✓ Telephone
- ✓ Oil & Gas Pipeline
- ✓ Power
- ✓ TV & Internet Cable
- ✓ Real Property / Asset Management

GeoPortals Architecture Options

GeoPortals Conceptual Model

Community Info   Resource Management   Infrastructure Management

Information Services
Business Services
Technology Services

Web based Infostructure

Host & Network

Spatial Data Backbone (TM of TT)   Attribute Data
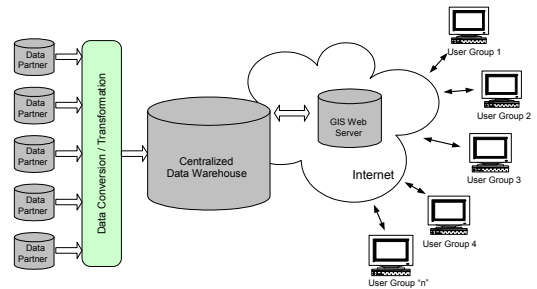
GeoPortals & Warehouses

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3 GeoPortals Architecture Options

- **GeoPortal with Centralized Warehouse**
- **GeoPortal with Distributed Data**
- **Hybrid GeoPortal**

GeoPortal with Centralized Warehouse

- **Selected Data Replicated to Warehouse**
- **Common Data Format & Standard Agreed to**
- **Users Access Warehouse Via Standard Suite of Discovery, Access and Business Applications**

## GeoPortal with Centralized Warehouse

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GeoPortal with Centralized Warehouse

- **Pros**
  - **Relatively Easy to Develop – Inclusive all Data Partners**
  - **Single Source of Data (Single Format)**
  - **Good Security**
  - **User View of the Data**
- **Cons**
  - **Relies on "push" from each Partner (Currency Issue)**
  - **Sub-set of data only**
  - **Duplicate Data to Manage**

GeoPortal with Distributed Database

- **Uses OGC Interoperability to Intelligently Communicate with a Network of Distributed Internet GIS Servers**
- **Hides Data from its Interface**
- **Internal Structure of Various Partner GIS Database not Exposed to the Outside World**

GeoPortal with Distributed Database
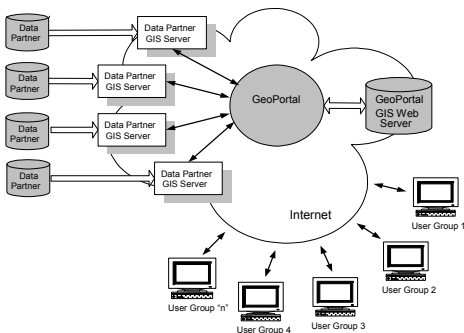
GeoPortal with Distributed Data

- **Pros**
  - **Immediate Currency of Data**
  - **Support Multiple Projections etc. via OGC**
  - **One stop Shopping**
- **Cons**
  - **All Partners must have OGC compliant systems**
  - **Each Partner Needs a GIS Server**
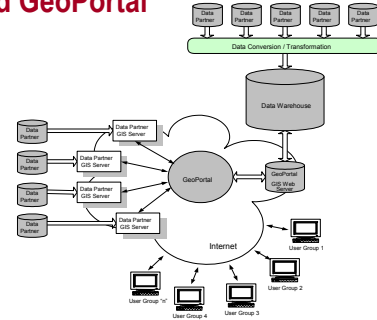 - **Security & Confidentially can be Complicated**

Hybrid GeoPortal

- **Centralized Warehouse Option for Data Partners without OGC Systems (or Security Conscious)**
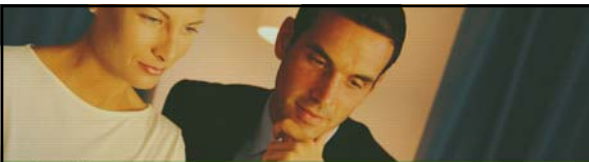- **GeoPortal with Distributive Data Option for Partners Ready for this**

Hybrid GeoPortal

Hybrid GeoPortal

- **Combines Pros of other Options plus**
  - **Permits Migration over Time**
- **Cons are the Same, Depending on Option Selected**
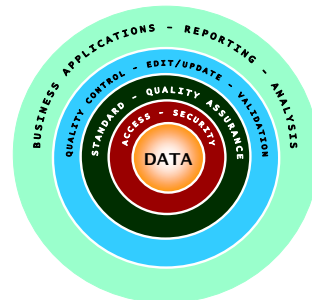
Best Practices Example of GeoPortal

- New York State Coordination Program
  www.nysgis.state.ny.us

Sierra Systems Data Centric Approach to Implementing Large GeoSpatial Systems

Sierra Systems Data Centric Approach

Data Layer

DATA

Data Layer

- **Spatial Data Meeting Corporate Standards.**
- **Attribute Data Meeting Corporate Standards (data model).**
- **Meta Data Meeting Corporate Standards**

Access & Security Layer

ACCESS - SECURITY
DATA

Access & Security Layer

- **File / Feature Management**
- **Only Clean Data is Allowed into Data Layer.**
- **Check out / in Access Security by User ID.**
- **Data Replication Control**
- **Version and Revision Stamps.**

Custodian Quality Assurance Layer

CUSTODIAN QUALITY ASSURANCE
ACCESS - SECURITY
DATA

Custodian Quality Assurance Layer

- **Corporate & Custodian QA Processes defined in ISDD.**
- **QA Scripts for each Custodian Storage Tile**
- **Spatial Tile / Attibute File Pair is Sealed and Zipped for Check in to System, only if Custodian QA process is Successful.**

Edit, Update & Validation Layer

EDIT · UPDATE · & · VALIDATION
CUSTODIAN QUALITY ASSURANCE
ACCESS · SECURITY
DATA
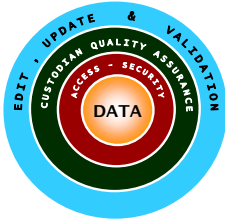
Edit, Update & Validation Layer

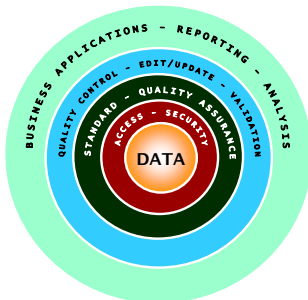- Spatial Data Edit/Update & Validation
- Attribute Edit/Update & Validation

Business Application, Reporting & Analysis

BUSINESS APPLICATIONS · REPORTING · ANALYSIS
EDIT · UPDATE · & · VALIDATION
CUSTODIAN QUALITY ASSURANCE
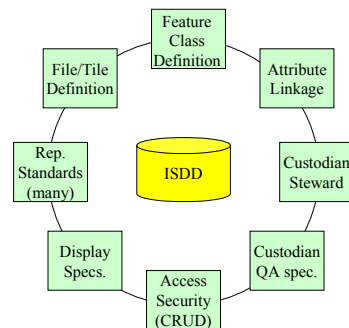ACCESS · SECURITY
DATA
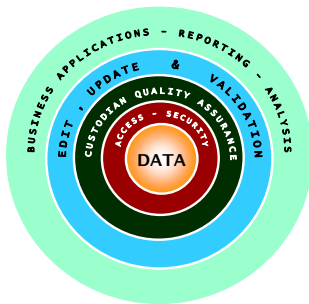
Business Application, Reporting & Analysis

- Custom Business Reports.
- Spatial Analysis Using GIS
- Custom Business Spatial Analysis Using GIS
- Data Viewing / Plotting Using GIS & Viewer.
- Other OLE Applications.

Sierra Systems Data Centric Approach

BUSINESS APPLICATIONS · REPORTING · ANALYSIS
QUALITY CONTROL · EDIT/UPDATE · VALIDATION
STANDARD · QUALITY ASSURANCE
ACCESS · SECURITY
DATA

Integrated Spatial Data Dictionary (ISDD)

Feature Class Definition
File/Tile Definition
Attribute Linkage
Rep. Standards (many)
ISDD
Custodian Steward
Display Specs.
Access Security (CRUD)
Custodian QA spec.

**BC Corporate Base Map
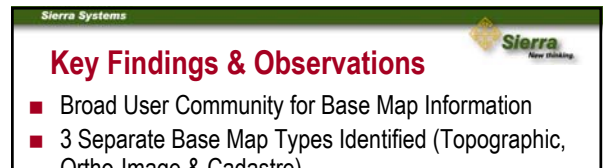Content, Standards & Governance Review**

Project Objectives

- **Phase 1 Objectives**
  - Identify Key Components of a Corporate Base Map.
  - Provide Recommendation on Changes to Base Map Content & Standards.
- **Phase 2 Objectives**
  - Review Current Governance Issues Regarding the Management of Corporate Base Map Data.
  - Provide Recommendations on Changes to the Current Governance Model.

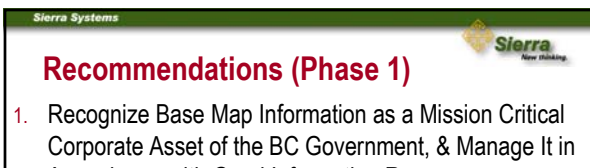**Phase 1 - Content & Standards Review**
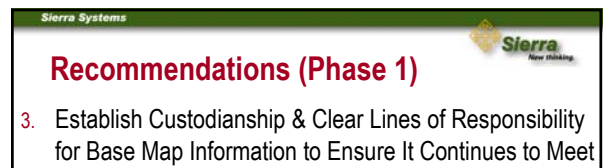

Key Findings & Observations

- Broad User Community for Base Map Information
- 3 Separate Base Map Types Identified (Topographic, Ortho-Image & Cadastre)
- Transportation, Hydrographic & Cadastre Features Most Important / Broadest Use
- GDBC (BMGS) Expected to Set & Enforce Standards, Maintain Currency & Provide Easy Access.
- Base Map Currency Very Important for Most Users – Particularly for Transportation & Cadastre Features
- Base Map Information Expected to be GIS Ready

Recommendations (Phase 1)

1. Recognize Base Map Information as a Mission Critical Corporate Asset of the BC Government, & Manage It in Accordance with Good Information Resource Management (IRM) Principles.
2. Establish a Formal Base Map Update Program that Includes Updates from Source Data Providers, and Ensures the Corporate Base Map Database is Sustainable & Continues to Meet User Requirements.

Recommendations (Phase 1)

3. Establish Custodianship & Clear Lines of Responsibility for Base Map Information to Ensure It Continues to Meet the Needs of the Province & Other Users.
4. Establish an Effective Governance Model for the Management & Funding of Base Map Information.
5. Establish a mechanism for notifying clients of base map updates.

Recommendations (Phase 1)

6. Establish Formal Data Exchange Agreements, Procedures & Standards that will Facilitate On-going Update of the Corporate Base Map Database from Source Data Providers (i.e. Regions, Districts, Other Programs, etc).

7. Update Transportation & Cadastre Features on an On-going Bases (at Least Annually). Other Corporate Base Map Features Should be Updated on a 5 Year Cycle, or as Available from Source Data Providers.

Recommendations (Phase 1)

8. Establish Common Corporate Standards for Base Map Information, Including:
   - Geo-Reference Framework Information
   - Base Map Content & Feature Definitions
   - Positional Accuracy
   - Topology Rules (Point, Line, Polygon)
   - Metadata & Attribute Linkage
   - Ortho-Imagery Products

Recommendations (Phase 1) Cont.

9. Convert the TRIM Base Map Data from the Current Line-String / File Based System to an Integrated, Seamless (Province-Wide), Feature Based Corporate Base Map Database.

10. Establish & Maintain Both Transportation & Hydrographic Feature Networks as Integral Components of the Corporate Base Map Information.

11. The Transportation & Hydrographic Feature Networks Should Include a Standardized Attribute Linkage that can be used by all stakeholders
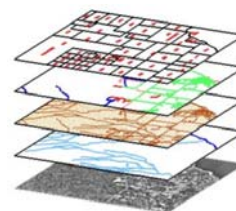

Recommendations (Phase 1) Cont.

12. Establish an Effective Intra/Internet Based System for the Management of the Corporate Base Map Database, Including Tools for:
   - Edit/Update, QA / QC
   - On-Line Access
   - On-Line Reporting & Analysis Services

Recommendations (Phase 1) Cont.

13. Undertake a Review of the Current Hydrographic Feature Atlas (TRIM Watershed Atlas) with Stakeholders to:
   - Identify Shortfalls, Issues & Concerns
   - Clarify Roles and Responsibilities
   - Recommend Changes to Content, Update Procedures & Standards to Meet User Needs.

Spatial Data Backbone *(Key Components of Corporate Data)*

Parcel Fabric

Transportation Network

Elevation Model

Hydrographic

Imagery

Phase 2 – Governance Review

Recommendations (Phase 2)

1. Corporate Standards Must be Established and Enforced for All Base Mapping carried out in the Province
2. Base Mapping Should be a Corporate Program Driven by Corporate Needs and should be situated in a Division with Corporate rather than Program Responsibilities
3. One Organization Should be Assigned Responsibility for Coordination and Management of Base Mapping Activity and base map data.
   - Where Another Organization has Responsibility for some Components of Base Map data, Clear Lines of Responsibility & Accountability Should be Established.
   - Changes to legislation and operating policy to support this governance model need to be identified and implemented.

Recommendations (Phase 2)

4. The Base Mapping and Geomatics Services (BMGS) Branch of MSRM Should be Assigned Responsibility for Base Mapping, including:
   - Establishment of corporate standards;
   - Management of all aspects of GSR (including geodetic control monuments and ACS)
   - Development and management of Topographic and Ortho-Images
   - Review of funding for base map activities with view to implementing central coordination (see Recommendation 4);
   - All base map data exchanges between the provincial agencies and external organizations; and
   - Provision of Topographic and Ortho-Image Base Maps and related data for distribution

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Recommendations (Phase 2)

5. ICI Should Assume Responsibility for the Cadastral Base Map
   - A close relationship should exist between ICI and BMGS, with the Director of BMGS serving on the ICI Board of Directors.
   - A Medium term objective should be to enable clients to integrate data from the Base Maps managed by both organizations
6. Early Priorities for BMGS & the BIS Division should be to:
   - Upgrade the Electronic Distribution Systems for Base Maps & Related Data
   - Encourage Users to Use Digital Rather than Hard Copy Maps
7. Formally Establish TRIM as the Official Base Map for the Province to which all Resource Data must be Referenced

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Recommendations (Phase 2)

8. Government Funding for all Base Map related Activities (including FRBC Funding), should be Coordinated through a single Organization to Ensure Corporate Standards are Applied, & the Data Collected is Provided to the Organization Responsible for Base Mapping
9. The Respective Mandates & Responsibilities of BMGS and the Surveyor General Branch Should be Clarified, & Consideration Should be Given to Merging the Two Branches

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Future Direction (Speculative)

- **Base Mapping & Geomatics Services moved to new Ministry of Sustainable Resource Management in June 2001**
- **Current Restructuring / "Right"-Sizing Resource & Registry Division**
- **Plans for DRA 2 in the Works**
- **Plan for Digital Image Management System in Place – Should Start to Implement in April, 2002**
- **Management of Corporate Base Map and Digital Imagery may be Candidate for Outsourcing – Possibly with ICI**

OGC, ISO TC211, FGDC, & other TLAs'
(You Too Can Be An Expert!)

Two Definitions of Expert

1. "Someone Who is One Page Ahead of Everyone Else in the Manual"

2. "Someone Who Knows More & More About Less & Less, Until they Absolutely Everything there is to Know about Nothing"

OGC

- **Open GIS Consortium**
- **Industry consortium aimed at growing interoperability for technologies involving spatial information and location**
- **All Major GIS Vendors Members**
- **Sets Interoperability Standards rather than Data Format Standards**
- **See http://www.opengis.org/ for more info**

FGDC

- **Federal Geographic Data Committee (US)**
- **GeoConnections "Sibling" Organization in the US**
- **Administrates the National Spatial Data Infrastructure (NSDI) for the US**
- **FGDC Standard for Metadata Content Broadly Accepted in US and Elsewhere including CGDI**
- **Wealth of Good info on http://www.fgdc.gov**

ISO TC211

- **International Standards Organization Technical Committee Number 211**
- **Setting International Standards for Geo-Spatial Information**
- **Slow, Academic & AR**
- **Working 5 Years plus on this – no end in sight**
- **Now Coordinating with OGC**
- **See http://www.isotc211.org/scope.htm#scope for more info - or for cure for insomnia!**

ISO Z39.50

- **ISO Z39.50**
  - **International Standards Organization Standards Number Z39.50**
  - **Search & Retrieval Protocol for Metadata**
  - **Used by Libraries & Museums for Many Years**
  - **Adapted for Geo-Spatial Data by FGDC, OGC & CGDI**
  - **Already Supported on Multi Platform by Many COTS**

Other TLA's

- COTS – Commercial Off The Shelf Software
- SCOTS – Standards Based Commercial Off The Shelf Software
- HTML – Hyper Text Markup Language
  - standard for encoding/decoding web site page descriptions that include simple images and formatted text

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Other TLA's

- XML – Extended Hyper Text Markup Language
  - allows developers to specify rules for designing text formats for any data in a way that produces files that are easy to generate and read (by a computer), that are unambiguous, and that avoid pitfalls such as lack of extensibility, lack of support for internationalization/localization, and platform-dependency

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Other TLA's

- GML – Geographic Markup Language
  - OGC Standard that extends XML for encoding the transport and storage of geographic information, including both the geometry and properties of geographic features
  - Based on OGC's abstract model of geography, which describes the world in terms of geographic entities called features

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Wrap Up

- Questions & Answers
- Action Items and Follow-up