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Morice & Lakes  
Innovative Forest Practices  
Agreement

Implementation Plan for a Data Sharing  
Network

Final Report

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## 1. Introduction

The management of data within IFPA planning presents substantive data management challenges. There is an immediate short term goal to support data sharing needs attached to the development of the IFPA Sustainable Forest Management Plan along with those attached the Morice and Lakes Land Resource Management Plans (LRMP). The long-term goal is to provide a data model and data structure that will support the broader needs associated with sustainable forest development relating to adaptive management and monitoring.

The establishment of a web based Data Sharing Network (DSN) would facilitate the loading, integration, analysis and querying of data supporting strategic planning activities. The purpose of this report is to identify the costs, issues and constraints associated with developing the DSN and provide a suggested structure for its implementation through consultation with the IFPA and partners. Partners are identified as Canadian Forest Products- Houston, Babine Forest Products, L & M Lumber, Fraser Lake Sawmills, Houston Forest Products, Ministry of Forests and the Ministry of Sustainable Resource Management.

This report will focus on satisfying the short term goals ( to support data sharing needs attached to the development of the IFPA Sustainable Forest Management Plan along with those attached the Morice and Lakes Land Resource Management Plans (LRMP)). The key is to propose a fairly rapid solution that satisfies the short term goal and to demonstrate an early success on which successive projects can be based.

## 2. Discussion of Interviews

Interviews were carried the weeks of Jan 21 and Jan 28, 2002. The interview sessions were initiated by a “kick-off” workshop where key participants were provided with project goals and objectives and the participants, in turn, provided some overall issues and concerns about the project. Interview times, locations and participants were scheduled. The objective of the interviews were to gather information on the participant organization, network capabilities, current software and hardware inventory, current systems in use, security measures in place, a summary of data holdings and any concerns the participant had about the data sharing network concept.

### 2.1. Participants

The following organizations participated in the interview process:

Organization	Contact	Description
MSRM	Don Morgan 250 847-7440	The Ministry of Sustainable Resource Management is a new ministry that is an

		amalgamation of the data management, analysis and planning functions from the Ministry of Forests, Ministry of Environment, Lands and Parks, Mining and other Ministries depending on the region. They are responsible for planning and analysis. Corporately, MSRMC is responsible for data standards across Ministries. The local section deals with the Skeena Regional office which traditionally had provided Forest Service district offices with corporate and local data and local data standards. A replicated data warehouse (from Victoria) sits in this office providing local district offices and forest companies with government corporate data under data sharing agreements. At the local level, there has often been value added to the corporate data based on local input.
CANFOR	Barry Watson 250-845-5272	CanFor (Formerly a Northwood site) is located in Houston, BC. The site has very mature systems in place to manage Forest Information. The spatial data is maintained by the GIS department whereas the tabular data is maintained by the operations.
PIR	Paul Schwarz 250-847-2656	PIR is a division of West Fraser and is located in Smithers, BC. This site operates in a low budget information management environment. The data management environment is a graphics/map based environment and the use of GIS to manage data is at a minimum because of budgetary constraints.
Houston Forest Products	Lyle McNabb 250-845-2322	Houston Forest Products is a subsidiary of Weldwood (with part ownership (timber rights) by West Fraser – Fraser Lake). As with nearby CanFor, they also have a very mature GIS system. Connection to the outside world is usually through links to Vancouver. There is some current informal data sharing between this office and nearby CanFor office.
Silvicon	Lorna Halverson 250-847-3680	SILVICON is a local forestry consultants specializing in operational and GIS consulting. They perform many project oriented tasks for many of the local forest companies. They often access both government, first nation, business

		and forest company data for such projects. They are involved extensively with data transformation and integration. They feel they would benefit from a data sharing network. A data sharing network (now defunct) setup by Bulkley district of the Forest Service proved to be invaluable to the firm and they would like to see something similar again.
Wet 'suwet 'en	Francois Depey (250) 847 3630	Wet'suwet 'en is the First Nations group located in Smithers. It collects, analyses and distributes First Nations data for land claims, internal data bases regarding land values, land use planning input for forestry companies/government. They are very interested in being a partner in the data sharing network. The biggest concern raised was maintaining ownership and control on their data and becoming true partners in the data sharing. Another advantage is seeing forestry and government derived data being displayed in the context of their Traditional House Boundaries.
Forest Service Bulkley District	Bob Copley – 250 847-7509	The focus was on a data sharing network which was set up a few years ago but is now defunct because of security concerns. The data sharing network was a server that shared data files with forest companies. Other users have expressed that this was a success (PIR, SILVICON). A number of 'lessons learned' for this network were provided.
Forest Service Morice District	Liz Saunders 250-845-6272	A forest service district office that set up a data sharing network as well. In addition, this district is working on methods to improve the Exhibit "A" process and streamline the forest data sharing process. The hub failed because of lack of resources. The hub was a file based system. Customers were Canfor and HFP.
Forest Service Lake District	Mark Price (250) 692-2245	The Forest service in Burn's Lake services the Lakes part of the IFPA area.
Fraser Lake	Fred Hankin (250) –699-6235	Fraser Lake is a subsidiary of West Fraser. Similar to PIR it operates its data management within a low budget environment. It also uses similar tools to PIR but will make use of tools

		from Houston Forest Products. This office is looking to head office for additional support enabling complete data management service abilities. Data linkages between tabular and spatial required as well as much data cleaning.
L & M Forest Products	Andy Fraser 250-567-2111	Avison Management (they are a contractor who do all forest operational work for L&M)
Babine	Greg Jodoin (250) 692-4570	Very similar to Houston Forest Products
McGregor Group	Nina Baksh (250) 612-4053	McGregor Group in Prince George have been contracted by the Morice and Lakes IFPA to produce the IFPA analysis. They have identified, amalgamated, clipped, cleaned and derived data from the IFPA members. The data goes through a number of models to produce derived data.

## 2.2. Data Sharing Network Participant Issues & Comments

### 2.2.1. The Current Environment

- No Provincial data sharing network yet – some corporate data warehouses – corporate and regionally replicated (TRIM, FOREST COVER)
- Some corporate initiatives on-going
- Some data sharing networks between forest company and forest service district office now defunct
- Current government downloading to Forest Companies
- Government offices amalgamating
- Government encouragement of public/private partnerships (eg. IFPA)
- Longer Term forest planning encouraged (Sustainable Forest Management)
- Licensees to do Timber Supply Analysis by consortium (eg. IFPA)
- Current information flow through email, CD and FTP of required data
- Currently submission of silviculture data through remote login to ISIS – not in all cases.
- Currently submission of cutting permits through paper submissions. There is a prototype web based Exhibit “A” application project in the Morice Forest District.

### 2.2.2. Benefits

- Better use of software, application and data (common environment)
- Reduce data and application redundancy
- Reduction of Project-oriented data sets

- Storage of Meta Data (currency, projection, measures of error)
- Keys to Certification (e.g. FCS)
- Demonstration to Forest Products Market Place of good data
- Economic Advantages (accuracy -> good planning, reduce data regeneration costs)
- Alleviate the current reduction in government services
- Possible submission of plans as a consortium
- Enables good operational planning through consistent, accurate data.
- Good opportunities for value-added products (e.g. Tourist Plan Study, Physio-Economic Mapping)

### **2.2.3. General Vision**

- Adherence to open data standards (OGC)
- Establishment of Data Ethic (collection, dissemination, sharing)
- Produce a data sharing network for strategic data (e.g. work done in IFPA)
- Low Cost Implementation
- Minimize the need for local data conversion by local users in order to prepare data for loading.
- Maintain current local systems
- Make it successful
- Make it expandable

### **2.2.4. DSN Requirements**

- Ability to query by spatial, attribute or search by meta info
- Need Forecasting/backcasting tools
- Need update corporate forest cover by silviculture (currently done by gov't)
- Need to develop a usage cost model (e.g. Flat fee for members, data fee for others)
- Would like to see a system that they once had where there was a data exchange network with the local Forest Service (this is key)
- Nice to have minimal editing tools for shared data
- Need an established update cycle for each data set
- Need to establish projection standards –some use Albers, some UTM
- Feedback methodology –ie changes to data fed back to custodian
- Establish a data consortium to manage the data sharing network
- Web based if possible
- Include/enforce business rules with meta data for each layer
- Establish a membership mechanism for the data sharing network
- Should include government funding through IFPA, FIA
- Data validation should occur when submitting to the data sharing network
- Notification of updates of other data sets to all members

- Notification of downloads to custodians
- No indexing or querying was present – nice to have
- No versioning or archiving – need to have
- No backups – need to have
- Need to have a log of who downloaded data and what date
- Need to help users with forgotten password
- Need Access to:
  - IFPA required data
  - Growth and Yield
  - PSP plot location and valuations

## **2.2.5. Concerns/Issues**

### **2.2.5.1. Data**

- Corporate data versus local (more accurate) data
- Sensitive data – native artifacts, read by industry but should be read by public
- Competitive data
- No mechanism to get local to update corporate
- Encourage DATA MANAGEMENT concern
- Silviculture data model proprietary (INFORM)
- Hide accuracy of data location
- Data rules in places to ensure that data uses correct boundaries
- Need to clean up common data sets

### **2.2.5.2. Metadata**

- Data sharing network should have metadata outlining currency, errors measure
- Need good metadata (current meta data is very patchy)
- Need site map of data “warehouse” holdings and ability to browse metadata
- Disclaimers on data
- In lieu of some data on the network, only metadata viewable, must get access to data directly through office

### **2.2.5.3. Data Standards**

- Government has one set of standards and businesses have their own (especially roads, streams and blocks)
- Road network too many standards
- Streams – often collected within blocks, not between, should be watershed based
- Vegetation – new inventory standards coming, how to integrate?
- Start with RIC (Resource Inventory Committee) standards but not as prohibitive
- Many standards resulting from one-off projects
- Work within many forest districts

#### **2.2.5.4. Network**

- Firewall issues - Head office controls firewall
- Bandwidth could be a problem in downsizing
- Concern for licensee bandwidths

#### **2.2.5.5. Software**

- May not have proper software to perform conversions

#### **2.2.5.6. Hardware**

- No issues concerned. All sites appear to have good hardware.

#### **2.2.5.7. Roles/Responsibilities and Resources**

- Need government legislation to trigger improvement of data through data standards, more stringent data collection requirements
- Establish roles of actors, responsibilities
- Establish true partnerships
- Data exchange difficult because of current in-house software differs from others
- Limited resources to massage data
- Government must take a lead role
- The role of updating the forest cover in a data sharing network
- Data consortium to establish collectively business rules and data standards
- Unanimous decisions in partnership
- Need additional resources to develop databases
- Maintenance of the data warehouse was time consuming/difficult
- Maintenance of the meta data was time consuming/difficult
- Notification to users of events was time consuming/difficult
- High administration time

### **2.3. Network**

In general, it appears that most participants (Forest Companies and government offices) have access to good networks. In most cases, access to the internet is to a remote server behind a firewall not located in their offices. For the contractors and First Nations, it was found that access to the internet was currently done through dial-up. In all cases, current data exchange had been at one time or another performed through a FTP transfer.

### **2.4. Software**

In all cases, participants are using a relational database management software ranging from latest versions of MS Access to Oracle and SQLServer. This does indicate that there is attempt at structured data storage.

In terms of GIS software, there are three distinct groups (Arc/Info Users, ArcView users and Microstation Users (with extensions). Data Formats range from coverages, shapefiles IGDS and DGN.) This limits the amount of potential data translation between formats to a minimum.

## **2.5. Data**

Data can be classified into four categories: Government corporate data, forest company strategic data, forest company operational data and stakeholder data. In all most to all cases, government corporate data has been edited or copied to a local version which represents more accurate data.

It was found that most data is created on a project-by-project basis with very little consideration for data standards or continuity.

The McGregor Group have been given the task to develop strategic data for the IFPA. In this process common data layers from each participant from the IFPA are amalgamated into one layer. This has been an onerous task given that the lack of common standards and the lack of knowledge on what is the latest or correct data set. Appendix A outlines the IFPA data sets that participants would like to see in the data sharing network.

A raised concern is that edits made to the government data are not sent back to the government for incorporation into the government corporate warehouse.

## **2.6. Hardware**

In all cases, all participants have access to Windows based PC workstation with good facilities to process and storage large amounts of data. In some cases, the participants make use of UNIX workstations as data storage facilities.

## **2.7. Security**

This is a large concern for security in terms of connecting to an internet. Most sites have a firewall or a dial-up connection to the network. Any FTP security is through user name and password and protected file structure. Any server that contains data for sharing must be located outside of the firewall.

## **2.8. Current Information Management Systems**

It was found that each site had various levels of customized information management systems in place. The following summarizes the current systems in place.

<b>Company</b>	<b>System</b>	<b>Description</b>
CANFOR	GENUS	Management of spatial and tabular Forest Operations data
CANFOR	Road Management System	
HFP	Forest Management Information System	Management of spatial and tabular Forest Operations data
HFP	Road Management System (RPM)	Management of Road data
MSRM (and all Forest Companies)	ISIS	Silvicultural Records management system
MSRM (and all forest companies)	Exhibit “A”	Harvest cut block permit system
PIR/West Fraser	LIMS	Weigh Scale System
PIR/West Fraser	MAP 3D	Some customized tools – no data management
PIR/West Fraser	FORTRAK	Analysis tool for roads (data management?)
PIR/West Fraser	FORMANAGER	(not local system) Management of spatial and tabular Forest Operations data
L & M	PhoenixPro	Silviculture records management system

## 2.9. Existing Data Warehouses/Data Sharing Networks

There are several examples or flavours of data sharing/data warehouse networks within Canada and BC. Most appear to be government/private industry initiatives. Below is a summary of the examples found and some lessons that could be used in the proposed Data Sharing Network.

### **2.9.1. Land Information Ontario ([www.lio.mnr.gov.on.ca](http://www.lio.mnr.gov.on.ca))**

Cuesta Systems Inc. was involved with the design and development of the Land Information Ontario warehouse and data sharing tools.

In recent years Geographic Information Systems (GIS) technology has progressed to the point that it can now be integrated with conventional information systems to provide an increasing variety of business solutions.

The key to harnessing this new information gathering and processing ability is the creation of a common infrastructure. One which will allow a wide range of consistent and well-managed land information to be captured, cataloged and made readily available. With a strong and effective infrastructure in place, Ontario will be fully positioned to harness land information to improve productivity, enhance planning activities, make better decisions, use its resources more wisely and create new business opportunities and jobs.

In 1997, following an internal "mapping review", the Province of Ontario established the Land Information Transition Project (LITP). The objective? To consult with stakeholders and provide recommendations on how to achieve more effective and efficient management of Ontario's Land Information assets.

During this period the Government of Ontario began to consult extensively with industries, local governments and groups concerned about land information management. These stakeholders unanimously agreed that a common framework to manage land information was essential.

Land Information Ontario (LIO) coordinates Ontario's participation in GeoConnections and is developing Ontario's land information infrastructure as part of the CGDI.

#### **Environment**

Access Infrastructure – standards-based approach to data exchange and distribution.  
Investing in web-enabled tools – tools which facilitate geospatial data cataloging, access and sharing – help erase duplication and improve quality and standardization.

Have created Ontario Land Information Warehouse (OLIW) Internet Map Browser-general purpose web-enabled data browser. Browser was developed using a Java client and server components that were built using ASP, VBSCRIPT, VB6, C++ and ARCIMS. Requires Netscape Communicator v4.5 or Microsoft Internet Explorer V4 or higher.

Also have developed OLID which is a web-based metadata search system.

#### **Funding/agreements**

LIO is establishing the [Ontario Geospatial Data Exchange](#), a multi-party agreement which will radically improve the ability of government (provincial, federal, municipal), broader public sector agencies, post secondary institutions, first nations and aboriginal communities, to share geospatial data amongst themselves for non-commercial purposes.

Various Ministries of the Ontario Government have agreed to pay an annual levy in support of the Ontario Land Information Infrastructure initiative which includes the OGDE. In consideration of this levy, free access will be provided to Ontario Government organizations including Schedule I & III agencies. The Federal Government, municipalities and non-government members will all pay an annual fee (waived in the first year) to cover hardware, software and support costs. There is no charge for the data itself.

Members, who are Ministries or Schedule I or III Agencies of the Province of Ontario, are exempt from membership fees, these agencies are providing contributions to the Ontario Land Information Infrastructure (OLII) in the form of annual levies through the Province. These funds will be used to help support the operation of the OGDE.

Municipalities, First Nations and aboriginal communities with annual budgets of more than \$100 million, (including those designated as non-profit), will pay no membership fees in the first year. Thereafter an annual membership fee of \$ 3,000 per annum will apply. Members with annual budgets of less than \$100 million will pay no membership fees in the first year. Thereafter an annual membership fee of \$1,000 will apply.

Federal departments who wish to participate will be required to contribute up to \$50,000 per department depending upon the scope and nature of provincial data. The combined federal contributions will be capped at \$500,000 annually and membership fees will be adjusted downwards accordingly.

Conservation Ontario, through contributions from Conservation Authorities across the province, has agreed to review a proposal with Conservation Authorities to contribute an annual fee of up to \$50,000. Conservation Ontario has also agreed to assume responsibility for developing and administering a formula to distribute this cost among the individual Conservation Authorities.

The Ontario College and University Librarians (OCUL) have proposed to contribute \$100,000 annually on behalf of post-secondary institutions.

Other parties interested in joining OGDE will be considered on a case by case basis. In such instances fees for the first year of access will be waived. In special cases an organization can apply to have fees, which would otherwise be applicable to participation in subsequent years, reduced or waived.

The expectation is that all geospatial datasets belonging to a member organization would be shared unless there is a legal, legislated or privacy reason not to do so. Members may specify restrictions on access by members to their sensitive or classified data.

As a condition of participation, members will be required to compile standardized metadata which will describe their data sets in the [Ontario Land Information Directory \(OLID\)](#). This process will make the data discoverable on the Internet. While members may elect to retain the responsibility of distributing their own data a central data warehouse facility, designated as the [Ontario Land Information Warehouse \(OLIW\)](#), has been established to facilitate standardized access by members.

Data which members borrow may only be used for internal, non-commercial purposes and cannot be redistributed. Any external, commercial or redistribution of borrowed data will require a separate license agreement and royalty fees may be incurred. The agreement establishing the Exchange allows members to retain full control of intellectual property rights relating to their data. Corrections made on another member's data become the intellectual property of the owner of the dataset - unless the parties agree otherwise.

On a second front LIO is working with a wide range of partners through the Federal GeoConnections "[supportive policy](#)" initiative, to develop a policy framework which can effectively address issues relating to geospatial data access. Once this framework has been established Ontario will utilize it to review and revise its policies concerning commercial access to geospatial data.

### **Lessons learned from this development.**

- Warehouse data model evolved from a government internal Natural Resources Values Information System (NRVIS) data model. Legacy structures were migrated. The model and these legacy structures and exceptions were poorly documented.
- Good security model whereby user logs in and is checked to be a member of a user group. Access is granted to tools, reports and data based on the user group membership.
- Sensitive data is modelled into separate tables to ensure security.
- Used the concept of Areas of Responsibilities (AOR) to enable many data stewards per data layer. Cannot submit/extract features outside of AOR (clipped).
- Data model did not fully utilize the full use of spatial tools, relied too heavily on tabular relationships, therefore the model became very complex.
- Tried to model and design for every contingency, therefore the design times were long and made requirements obsolete and the ability to leverage newer technologies almost impossible.
- Data model allowed for self-documentation, i.e., stored metadata generically so that one piece of code would work from all data layers (some exception code involved).
- The data exchange format was called Standard NRVIS Interchange Format (SNIF). A good format for the time (3 to 4 years ago, shape files and csv files with package header) but changes in the data model would necessitate changes in the content (which the supplier would have to know). Changes in the SNIF structure would necessitate much programming in the data publication and extraction tools. Any data sharing recipient which extracted data from the warehouse for given layers would get SNIF and would have to know the structure of SNIF to import. There was no documentation on layer content. This was found to be a big problem.

- Metadata tables held data layer information in terms of update schedules, reminders, etc., by data layer and the AOR. A large effort was put in to track who extracts, who updates, when and what was done. This was a good method to ensure warehouse update.
- Initially, users could not select by a spatial polygon, features from the database. It was limited to AOR selection. This is changing to give greater flexibility.
- Outside queries to the database through ArcIMS were not OGC compliant. The system now allows OGC compliant queries.
- Metadata can be accessed by the web.
- Web reports are available for data extracting and publishing status and data layer editing information.
- Much of the coded functionality (C and SDE API, Unix scripting) can now be handled by Microsoft data transformation tools and would have saved a lot of time.
- It was not a scalable project and therefore depended on all aspects being complete before rollout

### **2.9.2. GeoConnections ([www.cgdi.gc.ca](http://www.cgdi.gc.ca))**

The CGDI initiative is driven by GeoConnections is a national partnership initiative led by Natural Resources Canada. Through GeoConnections, governments are working with industry to build the Canadian Geospatial Data Infrastructure (CGDI), which will make Canada's geographic ("geospatial") databases, tools and services readily accessible via the Internet.

There are five policy thrusts 1. Access to data, 2. Framework Data, 3. Geospatial Standards, 4. Partnerships, 5. Supportive Policy

#### 1. Access to data

The Access Node is one of the seven programs of GeoConnections that is responsible for developing portions of the Canadian Geospatial Data Infrastructure (CGDI). It is a partnership program to make geo-info in government agencies accessible via the Internet through cost-shared development. The Access Node provides the private sector, Canadians and other government agencies with the ability to find government information via a common Internet access system.

The goal of the Access Node is to develop portions of the Canadian Geospatial Data Infrastructure that will provide the public with access to Geospatial data and services. The Node activities include implementing, delivering, and accessing common interoperable services for Discovering, Accessing and Evaluating the Canadian

Geospatial resources. The Access node played a major part in the development of CEONet, now known as the [GeoConnections Discovery Portal](#).

The objectives of the Access Node are to provide discovery, evaluation and access to Canadian public geospatial data and services by national and international clients through a common window based on interoperable, reusable tools and services. Also, to provide mechanisms for suppliers to advertise and distribute Canadian geospatial data and services, from base data to value-added services and to develop a Canadian industrial capability to exploit the growing international market for geomatics management, access and distribution systems

## 2. Framework Data

After users have identified the data they need from the CGDI, they will want to extract it in a form that they can easily use and possibly integrate with their own data or with other data. These expectations can be met if the access and extraction of the geographic data are part of a standardized national framework. Easier access and integration of geographical data will speed decision making and the development of new products.

The national framework is the infrastructure required to provide the geographic data sets about Canada that are based upon a common reference system, and it will enable the development of related applications and value-added services. The ease of access and use depends on the availability of advanced technology, accepted standards, procedures and partnerships to provide and maintain the data.

The main functions of the National Framework are:

1. to provide national coverage of commonly used data sets,
2. to enable Canadians to use data that are compatible, and
3. to provide data tools and services to work with the data

## 3. Geospatial Standards

To ensure that the CGDI is compatible with activities at the global level, stakeholders in Canada have agreed to base the CGDI on international geospatial standards. The CGDI is built upon a wide variety of standards that define everything from geospatial data exchange formats such as [GML](#), through to Internet-based services such as the Web Map Service, and data content standards such as those specified for [Framework Data](#).

International standards from [ISO](#) and [OGC](#) have been adopted where appropriate, but many of the required standards don't exist, or are still in the process of being developed.

GeoConnections participates in the development and promotion of critical standards relevant to the success of the CGDI, through the work of the CGDI Architecture Working Group (CAWG). This group is currently very active in selecting and developing specifications that are of relevance to the CGDI architecture. The CAWG often follows or influences the work being undertaken by the [OGC](#)

#### 4. Partnerships

partnerships between the federal and provincial and territorial governments and the private sector and academia. In the context of a common goal, CGDI will enable timely access to geospatial data, information holdings and services in support of policy development, decision-making and economic activity through interconnected infrastructure of government, private sector and academia. In continuing the co-operative nature of the geomatics community, due to the interrelated needs of governments and the industry for geographic information, the CGDI initiative has several key areas of public/private partnership where:

- the public sector is responsible for standards, policy and legislation;
- the public/private sector co-operatively designs and manages the private sector development of the infrastructure under contract and, over time, potentially assumes increasing responsibility for delivery of services; and
- the public and private sectors work co-operatively to market internationally the services and technologies developed under the CGDI initiative.

#### 5. Supportive Policy

The GeoConnections Policy Advisory Network Node is responsible for assessing policies related to data access and use, identifying data licensing and distribution issues, and promoting the harmonization of policies to facilitate broader data sharing.

"Collect geospatial data once and closest to the source, then use them many times" is a GeoConnections maxim that reflects the need to ensure optimum value from taxpayers' dollars. In broad terms, digital technology has removed the technical barriers to the sharing and multiple use of data. However, a variety of federal and provincial policies on data access and use have arisen in response to differing circumstances and policy goals; diverse implementation of cost recovery is among them.

Despite their intentions these policies are often inhibitors. The Policy Node is working to develop and recommend implementation of policies that:

- foster increased access to and use of geospatial data in the public and private sectors;
- resolve licensing and distribution issues in support data sharing and use;
- facilitate inter-agency geospatial data-sharing arrangements;
- expand partnerships; and
- reduce the cost of the collection, maintenance and distribution of geospatial data.

### **Environment**

CGDI Architecture working group has recently endorsed the Web Map Service specification based on the Open GIS Consortiums “ Web Map Server Interface” for specifications see <http://www.opengis.org/techno/specs.htm>.

### **Funding/agreements**

Initiative(s) was originally funded by Federal government in 1999 budget to the order of \$60-90 million in place. Listed partners are mostly federal agencies, provincial mapping agencies and organizations, associations and groups and academia. Private industry is represented by GIAC, the Geomatics Industry Association of Canada. There was no reference to a fee to belong to this partnership.

Organizations both public and private can register and ‘advertise’ themselves (products and services) on the GeoConnections Discovery Portal which is available to anyone who accesses the site. The Discovery Portal ([www.ceonet.gc.ca](http://www.ceonet.gc.ca)) also allows the user to search for geospatial data that has been ‘posted’ to the GeoConnections website or use some of their free tools.

### **2.9.3. AltaLIS ([www.altalis.com](http://www.altalis.com))**

AltaLIS is primarily a means of distributing/selling Alberta base mapping after the government opted out of providing this service.

As the agent for Spatial Data Warehouse Ltd., AltaLIS has the responsibility of making Alberta’s base mapping infrastructure more available, accessible, accurate and affordable. AltaLIS Ltd. is a joint venture company formed by QC Data Ltd. and Martin Newby Consulting Ltd. Since April 1998 the AltaLIS team has been performing the continued updating, re-engineering, storage, distribution, value-added redistribution and general management of four primary provincial mapping data sets - Urban Cadastral, Rural Cadastral, Topographic and Small Scale.

Spatial Data Warehouse (SDW) is a not-for-profit organization formed in June 1996 when the Government of Alberta discontinued its traditional role of funding and managing Alberta's digital mapping. The core purpose of SDW is to maintain and promote the broadest possible distribution of provincial digital mapping that meets the immediate needs of the Alberta market place and preserves the mapping systems for the long-term benefit of Albertans. SDW is a consortium made up of ATCO Electric, ATCO Gas, ATCO Pipelines, TELUS Services Inc., UtiliCorp Networks Canada (Alberta) Inc. and the Government of Alberta. The history and role of SDW, AltaLIS and the six participants of SDW are described in a White Paper Titled [Alberta Spatial Data Infrastructure Initiative - An Overview. \(1998\)](#).

### **Environment**

1998 white paper indicates they will use QC Data’s existing Information Hub facilities in Calgary and a web-based ordering facility. There was talk of re-engineering sub-

initiatives that will increase revenues. Plan to provide data in AutoCad, Microstation, ESRI and possibly other formats.

### **Funding/agreements**

Basically the companies that form SDW require the continued maintenance of the data. The SDW participants agreed to a 5 year commitment to financially support the Alberta Spatial Data Infrastructure initiative.

SDW is a government/private sector partnership - specifically implemented to improve the efficiency and cost-effectiveness of what was traditionally purely a government service;

Contractual steps have been taken to preserve the public interest by ensuring that ownership of these important data assets remains with the people of Alberta;

The removal of traditional government funding mandates the requirement to improve services, reduce costs and increase usage - to the benefit of all mapping users.

SDW is an Alberta-registered not-for-profit company. This means that any revenue surplus can not be distributed to participants. A surplus must be addressed through some combination of re-investment, data improvement and access cost reductions. Although SDW is currently far from a surplus situation, there are plans to address a surplus if and when it occurs.

SDW is working on a long-term plan that will see the establishment of funds to support on-going data quality work as well as continuous improvement of processes. The SDW mapping sets are generally of a high standard but are subject to defects. It is important that SDW establish a mechanism to identify, catalog and quantify defects and ultimately repair these defects over time. Equally, it is important that the Alberta Spatial Data Infrastructure Initiative not stand still.

Continuous improvement of services and lowering of costs are essential to the long-term success of the SDW initiative and more importantly, beneficial to the mapping users of Alberta. Funds generated by the sale of data alone are unlikely to be sufficient to meet all the requirements for the continuous improvement of SDW data.

### **2.9.4.BC SRMS Data Interim Warehouses** **(<http://srmwww.gov.bc.ca/gis/ims/>)**

MSRM indicates that three interim warehouses exist, generally these have been inherited from the various ministries that have now seen their IT/GIS initiatives fall under the MSRM umbrella.

- 1) The first and main interim warehouse architecture servicing MSRM is a central master Oracle Warehouse with associated ArcInfo spatial warehouse and 8 regional data marts (see Fig. 2). This architecture has developed

incrementally since 1994, when ARC/INFO was adopted as the Ministry's corporate GIS and Oracle as the corporate database environment.

This interim MSRM warehouse in Victoria contains both spatial and attribute data. A large percentage of the spatial data holdings are obtained from the Base Mapping and Geomatics Services Branch. Other spatial and attribute data are loaded into the warehouse from MSRM, MOF and MWLAP operational business systems by automated scripts. Spatial and attribute data is also loaded by GIS and attribute technicians who have acquired and translated it from other Ministries and external agencies.

Regional GIS staff oversee capturing and digitizing of many layers for local needs. Special projects may take years to create, verify, and load detailed information. Knowledge of what process was used for each data source is recorded as metadata in the warehouse, or in the Data Registry.

Currently, spatial and attribute data is replicated nightly across provincial wide area network (>10mbps) to 6 regional data marts and 2 sub-regional data marts. Ancillary information such as symbology tables and fonts are in the data warehouse, and managed the same way.

The three methods of access to the distributed MSRM data warehouse are:

- Client/server access, Windows NT Terminal Server, and host-based access. MSRM employees use spatial information directly on disk via the Local Area Networks in their offices. GIS technical staff log on to the local Unix server to run workstation ARC/INFO. Other employees run ArcView, GIS Oracle Access Tool (GOAT) and Oracle tools on a multi-user Windows NT Terminal server or their own desktop PC's. GOAT is a customized data access application built on top of ArcView and has an Oracle interface. Victoria staff in several offices access the warehouse over the high-speed (100 Mb) Metropolitan Area Network (MAN).
  - External agencies and companies with their own computer infrastructure download files from the public FTP (File Transfer Protocol) site, decompress and convert them to use with their own GIS software. There are a number of query-based applications that report attribute data from the warehouse. Public data are also available on drives that may be mounted via samba.
  - Public access via Web browser is available using MSRM's Internet Mapping Framework to the Oracle/SDE warehouse and via Oracle Reports.
- 2) The second interim warehouse architecture is an Oracle/SDE warehouse (pilot) that is currently being used for Web spatial data access. This

infrastructure was originally developed in the Ministry of Forests under the Resource Management Data Warehouse initiative.

Access to the Oracle/SDE interim warehouse is currently enabled through the Internet Mapping Framework and ArcIMS. The data warehouse access architecture depicted in Fig. 3 consists of a web server, Internet Mapping Framework object model, Java servlet engine, Arc/IMS, and Oracle/SDE. The use of the Internet Mapping Framework to-date has been of a pilot nature. The production offering of the Internet Mapping Framework is scheduled for spring 2002.

- 3) The third interim warehouse architecture is the NT terminal server infrastructure known as MUNT. It was developed by Ministry of Forests to provide GIS analysts and planners in MSRM/MOF regional and district offices with access to the centralized warehouse of ArcInfo and Oracle data.

### **2.9.5. Arrow Innovative Forestry Practices Agreement ([www.arrow-ifpa.com](http://www.arrow-ifpa.com))**

Arrow IFPA indicates on their web site that they plan to develop an Information Management System that will capture, archive and extend all information that results from IFPA activities. Intended to focus on strategic use of information, operational use will be an ancillary benefit.

Key elements are:

- Central library of information
- An accessible list of the information in the library (metadata)
- Seamless database
- Easy access for IFPA members
- Easy system for IFPA members to add and update information
- Training for IFPA members to use system

No reference to environment or funding agreements to support this initiative were found on their web site.

### **2.9.6. Vanderhoof Innovative Forest Practices Agreement**

Vanderhoof IFPA is currently in the process of establishing a data hub for IFPA members. Work is underway cataloguing the metadata for information that will support their forest development plans. The metadata is being created using a FGDC compliant

XML structure. Vanderhoof is planning on utilizing the Natural Resource Information Network web site which will allow their data to be searchable via the NRIN search tools.

### **2.9.7. Bulkley District Data Sharing Network**

Bulkely District (Forest Service) set up a data sharing network a few years ago but it is now defunct because of security concerns. The data sharing network was a server that shared data files with forest companies. Other users have expressed that this was a success (PIR, SILVICON). Data was shared freely but through a data sharing agreement.

#### **Environment**

- Dial-up to an IP address outside the firewall
- Link through firewall to data hub (T1)
- Arc/Info (for data conversion)
- Microstation (for data conversion)
- Arcview 3.2 (for data conversion)

#### **Data Holdings**

- TRIM 1 and 2 (data sharing agreements)
- Forest Inventory
- Core Inventories
- Shareholder data
  - Management options
  - Critical wildlife habitat
  - Core ecosystem networks
  - Riparian zones
  - Intensive forestry zones
  - Community watershed
  - Woodlot
  - Parks
  - Forest health
  - Operability
- Imagery (proprietary – cost sharing/agreements)
- Metadata format
  - Data set
  - description
  - Frequency of update
  - Last update
  - Data manager
  - Custodian
  - Accuracy
  - projection
  - Warnings

- conditions

### **Data Sharing Network Description**

- User login with user name and password
- System outside the firewall
- System only allowed certain IP addresses to logon
- NT file system privileges based on user name
- Data sharing network server (manual system)
- Two years reliable service
- User logs in, writes to InComing Directory under their name
- Data manager moves data from incoming to outgoing (read only) (some conversion to plotfile, imagery, shapefiles, coverages, IGDS, DGN)
- A meta data file maintained for all data (read me file)
- User can browse this and down load data file.

### **Data Sharing Network Concerns/Issues**

The following concerns/issues were expressed by the administrator of the network.

- Fear by users getting the same data
- Maintenance of the data warehouse was time consuming/difficult
- Maintenance of the meta data was time consuming/difficult
- Notification to users of events was time consuming/difficult
- No indexing or querying was present – nice to have
- No versioning or archiving – need to have
- No backups – need to have
- High administration time
- Need to have a log of who downloaded data and what date
- Need to help users with forgotten password

### **2.9.8.Morice District Data Sharing Network**

The Morice District (Forest Service) had a similar system in place through a data sharing agreement. It was managed by the District Staff but wound down because of government reduction in funding. It was stressed that greater automation of data flow and user tools to view/submit/extract data would be important within an environment of government downsizing.

### **3. Challenges for a DSN**

#### **3.1. Network**

Since there is a variety of line speeds and reliability, the data sharing network should not be mission critical or distributed amongst the data stewards. That is, direct editing to the warehouse would not be practical because of the required high bandwidth. In addition, a central server polling distributed datasets may be dependent on the reliability lines. The challenge would be to design a network to ensure integrity within and between datasets and to ensure that the dataset in use is the most current.

Any server(s) housing the data must be protected from hacking and have a good security model to restrict user access to data based on user privileges.

#### **3.2. Software/ Current Systems**

Another challenge is to promote a common data standard and warehouse tools while allowing each participant to maintain legacy systems and/or databases. There are many current systems used for information management producing different data formats. The challenge would be to have a common data model and have a method to allow the data to be transformed from the data stewards legacy system to the data sharing network's common data standard.

#### **3.3. Data Management**

There are various levels of data management observed amongst potential partners. Most data found was created by special projects using varying standards. The challenge would be to develop common data structure standards, common metadata standards and common accuracy standards.

With a greater variety of partners, data security and sensitivity has become more of an issue. The challenge is to restrict access to data based on a role based access model. In addition, the knowledge of who is using the data and how would be important to track.

#### **3.4. General**

The greatest challenge would be to resolve challenges bearing in mind the General Vision of the project

- Low cost to startup and maintain
- Early success
- Scalability
- Extensibility
- True partnership between participants

## 4. Proposed DSN Organization

This section outlines the proposed data sharing network organization goals in terms of framework, participant roles, and agreement mechanisms.

### 4.1. DSN Organization Framework

Since we are dealing with government and industry in the Northwest Region of British Columbia it seems appropriate to refer it as the Northwest Region Data Sharing Network (DNS).

Initially, we envision a partnership between provincial government and the Morice and Lakes IFPA members, though participation outside of these members would be included (see participant roles section 3.2). Potential funding sources to get the network up and running could be through the IFPA and/or FIA funding.

After startup, the network would be primarily funded by the participants (see Economic Model, section 4.3).

The DSN would be politically administered by an independent Board of Directors, initially composed of IFPA and Ministry representatives (through a startup agreement to form a society) and expanded as the society grows.

We suggest you consider the physical administration of the DSN in the initial phases be carried out by representatives of the MSRM because it is a public organization and has some current infrastructure with which to execute this. Once the society and its Board have created the initial business plan and governance structures, they can consider hiring staff to manage the DSN.

### 4.2. DSN Participant Roles

The DSN will be comprised on a number of roles and responsibilities. The following table summarizes the various roles. These roles will be reviewed by the consortium as a prerequisite to startup and at period intervals (e.g., annually)

Role Name	Description	Responsibility
NW DSN Board of Directors	MSRM, MOF IFPA members, First Nations, additional data contributors (non-IFPA forest company members), municipalities, stakeholders groups	<ul style="list-style-type: none"> <li>Define governance and a constitution</li> <li>Define and amend first round of agreements</li> <li>Define participant roles as part of governance</li> <li>Accept additional participants to the</li> </ul>

		<p>consortium or DSN</p> <ul style="list-style-type: none"> <li>Accountable to the Member corporations for DSN “trust” funds</li> <li>Create a vision statement for the DSN</li> <li>Hires the Executive Director</li> </ul>
DSN Executive Director	MSRM Data Center or Consortium designate	<ul style="list-style-type: none"> <li>Accountable to the Board for all results and the realization of the DSN vision</li> <li>Hires all technical staff</li> <li>Accountable to the Board for trust fund</li> </ul>
Custodians	<p>Owner of data layer</p> <ul style="list-style-type: none"> <li></li> </ul> <p>Examples: Custodian Layer</p> <p>IFPA IFPA layers</p> <p>MSRM Vegetation</p> <p>Data Consortium Roads, Streams, Cutblocks, Operation layers</p> <p>First Nations Values</p>	<p>Responsible for meta data for layer</p> <p>Define Data Standards for layer</p> <p>Assign layer privileges</p> <p>note shared custodial layers (e.g., roads, streams, cutblocks) could be assigned to data consortium or sub committee)</p>
Stewards (Data Suppliers)	<p>Suppliers/maintainers of the Data Layers</p> <p>Conform to data standards</p>	<p>Supply DSN with data</p> <p>Maintain layers</p>
Subscribers	Extract data from DSN	none

Browsers	Browse DSN metadata (with public access)	none
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### 4.3. DSN Economic Model

The DSN would be overseen by the Board of Directors but administered by staff. On startup, it may be possible to utilize IFPA and FIA funding for initial setup of server, web site, DSN software development, and a one year maintenance contract (for bug fixing, administrators time). There may not be staff hired in the first year.

After Year 1, DSN annual membership fees could be used to maintain the DSN. Funding and membership fees to be paid to the society which maintains a minimum amount of money to ensure a six month operating horizon. The Data Sharing Network partners will also commit to **at least** one additional year of funding.

All membership fees will be set by staff and reviewed by the Board on an annual basis. These fees will cover costs of salaries for administration, and maintenance, and the cost of software licenses and upgrades as covered in the society's business plan. A proposed fee structure would be based on consideration of in-kind contributions to the network. For example, members of the data consortium would be required to pay a lower fee if they work on in-kind projects. Groups requesting data but not contributing data or work in-kind would have a higher membership fee.

We anticipate the society's business plan will explore the factors involved in setting the fee structure, revenues from partners, revenues from other sources (if any), costs, profits, and longevity of the fabric, etc.

### 4.4. Discussion

The DNS can be incorporated as a society. Legal advice was taken to explore the differences between a for-profit corporation, a limited liability partnership, and a Society.

Agreements can be modelled after the Integrated Cadastral Information Society data sharing agreements.

## 5. Conceptual Data Model

### 5.1. Proposed Data Model

The data that is published into and subscribed out of the DSN will consist mostly of GIS data. This data will be in the form of predefined feature classes eventually representing all of the IFPA's classes of data and the topographical relationships. The GIS DSN data consists of both spatial and non-spatial feature data that can be defined through UML modeling techniques

### **5.1.1. Data Modeling in UML**

The data model represents the DSN data schema. We recommend that the model be captured in UML for a number of reasons. UML provides a series of diagrammatic tools allowing for the modeling of class structure. UML allows for the definition of classes and class attributes and any meta-data desired for each class and each class's attributes. It models abstract levels or classes allowing for such things as inherited attributes, meta-data and behavior.

### **5.1.2. Modeling Abstract Classes**

#### **5.1.2.1. Abstract class**

At the highest levels in a UML data model you will find the Abstract class levels (Figure 1). It is here that we define the two types of data that we are modeling, spatial and non-spatial. The spatial abstract classes provide the means to record geometric shapes and additional attribute data. The non-spatial abstract classes provide the means to record related business objects that may or may not be associated with the spatial classes.

#### **5.1.2.2. Spatial Abstract Classes**

After it has been determined that the class is geometric in nature the next determination that has to be made is what type of geometric feature it is. The model suggests there be the following spatial abstract classes, a geometric point, line and polygon. Additional spatial abstract classes would include multi-point, multi-line and multi-polygons. To further this same level as to encapsulate object behavior we include Full-Coverage and Non-Full-Coverage versions of polygon and multi-polygons. Additional spatial abstract classes could be derived to allow for regional constraints.

#### **5.1.2.3. Spatial Concrete Classes**

Once the spatial abstract classes have been defined the concrete classes can be added to the model. The concrete class structure (Figure 2) defines the physical storage of the class. This translates into a data layer.

#### **5.1.2.4. Spatial Validation**

To ensure that any features added to the DSN are spatially valid requires careful planning. The derived data model should, at the abstract class level apply spatial validation rules.

The definition for these features classes are yet to be fully defined, but safe to say the schema or structure of the feature classes will be modeled in a UML data model.

Figure 1 – UML Data Model Showing Abstract Classes

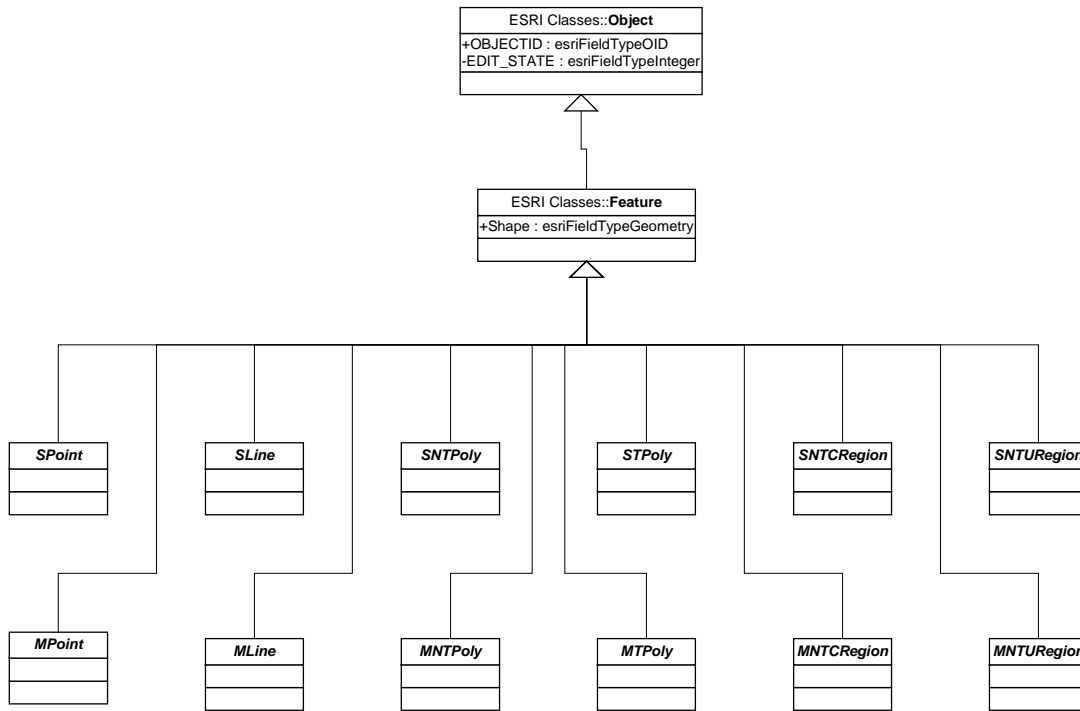
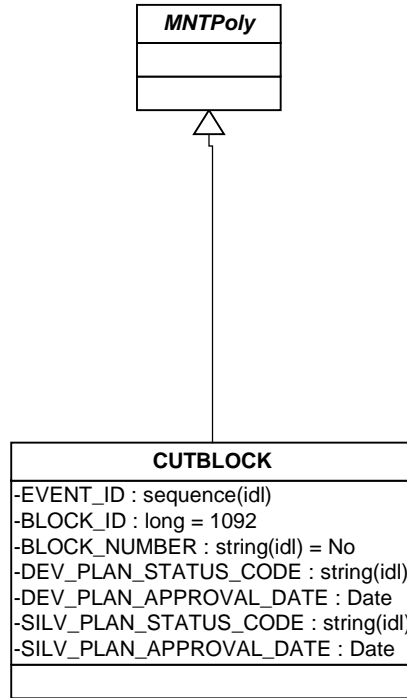


Figure 2 – Concrete Class Inheritance from Abstract Class



### 5.1.3. Proposed DSN Datasets

The proposed datasets for the DSN as indicated by the potential users are shown in the following table. IFPA layers are indicated as the top priority datasets. MSRM and the McGregor Group are reviewing the IFPA data layers and identifying the data sources for each layer. Where the data source is government, the Skeena Region MSRM will provide the data. The McGregor Group will provide all industry derived data layers and new IFPA inventories. Data from the MSRM data centre that are not already in the IFPA datasets will be next.

Also indicated as very important to be included in the DSN are the three layers Roads, Hydrology and Cutblock. The level of effort required to standardize these layers make them less of a realistic priority for now. The vegetation layer is somewhat important but will become much more important when the government downloads the maintenance effort to industry and finalizes the new vegetation data structure and collection standard.

Proposed Layers	Priority
MSRM data layers – specific to the IFPA (Appendix A)	High
Non-government IFPA layers (Appendix A)	High
Roads	Medium
Streams	Medium
CutBlock	Medium

Vegetation	Low
Others	Low

### 5.1.4. Dataset Business Rules

Each dataset will have associated with it spatial (section 4.1.2.4) and attribute business rules. Below are examples of such rules.

General Rule	Description
Conformance to fixed boundaries (eg. TRIM)	<ul style="list-style-type: none"> <li>Operational datasets based on base features such as cadastre.</li> </ul>
Topological checks	<ul style="list-style-type: none"> <li>Connectivity</li> <li>Dangling nodes</li> <li>Overlapping or gaps in polygons where illegal</li> <li>Cutblock in lake</li> </ul>
Layer dependencies	<ul style="list-style-type: none"> <li>Pre-existence of “parent” feature/record before feature/record loaded (e.g., cutblock exists before silviculture record loaded)</li> </ul>
Data Dictionary checks	<ul style="list-style-type: none"> <li>Assurance that loaded data matches data type and domain rules</li> </ul>

## 5.2. Proposed Metadata Contents

Consideration should be given to conforming to the US Federal FGDC standards as other IFPAs are adopting this strategy (see Vanderhoof IFPA). It will be the responsibility of the data custodians to provide to the network the metadata describing each prospective dataset.

Below is an example content for the DSN metadata. Often metadata is web enabled to allow for easier searching of the data sharing network contents. The selected dataset in the metadata search can then be viewed (or contact email generated for sensitive data) for further user extraction.

Content	Description
Data set name	Logical name of the dataset
Description	General description of the data set contents
Frequency of update	The frequency of updates (daily, monthly, etc.)
Last update	The last update of the data
Data Supplier (steward)	Who supplied (organization and contact information) the last update (this may be

	complex if we consider Areas of Responsibility)
Custodian	The organization/contact information who “owns” the data.
Accuracy	Accuracy description
Projection	Projection description
Warnings	Statements of cautions for users of the data
Conditions	Conditions of use
Security	Security / Sensitivity description
Dataset Dependencies	A description of any dependencies this dataset has upon other datasets and any dependencies that other datasets have on this dataset.
Data Dictionary	<p>Attribute description</p> <p>Item Description</p> <p>Column Name Name of column</p> <p>Physical Name Physical name (optional)</p> <p>Description Short description about the contents</p> <p>Data Type Standard data type description (eg. Long, integer (width optional)</p> <p>Domain Range List of domain values or number range</p>

### 5.3. Proposed Translation Options

The data translation options will depend on the type of DSN implemented and the standards set by the data consortium. In general, the more automated the system the more upfront data translation work will be required.

We are recommending a system that will not require any changes to any data supplier’s legacy or current metadata formats. Essentially, the data supplier will provide the data in their current metadata format and the system will translate the data into the DSN defined

metadata format. The work to be done by the users will be in defining a one-time translation between their system’s metadata and the DSN metadata standard.

The following summarizes the Translations options

DSN option	Translation work required	Notes
File Server DSN	None	Data Supplier just sends up files from their system as specified in associated metadata - no DSN standard
Automated – No Spatial Store DSN	Data Supplier provides a data translation mapping (see Proposed Design Architecture)	DSN standard metadata
Automated – Spatial Store DSN	Data Supplier provides a data translation mapping (see Proposed Design Architecture)	DSN standard metadata

#### 5.4. Cost Summary for Options

The cost of data translation will be one time for each data set defined. If the legacy datasets change then a modification of the translation mapping would be performed.

The following summarizes the Translations options

DSN option	Work required	Notes
File Server DSN	Metadata defined for each dataset by data supplier	Less than 1 day per dataset
Automated – No Spatial Store DSN	Custodian defines metadata one time. Data supplier provides data translation mapping.	1 day per dataset
Automated – Spatial Store DSN	Custodian defines metadata one time. Data supplier provides data translation mapping.	1 day per dataset

The translation effort for the IFPA datasets would be minimal if the consortium uses the current data standards used by MSRM and the McGregor group for the IFPA modeling work. The effort would be increased if the IFPA participants want to maintain their own metadata about the IFPA layers they have contributed and translate them to the proposed IFPA DSN standard. (The MSRM has meta files associated with each coverage

following a provincial government meta standard. There should be consideration given to using federal government standards and coordination with the suggested future standards from MSRM).

## **6. Proposed System Design Architecture**

A model for the requested DSN architecture will facilitate the loading, integration modeling, analysis, and querying of data. After interviews with many of the IFPA members, a list was compiled that represented those components that were deemed the most important factors in achieving the goals set forth by the IFPA for a successful and manageable DSN that was representative of all the IFPA members.

In general terms the DSN will consist of a server that is accessible via the internet and will allow users to publish and subscribe data to and from it. In general terms the server side software will provide an interface to the data, allow management of the data and provide the security for the data.

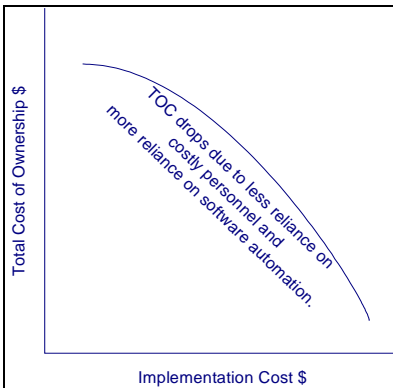
Our recommendation is to have the DSN act as a feature server as opposed to a map server. A feature server allows for the interchange of feature data in a defined format. While a map server serves up rendered images through a series of server side processes. Both types of data servers allow for the information to be spatially queried with a predefined query language. Both systems are accessible via the Internet usually as an addressable URL or accessed as a web service. A web service is simply an interface that exposes server side operations via simple HTTP post get mechanisms.

Note: A map server component option is included as an option to enable users to spatially query the database or to produce maps of the database.

## 6.1.1. Considerations

### 6.1.1.1. Cost

By far the number one concern brought forward was the cost of the DSN. Unfortunately as with any technical solution, you sacrifice functionality for price. This report will discuss cost verses functionality so as to offer more than one solution. It will also become apparent that there are initial costs as well as ongoing maintenance costs and that a fully automated DSN would end up saving more over time versus a system that relies primarily on human intervention.



### 6.1.1.2. Scalability

The proposed DSN should be scalable. In information technology, scalability has two usages:

- (1) “It is the ability of a computer application or product (hardware or software) to continue to function well as it (or its context) is changed in size or volume in order to meet a user need. Typically, the rescaling is to a larger size or volume. The rescaling can be of the product itself (for example, a line of computer systems of different sizes in terms of storage, RAM, and so forth) or in the scalable object’s movement to a new context (for example, a new operating system).”
- (2) “It is the ability not only to function well in the rescaled situation, but to actually take full advantage of it. For example, an application program would be scalable if it could be moved from a smaller to a larger operating system and take full advantage of the larger operating system in terms of performance (user response time and so forth) and the larger number of users that could be handled.”

The proposed solution for the DSN must take into account future growth potential.

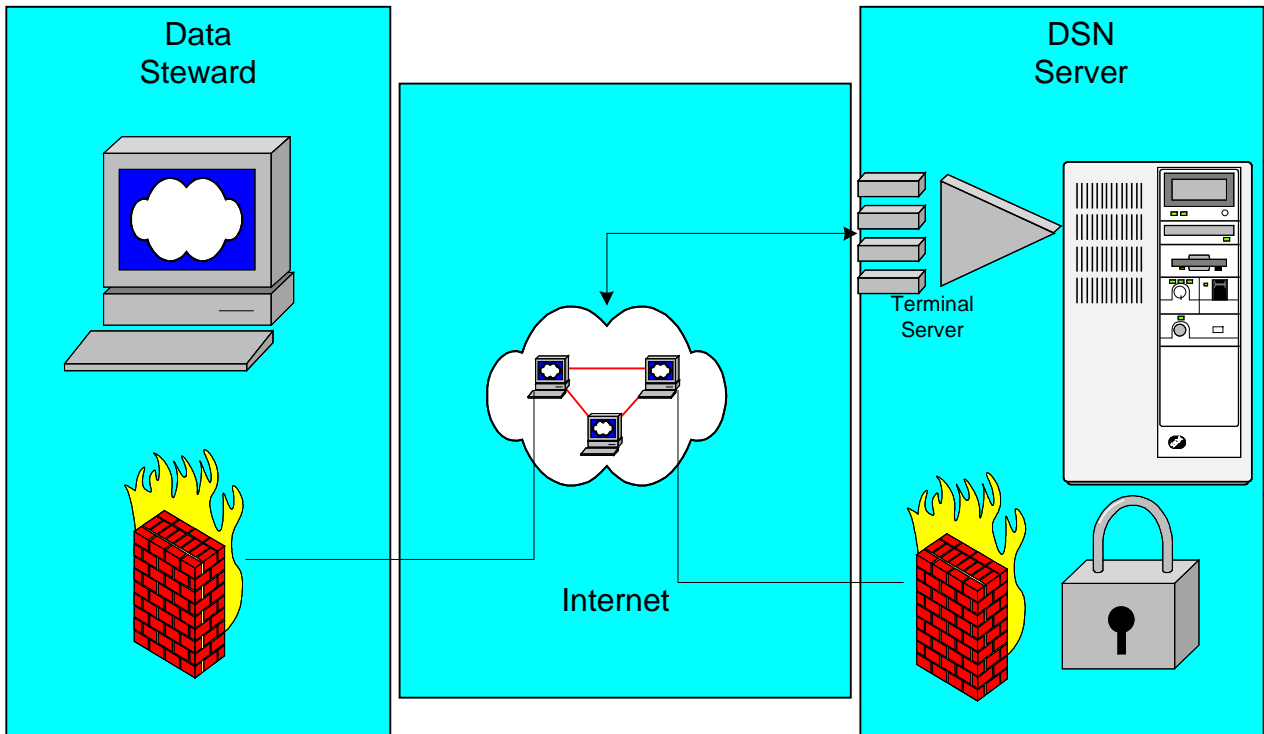
### 6.1.1.3. Security and Accessibility

Regardless of the solution type, security in the DSN is paramount. The DSN should be protected from viruses, hackers and unprivileged users. The following security items should be part of all of the solution options.

- Firewall Protection – protection from unauthorized intruders
- Secure Password Access – interface and data level security
- Auto-Virus Scan – virus protection
- Remote Administration – ability to place server in a secure location without required on-site interface for administration

Figure 3 illustrates the locations of the security items.

Figure 3 – Security and Access



### 6.1.2. Architecture Options Approach

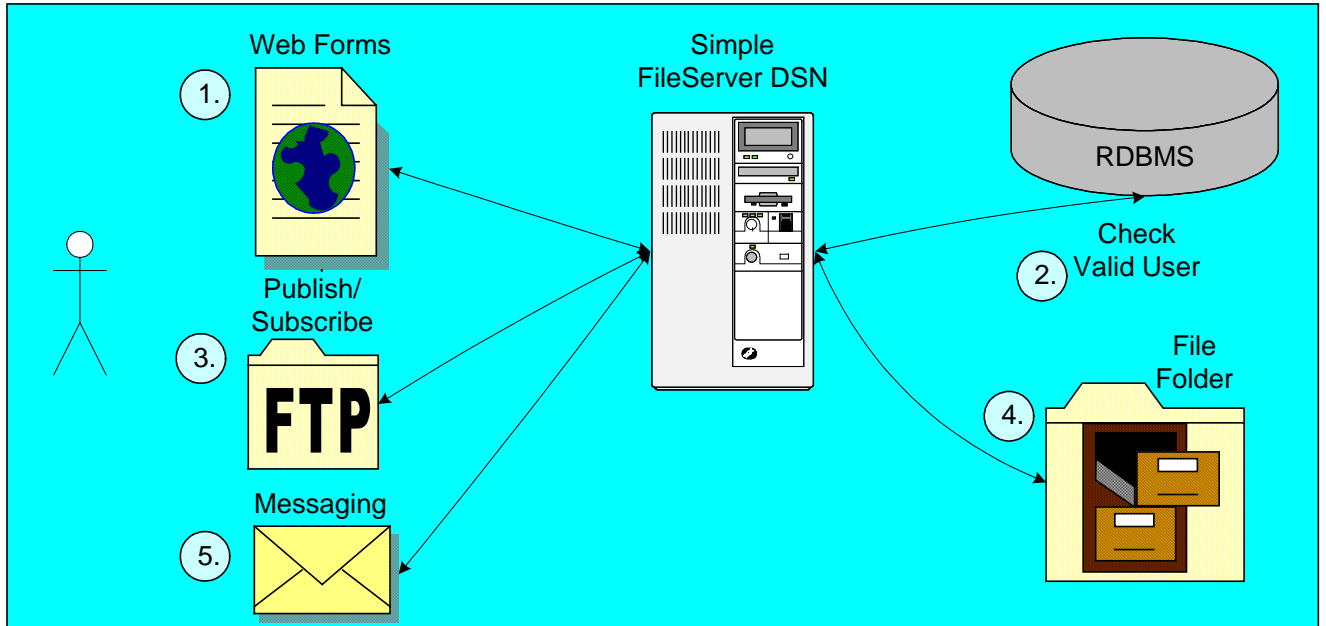
The underlying consideration for the proposed architectures is the notion of scalability and conformance to open standards. Items in the realm of open standards which will be part of the architecture are:

1. OGC Web Feature Server (WFS) Compliant – standard feature server web
2. OGC Feature Query Compliant – standard query ability from multiple access points

3. OGC GML 2.0 Data Transformation, Storage, XML (see Appendix B) – generic or open data exchange and transformation formats and methods
4. OGC Web Map Server (Future) – standard web query methods
5. Scalable Vector Graphic (SVG) - low cost viewer of XML/GML data

### 6.1.3. Proposed Solution Types

This report suggests three solutions for a DSN. The solutions are primarily based upon cost. In all three cases a data model of the feature data is a requirement, and this report suggests that the DSN data model be captured in UML format.



#### 6.1.3.1. File Server DSN

##### Architecture

The File Server DSN option is comparable to an Internet based file server (Figure 4). Data publishing and subscription is accomplished via a FTP site through a web interface. No file conversion to or from submitted data files is required. Data is submitted in it's native format. Data is stored in simple folder structures. – with file permissions. Onus is on the subscriber to convert data to their native format.

A simple, non-spatial database manages information such as user profiles, data submissions and retrieval, data location and login. Simple metadata acquired upon data file submission.

Figure 4 – File Server DSN Components

## Hardware and Software Requirements

The hardware and software requirements are very few in this option.

1. NT or UNIX Server
2. Web Server – e.g. Apache (UNIX), IIS (NT)
3. Data Base – to manage users, permissions, etc. (e.g. MySQL)

## Network Requirements

Users require at a minimum dial-up capabilities and FTP and a recommended minimum of 56K connection speed to Internet

## Operational Requirements

This option relies heavily on an administrator to maintain the system. The administrator will be required to do the following:

1. Administrator maintains metadata
2. Administrator maintains security
3. Administrator maintains directory structure and disk maintenance
4. Administrator maintains backup
5. Administrator notifies user of errors

## Advantages of this option

- o Low Cost \$
- o Quick to Implement

## Disadvantages of this option

- o No Data Transformation
- o Limited Data Validation
- o Not Scalable
- o No Third Party support

## Cost Summary

### Startup (Year 1) Costs

Item	Quantity	Cost (\$)
Administrator	100% annual effort	50K to 70K per annum
Server	1	10K to 15K
Backup Software	1	1K
Backup Drive	1	5K
Internet Provider	1	2K to 6K per annum
<b>Total</b>		<b>app. 100K</b>

\* costs are best estimates, actual costs may vary, applicable taxes not included

**Annual Ongoing (Year 2 +) Costs**

Item	Quantity	Cost (\$)
Administrator	100% annual effort	55K to 75K
Server replacement fund	25% per annum	4K
Maintenance fees		2K to 3K
Internet Provider	1	2K to 6K
<b>Total</b>		<b>app. 85K</b>

\* costs are best estimates, actual costs may vary, applicable taxes not included

### 6.1.3.2. Automated – No Spatial Store DSN

#### Architecture

This option carries all of the same features as option 1 but an automated data manager feature (ADM) is added to reduce the work of an administrator. The ADM performs attribute and metadata enforcement, notifies user in case of errors, issues warnings and notes, transforms the data and stores it (Figure 5).

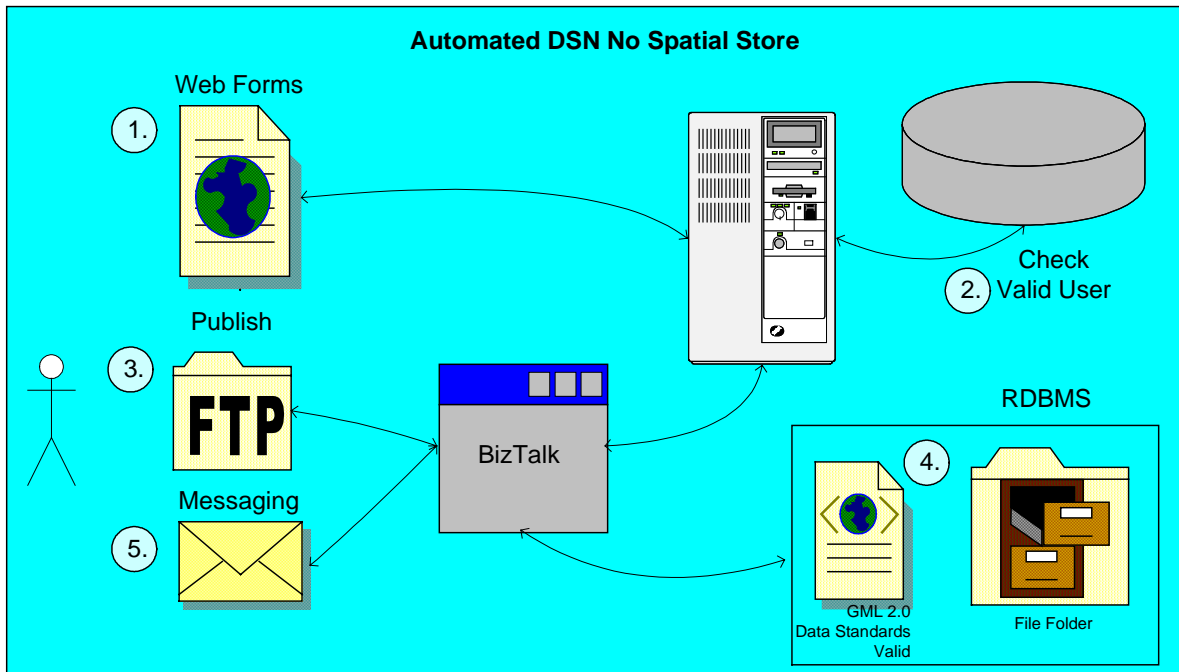
Submitted data files are transformed into GML and further into the DSN standards also in GML format. Map server - served in a map engine that follows the Web map service specification is based on the Open GIS Consortium standard.

Metadata is gathered from the data steward at point of data publication, and verified with meta-requirements from data model. This option provides browse abilities of metadata stored in the DSN.

This option also adds advanced reporting and messaging capabilities.

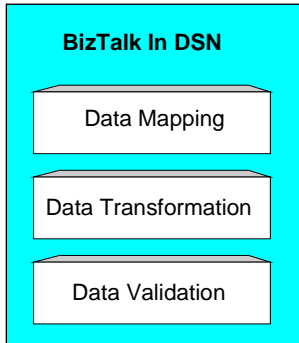
Data Steward based subscribers get data in their native file format through reverse transformation.

Figure 5 – Automated DSN - No Spatial Store components



## BizTalk Server

As mentioned, an ADM is added to this option. We are recommending a product from Microsoft that provides this functionality. The product is Biz Talk Server. It serves many functions. It aids in building a data exchange server through its “rapid development tool” Orchestrator and it operates as a service to provide data mapping, data transformation and data validation during the data exchange.

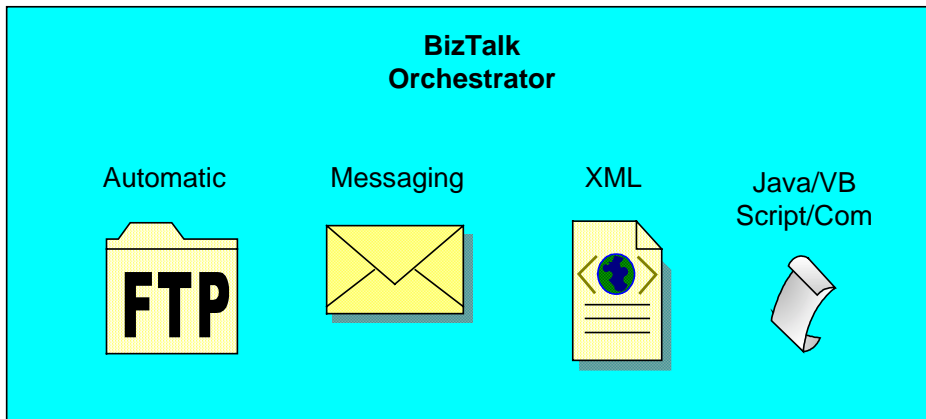


## Orchestrator

The advantage of Orchestrator is that it saves on development costs and is easy to use. It is Flow Chart based so the data and business processes mapping are relatively easy to model. It supports messaging and automates Business Processes (e.g., rule checking). It will also support long transactions management.

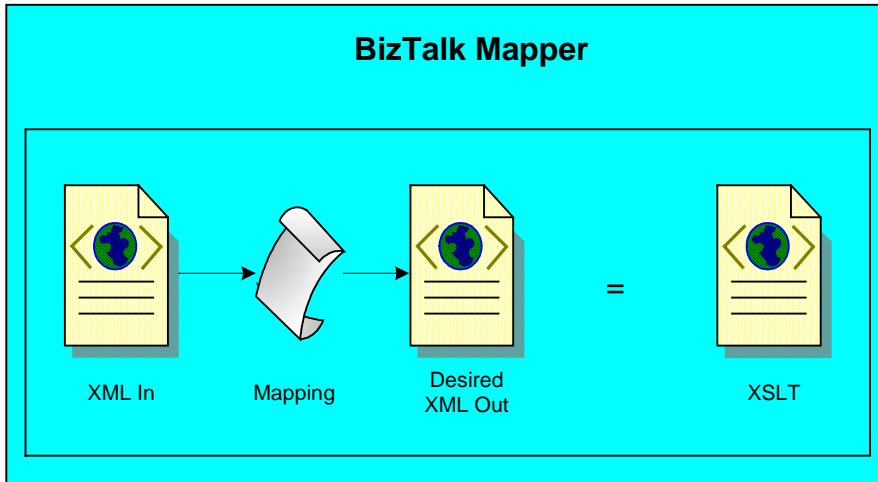
Orchestrator utilizes XML documents (GML 2.0) as a means of storing the mappings.

## BizTalk Mapper

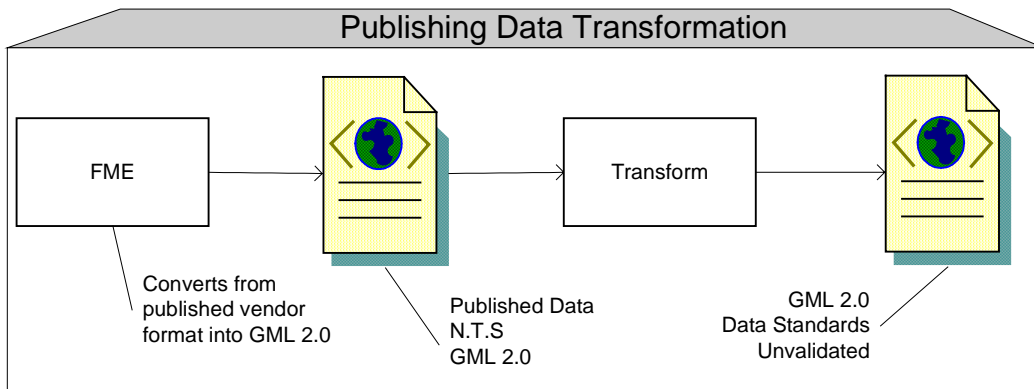


BizTalk’s Mapper again saves on development costs. It maps XML document to XML document (see Appendix B). The end result is a data transformation document (XSLT) which is stored against a users (data steward) profile. Data is verified and transformed based on the users profile.

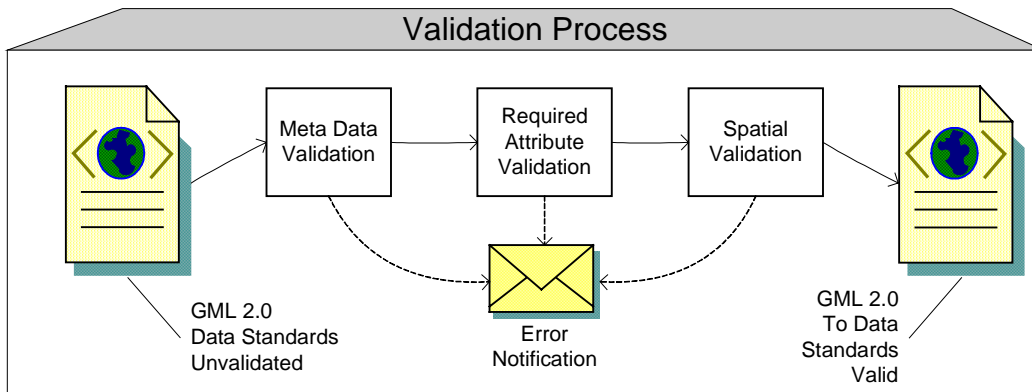
The mapper also transforms Non-Standard GML to Standard GML.



The user would submit their data, it is transformed to the GML/XML document unvalidated using FME (universal data format translator), then validated against



the set business rules and mapping, then transformed to the database standard.



**Hardware and Software Requirements**

1. NT only – required for BizTalk Server
2. Web Server
3. GML/XML editing tools
4. BizTalk Server (SQLServer required)
5. FME data transformation – data translation

**Network Requirements**

Users require at a minimum dial-up capabilities and a recommended 56K access speed, preferably higher if possible/practical.

**Operational Requirements**

Low operational requirements, administrator has maintenance role for the system. The data steward will maintain the data mapping and business rules part as data structures change (recommend remote administration such as terminal services). The other admin functions will be as follows:

1. Administrator maintains security
2. Administrator maintains backup

**Advantages to this option**

- o Low maintenance
- o Automatic Data Transformation
- o Automatic Data Validation
- o Open Standard Framework

**Disadvantages to this option**

- o Limited Spatial Query
- o More Expensive \$

**Cost Summary**

**Startup (Year 1) Costs**

Item	Quantity	Cost (\$)
Administrator	50% annual effort	25K to 35K per annum
Server	1	10K to 15K
Backup Software	1	1K
Backup Drive	1	5K
Internet Provider	1	2K to 6K
XML/GML tools/BizTalk Server	1	15K to 20K
Data Transformer (FME)	1	15K to 20K (plus 20% annual support fee)
Development	1	40k to 50K
<b>Total</b>		<b>app. 150K</b>

\* costs are best estimates, actual costs may vary, applicable taxes not included

**Annual Ongoing (Year 2 +) Costs**

Item	Quantity	Cost (\$)
Administrator	50% annual effort	30K to 40K
Server replacement fund	25% per annum	4K
Maintenance fees		4K to 6K
Internet Provider	1	2K to 6K
Data Transformer (FME)	20% per annum	4K
<b>Total</b>		<b>app. 60K</b>

\* costs are best estimates, actual costs may vary, applicable taxes not included

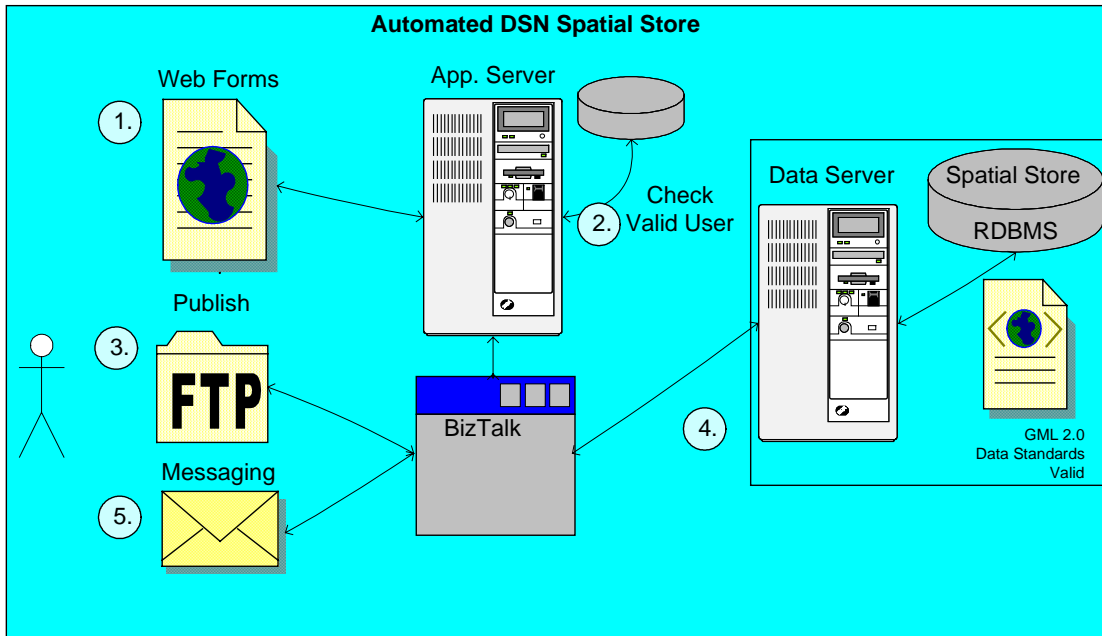
**6.1.3.3. Automated – Spatial Store DSN**

This option carries the same features found in option 2 including an additional full-featured Spatial RDBMS so as to provide querying and transactional control of data in DSN (see full discussion on BizTalk Server in option 2). This option requires an OGC Feature Web Server compliance. It provides OGC Common Query Language interface to allow data to be spatially extracted from the spatial data store.

On file submission, after the data has been transformed into GML and after it has been validated for proper form and metadata, data is spatially validated. Spatial validation rules are retrieved from the data model based upon feature class of submitted data. Data is checked for spatial validity before and after it is merged with existing DSN data of same feature class.

There will be additional messaging on data transformation because it will be inserted into a relational database.

Since it does more, it has to maintain more information, thus richer reporting capabilities. Administrator interfaces for adding additional users and dataset information (agreements, update schedule, area of responsibility) are included.



### Hardware and Software Requirements

1. NT Server Only
2. Web Server (e.g., IIS)
3. GML/XML editing tools
4. BizTalk Server (SQLServer required)
5. FME data transformation
6. RDBMS (Oracle or SQLServer)
7. Spatial Data Engine (e.g. SDE, Oracle Spatial)
8. Optional Web Map Server

### Network Requirements

Users require at a minimum dial-up capabilities and a recommended 56K access speed, preferably higher if possible/practical.

### Operational Requirements

Low operational requirements, administrator has maintenance role for the system. The data steward will maintain the data mapping and business rules part as the data structures change (recommend remote administration such as terminal services). The other system admin functions will be as follows:

1. Administrator maintains security
2. Administrator maintains backup

### Advantages

- o Low maintenance

- Automatic Data Transformation
- Automatic Data Validation
- Open Standard Framework
- Full Spatial Query Support

**Cons**

- Even More Expensive \$

**Cost Summary**

**Startup (Year 1) Costs**

Item	Quantity	Cost
Administrator	25% annual effort	13K to 20K per annum
Server	1	10K to 15K
Backup Software	1	1K
Backup Drive	1	5K
XML/GML tools/BizTalk Server	1	15K to 20K
Data Transformer (FME)	1	15K to 20K (plus 20% annual support fee)
Development	1	60K to 80K
Web Server	1	2K
Spatial Server (RDBMS and spatial engine)	1	20k to 30K (plus 20% annual fee)
Internet Provider	1	2K to 6K per annum
<b>Total</b>		<b>app. 200K</b>

\* costs are best estimates, actual costs may vary, applicable taxes not included

**Annual Ongoing (Year 2 +) Costs**

Item	Quantity	Cost
Administrator	25% annual effort	15K to 20K
Server replacement fund	25% per annum	4K
Maintenance fees		4K to 6K
Internet Provider	1	2K to 6K
Data Transformer (FME)	20% per annum	4K
Spatial Server (RDBMS and spatial engine)	20% per annum	4k to 6K
<b>Total</b>		<b>app. 45K</b>

\* costs are best estimates, actual costs may vary, applicable taxes not included

## 7. APPENDIX A – IFPA Coverages

Lakes	Agriculture/Range	Canadian Land Inventory, (Lakes).
Lakes	Agriculture/Range	Agricultural Land Reserves (NWDC2)
Lakes	Agriculture/Range	Range Units (NWDC2)
Lakes	Agriculture/Range	Grazing Licenses (MOE)
Lakes	Agriculture/Range	Range Tenure Mapping (Lakes)
Lakes	Agriculture/Range	5000m Range Tenure Buffer (Lakes)
Lakes	Agriculture/Range	Derived Backcountry Lakes (Lakes)
Lakes	Agriculture/Range	Potential Range Tenure (Lakes)
Lakes	Agriculture/Range	Agricultural Settlements 2 (MOF, District)
Lakes	Base Features	Roads Existing (Avison2)
Lakes	Base Features	Culvert and Road Information (Canfor)
Lakes	Base Features	Culvert and Road Information (Babine)
Lakes	Base Features	Culvert and Road Information (SBFEP)
Lakes	Base Features	Roads (SBFEP3)
Lakes	Base Features	Terrain Maps (SBFEP)
Lakes	Base Features	Roads (Babine,2)
Lakes	Base Features	Roads Database (Babine,,2)
Lakes	Base Features	Terrain Maps (Babine)
Lakes	Base Features	BL Comfor Boundary (Lakes)
Lakes	Base Features	Roads, Lakes (Amalgamated)
Lakes	Base Features	Digital Elevation Model (NWDC2)
Lakes	Base Features	Railways (NWDC2)
Lakes	Base Features	Culvert and Road Information (Avison)
Lakes	Base Features	Roads Existing (Avison5)

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Lakes	Base Features	IFPA Slope Class cover (Lakes)
Lakes	Base Features	Slope Zones (Lakes)
Lakes	Base Features	Culvert and Road Information (FLS)
Lakes	Biodiversity/Ecology	Terrestrial Ecosystem Mapping
Lakes	Biodiversity/Ecology	Habitat Layer which fed the BEN derivation (Lakes)
Lakes	Biodiversity/Ecology	Locations of Dry Ecosystems (Lakes)
Lakes	Biodiversity/Ecology	TEM (Tweedsmuir Caribou Herd, Lakes)
Lakes	Biodiversity/Ecology	Rare Ecosystem (Lakes, Derived)
Lakes	Biodiversity/Ecology	Big Bec (Lakes,MOF)
Lakes	Biodiversity/Ecology	Biological Ecological Netorks (BENS,MOF)
Lakes	Biodiversity/Ecology	Chelasli, rare ecotype (MOF,District)
Lakes	Cultural Heritage	Wet'suwet'en House Territory Coverage (Lakes)
Lakes	Cultural Heritage	House Territory Coverage (Lakes)
Lakes	Cultural Heritage	Traditional Territories (Lakes)
Lakes	Cultural Heritage	Culturally Modified trees. (LARP)
Lakes	IRM	Reserves (Timberline)
Lakes	IRM	Guide Licenses (Babine)
Lakes	IRM	New LRMP Map
Lakes	IRM	Protected Areas (MOF)
Lakes	Mineral/Energy	Power and Pipelines (NWDC2)
Lakes	Mineral/Energy	Chikamin,Lindquist Mineral Enclaves (MOF,District)
Lakes	Recreation	Existing Trail Mapping (Lakes)
Lakes	Recreation	Public Use Site Inventory (NWDC,Lakes)
Lakes	Recreation	Recreation Sites (MOF,Lakes)
Lakes	Recreation	Trail Coverage (Public Input, Lakes)
Lakes	Recreation	Lava Dome

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Lakes	Recreation	200m Rec Site Buffers (Lakes, Derived)
Lakes	Recreation	100 m Trail Coverage Buffers (Lakes, Derived)
Lakes	Recreation	Babine Boating Sites (MOF, District)
Lakes	Recreation	Backcountry Lakes (MOF, District)
Lakes	Recreation	High Value Recreation (MOF, District)
Lakes	Timber	Beetle Management Harvesting (Avison)
Lakes	Timber	Forest Development Plan Existing (Avison2)
Lakes	Timber	Forest Development Plan Proposed (Avison2)
Lakes	Timber	Forest Development Plan (Canfor 2, Lakes)
Lakes	Timber	Silviculture Database (Canfor)
Lakes	Timber	Cruise Records (Babine, Lakes)
Lakes	Timber	Seed Planning Zones (Lakes)
Lakes	Timber	SPAR database (Lakes)
Lakes	Timber	Forest Development Plan (SBFEP, Lakes)
Lakes	Timber	Forest Development Plan (Babine2)
Lakes	Timber	Silviculture Database (Babine)
Lakes	Timber	Community Forests (lakes, mof)
Lakes	Timber	Cruise Records (CANFOR, Lakes)
Lakes	Timber	MBP Infestation (Lakes)
Lakes	Timber	Distict Boundary (Lakes, NWDC2)
Lakes	Timber	Forest Cover (NWDC 2, Lakes)
Lakes	Timber	Forest Inventory Planning Files (Lakes)
Lakes	Timber	Inventory Region and Compartments (NWDC2)
Lakes	Timber	Ownership (NWDC 2, Lakes)

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Lakes	Timber	Permanent Sample Plots (Lakes)
Lakes	Timber	Provincial Forests (NWDC2)
Lakes	Timber	Public Sustained Yield Units (NWDC2)
Lakes	Timber	Timber Supply Area and Blocks (NWDC2)
Lakes	Timber	Beetle Management Zonation (Lakes)
Lakes	Timber	Cruise Records (Small Buisness, Lakes)
Lakes	Timber	Tetachuk Small Openings (SBFEP, Lakes)
Lakes	Timber	Derived OGMA Mapping (Lakes)
Lakes	Timber	Harvest Operations (Slope Classes)
Lakes	Timber	Silviculture Database (Small business)
Lakes	Timber	Silviculture Database (Avison)
Lakes	Timber	Forest Development Plan 2 (Fraser Lake)
Lakes	Timber	Silviculture Database (Fraser Lake 2)
Lakes	Timber	Landscape Units (MoF, District)
Lakes	Timber	Landscape Units/ Watershed Units (MOF, District)
Lakes	Timber	Woodlot Licenses (MOF)
Lakes	Visual	Visual Quality Objectives (Babine,2)
Lakes	Watershed/Riparian	Points of Diversion (CANFOR,Lakes)

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Lakes	Watershed/Riparian	Watersheds (Cnfr)
Lakes	Watershed/Riparian	Single-line Streams
Lakes	Watershed/Riparian	Critical Watershed Boundaries (Lakes)
Lakes	Watershed/Riparian	Temperature Sensitive Watersheds (Lakes)
Lakes	Watershed/Riparian	Double Line Rivers
Lakes	Watershed/Riparian	Lakes
Lakes	Watershed/Riparian	Riparian Management and Res. Area Buffers (Lakes)
Lakes	Watershed/Riparian	Wetlands
Lakes	Watershed/Riparian	1km buffer around lakes > 100 ha (Lakes)
Lakes	Watershed/Riparian	Lakeshore Management and Res. Area Buffers (Lakes)
Lakes	Watershed/Riparian	Double-wide Lakeshore Management and Res. Area Buffers (Lakes)
Lakes	Watershed/Riparian	Wetland Management and Res. Area Buffers (Lakes)
Lakes	Watershed/Riparian	Double-wide Wetland Management and Res. Area Buffers (Lakes)
Lakes	Watershed/Riparian	Double-wide Riparian Management and Res. Area Buffers (Lakes)
Lakes	Wildlife	Ungulate Winter Range (Lakes, Canfor)
Lakes	Wildlife	200m Osprey and Eagle Buffer (Lakes)
Lakes	Wildlife	Osprey Mapping, Rel. to Underwater Salvage (Lakes)
Lakes	Wildlife	Caribou Habitat (Babine)

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Lakes	Wildlife	Existing Raptor Nesting Sites (HFP,Lakes)
Lakes	Wildlife	Goshawk Map (Lakes)
Lakes	Wildlife	Suitable Black Bear Denning Sites (Lakes, Derived)
Lakes	Wildlife	Derived Mountain Goat Habitat (Lakes)
Lakes	Wildlife	200m Goshawk Buffer (Lakes) BFP
Lakes	Wildlife	200m Mountain Goat no-road buffer (Lakes)
Lakes	Wildlife	500m Goshawk Buffer (Lakes) BFP
Lakes	Wildlife	600m Mountain Goat no-new-road buffer (Lakes)
Lakes	Wildlife	Moose Winter Range from Public Input (Lakes)
Lakes	Wildlife	Mountain Goat Public Input Map (Lakes)
Lakes	Wildlife	Public Input Deer Winter Range (Lakes)
Lakes	Wildlife	500m Mountain Goat Reserve Buffer (Lakes)
Lakes	Wildlife	500m Mountain Goat SMZ Buffer (Lakes)
Lakes	Wildlife	500m Mountain Goat no-new-road buffer (Lakes)
Lakes	Wildlife	200m Goshawk Buffer (Lakes)
Lakes	Wildlife	500m Goshawk Buffer (Lakes)
Lakes	Wildlife	Caribou Migration Corridors and Grizzly (MOF)

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Lakes	Wildlife	Ungulate Winter Range (MOF)
Morice	Agriculture/Range	Agricultural Land Reserves 2
Morice	Agriculture/Range	Range Tenure Mapping (MOF, District)
Morice	Agriculture/Range	Range Tenure Mapping May 2001 (Morice District)
Morice	Agriculture/Range	Soil Capability Mapping for Agriculture (Lakes)
Morice	Agriculture/Range	Range Tenure (MOF)
Morice	Agriculture/Range	5000m range tenure buffer (Morice, Derived)
Morice	Agriculture/Range	Range Opportunity Criteria (Morice, Derived)
Morice	Agriculture/Range	Agriculture Lease Land (Morice)
Morice	Agriculture/Range	Range Tenure Mapping (Morice)
Morice	Base Features	Culvert and Bridge Locations (Canfor)
Morice	Base Features	Huckleberry Powerline coverage
Morice	Base Features	Slope Polygons (Morice)
Morice	Base Features	Culvert and Bridge Locations (SBFEP)
Morice	Base Features	Culvert and Bridge Locations (HFP)
Morice	Base Features	Amalgamated Roads Coverage (Morice, Rustad)
Morice	Base Features	100meter elevation bands

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Morice	Base Features	Aspect Polygons
Morice	Base Features	BCGS Mapsheet Neatlines (NWDC2).
Morice	Base Features	Digital Elevation Model (nwdc 2)
Morice	Base Features	Power and Pipelines (nwdc 2)
Morice	Base Features	Railways (nwdc 2)
Morice	Base Features	Huckleberry Powerline Buffer Params.(MOF)
Morice	Base Features	Grease Trail Location (MOF)
Morice	Base Features	Summer Motorized Access (Morice, Derived)
Morice	Base Features	Area Impacted by Roads (Derived, Morice)
Morice	Base Features	Existing Snowmobile Trail (Morice)
Morice	Base Features	Winter Road Criteria (Morice)
Morice	Base Features	4km road proximity mapping (Morice, Derived)
Morice	Base Features	2km road proximity mapping (Morice, Derived)
Morice	Base Features	1km road proximity mapping (Morice, Derived)
Morice	Base Features	200m Road Proximity Buffer (Morice, Derived)
Morice	Base Features	500m Road Proximity Buffer (Morice, Derived)
Morice	Base Features	1000m Road Proximity Buffer (Morice, Derived)
Morice	Base Features	4000m Road Proximity Buffer (Morice, Derived)
Morice	Base Features	5000m Road Proximity Buffer (Morice, Derived)

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Morice	Base Features	35 km Proximity Buffer around Houston (Morice, Derived)
Morice	Base Features	Grease Trail Location (HFP)
Morice	Biodiversity/Ecology	Predictive Ecosystem Mapping (Morice)
Morice	Biodiversity/Ecology	Terrestrial Ecosystem Mapping 1
Morice	Biodiversity/Ecology	Rare Ecosystem (Morice, Derived)
Morice	Biodiversity/Ecology	FEN1
Morice	Biodiversity/Ecology	Terrestrial Ecosystem Mapping 2
Morice	Biodiversity/Ecology	Terrestrial Ecosystem Mapping 3
Morice	Biodiversity/Ecology	Terrestrial Ecosystem Mapping 4
Morice	Cultural Heritage	First Nations Wet'suwet'en House Territory Coverage
Morice	Cultural Heritage	Archeological Assessments (Ministry of Forests)
Morice	Cultural Heritage	Traditional Territories (HFP)
Morice	IRM	Guide Licenses 2
Morice	IRM	Trapping Licenses 1
Morice	IRM	Nez Lake Proposed SMA (Morice)
Morice	IRM	Morice Land and Resource Use Plan 1
Morice	IRM	Morice LRUP with Specialty Regions
Morice	IRM	Nadina Land and Resource Use Plan

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Morice	IRM	Nadina LRUP with specialty regions
Morice	IRM	Trapline Usage (Morice)
Morice	IRM	Protected Area's Strategy 1
Morice	IRM	Protected Area's Strategy 4
Morice	IRM	Guide Licences (MoF)
Morice	IRM	Commercial Hunting Op. (Morice, Derived)
Morice	IRM	Classified Angling Waters
Morice	IRM	1 km PAS Study Area High Biodiversity Buffer (Morice, Derived)
Morice	IRM	5 km PAS Area Monitoring Buffer
Morice	IRM	5 km PAS Study Area High Biodiversity Buffer (Morice, Derived)
Morice	Mineral/Energy	Industrial Mineral Potential (Morice, Derived)
Morice	Mineral/Energy	Fly in Mineral Exploration (Morice, Derived)
Morice	Mineral/Energy	Developed Prospect Mapping (Morice)
Morice	Mineral/Energy	Mineral Tenures (Morice)
Morice	Mineral/Energy	Mineral Occurrences (Morice)
Morice	Mineral/Energy	Metallic Mineral Potential (Morice, Derived)
Morice	Recreation	Andrews Bay Park (Canfor)
Morice	Recreation	Granisle Snowmobile Trail Coverage (Morice)
Morice	Recreation	IFPA Recreation Feature Mapping (Morice)

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Morice	Recreation	Commercial Lodge Locations (Morice)
Morice	Recreation	Commercial Lodge Locations 2 (Morice)
Morice	Recreation	Commercial Lodge Locations 3 (Morice)
Morice	Recreation	Commercial Angling Area Mapping 2 (Morice, Derived)
Morice	Recreation	Andrews Bay Park (ParksBC)
Morice	Recreation	Public Use Site Inventory (NWDC, Morice)
Morice	Recreation	Recreation Inventory 2
Morice	Recreation	Angling Locations (HFP)
Morice	Recreation	Morice Recreation Map (Morice)
Morice	Recreation	Recreation Sites (MOF)
Morice	Recreation	Existing Snowmobile trail zones (Morice)
Morice	Recreation	Backcountry Lake Class (Morice, Derived)
Morice	Recreation	Classified Angling Waters (Morice, Derived)
Morice	Recreation	200m buffer of Classified Angling Waters
Morice	Recreation	Recreation Features Buffers (Morice, Derived)
Morice	Recreation	VQO polygons around commercial Cabins (Morice)
Morice	Recreation	Commercial Angling Opportunities (Morice, Derived)
Morice	Recreation	Commercial Angling Area Mapping (Morice, Derived)
Morice	Recreation	Existing Trail Mapping (Morice)

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Morice	Recreation	Existing High Value Trail 100m Man. Zone. Buffer
Morice	Recreation	Existing High Value Trail 100m Res. Zone. Buffer
Morice	Recreation	5km Fly in Fishing Lake Buffers (Morice, Derived)
Morice	Recreation	Existing Fly in Fishing Lakes (Morice, Derived)
Morice	Recreation	New Fly in Fishing Lakes (Morice)
Morice	Recreation	5km buffer around New Fly in Fishing Lakes(Morice)
Morice	Recreation	200 Meter user Rec Site Buffer (Morice, Derived)
Morice	Recreation	200 Meter known Rec Site Buffer (Morice, Derived)
Morice	Recreation	Use for the Rec. Enjoyment of the People (Morice)
Morice	Recreation	Non Com Snowmobile Op. Mapping (Morice, Derived)
Morice	Recreation	Non-Com X country Ski Opp. (Morice, Derived)
Morice	Recreation	Non Com touring/skiing opp. Map. (Morice, Derived)
Morice	Recreation	1 km Provincial Park Buffer Zone (Morice, Derived)
Morice	Recreation	Recreation Areas (Morice, Derived)
Morice	Recreation	Existing Well Used Trail 100m Man. Zone. Buffer
Morice	Recreation	Recreation Polygons (Morice, derived)
Morice	Timber	Forest Development Plan 2 (Canfor,Morice)
Morice	Timber	Pesticide Management Plan Data Zone 3 (CANFOR)
Morice	Timber	Pesticide Management Plan Data Zone 4 (CANFOR)

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Morice	Timber	Silviculture Information (Canfor)
Morice	Timber	Terrain Stability Mapping 1
Morice	Timber	Forest Development Plan (SBFEP, Morice)
Morice	Timber	Silviculture Information (ISIS Database for Small
Morice	Timber	Forest Development Plan (HFP)
Morice	Timber	Harvest Operations (Slope Classes 1)
Morice	Timber	Forest Cover (NWDC 2, Morice)
Morice	Timber	Forest Inventory Planning Files (Morice)
Morice	Timber	Inventory Region and Compartments (nwdc 2)
Morice	Timber	Ownership (NWDC 2, Morice)
Morice	Timber	Permanent Sample Plots (Morice)
Morice	Timber	Planning Cells (nwdc 2)
Morice	Timber	Planning Units
Morice	Timber	Provincial Forests (nwdc 2)
Morice	Timber	Public Sustained Yield Units (nwdc 2)
Morice	Timber	Timber Supply Area and Blocks (nwdc 2)
Morice	Timber	TSA Boundaries (District Boundaries)
Morice	Timber	Woodlot Licenses (nwdc 1)

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Morice	Timber	Public Sustained Yield Units 2 (MOF)
Morice	Timber	Community Forests (Morice)
Morice	Timber	Landscape Units (nwdc2)
Morice	Timber	Old Growth Management Areas (Morice, Derived)
Morice	Timber	Interior Forests (Morice, Derived)
Morice	Timber	Interior Forest Polygons (Morice, Derived)
Morice	Timber	Candidate OGMA's based on LU planning (Morice)
Morice	Timber	Forest Development Plan (HFP, patches)
Morice	Timber	Silviculture Information (HFP2)
Morice	Visual	Visually Landscape Inventory 1
Morice	Visual	Visually Sensitive Areas 1
Morice	Visual	High Value Rivers (Morice)
Morice	Visual	High Value Lake VQO Partial Retention polygons (Morice)
Morice	Visual	High Value Lake VQO Retention polygons (Morice)
Morice	Visual	High Value Rivers VQO Preservation polygons (Morice)
Morice	Visual	VQO polygon around Gordeau Lake. (Morice, Derived)
Morice	Visual	VQO Polygons around Commercial Lodges (Morice, Derived)
Morice	Visual	Lower Parrott Lakes 100m "P" VQO

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Morice	Visual	Lower Parrott Lakes 400m "P" VQO
Morice	Watershed/Riparian	Water features database (Canfor)
Morice	Watershed/Riparian	Double Line Rivers (Western GIS)
Morice	Watershed/Riparian	Lakes (Western GIS)
Morice	Watershed/Riparian	Single Line Streams (Western GIS)
Morice	Watershed/Riparian	Wetlands (Western GIS)
Morice	Watershed/Riparian	Temperature Sensitive Watersheds (Morice)
Morice	Watershed/Riparian	HFP's Lake Inventories (Morice)
Morice	Watershed/Riparian	Watersheds 1:20,000 3rd order (Morice,HFP)
Morice	Watershed/Riparian	Critical Watershed Boundaries (Morice)
Morice	Watershed/Riparian	FPC RRZ x2 (Morice Derived)
Morice	Watershed/Riparian	Watershed Information Map (Morice, Derived)
Morice	Watershed/Riparian	Glacier Creek Area 200m Buffers (Morice, Derived)
Morice	Watershed/Riparian	300m LRZ and 700m LMZ for Lakes > 1000 ha (Morice, Derived)
Morice	Watershed/Riparian	100m RMZ buffer, Owen Creek (Morice, Derived)
Morice	Watershed/Riparian	30m RRZ buffer, Owen Creek (Morice, Derived)
Morice	Watershed/Riparian	Owen Lake/Creek Watershed (Morice, Derived)
Morice	Watershed/Riparian	Riparian Management and Res. Area Buffers (Morice, Derived)

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Morice	Watershed/Riparian	Lakeshore Management and Res. Area Buffers (Morice, Derived)
Morice	Watershed/Riparian	Wetland Management and Res. Area Buffers (Morice, Derived)
Morice	Watershed/Riparian	200m LRZ and 50m LMZ for Lakes => 100 ha & <= 1000 ha (Morice, Derived)
Morice	Watershed/Riparian	30m WMZ (all classes) (Morice, Derived)
Morice	Watershed/Riparian	600m proximity buffer all streams (Morice, Derived)
Morice	Watershed/Riparian	600m proximity buffer on all lakes (Morice, Derived)
Morice	Watershed/Riparian	600m proximity buffer on all wetlands (Morice, Derived)
Morice	Watershed/Riparian	50m LRZ and 50m LMZ for Lakes > 10 ha & > 100 ha (Morice, Derived)
Morice	Watershed/Riparian	10m LRZ and 50m LMZ for Lakes < 10 ha (Morice, Derived)
Morice	Watershed/Riparian	River Flood Plain RRZ (first elev break) and RMZ (second elev break)
Morice	Watershed/Riparian	100m RRZ and 50m RMZ, double line rivers, no flood plain (Morice, Derived)
Morice	Watershed/Riparian	50m RRZ and 25m RMZ, single line streams, no flood plain (Morice, Derived)
Morice	Watershed/Riparian	Double-wide LRZ and LMZ Buffers (Morice, Derived)
Morice	Watershed/Riparian	Double-wide WRZ and WMZ Buffers (Morice, Derived)
Morice	Watershed/Riparian	Trophy Rainbow Trout and Lake Trout Lakes (Morice, Derived)
Morice	Watershed/Riparian	1000m Buffer Trophy Rainbow Trout & Lake Trout Lakes (Morice, Derived)
Morice	Watershed/Riparian	600m Buffer on Streams, Lakes & Wetlands (Morice, Derived)
Morice	Watershed/Riparian	50m WRZ (W1 & W5) (Morice, Derived)

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Morice	Watershed/Riparian	30m WRZ (W3) (Morice, Derived)
Morice	Watershed/Riparian	30m WRZ (all classes) (Morice, Derived)
Morice	Wildlife	Caribou Habitat (Canfor)
Morice	Wildlife	Moose and Marten Wildlife Corridors
Morice	Wildlife	Telkwa Caribou Access Man. Area.
Morice	Wildlife	Ungulate Winter Range (Canfor)
Morice	Wildlife	Telkwa Caribou Herd Zones (Morice)
Morice	Wildlife	Existing Raptor Nesting Sites (HPF, Morice)
Morice	Wildlife	Mountain Goat Habitat (Morice, Derived)
Morice	Wildlife	Goshawk Map (Morice)
Morice	Wildlife	200m Critical Spring Forage Sites (Black Bear) (Morice)
Morice	Wildlife	Bull Trout Spawning and Holding pools (Morice)
Morice	Wildlife	Close Canopy Deer Winter Range (Morice, Derived)
Morice	Wildlife	Open Canopy Deer Winter Range (Morice, Derived)
Morice	Wildlife	Fisher Feeding Habitat (Morice, Derived)
Morice	Wildlife	500m Goshawk buffer (Morice, Derived)
Morice	Wildlife	200m Goshawk buffer (Morice, Derived)
Morice	Wildlife	Grizzly-Salmon Zones (Morice)
Morice	Wildlife	Wildlife Corridors (Morice, Local Knowledge)
Morice	Wildlife	500m Moose Feeding Area Buffer (Morice, Derived)
Morice	Wildlife	600m Mountain Goat no-new-road buffer (Morice, Derived)
Morice	Wildlife	200m Mountain Goat no-road buffer (Morice, Derived)
Morice	Wildlife	200m Osprey Buffer (Morice, Derived)

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Morice	Wildlife	Telkwa Caribou Herd Spring Habitat (Morice, Derived)
Morice	Wildlife	Telkwa Caribou Herd Summer Habitat (Morice, Derived)
Morice	Wildlife	Fisher Breeding Habitat (Morice, Derived)
Morice	Wildlife	High Value Grizzly Watersheds (Morice, Derived)
Morice	Wildlife	FDIS fish inventory Database (Morice)

## 8. APPENDIX B – Component Definitions

### 8.1. WHAT is XML?

The Web is the visual interface to the Internet's vast collection of resources. Today, HTML (Hyper Text Markup Language) is the predominant language for expressing web pages. An HTML document consists of the textual content of the document embedded in matched display tags, which specify the visual presentation of the content. A well-designed HTML document is visually interesting to a human viewer when displayed in a web browser. However, the automatic extraction of information from HTML documents is difficult since HTML tags are designed to express presentation rather than semantic information. This makes HTML a less than ideal medium for general electronic interchange in the Internet.

HTML is a specific tailoring of the more powerful SGML (Standard Generalized Markup Language), a sophisticated tag language that separates view from content and data from metadata. Due to SGML's complexity, and the complexity of the tools required, it has not achieved widespread uptake.

XML, the Extensible Markup Language, is a new format designed to bring structured information to the web. It is in effect a Web based language for electronic data interchange. XML is an open technology standard of the World Wide Web Consortium (W3C), the standards group responsible for maintaining and advancing HTML and other Web related standards.

XML is a subset of SGML that maintains the important architectural aspects of contextual separation while removing nonessential features. The XML document format embeds the content within tags that express the structure. XML also provides the ability to express rules for the structure (i.e., grammar) of a document. These two features allow automatic separation of data and metadata, and allow generic tools to validate an XML document against its grammar.

Unlike HTML, an XML document does not include presentation information. Instead, an XML document may be rendered for visual presentation by applying layout style information with technologies such as XSL (Extensible Style Language). Web sites and browsers are rapidly adding XML and XSL to their functionality.

#### 8.1.1. Benefits of using XML

- XML is an open, platform independent, and vendor independent standard.
- XML supports the international character set standards of extended ISO Unicode.
- The XML standard itself is programming language-neutral and API-neutral.
- The cost of entry for XML information providers is low. XML documents can currently be created by hand using any text editor.
- XML's tag structure and textual syntax make it as easy to read as HTML, and is clearly superior for conveying structured information.
- The XML approach to structured data interchange has been validated through the wide experience with XML itself and with other members of the XML family: SGML, used in high-end document processing, and HTML, the predominant language of the web.

- Used with XSD and DTD documents, data described in XML is automatically validated to ensure that attributes that are required are present and order properly.
- Used with XSLT documents, data describe in XML can automatically be transformed to other data formats such as different XML data or HTML for presentation in web form.
- Used in XML documents, meta-metadata can be interchanged with other systems.