Aboriginal Community Land and Resource Management:
Geospatial Data Needs Assessment and Data Identification and Analysis

Volume 2

Data Identification and Analysis

Prepared for:

GeoConnections
Natural Resources Canada

Prepared by:

Makivik Corporation
C.P. 179 Kuujjuaq Quebec JOM 1C0

Société Makivik
Makivik Corporation

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Disclaimer

1. Each of the land use plans reviewed in this study is unique: unique in methods, data and analysis. To assist in the statistical analysis of each plan's data, a gross assumption was made that the plans are comparable. This, in fact, is not true. The methodological approach of the Tsleil-Waututh bioregional watershed study, for example, in no way compares to the methodological approach of the Algonquin's comprehensive land use plan. Recognizing this, we strived to normalize the plans to help flesh out trends at a high-level and compare plans with reference to geospatial data alone.

2. Data depicted in the plans are not necessarily representative of the data behind the plans. As many plans were prepared using local and external experts, many datasets were folded into the final land use plans without explicit reference. To address this problem, the authors would need to interview each community's technical planning team member and review all of the referenced literature that accompanies each plan. This was beyond the mandate of our project. However, there is no doubt that this type of research would have an effect on the statistical analysis used herein. For example, the Algonquin's $10+ million land use plan was one of the most data intensive research / mapping projects in Canadian planning history, but according to the information we have access to, the plan ranks the lowest in terms of data components used for its preparation.

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1.0 Introduction

Our study set out to develop a better understanding of geospatial data needs among Aboriginal groups across Canada and issues surrounding how these data are being used. In short, our objectives were:

- to determine the key geospatial datasets required to support land and resource management by Aboriginal communities; and,
- to determine who the authoritative closest-to-source custodians are for the identified key geospatial datasets required to support land and resource management.

Our research has produced a two-volume report to meet these objectives. Our Volume One report focuses on capturing high-level stories from interviews with community technicians and leadership regarding their experiences in completing Aboriginal land use plans. Their stories were organized into ten main themes, along with recommendations for each. The themes were:

1. access to data issues;
2. web-based mapping not being used;
3. problems locating and downloading geospatial data;
4. lack of standards and format issues;
5. access issues to satellite imagery;
6. investments needed to support cultural data inventories;
7. geomatics capacity;
8. data confidentiality and protocols;
9. land use planning in context of broader issues; and
10. need to continue the dialogue.

These stories and themes provide the context and a departure point to look at data needs and data sources in more detail. This is the focus of this Volume 2 report.

In this Volume, we document and summarize the geospatial data used in ten Aboriginal land use planning projects. We look at the data sources and their custodians, data availability and datasets that were missing at the time of the planning. The data summary exercise recorded 1,338 datasets, of which 426 related to framework data and 912 to thematic data. We organized the data by theme and conducted statistical summaries on the frequency of their use. Our research methods are presented in the next section of this report.

2.0 Methodology

The ten land use plans reviewed in our study are all unique. This makes the question "what data are needed to support land use planning" difficult to answer, as it is being asked in reference to land use plans that focused on forest management (Innu; Algonquins of Barriere Lake; Whitefeather; and to a lesser extent, the Haida plan), protected areas planning (Poplar River), watershed management (Tsleil-Waututh), the resolution of specific land use conflicts (Dehcho; Prince Albert Grand Council) and planning for land-claims implementation (Nunavut Planning Commission; Sahtu). Each plan has its own unique data requirements.

However, the diversity of these plans can be regarded as a strength to our study; our data summaries have captured a broad spectrum of information that is reflective of the complex challenges facing Aboriginal land management. The plans also share a similar use of mapping and underlying framework data, and a reliance on cultural data as a key thematic layer.

Our methods to inventory and assess the geospatial data used in these plans can be broken down into two main undertakings: (1) data summary; and (2) analysis and reporting. Each of these is described in more detail below.

2.1 Data Summary Methods

We described in our Volume One report (section 2.2 – Finding the Right Plans to Review) our methods for selecting the completed land use plans for our research. Once the plans were selected, the project team analyzed each plan's set of maps and summarized a list of data used for each map. This resulted in a preliminary list of data used for each plan, summarized in an Excel spreadsheet. Table 1 on the following page summarizes the information captured for each data layer in our summary spreadsheet.

In order to verify that our summary spreadsheets were accurate and complete, we sent the spreadsheets to our contacts in the communities for review. This was completed prior to our workshops to allow time for revisions and reflection. This process proved to be quite difficult in communities such as Poplar River where there was no geomatics capacity at the time of the study and staff originally involved in the mapping could not be located.

During the workshops, each community was asked to complete a workshop guide (See Volume One, Appendix B). From our review and input from the workshops we created a "missing / needed" spreadsheet. This spreadsheet captured data that were missing or not available at the time of planning, and data needed to help in the implementation of the plans. The fields used to in this spreadsheet were the same as those listed in Table 1. Combined, the two summary spreadsheets (the geospatial data used during the planning, and the geospatial data that were missing, needed or not available at the time of the planning) provided a core source of information for our analysis and reporting in this Volume.

The spreadsheets at this point were largely complete, with the exception that they did not identify the authoritative sources or custodians for each data layer. To fill this gap, we conducted Internet research and telephone inquiries. In approximately half of the cases, the information required was found through Internet searches alone, with the remainder requiring follow-up or

TABLE 1:

List of parameters recorded for each geospatial data layer

FIELD	DESCRIPTION
Group	The selected Aboriginal group
Dataset name	The name of the dataset
Format	The format of the dataset (e.g. shapefile)
Resolution/Scale	The scale of the dataset (e.g. national, provincial/territorial, regional and local)
Category	The data category (e.g. thematic or framework data)
Class	Main classes for data identified (biophysical, admin/development, natural and cultural heritage)
Sub-Class	Further sub-divisions of classes, providing increased resolution to the classification of the data identified
Update Status	Status of the data, updated and current as of (date)
Structure	Structure of the data (vector or raster)
Source	The authoritative source of the dataset
Metadata	Does the data have accompanying metadata? (yes/no)
Security	Can the dataset be shared (high, medium and low)
Cost	Any cost associated with obtaining the data
Access	Data access mechanism (free download, web services etc)
Barriers to access	Any barriers to accessing the data
Data availability	The availability data
Currency	Time period and data release date
Notes or Comments	Any notes or comments about the dataset

further research by telephone. While attempts were made to obtain complete information for each data set identified, in some cases it was not possible to track down a custodian or supplier because of a lack of details or descriptive information about the data. In total, data supplier or custodian information was identified for approximately 80 percent of the 1338 data sets recorded.

In order to analyze the large number of datasets that were collected (n=1338) and to develop a clear understanding of the main trends and data requirements for land and resource planning, it was necessary to implement a data classification scheme. Each data entry was classified using multiple-level classification criteria. A discussion of the classifications can be found in Volume One, section 2.3 Reviewing the Plans. Table 2 below summarizes the categories and sub-categories used in our analysis and a comprehensive list of datasets organized by category, class and subclass can be found in Appendix A.

TABLE 2: Data Classes and Sub-classes

CATEGORY	CLASS	SUB-CLASS
Thematic	Administrative / Development	Aboriginal Territories Land Ownership Socio-Economic Information Conservation/Protected Areas Agriculture Fishery Forestry Land Use / Land Management Areas Tourism and Recreation Energy Development Mining Oil and Gas
	Biophysical	Weather and Climate Geology Land Cover Hydrology Coastal Zone
	Natural Heritage	Fauna Flora Habitat Sensitive Areas Ecology
	Cultural Heritage	Archaeology Ceremonial and Sacred Sites Use and Harvesting Areas Occupancy Areas Cultural Toponymy Travel and Trade Routes
Framework*	Framework	Hydrography Elevation Toponymy Bathymetry Infrastructure Railways Roads Remote Sensing Administrative Boundaries National Topographic Datasets Provincial Topographic Datasets Transportation

*During the analysis of data sub-classes, challenges were experienced with respect to the way that framework data had been reported by the Aboriginal groups. In some cases, individual layers were specified (such as rivers, lakes and contours), whereas in others the entire topographic dataset (NTDB or TRIM) at a particular scale was referenced.

2.2 Data Analysis Methods

In order to identify trends and overall patterns of use for both framework and thematic datasets, the records for each dataset used were summarized using the following statistical frequency analyses:

- total number of records per group;
- class and sub-class frequency;
- summary of resolution/scale;
- summary of data custodians and suppliers;
- summary of frequency of updates;
- summary of data formats;
- summary of data access and access mechanisms;
- summary of confidentiality;
- summary of datasets where cost is a factor in acquisition;
- summary of metadata availability; and,
- summary of priority datasets.

These summary statistics were generated using Microsoft Excel. The results of this work are presented in the next section of the report.

3.0 Research Findings

We included in our analysis both datasets that were used in planning, and datasets that were missing or identified as needed for planning and plan implementation. Of the total data (n=1,338), 85 percent of the datasets were used in planning and 15 percent were identified as missing or needed. Both types of data were merged into a single list.

The data sets comprise 426 framework and 912 thematic data layers (Table 3).

The largest category of datasets inventoried for our study concerns administration and development (511 data layers). This high percentage is not surprising, as land use and resource management planning is largely concerned with the delineation of zones for a range of conservation and development activity, and relating these zones to other administrative boundaries, including land tenure, development zones and conservation areas.

3.1 Number of Data Layer Records by Community

The number of data layers used by communities differs quite significantly (Table 4). These differences are due to a variety of variables. The most important variable is differences in needs for geospatial data in planning. Other variables include:

- The final plans may not list all of the datasets used during the land use planning process.
- The final plans present summary maps, not interim data layers used for their analysis.
- The types of issues being addressed in each plan differed.
- Differing methodologies were used in the planning process.
- The level of funding and public scrutiny varied among plans.
- Planning approaches (policy-based or operationally-oriented) differed.
- Our research team didn't have access to geomatics staff in some communities to create a comprehensive summary.

In our inventory, the Whitefeather Land Use Strategy made the highest contributions to thematic data (n=146). This high number reflects the diversity of values and interests that were accommodated in the plan, with maps created for each. This plan also uses the lowest number of

TABLE 3: Geospatial data by type

#	DATA CLASS	LAYER COUNT	TOTAL LAYERS BY TYPE
1	Administrative/Development	511	912 (thematic)
2	Biophysical	58	
3	Cultural Heritage	173	
4	Natural Heritage	170	
5	Framework	426	426 (framework)
Total		1338	1338

Table 4: Number of records by community

ABORIGINAL GROUP	FRAMEWORK # RECORDS	FRAMEWORK PERCENT	THEMATIC # RECORDS	THEMATIC PERCENT
Algonquin	40	9.4%	51	5.6% (LOWEST)
Athabasca	55	12.9%	118	12.9%
Dehcho	78	18.3%	132	14.50%
Haida Gwaii	33	7.7%	111	12.2%
Innu	99	23.2% (HIGHEST)	64	7.0%
Nunavut Planning Commission (NPC)	15	3.5%	98	10.7%
Poplar River	18	4.2%	52	5.7%
Sahtu	24	5.6%	62	6.8%
Tsleil-Waututh	58	13.6%	78	8.6%
Whitefeather	6	1.4% (LOWEST)	146	16.0% (HIGHEST)
Total	426	100%	912	100.00%

framework datasets; this is the case because simple basemaps were used in the plans, all of the same scale.

The Innu plan made the highest contributions to the number of framework datasets recorded in our survey. This is reflective of the large portfolio of maps presented in the plan, their varying scales, and a high level of base map detail.

The Algonquin plan stands out as an anomaly in our review. The Algonquin plan was the most expensive and comprehensive of all the plans, so we were surprised to see it rank the lowest in the number of thematic layers in our inventory. We believe that this is because the final plan that we reviewed (Kiackinapilok) is only one of seven plans drafted for each Traditional Management Area. The Kiackinapilok plan is a synthesis of dozens of research initiatives, each containing their own portfolio of maps. These background documents were not included in our assessment.

It must be noted that there are some differences in the way that the data from the different Aboriginal groups were counted. For example, in the case of the Algonquin, wildlife was encapsulated in a single map and was therefore counted as a single record, whereas the NPC had identified twenty-two wildlife maps in its plan, all of which counted as individual records. While this emphasizes the importance of wildlife to the planning process and the people of Nunavut, it also potentially skews the data.

3.2 Data Layers Grouped by Category, Class and Sub-class

A simple frequency analysis for the summary table of all data broken down by category, class and sub-class is helpful for identifying common themes and priorities. Table 5 summarizes this information and ranks it in order of occurrence in our database.

The framework data sub-classification includes a mixture of complete topographic datasets and a series of individual topographic layers. National and provincial/territorial topographic datasets account

TABLE 5: Number of records by category, class and sub-class

CATEGORY	CLASS	SUB-CLASS	COUNT	PERCENT OF TOTAL DATA
Thematic	Natural Heritage	Wildlife	124	13.6%
	Administrative / Development	Land Use / Land Management	109	12.0%
	Administrative / Development	Forestry	95	10.4%
	Cultural Heritage	Travel and Trade Routes	76	8.3%
	Administrative / Development	Mining	70	7.7%
	Administrative / Development	Tourism and Recreation	69	7.6%
	Administrative / Development	Conservation/Protected Areas	56	6.1%
	Natural Heritage	Ecology	42	4.6%
	Administrative / Development	Aboriginal Territories	41	4.5%
	Cultural Heritage	Use and Harvesting Areas	33	3.6%
	Cultural Heritage	Cultural Toponymy	28	3.1%
	Administrative / Development	Fishery	23	2.5%
	Cultural Heritage	Occupancy Areas	19	2.1%
	Administrative / Development	Oil and Gas	18	2.0%
	Biophysical	Weather and Climate	17	1.9%
	Biophysical	Geology	15	1.6%
	Administrative / Development	Energy Development	13	1.4%
	Biophysical	Hydrology	13	1.4%
	Cultural Heritage	Ceremonial and Sacred Sites	11	1.2%
	Biophysical	Land Cover	8	0.9%
	Administrative / Development	Land Ownership	6	0.7%
	Administrative / Development	Socio-Economic	6	0.7%
	Cultural Heritage	Archaeology	6	0.7%
	Administrative / Development	Agriculture	5	0.5%
	Biophysical	Coastal Zone	5	0.5%
	Natural Heritage	Sensitive Areas	4	0.4%
SUBTOTAL			912	100%

CATEGORY	CLASS	SUB-CLASS	COUNT	PERCENT OF TOTAL DATA
Framework	Framework	National Topographic Datasets	138	32.4%
	Framework	Hydrography	94	22.1%
	Framework	Roads	54	12.7%
	Framework	Provincial Topographic Datasets	51	12.0%
	Framework	Infrastructure	32	7.5%
	Framework	Administrative Boundaries	25	5.9%
	Framework	Elevation	13	3.0%
	Framework	Remote Sensing	7	1.6%
	Framework	Toponymy	6	1.4%
	Framework	Bathymetry	2	0.5%
	Framework	Transportation	2	0.5%
	Framework	Nautical Charts	1	0.2%
	Framework	Transportation - Other	1	0.2%
SUB-TOTAL			426	100.0%
TOTAL			(912+426)= 1,338	

for 44.4 percent of the 426 records counted. When combined with the individual topographic layers, we conclude that about 82 percent of all framework data is derived from topographic base maps. This is not surprising in light of the important role of topographic data as reference layers to locate other geographic themes.

For thematic data, the highest single sub-class ranking is natural heritage, wildlife (13.6 percent). This is an important statistic for our study, as it emphasizes the role of wildlife habitat and range data within the Aboriginal land use planning context. Wildlife likely will continue to be an important value to consider in Aboriginal planning because of its food and cultural significance, its ties to Aboriginal Rights (e.g. R. Vs. Sparrow decision (1990); R. v. Marshall decision (1999)) and on-going legislative considerations (e.g. Species at Risk Act).

Cultural heritage data in our study is broken down into sub-classes. Because of this, it is difficult to see the importance of cultural use and occupancy studies within the land use planning context. If we add up the percentage of occurrences of data derived from these types of studies, we see that 18.3 percent of all recorded thematic data is derived from community cultural use and occupancy studies. The importance of these data to land use planning was echoed during our workshops and is documented in our Volume One report, which highlights the need for investments to support new cultural inventories (recommendation number 12).

Forestry and mining data comprise 18.1 percent of all thematic data. This statistic highlights the importance of having access to industry-related data to help address third-party interests in local land use plans. This idea was raised many times during our workshops; community technicians and leaders indicated that they want routine access to

industry data. This was noted as one of our main recommendations in our Volume One report (recommendation number 1).

3.3 Scale (Resolution) of Geospatial Data

The scale and resolution of the data is difficult to summarize without a concise definition of terms. Confusion around the scale of the source data and the scale of their cartographic outputs caused consistency problems when summarizing the data layers. We make a distinction in our study regarding the scale of the source data and the scale at which these data are used in cartographic outputs. The scale or resolution of source data when created or supplied is important.

For the purposes of our study, the scale or resolution of geospatial data was broken down into the following categories:

1. Local scale: > 1:50,000
2. Regional scale: 1:50,000 to >= 1:250,000
3. Provincial/Territorial scale: < 1:250,000 to >= 1:2,000,000
4. National scale: < 1:2,000,000

We recognize that perspectives on scale are unique to the cartographer and her/his audiences. A provincial government, for example, might view the term "local" as meaning 1:20,000 scale, whereas an Aboriginal group may view something local as 1:50,000 or 1:100,000 scale. Furthermore, traditional measures of scale in Canada are somewhat different to other parts of the world. Provincial/Territorial territorial scales are generally similar to national data scales used in other countries.

For our study, source data scales were gathered from descriptive information from the plans or from our dialogue with local practitioners. Where data scale was unknown, the maps were studied to give us a general proxy scale for the datasets. Table 6 summarizes data layers by scale category.

As the planning processes we studied deal with issues at scales ranging from local to Provincial/Territorial, no framework data at the national scale were used. We can conclude that the most common framework data scales for the plans (63.2 percent) are those derived from 1:50,000 and 1:250,000 topographic map series, products of Natural Resources Canada. The importance of framework data at these scales was noted during our community workshops and addressed in our Volume One report (recommendations 6 & 7) with suggestions on where improvements can be made to simplify access and symbolization of these layers.

Even though many Aboriginal groups were dealing with planning for large areas, some very large scale data were used for certain maps. For the Forest Ecosystem Strategy Plan for Nitassinan, the Innu

TABLE 6: Number of records by scale

CATEGORY	RESOLUTION	COUNT	PERCENT
Thematic	Local	135	14.8%
	Regional	270	29.6%
	Provincial/Territorial	498	54.6%
	National	7	0.8%
	Unknown	2	0.2%
	Total	912	100.0%
Framework	Local	157	36.9%
	Regional	88	20.7%
	Provincial/Territorial	181	42.4%
	TOTAL	426	100.0%

used framework data up to 1:12,500 scale for a variety of features, including hydrography and transportation routes.

The majority of thematic datasets used in our review were of the Provincial/Territorial scale (54.6 percent), reflecting the size of the territories and the regional issues being dealt with in the plans. National scale datasets were used on a very limited number of maps, mainly for general trend maps to put the territories into context. In general, the majority of work appears to have been done using data of 1:50,000 (regional) and 1:250,000 (Provincial/Territorial) scale. These are common mapping scales for topographic and natural resource maps.

Locally-scaled thematic data (14.8 percent) often included industry or operational data. Data in this scale category were used by the Innu, Algonquin and the Tsleil-Waututh to help inform site-specific planning. The largest part of information at these scales (forest development plans, mining maps, oil and gas sites) is mapped at the 1:10,000 or 1:20,000 map scales. These scales are consistent with the provincial / territorial base mapping in these areas. These data, however, are noted in our Volume One report as not being readily accessible, standardized or routinely updated (recommendations 3 & 9).

3.4 Data Custodians / Suppliers

In this section, we summarize the authoritative sources for each data layer. We grouped data suppliers using the following categories:

- Aboriginal group;
- Federal Government;
- Provincial/Territorial Government;
- Municipal Government;
- Industry;
- Non-Governmental Organization (NGO); and
- Academic.

Data sources for each of the thematic and framework data categories are summarized in Table 7.

Because of the nature of framework data, it is not surprising that more then 95 percent of framework data sources are governmental, with 55 percent coming from provincial/territorial sources and 40 percent from federal sources.

TABLE 7: Data by source

Category	SOURCE	COUNT	PERCENT
Thematic	Aboriginal Group	422	46.3%
	Provincial / Territorial	333	36.5%
	Federal Government	112	12.3%
	Industry	35	3.8%
	Other (Municipal, NGO, University)	10	1.1%
TOTAL		912	100.0%
Framework	Provincial / Territorial	238	55.9%
	Federal Government	172	40.4%
	Industry	11	2.6%
	Other (Municipal, NGO, University)	5	1.1%
TOTAL		426	100.0%

Some framework data were identified as available from both federal and provincial/territorial government sources. Other sources of framework data include private companies and municipal government. A detailed summary of authoritative sources of each of the key geospatial data layer is provided in Appendix B.

Aboriginal groups were the largest source of thematic data, representing 46 percent of all recorded thematic data. Data sourced from the Aboriginal groups fall largely within the cultural heritage class (which includes land use and occupancy datasets). In addition, many datasets showcasing land use zoning (created as a result of the planning process) were categorized under the Administrative/Development class.

However, the Innu, Haida, Prince Albert Grand Council and the Algonquin did not share information regarding cultural or local knowledge because of confidentiality concerns. Their contributions to this summary statistic would no doubt increase this percentage significantly.

Again, the importance of cultural inventories is highlighted by this summary, supporting our recommendation to develop additional support programs to capture these types of data (recommendation 12). The need for confidentiality agreements and information sharing agreements is also highlighted. Having access to example templates that have worked well elsewhere would no doubt benefit many communities that want to use their cultural data in public planning forums (recommendation 19).

Provincial/Territorial governments are ranked as the second largest source of thematic data, with 36 percent of all records assigned to this source. This largely reflects how natural resources are being managed in Canada, where the provinces and territories have the legal and fiduciary duty to manage these resources on behalf of the Crown. Apart from government and the Aboriginal groups themselves, a very small percentage of thematic datasets seem to be sourced to industry, university and non-government organizations (about 5 percent). However, it would be incorrect to assume that these data sources are not important. In our community workshops, data describing activities from industry were highlighted as very important. Although these data are maintained by each company separately, provincial and territorial agencies often maintain aggregated summaries of activities by sector. It is these summaries that often find their way into the land use planning process.

3.5 Frequency of Updates (Data Currency)

For each data layer, we associated a field describing how often the community would like the data to be updated. We used the following categories to describe the frequency of updates:

- Daily
- Weekly
- Monthly
- Yearly (1+years)
- Historical data

From our survey, a small number of datasets were identified to require daily or weekly updates (2 percent). 46 percent of the geospatial datasets fell within the yearly category (updates every year or every few years). It was mentioned by some communities that data should, at minimum, be updated at the time of each plan review, which in many cases is approximately every five years. Data updates on a 5 to 10 year update schedule account for approximately 14 percent of the data. Local knowledge data were found to be mostly historical in nature. However, some groups have collected current land use and occupancy data during the planning process (Algonquin, for example) and some groups have expressed the need for updating their Traditional Ecological Knowledge (TEK) datasets (Poplar River, Tsleil-Waututh, Haida, Algonquin). This need is consistent with our recommendation from Volume One, to bring additional support to cultural data inventories (recommendation 12).

In general, most of the datasets were not updated since the plan had been created, especially in the communities where GIS capacity is an issue. Data updating is a significant issue for many communities (Dehcho, Sahtu, Algonquin, Poplar River, Prince Albert Grand Council) where years have passed since their plans have been completed but plans have yet to be implemented. No doubt many of these plans will need to be updated or redone with new data if the barriers to implementation are removed.

3.6 Data Formats

For each data layer in our summary spreadsheets, we noted the layer's original data format as it was received from the supplier. The main data format categories are:

- Shapefile
- Tabular Data
- Web Service
- Raster
- PDF
- Word Document
- DGN
- ESRI GIS (vector/raster)
- Unknown

ESRI's GIS (vector/raster) category includes files received in ESRI Arc Interchange (or Coverage) format (*.E00). Raster data includes scanned topographic maps and remote sensing data (aerial photography and satellite imagery); these often are the only sources of reference data or information when digital vector data are not available.

All the above formats were encountered during data compilation. New CGDI endorsed formats such as KML or GML were not mentioned in the communities. Table 8 summarizes the frequency of these categories for both thematic and framework data.

TABLE 8: Data format

CATEGORY	DATA FORMAT	COUNT	PERCENT
Thematic	Shapefile	754	82.7%
	Unknown	72	7.9%
	Tabular Data	28	3.0%
	Web Service	26	2.9%
	Raster	22	2.4%
	PDF	7	0.8%
	Word Document	2	0.2%
	DGN	1	0.1%
	Total	912	100.0%
Framework	Shapefile	338	79.3%
	ESRI GIS (vector/raster)	55	12.9%
	Raster	16	3.8%
	Unknown	13	3.1%
	Web Service	2	0.5%
	PDF	1	0.2%
	Tabular Data	1	0.2%
	TOTAL	426	100.0%

Over 82 percent of thematic data and a combined 92 percent of framework data was received in shapefile format. This reflects the fact that all of the communities who participated in our study use ESRI-based software for their GIS. During our workshops, communities were frustrated with suppliers who packaged their data in non-ESRI formats. We recorded their concerns and noted them in our Volume One report in recommendations 3 and 10, which state that programs developed for the Aboriginal sector should support the shapefile or ESRI-based formats.

Only 3.1 percent of the thematic data and 0.5 percent of the framework data was obtained in a Web service format. Our research concluded that the communities surveyed do not access their data via Web services and prefer to download their data locally. We addressed this preference in our recommendation 4 and 5, which advise that data custodians should continue to support the downloading of data to local libraries, not necessarily connected to source. This issue is addressed in more detail in the next section of the report.

3.7 Data Access

For the purpose of this study, access to data is determined primarily by the access mechanism. We categorized data access mechanisms into the following themes:

- Free download
- For fee download
- Web services
- Community owned
- Available upon request
- Not accessible

A summary of data access mechanisms for both thematic and framework data is provided in Table 9.

As framework data are generally topographic base data provided by Provincial/Territorial and Federal government departments as part of their mandates, generally these are available for free to download (47 percent) or available upon request (49 percent). The information in Table 8 shows that the highest percentage of thematic data (closest to 45 percent) must be requested in order to gain access. Another 44 percent of datasets are community owned, which indicates the important role that community and cultural research plays in Aboriginal land use planning.

TABLE 9: Data Access Mechanism

CATEGORY	DATA ACCESS MECHANISM	COUNT	PERCENT
Thematic	Available upon request	408	44.7%
	Community owned	403	44.2%
	Not accessible	68	7.5%
	Web service	28	3.1%
	Free download	5	0.5%
	Total	912	100.0%
Framework	Available Upon Request	209	49.1%
	Free Download	201	47.2%
	Not Accessible	13	3.0%
	Web service	2	0.5%
	Community Owned	1	0.2%
	TOTAL	426	100.0%

Consistent with our findings in the previous section, web services make up only a small percentage of the total thematic and framework data used or needed (about 3.0 percent and 0.5 percent). Looking more closely into the methods used to generate the plans, we found that all of the communities relied heavily on large-format paper plots to assess, communicate and analyze multi-sectoral interests and concerns. These plots necessitate access to local, high-resolution data to support high-quality map outputs. It is not likely that web-based data distribution mechanisms will play a significant role in Aboriginal land use planning process in the near future. There is a role, however, for these tools in the communication and implementation of the final land use plans.

Table 10 identifies preferred data access methods as identified by each of the Aboriginal groups during workshops.

All of the groups (except for Whitefeather, where a workshop did not take place) identified direct Internet download of geospatial data, along with FTP and email, as preferred access methods. Free download constitutes 47 percent of access to framework data, while data available upon request (45 percent thematic and 49 percent framework) are usually delivered via FTP or email. Some groups mentioned other means of data delivery and sharing, such as CD-ROM (Innu) and paper maps (Poplar River). Only the Nunavut Planning Commission seems to be accessing some geospatial data through WMS/WFS services.

3.8 Data Confidentiality

Three levels of confidentiality were examined for the geospatial data summary. Here, confidentiality refers to the sensitivity of the data to public access and conditions attached to their use or circulation. The confidentiality categories are:

- High security – unable to share information;
- Medium security – can be shared among small user groups; and
- Low security – can be shared with a large user group.

In general, community owned data, mainly TEK and use and occupancy data, were not being shared or were usually shared within the owner communities. These datasets were almost all classified as high

TABLE 10: Preferred data access methods from community meetings and interviews

ABORIGINAL GROUP	DATA ACCESS METHOD
Algonquin	Internet
Athabasca	Internet, Email
Dehcho	Internet
Haida Gwaii	Internet, Email
Innu	Internet, CD-ROM
NPC	Internet, FTP, WMS-WFS
Poplar River	Internet, Hardcopy
Sahtu	Internet, FTP
Tsleil-Waututh	Internet
Whitefeather	N/A

security data. Some groups shared geospatial data with a limited number of users outside their immediate organizations, mainly with different communities and organizations belonging to the same Aboriginal group. Occasionally, selected datasets were being shared with Government and/or industry through data sharing agreements. These datasets were classified as medium security.

To the contrary, most of the data coming from Government can be shared with a large group of users. These datasets were classified as low security.

Data security refers to the degree of sensitivity of the information contained within the dataset and the level of security normally applied to it to protect it from misuse. Table 11 provides a summary of the levels of confidentiality for thematic and framework data.

As the majority of framework data is public information, generated using taxpayers money by mandated government departments, federal framework data are generally freely available with little or no user restrictions applied. Conditions are almost always tied, however, to the use of Provincial and Territorial framework data; these data need to be accessed through memberships, special information sharing requests or direct purchase. Here, there is a contradiction in our findings. In Table 6 we saw that 54.6 percent of framework data is sourced from a provincial or territorial government. With 96.7 percent of the framework data ranked as low in terms of confidentiality or user-restrictions, we can only assume that provincial or territorial framework data were obtained without limited-use agreements or formal information sharing mechanisms restricting use.

For thematic data, the high and medium confidentiality rankings (combined 40.9 percent) are associated with community cultural data. For public planning forums, this is a high percentage of confidential information. The sensitivities surrounding the sharing of these data were reiterated during the community workshops and in communications with local practitioners. There is an important need to have solid data sharing protocols and confidentiality agreements in place to protect these data. Communities have asked that examples of best-practices in this regard be shared to help safeguard the data while, at the same time, allow the data to inform public planning. This is reflected in Volume One, recommendation 19.

TABLE 11: Data Confidentiality

CATEGORY	SECURITY	COUNT	PERCENT
Thematic	Low	497	54.5%
	Medium	216	23.7%
	High	157	17.2%
	Unknown	42	4.6%
	Total	912	100.0%
Framework	Low	412	96.7%
	Unknown	13	3.1%
	Medium	1	0.2%
	TOTAL	426	100.0%

3.9 Datasets Where Cost is a Factor in Acquisition

All of the plans that were reviewed (except for the Tsleil-Waututh plan) were initiated before the Federal Government implemented a no-fee pricing structure on all information products owned exclusively by NRCAN, which includes NTDB, CanVec, and National Road / Hydro network data, among other datasets. This policy went into effect in April, 2007. With many provinces following suit (e.g. Ontario now supports free access to the Ontario Geospatial Data Exchange through registration with Land Information Ontario), we suspect that data pricing as a barrier to access will become significantly less of an issue for groups who are undertaking land use planning today.

Table 12 provides a summary of the number of thematic and framework datasets assessed in regards to cost as a condition to data accessibility.

For the framework data, 48.6 percent of data documented in the study was available at no cost, with 13.8 percent requiring purchasing. We suspect that this second number may be slightly lower now after the recent change in Federal pricing policies. However, provinces such as British Columbia and Quebec routinely charge for access to provincial framework data. Other sources available at cost include LIDAR, DEM and remote sensing data.

The Tsleil-Waututh Nation noted that pricing was a barrier in accessing cadastral data for its territory. The Haida stated that legal system mapping, erosion vulnerability layers and vegetation resource inventory (VRI) data to be prohibitively priced. The Dehcho First Nation was frustrated at the high cost of Indian Resource Satellite (IRS) 5 metre imagery for its area of interest and noted the pricing structure as a barrier to routine access.

TABLE 12: Data pricing barriers

CATEGORY	COST	COUNT	PERCENT
Thematic	No	717	87.8%
	Yes	4	0.5%
	Unknown	96	11.7%
	Total	817	100.0%
Framework	No	207	48.6%
	Unknown	160	37.6%
	Yes	59	13.8%
	TOTAL	426	100.0%

3.10 Metadata

Information about the presence of metadata was collected for each layer in our data summary table. Table 13 summarizes our findings for both thematic and framework data.

There is a significant difference in the occurrence of metadata between thematic (12 percent) and framework data (94.4 percent). The provision of metadata is a standard that most government departments follow and most of the datasets in the framework category are obtained from government sources. Therefore it is not surprising that the percentage of framework datasets accompanied by metadata is high. Environics' 2006 study recommended an education campaign focused on increasing the awareness to the importance of metadata. Despite the recognized importance of metadata, providing this information is routinely neglected. It is worth focusing on this issue as an action item to help address the gap between CGDI metadata standards and what is actually

happening on the ground (i.e. no metadata). Only one Aboriginal group (Tsleil-Waututh) has claimed that it does not use any data if not accompanied by metadata.

We recommend that GeoConnections look more closely at why there is such a poor metadata completion rate for thematic data (recommendation 22). This dialogue needs to be realistic regarding the sense of 'burden' experienced by communities to meet CGDI metadata specifications. Perhaps new tools are needed to help create efficiencies in metadata entry, or lowering the bar as to what actually needs to be captured.

TABLE 13: Completeness of Metadata

CATEGORY	METADATA	COUNT	PERCENT
Thematic	No	678	74.3%
	Unknown	125	13.7%
	Yes	109	12.0%
	Total	912	100.0%
Framework	Yes	402	94.4%
	No	11	2.6%
	Unknown	13	3.0%
	TOTAL	426	100.0%

3.11 Priority Datasets

One of the main tasks of this project was to prioritize data-needs based on the results of our methods and analysis. For this deliverable, we decided that it would be most appropriate to have participants in the study prioritize their own data.

We ranked priorities based on the following categories:

- High – absolutely necessary to complete a comprehensive plan
- Medium – of benefit to complete the plan
- Low – not necessary but useful to have data in order to complete plan

To produce a Canadian wide priority list, we tallied the rankings from all ten communities and noted 'high' rankings that were common between them. This was done by placing ranked data and Aboriginal groups into a matrix table.

For this matrix, we used data sub-classes for data headings. For example, we used the more detailed sub-class “wildlife” instead of the more general data class “natural heritage”. This gave us more texture in our analysis. For each sub-class, we gave it a score of 3 if it was ranked highly by at least one Aboriginal group. If the data sub-class was ranked high by all ten communities, it was given a ranking of 30. Framework and thematic data were each ranked independently.

To define high priority at the cross-Canada level, it was decided that at least seven of ten groups must have ranked the sub-class of data as a high priority. Sub-classes ranked from four to six were classed as medium. Sub-classes less than or equal to three Aboriginal groups were classed as low. Possible scores and priority identification can be seen in Table 14.

Priority datasets for thematic data can be seen below in Table 15, and for framework data in Table 16. A comprehensive view of priority datasets both framework and thematic as well as a list of the associated information (description, number of

records, resolution, data providers, and dataset examples) can be found in Appendix B and C respectively.

Datasets in the thematic class that have a high degree of temporal change—many year-to-year (wildlife movement / habitat patterns, mining claims and mining activities, forestry harvesting)—are seen to be of higher priority. Wildlife was the only sub-class that received recognition as a high priority from ten out of ten communities, and therefore is ranked as the highest priority dataset from our sample study. The importance of wildlife data was stressed during the workshops with the Aboriginal communities and no doubt reflects the historical importance of wildlife in Aboriginal culture. The second highest priority dataset from the analysis is the mining sub-class. The Innu were the only group not to identify mining as a high priority; likely this was because the focus of their plan was producing a forest management strategy and that there are few mining claims in their planning area.

Eight of ten Aboriginal groups also identified that Aboriginal Territories, Forestry, Land Use / Land Management and Tourism and Recreation are of high priority.

In the framework class, Roads and Infrastructure (such as water supply and powerlines) were the only two datasets identified by at least seven of ten study participants to be of high priority. Both of these datasets, as with many of the high priority thematic layers, are likely high priority as they are not static like other framework layers (rivers and lakes for example) and can change rapidly from year-to-year, especially in quickly developing areas such as those with forestry operations or mining/exploration sites.

Regional Anomalies

Some sub-classes are important when considering data requirements within regions rather than overall participant rank. For example, the forestry data sub-class was chosen by all communities in the East, Central, and West regions. One community in the north, the Dehcho, which is the most southern “northern” plan, identified forestry data as important. However, we would expect that forestry data would not be important in the far north. Therefore, some priority must be placed on forestry data, especially for southern based Aboriginal groups.

Similarly, only the three northern communities in this study identified Oil and Gas as a priority. Thus, overall, this dataset appears to be low priority.

TABLE 14: Priority Analysis Criteria

NUMBER OF GROUPS	POSSIBLE SCORE	PRIORITY DEFINITION
0 of 10	0	LOW
1 of 10	3	LOW
2 of 10	6	LOW
3 of 10	9	LOW
4 of 10	12	MEDIUM
5 of 10	15	MEDIUM
6 of 10	18	MEDIUM
7 of 10	21	HIGH
8 of 10	24	HIGH
9 of 10	27	HIGH
10 of 10	30	HIGH

TABLE 15: Thematic Data Priority List

CLASS	SUB-CLASS	SCORE	PRIORITY
Natural Heritage	Wildlife	30	HIGH
Administrative/Development	Mining	27	HIGH
Administrative/Development	Aboriginal Territories	24	HIGH
Administrative/Development	Forestry	24	HIGH
Administrative/Development	Land Use / Land Management	24	HIGH
Administrative/Development	Tourism and Recreation	24	HIGH
Administrative/Development	Conservation/Protected Areas	21	HIGH
Cultural Heritage	Use and Harvesting Areas	21	HIGH
Natural Heritage	Ecology	21	HIGH
Administrative/Development	Fishery	18	MEDIUM
Biophysical	Hydrology	15	MEDIUM
Cultural Heritage	Travel and Trade Routes	15	MEDIUM
Biophysical	Geology	12	MEDIUM
Cultural Heritage	Archaeology	12	MEDIUM
Cultural Heritage	Ceremonial and Sacred Sites	12	MEDIUM
Administrative/Development	Energy Development	9	LOW
Administrative/Development	Oil and Gas	9	LOW
Cultural Heritage	Occupancy Areas	9	LOW
Administrative/Development	Land Ownership	6	LOW
Administrative/Development	Socio-Economic	6	LOW
Biophysical	Land Cover	6	LOW
Biophysical	Weather and Climate	6	LOW
Natural Heritage	Sensitive Areas	6	LOW
Administrative/Development	Agriculture	3	LOW
Cultural Heritage	Cultural Toponymy	3	LOW
Biophysical	Coastal Zone	0	LOW

See Appendix A for the explanation of the data classes and subclasses

TABLE 16: Framework Data Priority List

CLASS	SUB-CLASS	SCORE	PRIORITY
Framework	Roads	24	HIGH
Framework	Infrastructure	18	MEDIUM
Framework	Administrative Boundaries	15	MEDIUM
Framework	Hydrography	15	MEDIUM
Framework	National Topographic Datasets	9	LOW
Framework	Elevation	6	LOW
Framework	Remote Sensing	6	LOW
Framework	Transportation	6	LOW
Framework	Provincial Topographic Datasets	3	LOW
Framework	Toponymy	3	LOW
Framework	Bathymetry	0	LOW
Framework	Nautical Charts	0	LOW
Framework	Transportation – Other	0	LOW

However, regionally all three groups have selected it as a high priority and therefore close attention should be paid to Oil and Gas data for northern regions. The apparent high priority of mining information in the north can be attributed to two of three communities directly in the vicinity of the Mackenzie Valley projects and the recent high exploration rates for oil and gas in northern regions.

Tourism and Recreation appear to be of a higher priority in southern regions. Two of three northern groups (NPC and Sahtu) have not identified Tourism and Recreation as a high priority, likely because of the historical lack of tourism in these remote regions. However, recent developments in northern parks (both Provincial/Territorial, and National Parks) may lead to this having a higher importance in the future.

Other Anomalies

One sub-class that received a high priority is land use and land management. This sub-class includes many types of layers that are created during the planning process. In most cases, these are created through the spatial analysis of other layers. Therefore, for the purposes of identifying and listing priorities for GeoConnections, the land use and land management sub-class isn't so much needed for planning, rather, it is the outcome from the planning. As such, this sub-class may not be one that GeoConnections focuses on as a priority dataset for groups embarking on land use planning.

Both bathymetry and nautical charts scored low in our study, but may prove to increase in priority in future years as groups focus on marine-based plans, coastal management plans and marine conservation plans. The Heiltsuk First Nation's mapping of marine resources on the Central Coast of British Columbia is a good example of this. The Haida also expressed the need for marine-based layers to support their Marine Use Plan in collaboration with the BC government.

3.12 Missing Geospatial Data and Barriers to Access and Use

Seven groups identified that they were missing information during their planning processes. Only two Aboriginal groups, Poplar River and Tsleil-Waututh had all the information they needed for their planning.

Missing Geospatial Data

We recorded a summary of missing geospatial datasets during the workshops and through our consultations with the participating groups. We also pulled information from the completed plans where data gaps were noted in the text or the maps. Combined, these data are listed in Table 17 (first column). The second column identifies geospatial data that are missing for the plan implementation process (a data wish-list). Thus, Table 17 lists both data that were missing at the time of planning and data that are currently needed for both land use plan implementation and for routine planning.

About 15 percent of all geospatial datasets were identified as missing or not accessible during the planning process. In some cases, these were community use and occupancy datasets that come from internal sources (Haida, Innu, and Whitefeather), while in others datasets missing were from external sources, such as mineral potential, oil and gas etc. A number of groups also identified satellite images and derived products as missing at the time. Furthermore, some of the datasets that were missing during the planning process have still yet to be obtained or acquired. It is also interesting to note the heavy emphasis on current needs for higher-resolution satellite imagery (identified by seven groups; Algonquin, Athabasca, Dehcho, Innu, NPC, Poplar River and Sahtu), EO derived products (identified by four groups), aerial photography and LIDAR (identified by three groups) and high-resolution DEMs (Volume One recommendation 11).

In most cases, no new datasets were acquired after the plans were completed.

Barriers to Access and Use

The barriers to data access were identified using two methods:

1. Information gathered during workshops and consultations with communities; and
2. analysis of the data user needs surveys.

Table 18 summarizes barriers to geospatial data access as identified during the workshops. The first column identifies some of the barriers to accessing the existing geospatial data used in the land use planning process, and the second column identifies barriers to accessing missing data that were not used in the plans but are on a community's wish list.

The following is a summary of the main barriers captured from this table:

- Cost
- Licensing
- Lack of capacity to manage/access information
- Incompatible data formats, bandwidth issues
- Gaps in data
- Custodians (government, industry, outside consultants) reluctant to share data
- Process to obtain data too difficult/time consuming
- Metadata not available
- Lack of availability (source unknown, not available at appropriate scale)

The most frequently mentioned barriers were cost and accessibility.

Cost was one of the most-mentioned barriers to geospatial data access (Algonquin, Dehcho, Haida, NPC and Sahtu). However, as can be seen in table 20, data cost was primarily related to accessing framework data from government sources which has since changed for federal framework data, but is still an issue in trying to access provincial data (e.g. Quebec, British Columbia)

Accessibility was the other main barrier. The most frequently mentioned accessibility barrier was reluctance of Provincial/Territorial governments to share information (Quebec, NWT, Saskatchewan) and sometimes inability to produce data (NWT). As well, sometimes it was felt that the request process was too slow and time consuming (BC, Nunavut). In other cases, development companies' reluctance to share data and general lack of cooperation were mentioned (Haida). A total of five groups identified this as one of main obstacles in acquiring the

TABLE 17: Missing datasets identified by Aboriginal groups

ABORIGINAL GROUP	MISSING DATASETS (During Planning)	(Current) DATA NEEDS
Algonquin	moose habitat fisheries habitat models requiring additional study	standardized forestry data wildlife habitat (moose) fisheries Landsat RADARSAT
Athabasca	outfitting ecological classification mineral potential	outfitting forestry vegetation resource inventory LIDAR SPOT
Dehcho	forest resource inventory mineral development potential EO-derived vegetation classification / caribou habitat food harvest	vegetation classification forest resource inventory climate Landsat RADARSAT
Haida Gwaii	historical forest cover cut block records inventory of monumental cedars terrestrial ecosystem maps cultural surveys assessment of viewscapes	TRIM forest cover aerial photos climate
Innu	digital ortho-photos cultural data viewshed maps	aerial photos high-resolution satellite images climate data carbon geology
NPC		EO data EO derivatives (cumulative effects assessment)
Poplar River		carbon TEK mining satellite imagery
Sahtu	wildlife bedrock geology hydrocarbon potential oil and gas licensing mineral potential high resolution satellite imagery DEM	topographic data (NAD 83) higher-resolution satellite imagery DEM
Tsleil-Waututh	detailed hydro riparian and assessment data	
Whitefeather	TEK (still undergoing construction)	

TABLE 18: Summary of barriers to data access as identified by Aboriginal groups during workshops

ABORIGINAL GROUP	MAIN BARRIERS IN ACCESSING EXISTING GEOSPATIAL DATA	MAIN BARRIERS IN ACCESSING MISSING GEOSPATIAL DATA
Algonquin	Cost Licensing Lack of capacity to manage / access spatial data	Reluctance of government agencies to share (Quebec)
Athabasca	N/A	Province of Saskatchewan
Dehcho	Availability Cost Reluctance to share (NWT Government) Format	Government of NWT – no capacity to produce accurate vegetation classification / forest resource inventory
Haida Gwaii	Cost Licensing Requests with Government Development companies reluctance Gaps in data	Lack of funding Lack of cooperation (TEK) from licensees
Innu	Format Scale	N/A
NPC	Cost Request process time consuming	Gaps in data
Poplar River	Outside consultants	N/A
Sahtu	Cost Supplier unknown Bandwidth limitations	Cost
Tsleil-Waututh	Metadata	N/A
Whitefeather	N/A	N/A

necessary data. To overcome this obstacle, government and industry should make investments that support provincial and territorial government efforts to make available development data with potential use-rights for Aboriginal communities under a consultation-accommodation framework (Volume One, recommendation 1).

Accessibility was also affected, but to a lesser extent, by issues such as licensing, data quality and data availability. Apart from licensing issues (Algonquin, Haida), inappropriate scale (Innu), data gaps (Haida, NPC), data format (Dehcho, Innu) and lack of availability of metadata (Tsleil-Waututh) are some of the other major barriers mentioned during workshops. Non availability of geospatial data or data supplier was identified by the Dehcho and the Sahtu. Lack of capacity to manage / access spatial data still remains a barrier in 50 percent of Aboriginal communities that participated in the project (see Volume One, recommendation 13).

Table 19 provides a summary of the barriers to access for framework and thematic data as identified by Aboriginal groups for individual geospatial layers:

For framework data, 17 percent of geospatial layers were difficult to obtain compared to the 33 percent for thematic data. We can conclude that the barriers in accessing thematic data were more pronounced than for obtaining framework data. Main reasons for difficulties identified during workshops are summarized in the next table.

Only 17 percent of framework datasets were identified as having a barrier to access, with 80 percent of these datasets having a cost associated with them. Some provincial/territorial government departments still charge for topographic datasets (BC Government TRIM topographic data) and most of the plans were made at the time when framework data from federal government were not yet available without charge.

Within the "Yes" category (indicating a barrier to access) for thematic data, security was the most significant factor (78 percent of the 299 responses), with accessibility also an issue (23 percent of the 299 responses). Whereas cost would normally be expected to be a major barrier to access, only 4 records identified cost as a barrier in getting thematic data, which is less than 1 percent of the 299 thematic geospatial datasets identified. The thematic datasets with an associated cost included vegetation resource inventory data (Haida Gwaii), legal system information (Haida Gwaii), cadastral information (land boundary/ownership) (Tsleil Waututh) and erosion vulnerability (Haida Gwaii).

The main barrier to using geospatial data remains the geomatics capacity in the communities. During the planning process, this barrier was overcome to a certain extent by use of outside consultants, but capacity to use and manage geospatial data after the plans were completed remains one of the key barriers facing Aboriginal communities today (recommendation 13).

Data Sharing and Barriers to Sharing

Data sharing is an important component of any land use planning process. The sharing of data helps to build trust and mutual understanding between parties. Maintaining efficient, transparent and standardized data sharing programs are also of strategic importance for plan implementation and for routine decision making relating to consultations and accommodation.

TABLE 19: Summary of barriers for framework and thematic data

BARRIERS TO ACCESS	FRAMEWORK COUNT	FRAMEWORK PERCENT	THEMATIC COUNT	THEMATIC PERCENT
No	231	54.0%	585	64.0%
Unknown	122	29.0%	27	3.0%
Yes	73	17.0%	300	33.0%
TOTAL	426	100%	912	100%

TABLE 20: Identified barriers to access for framework and thematic data

BARRIER	FRAMEWORK COUNT	FRAMEWORK PERCENT	THEMATIC COUNT	THEMATIC PERCENT
Security	1	<1%	233	77%
Cost	59	81%	4	<1%
Accessibility*	13	18%	68	23%
	73	100%	299*	100%

*Note that 6 records had *not accessible* and *security* as barriers.

Data sharing was discussed during the workshops with the community practitioners. A summary of community feedback is listed below (Table 21).

Confidentiality and intellectual property rights in relation to cultural heritage (cultural use and occupancy data) data were the most frequently mentioned barriers to sharing of geospatial data (recommendation 19). In other cases, restrictive licenses were a barrier, and sometimes data formats (e.g. non-availability of data in shapefile format) and standardization were mentioned (recommendations 3 and 9).

Most data sharing occurs via email or FTP sites. A good amount of information is still shared through hard copy paper maps and in PDF formats as attachments in email.

TABLE 21: Data sharing and identified barriers

ABORIGINAL GROUP	DATA SHARING	BARRIERS TO SHARING
Algonquin	Limited	confidentiality issues restrictive licenses for some dataset
Athabasca	Yes (Province)	
Dehcho	Limited (internally and externally)	Confidentiality intellectual property (TEK) restrictive licenses (IRS)
Haida Gwaii	Internal (TEK) External	confidentiality intellectual property
Innu	Yes	
NPC	Internal (TEK) External	Confidentiality format (SHP)
Poplar River	No	no one ever asked
Sahtu	Internal External	data availability data standardization
Tsleil-Waututh	YES (ILMB) Limited (TEK)	N/A
Whitefeather	N/A	N/A

4.0 Summary

This Volume Two report presented an overview of geospatial data that were used by the ten selected communities in preparing their land use plans. The overview also reviewed data that were missing at the time the plans were prepared, and data identified as important for plan implementation. It is important to remember two caveats from the beginning of this report: (1) each of the land use plans reviewed in this study is unique but our analysis assumes that they are comparable in order to flesh out trends at a high-level; and, (2) the data depicted in the plans are not necessarily representative of the data used in the plans, as many plans were prepared using data to which we did not have access and without any explicit reference indicating their use.

Our objectives were to determine the key geospatial datasets required to support land and resource management by Aboriginal communities and to determine who the authoritative closest-to-source custodians are for the identified key geospatial datasets. In order to identify trends and overall patterns of use for both framework and thematic datasets, we prepared statistical summaries of the recorded data layers. Where possible, we have tied the results of our analysis to some of the recommendations made in our Volume One report.

Of all the recorded data layers (n=1,338), 68 percent are thematic and 32 percent are framework. Most of the framework data (82 percent) are derived from topographic base maps supplied by government. For thematic data, the highest single sub-class ranking is wildlife (13.6 percent). This was identified as a priority dataset by all ten communities. Summing the percentage of occurrences of data by sub-class, we found that 18.3 percent of all recorded thematic data was derived from community cultural use and occupancy studies; these normally are highly confidential in nature. Of equal importance are forestry and mining datasets, which comprised 18.1 percent of all recorded thematic data. We can conclude that wildlife, cultural inventories and development data (forestry and mining) are the most commonly used and priority thematic data themes for the plans we reviewed.

Aboriginal groups were the largest source of thematic data, representing 46 percent of all recorded thematic data. Provincial/Territorial governments are ranked as the second largest source of thematic data, with 36 percent of all records assigned to this source. Governments supply a range of data to the land use planning processes, including summaries of forestry and mining activities, and wildlife-related data.

Over 82 percent of thematic data and a combined 92 percent of framework data were received in shapefile format. These data were obtained through direct Internet downloads or via hard-coded media, with less than 5 percent of data being transferred using web-mapping applications. Looking more closely into the methods used to generate the plans, we found that all of the communities relied heavily on large-format paper plots to assess, communicate and analyze multi-sectoral interests and concerns.

Cost was one of the most-mentioned barriers to geospatial data access (Algonquin, Dehcho, Haida, NPC and Sahtu). However, this barrier was primarily related to the accessing of framework data from government sources, which has since changed for federal framework data, but is still an issue in many provinces and territories (e.g. Quebec, British Columbia). Confidentiality and

intellectual property rights in relation to cultural heritage (cultural use and occupancy data) data were the most frequently mentioned barriers to sharing of geospatial data. Incomplete metadata will no doubt add to the costs of sharing data; only 12 percent of thematic data contained completed metadata (compared to 94.4 percent of framework data).

We encourage the reader to interpret the statistical summaries within the context of our Volume One report. The statistics removed from the experience of the communities will only tell part of the story, and could lead to incorrect conclusions. We trust that our recommendations and conclusions adequately reflect the voices of the communities and that these voices will be helpful to those who are at the starting stages of a land use planning process.

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Appendix A

Data Categories, Classes and Sub-classes

Category	Class	Sub-Class	Dataset
THEMATIC	Administrative / Development	**Aboriginal Territories**	Boundary, Indian Reserve
			Boundary, Indian Territory
			Boundary, Treaty
			Settelement Area Boundary
		Land Ownership	Boundary, Private Land
			Cadastral
			Right of Way
		Socio-Economic	Economic Data
			Population/Census
			Population Desnity
		Conservation/Protected Areas	Conservation/Protected Areas
			National Parks
			Park Proposals
			Provincial Parks
			Boundary, Parks
			Protected Areas
			Conservation Zone
		Agriculture	Agriculture
		Fishery	Fishery, Commercial
		Forestry	Forestry
			Eligible Harvest Areas
			Timber Harvesting
			Proposed harvest units
		Land Use / Land Management	Land Use Zones
			Land Management Zones
			Land, Commercial
			Land, Institutional
			Land, Residential
			Designated Areas
			Human Impact
			Landfill / Waste Sites
			Special Management Zones
		Tourism and Recreation	Tourism
			Hunting, Commercial
			Hunting, Sport
			Outfitting
			Recreational Areas
			Tourism Potential
			Tourism Areas
		Energy Development	Energy Development

			Wind
			Hydro development
		Mining	Mining
			Mineral Potential
			Mineral Claim and Leases
			Coal - Developed Prospect (Map 31 also)
			Coal - Past Producer (Map 31 also)
			Coal - Prospect (Map 31 also)
			Coal - Showing (Map 31 also)
			Coal Exploratoin License
		Oil and Gas	Oil and Gas
			Oil and Gas Rights
			Proposed Pipeline
THEMATIC	Biophysical	**Weather and Climate**	Climatology
			Precipitation
			Temperature
			Snowfall
		Geology	Geology
		Land Cover	Land Cover
			Vegetation
			Wetland Types
			Wetlands
			Built-up Areas
		Hydrology	Hydrology
			Watershed Boundary
			Watershed Units
			Watersheds
		Coastal Zone	Tides, Currents, Water Levels
THEMATIC	Natural Heritage	**Fauna**	Animals
			Birds
			Fish
		Flora	
		Ecology	Habitat
			Biogeography
			Paleo-ecology
		Sensitive Areas	Environmentally Sensitive Area
			Disturbed Area
THEMATIC	Cultural Heritage	**Archaeology**	Archaeology
			Archaeological Finds
			Archaeology Density
		Ceremonial and Sacred Sites	Sacred Areas and Burial Sites
			Cultural Value Survey

			Heritage Sites
			Birth sites
		Use and Harvesting Areas	Traditional Land Use
			Traditional Hunting
			Fishing Sites
			Medicinal Plants
			Trapline Boundary
			Traplines
			Trapping
			Traditional Use (Sites)
			Wildlife, Critical
			Land Access
		Occupancy Areas	Cabins
			Camps
			Trading Posts
		Cultural Toponomy	Traditional Place Names
		Travel and Trade Routes	Transportation Routes
			Travel Routes
			Canoe routes
			Canoe Heritage Trail
			Human Migration
			Portage trails
			Portages
			Traditional trails
FRAMEWORK	Framework	**Hydrography**	Waterbodies (Lakes/Ponds)
			Waterways (Rivers/Streams)
		Elevation	Contours
			DEM
			Hillshade
		Toponomy	Place Names (Toponomy)
		Bathymetry	Bathymetry
		Infrastructure	Infrastructure
			Utilities
			Utility Line
			Water Supply
			Powerlines
			Transmission Lines
			Transmission Tower
			Airstrip
			Anchorages
			Bridges
			Communication Lines

		Transportation	Railways
			Shipping
			Other
		Roads	Roads
			All Weather Roads
			Existing Roads
			Unpaved (Public) Roads
			Seasonal Road
			Winter Roads
		Remote Sensing	Satellite Imagery
			Aerial Photography
			Lidar
		Administrative Boundaries	Boundary, Province
			Boundary, Country
			Towns and Communities
		National Topographic Datasets	Base Data - National Topographic Data Base
		Provincial Topographic Datasets	TRIM

Appendix B

Key Framework Priority Datasets

Roads

<table>
<tr><td>Description:</td><td colspan="2">The Roads sub-class covers all transportation datasets and are a critical source of reference for cartography and includes all information related to highways, roadways, tracks, winter-roads, etc.</td></tr>
<tr><td rowspan="3">Data:</td><td>Category: Framework
Class: Framework</td><td>Records: 54 of 426 framework data (12.7%)</td></tr>
<tr><td>Resolution:
Local (30)
Regional (16)
Provincial/Territorial (8)</td><td>Sources:
Provincial/Territorial Government (48)
Federal Government (6)</td></tr>
<tr><td colspan="2">Costs:
1 of 54 = Yes
8 of 54 = No
45 of 54 = Unknown</td></tr>
<tr><td colspan="3">Example datasets (used at different scales)</td></tr>
<tr><td rowspan="6"></td><td colspan="2">Provincial/Territorial</td></tr>
<tr><td>All weather road
Existing Roads
New Roads</td><td>Roads
Seasonal road</td></tr>
<tr><td colspan="2">Region</td></tr>
<tr><td>Major Highways
Paved Public Roads
Paved Roads
Resource Roads
Road Network</td><td>Roads
Transportation
Unpaved Public Roads
Unpaved Roads</td></tr>
<tr><td colspan="2">Local</td></tr>
<tr><td>Paved Public Roads
Unpaved Public Roads</td><td>Roadway – decommissioned
Roadway</td></tr>
<tr><td rowspan="4">Map Applications</td><td colspan="2">National
N/A</td></tr>
<tr><td colspan="2">Provincial/Territorial
Community-identified examples of abandoned uranium exploration trenches
Draft Land Use Zones
Geographic area being considered in draft agreement
Mineral Claims, Leases and Prospecting Permits
Planning Area
All maps</td></tr>
<tr><td colspan="2">Regional
Plan Area
Road Network
Tourism Features</td></tr>
<tr><td colspan="2">Local
Transportation and Communication Infrastructure
Most maps</td></tr>
<tr><td>Data Providers (By source type)</td><td colspan="2">Federal Government
Natural Resources Canada/Centre for Topographic Information, Sherbrooke, Quebec
HTML access: http://www.geogratis.ca/geogratis/en/product/search.do
(See also National Topographic Datasets sub-class.)</td></tr>
</table>

Data Providers (Cont'd.))	**Provincial/Territorial Government** BC Ministry of Forests Resources Inventory Branch Integrated Land Management Bureau, BC : http://ilmbwww.gov.bc.ca/ or GeoBC http://ilmbwww.gov.bc.ca/geobc/index.html DCW/GNWT Spatial Data Warehouse: http://maps.gnwtgeomatics.nt.ca/portal/index.jsp DFRA (Department of Forest Resources and Agrifoods Newfoundland and Labrador) http://www.nr.gov.nl.ca/nr/ Ontario Ministry of Natural Resources http://www.mnr.gov.on.ca/en/STEL02_168321.html or http://www.mnr.gov.on.ca/fr/199180.html Quebec Geographique http://www.quebecgeographique.gouv.qc.ca/ Saskatchewan Department of Highways and Transportation: http://www.highways.gov.sk.ca/sask-maps/ ; also contact Drafting Services at 306-787-7933.

Infrastructure

<table>
<tr><td>Description:</td><td colspan="2">The Infrastructure sub-class includes all types of physical infrastructure, including pipelines, communications infrastructure, power lines, water supply information other types of utilities.</td></tr>
<tr><td rowspan="3">Data:</td><td>Category: Framework
Class: Framework</td><td>Records: 32 of 426 framework data (7.5%)</td></tr>
<tr><td>Resolution:
▪ Provincial/Territorial (13)
▪ Local (10)
▪ Regional (9)</td><td>Sources*:
▪ Provincial/Territorial Government (28)
▪ Private Company (3)
▪ Federal Government (2)
▪ Industry (2)
*Note: some data from multiple sources</td></tr>
<tr><td colspan="2">Costs:
▪ 9 of 32 = Yes
▪ 6 of 32 = No
▪ 17 of 32 = Unknown</td></tr>
<tr><td colspan="3">Example datasets (used at different scales)</td></tr>
<tr><td rowspan="6"></td><td colspan="2">Provincial/Territorial</td></tr>
<tr><td>▪ Communication
▪ Power Transmission
▪ Tract Lines</td><td>▪ Transportation / Shipping
▪ Utility Corridors</td></tr>
<tr><td colspan="2">Region</td></tr>
<tr><td>▪ Communication
▪ Hydro lines (corridor)
▪ Pipeline, Penstock
▪ Pole Line</td><td>▪ Power Transmission
▪ Transmission Lines
▪ Utility Corridors</td></tr>
<tr><td colspan="2">Local</td></tr>
<tr><td colspan="2">▪ Drinking water</td></tr>
<tr><td>Map Applications</td><td colspan="2">National
▪ N/A</td></tr>
<tr><td></td><td colspan="2">Provincial/Territorial
▪ N/A</td></tr>
<tr><td></td><td colspan="2">Regional
▪ N/A</td></tr>
<tr><td></td><td colspan="2">Local
▪ N/A</td></tr>
<tr><td>Data Providers (By source type)</td><td colspan="2">Provincial/Territorial Government
Departmental Systems Coordinator, Dept of Health and Social Services, Government of Nunavut http://www.hc-sc.gc.ca/ewh-semt/pubs/eval/inventory-repertoire/waterqualityNU-eng.php
DFRA (Department of Forest Resources and Agrifoods Newfoundland and Labrador) http://www.nr.gov.nl.ca/nr/
Manitoba Hydro
Nunavut Economic Development and Transportation
Ontario Ministry of Natural Resources http://www.mnr.gov.on.ca/en/STEL02_168321.html or http://www.mnr.gov.on.ca/fr/199180.html</td></tr>
<tr><td></td><td colspan="2">Private Company
Qulliq Energy Corp. http://www.nunavutpower.com</td></tr>
</table>

Administrative Boundaries

Description:	The Administrative Boundaries sub-class covers all types of boundary information related to administration, zoning, planning and division of land.	
Data:	**Category:** Framework **Class:** Framework	**Records:** 25 of 426 framework data (5.9%)
	Resolution: ▪ Regional (16) ▪ Provincial/Territorial (5) ▪ Local (4)	**Sources:** ▪ Provincial/Territorial Government (14) ▪ Industry (5) ▪ Federal Government (4) ▪ Municipal Government (2)
	Costs: 19 of 25 = No 5 of 25 = Unknown 1 of 25 = Yes	
Example datasets (used at different scales):		
	Provincial/Territorial	
	▪ Community ▪ Provincial boundaries	▪ Towns
	Region	
	▪ Towns	▪ Communities
	Local	
	▪ RCMP Districts ▪ Regional Districts	▪ School Districts
Map Applications	**National** ▪ N/A	
	Provincial/Territorial ▪ Beverly and Qamanirjuaq Caribou Range ▪ Community-identified examples of abandoned uranium exploration trenches ▪ Draft Athabasca Land Use Zones: Stage 1 Planning Area	
	Regional ▪ Monumental, Archaeological and Cultural Cedar Forest Resource Value Areas ▪ Plan Area	
	Local ▪ Administrative Units	
Data Providers (By source type)	**Federal Government** Natural Resources Canada/Centre for Topographic Information, Sherbrooke, Quebec HTML access: http://www.geogratis.ca/geogratis/en/product/search.do	
	Provincial/Territorial Government DFRA (Department of Forest Resources and Agrifoods Newfoundland and Labrador) http://www.nr.gov.nl.ca/nr/ Integrated Land Management Bureau, BC : http://ilmbwww.gov.bc.ca/ or GeoBC: http://ilmbwww.gov.bc.ca/geobc/index.html Ontario Ministry of Natural Resources: http://www.mnr.gov.on.ca/en/STEL02_168321.html or: http://www.mnr.gov.on.ca/fr/199180.html	
	Municipal Government District of North Vancouver	
	Industry Silva Ecosystems Consultants, 3301 Koch Siding, Winlaw, BC, V0G 2J0. Tel: 250 226 7222	

Hydrography

<table>
<tr><td>Description:</td><td colspan="2">The Hydrography sub-class covers all framework datasets related to streams, rivers, lakes, wetlands, dams, reservoirs, canals, etc.</td></tr>
<tr><td rowspan="3">Data:</td><td>Category: Framework
Class: Framework</td><td>Records: 94 of 426 framework data (22.1%)</td></tr>
<tr><td>Resolution:
Provincial/Territorial (85)
Regional (8)
Industry (1)</td><td>Sources:
Provincial/Territorial Government (85)
Federal Government (8)
Industry (1)</td></tr>
<tr><td colspan="2">Costs:
8 of 94 = No
86 of 94 = Unknown</td></tr>
<tr><td colspan="3">Example datasets (used at different scales):</td></tr>
<tr><td rowspan="6"></td><td colspan="2">Provincial/Territorial</td></tr>
<tr><td colspan="2">Lakes
Rivers</td></tr>
<tr><td colspan="2">Region</td></tr>
<tr><td colspan="2">Lake
Stream</td></tr>
<tr><td colspan="2">Local</td></tr>
<tr><td colspan="2">Lake
Stream</td></tr>
<tr><td rowspan="4">Map Applications:</td><td colspan="2">National
N/A</td></tr>
<tr><td colspan="2">Provincial/Territorial
All maps (reference and hydrological applications)</td></tr>
<tr><td colspan="2">Regional
All maps (reference and hydrological applications)</td></tr>
<tr><td colspan="2">Local
All maps (reference and hydrological applications)</td></tr>
<tr><td rowspan="3">Data Providers (By source type)</td><td colspan="2">Federal Government
Natural Resources Canada/Centre for Topographic Information, Sherbrooke, Quebec
HTML access: http://www.geogratis.ca/geogratis/en/product/search.do</td></tr>
<tr><td colspan="2">Provincial/Territorial Government
Quebec Ministry of Natural Resources: http://www.mrnf.gouv.qc.ca/english/home.jsp or http://www.mrnf.gouv.qc.ca/accueil.jsp
Quebec Geographique http://www.quebecgeographique.gouv.qc.ca/
Integrated Land Management Bureau, BC : http://ilmbwww.gov.bc.ca/ or GeoBC http://ilmbwww.gov.bc.ca/geobc/index.html
DFRA (Department of Forest Resources and Agrifoods Newfoundland and Labrador) http://www.nr.gov.nl.ca/nr/
Ontario Ministry of Natural Resources http://www.mnr.gov.on.ca/en/STEL02_168321.html or http://www.mnr.gov.on.ca/fr/199180.html</td></tr>
<tr><td colspan="2">Industry
Silva Ecosystems Consultants, 3301 Koch Siding, Winlaw, British Columbia, V0G 2J0. Telephone: 250 226 7222</td></tr>
</table>

National Topographic Datasets

<table>
<tr><td>Description:</td><td colspan="2">The National Topographic Datasets sub-class covers all national framework datasets used in mapping and analysis.</td></tr>
<tr><td rowspan="3">Data:</td><td>Category: Framework
Class: Framework</td><td>Records: 138 of 426 framework data (32.4%)</td></tr>
<tr><td>Resolution:
▪ Provincial/Territorial (136)
▪ Regional (2)</td><td>Sources:
▪ Federal Government (138)</td></tr>
<tr><td colspan="2">Costs:
▪ 138 of 138 = No
▪ 0 of 138 = Unknown</td></tr>
<tr><td colspan="3">Example datasets (used at different scales)</td></tr>
<tr><td rowspan="8"></td><td colspan="2">National</td></tr>
<tr><td colspan="2">▪ National Topographic Data Base</td></tr>
<tr><td colspan="2">Provincial/Territorial</td></tr>
<tr><td colspan="2">▪ National Topographic Data Base</td></tr>
<tr><td colspan="2">Region</td></tr>
<tr><td colspan="2">▪ National Topographic Data Base</td></tr>
<tr><td colspan="2">Local</td></tr>
<tr><td colspan="2">▪ N/A</td></tr>
<tr><td rowspan="4">Map Applications</td><td colspan="2">National
▪ N/A</td></tr>
<tr><td colspan="2">Provincial/Territorial
▪ All maps</td></tr>
<tr><td colspan="2">Regional
▪ All maps</td></tr>
<tr><td colspan="2">Local
▪ N/A</td></tr>
<tr><td>Data Providers (By source type)</td><td colspan="2">Federal Government
Natural Resources Canada/Centre for Topographic Information, Sherbrooke
HTML access: http://www.geogratis.ca/geogratis/en/product/search</td></tr>
</table>

Provincial/Territorial Topographic Datasets

<table>
<tr><td>Description:</td><td colspan="2">The Provincial/Territorial Topographic Datasets sub-class covers all terrain datasets obtained from provincial or territorial and used in mapping and analysis.</td></tr>
<tr><td rowspan="3">Data:</td><td>Category: Framework
Class: Framework</td><td>Records: 51 of 426 framework data (12.0%)</td></tr>
<tr><td>Resolution:
▪ Local (38)
▪ Regional (13)</td><td>Sources:
▪ Provincial/Territorial Government (51)</td></tr>
<tr><td colspan="2">Costs:
▪ 38 of 51 = Yes
▪ 13 of 51 = No</td></tr>
<tr><td colspan="3">Example datasets (used at different scales)</td></tr>
<tr><td rowspan="4"></td><td colspan="2">Region</td></tr>
<tr><td colspan="2">▪ Provincial/Territorial Topographic Data Base</td></tr>
<tr><td colspan="2">Local</td></tr>
<tr><td colspan="2">▪ Terrain Resource Information Management (TRIM - BC)</td></tr>
<tr><td rowspan="4">Map Applications</td><td colspan="2">National
▪ N/A</td></tr>
<tr><td colspan="2">Provincial/Territorial
▪ All maps</td></tr>
<tr><td colspan="2">Regional
▪ All maps</td></tr>
<tr><td colspan="2">Local
▪ All maps</td></tr>
<tr><td>Data Providers (By source type)</td><td colspan="2">Provincial/Territorial Government
Integrated Land Management Bureau, BC : http://ilmbwww.gov.bc.ca/ or GeoBC http://ilmbwww.gov.bc.ca/geobc/index.html
Only specified in BC. Data providers for other provinces include:
Alberta Government Altalis – http://www.altalis.com/
Manitoba Conservation Geomatics and Remote Sensing department http://www.gov.mb.ca/conservation/geomatics/topo_mapping/index.html
DFRA (Department of Forest Resources and Agrifoods Newfoundland and Labrador) http://www.nr.gov.nl.ca/nr/
Northwest Territories: http://ntgomap.nwtgeoscience.ca/
Nunavut - http://www.nunavutgeoscience.ca/cngo/geospatial_e.html
Ontario Ministry of Natural Resources http://www.mnr.gov.on.ca/en/STEL02_168321.html or http://www.mnr.gov.on.ca/fr/199180.html
Quebec Geographique http://www.quebecgeographique.gouv.qc.ca/
Information Services Corporation of Saskatchewan http://www.isc.ca/land/gis_public/scripts/gis.asp
Yukon Department of Highways and Public Works – Yukon Spatial Data Clearinghouse: http://www.geomaticsyukon.ca/data.html</td></tr>
</table>

Appendix C

Key Thematic Priority Datasets

Wildlife

Description:	The Wildlife sub-class includes habitat location, extent and distribution, information about specific types of habitat (marine, terrestrial and riparian), and other wildlife-related information.	
Data:	**Category:** Thematic **Class:** Administrative/Development	**Records:** 124 of 912 thematic data (13.6%)
	Resolution: ▪ Provincial/Territorial (56) ▪ Regional (36) ▪ Local (29) ▪ National (3)	**Sources: *** ▪ Provincial/Territorial Government (45) ▪ Aboriginal Group (40) ▪ Federal Government (26) ▪ Industry (16) ▪ Private Company (3) ▪ University (1) *Note: some data from multiple sources
	Costs: ▪ 104 of 124 = No ▪ 20 of 124 = Unknown	
Example datasets (used at different scales)		
	National	
	▪ Wildlife ▪ Aquatic wildlife	▪ Terrestrial wildlife
	Provincial/Territorial	
	▪ Migratory Bird Sites ▪ Birds ▪ Caribou habitat ▪ Fish species and habitats ▪ Habitats Moose Habitat Suitability Index ▪ Migration	▪ Population distribution ▪ Habitat Value ▪ Fur Bearers ▪ Nesting sites ▪ Calving Areas ▪ Known caribou water crossings ▪ Nesting and bear denning (250m buffer)
	Region	
	▪ Marine invertebrates ▪ Fish ▪ Protection areas	▪ Wildlife habitats ▪ Nesting colonies
	Local	
	▪ Habitat suitability rating ▪ Habitats ▪ Forest stand per hectare ▪ Spawning grounds	▪ Salmon stream information ▪ Fish potential
Map Applications	**National** ▪ N/A	
	Provincial/Territorial ▪ Conservation value ▪ Known sensitive habitats	▪ Caribou migration routes ▪ Mineral claims and prospecting areas
	Regional ▪ Wildlife population densities ▪ Habitat maps	

	Local ▪ Habitat suitability ▪ Recreation impact
Data Providers (By source type)	**Federal Government** Environment Canada, Canadian Wildlife Service http://www.cws-scf.ec.gc.ca/publications/AbstractTemplate.cfm?lang=e&id=325 Fisheries and Oceans Canada (DFO) http://www.dfo-mpo.gc.ca and http://www.charts.gc.ca/pub/en/ Parks Canada http://www.pc.gc.ca/
	Provincial/Territorial Government Newfoundland and Labrador http://www.env.gov.nl.ca/env/wildlife/wildlife_at_risk.htm Recovery Strategy for Three Woodland Caribou Herds (Rangifer tarandus caribou; Boreal population) in Labrador Quebec Satellite Telemetry Maps of Caribou Migrations http://www.mrnf.gouv.qc.ca/english/wildlife/maps-caribou/maps.jsp Northwest Territories, Environment and Natural Resources, Wildlife Division, NWT Species Monitoring Infobase http://www.nwtwildlife.com/enr_infobase/asp/search.asp Integrated Land Management Bureau, BC, http://ilmbwww.gov.bc.ca/ Manitoba Conservation http://www.gov.mb.ca/conservation/geomatics/index.html Quebec Ministry of Natural Resources http://www.mrnf.gouv.qc.ca/accueil.jsp Government of Canada Nunavut Wildlife Management Board (NWMB) http://www.nwmb.com/ Northwest Territories Wildlife Division http://www.nwtwildlife.com/
	Aboriginal Group Beverly and Qamanirjuaq Caribou Management Board (BQCMB) http://www.arctic-caribou.com/index.html Dehcho Land Use Planning Committee_http://www.dehcholands.org/home.htm Nunavut Planning Commission_http://npc.nunavut.ca/ Nunavut Research Institute_http://www.nri.nu.ca/ Poplar River First Nation_http://www.poplarriverfirstnation.ca/ Sahtu GIS sahtugis@gov.nt.ca_http://www.sahtu.ca/ Whitefeather Forest Management Corporation_http://www.whitefeatherforest.com/
	Private Company NPC- Jaques Whitford Study
	Industry Arbex Forest Resource Consultants Ltd. http://www.arbex.ca/
	University Bird List http://www.nhs.nf.ca/cbc_etc/checklist.htm Bird List http://www.birdlist.org/nam/canada/newfoundland/newfoundland.htm Memorial University: http://www.mun.ca/, Dalhousie University: http://www.dal.ca/ Canadian Wildlife Service: http://www.ns.ec.gc.ca/wildlife/index.html

Mining

<table>
<tr><td>Description:</td><td colspan="2">The Mining sub-class covers all datasets related to surface and sub-surface mining developments, activities and impacts.</td></tr>
<tr><td rowspan="3">Data:</td><td>Category: Thematic
Class: Administrative/Development</td><td>Records: 70 of 912 thematic data (7.7%)</td></tr>
<tr><td>Resolution:
Regional (40)
Provincial/Territorial (25)
Local (5)</td><td>Sources:
Provincial/Territorial Government (46)
Federal Government (16)
Aboriginal Group (8)</td></tr>
<tr><td colspan="2">Costs:
68 of 70 = No
2 of 70 = Unknown</td></tr>
<tr><td colspan="3">Example datasets (used at different scales)</td></tr>
<tr><td rowspan="6"></td><td colspan="2">Provincial/Territorial</td></tr>
<tr><td>Abandoned mines
Advanced exploration sites of concern identified by local users
Claims Status
High gravel priority (existing dispositions and known gravel areas)
High priority (existing claim or lease)
Medium gravel priority (eskers)
Medium priority (mineral potential ratings)</td><td>Mineral Claims and leases
Mineral Development Potential
Mineral potential
Mineral resource assessment ratings
Mining rights
Operating mines
Permit Owner
Provincial Mineral Potential
Quarrying
Sand and gravel</td></tr>
<tr><td colspan="2">Regional</td></tr>
<tr><td>Aggregate Quarry Operation
Area of Interest
Claims Map
Coal - Developed Prospect
Coal exploration license
Cores
Crown Granted Mineral Claims
Existing Discoveries
Existing Subsurface Only Land Withdrawals
Existing Surface and Subsurface Only Land Withdrawals
Industrial Mineral Potential
Interim Land Withdrawals
Land Use Permits
Mineral licenses</td><td>Mineral potential
Mineral Tenures
Mining information
Mining tenure
Musselwhite Mine
No Subsurface Withdrawal
Non-Exclusive Geophysical Surveys
Subsurface Withdrawal Rights
Surface Dispositions
Metallic Mineral Potential
Mine Sites
Mineral - Developed Prospect
Mineral - Past Producer
Mineral – Prospect
Mineral Claim</td></tr>
<tr><td colspan="2">Local</td></tr>
<tr><td>Mineral potential
Mineral Claims</td><td>Mining claims
Quarry, sand pit</td></tr>
</table>

Map Applications	**National** ▪ N/A
	Provincial/Territorial ▪ Abandoned Mines - Uranium City Area ▪ Bedrock Geology ▪ Community-identified examples of abandoned uranium exploration trenches ▪ Crown Land Dispositions ▪ Hydrocarbon Potential ▪ Map of Mineral Claims in the Athabasca Region ▪ Map of Operating Mines in the Athabasca Region ▪ Mineral Development Potential ▪ Mineral Potential in Stage 1 Planning Area ▪ Northwest Territories Protected Areas Strategy ▪ Oil and Gas Licenses ▪ Potential conflict between land uses in Stage 1 planning area ▪ Priority Areas for Gravel in Stage 1 Planning Area ▪ Priority Areas for Mineral Activity in Stage 1 Planning Area ▪ Provincially Significant Mineral Potential
	Regional ▪ Comparison of Land Use Zones with Existing Land Withdrawals ▪ Earth and Life Science Sites ▪ Existing Uses ▪ Industrial Mineral Potential ▪ Metallic Mineral Potential ▪ Mineral Tenures ▪ Non-Exclusive Geophysical Survey Restrictions
	Local ▪ Community of the Watershed ▪ Mineral Potential ▪ Mineral Tenures ▪ Recreational, canoe, and portage sites within the Gull Lake TMA
Data Providers (By source type)	**Federal Government** Indian and Northern Affairs Canada (Nunavut) http://www.ainc-inac.gc.ca/nu/nuv/cts_e.html Indian and Northern Affairs Canada (NWT): http://nwt-tno.inac-ainc.gc.ca/ism-sid/index_e.asp
	Provincial/Territorial Government Integrated Land Management Bureau, BC, http://ilmbwww.gov.bc.ca/ Manitoba Mines Branch http://www.gov.mb.ca/stem/mrd/geo/gis/minesmaps.html Ministry of Northern Development and Mines, CLAIMaps Northwest Territories Geoscience Office: http://ntgomap.nwtgeoscience.ca/ Nunavut Economic Development and Transportation http://www.edt.gov.nu.ca/apps/authoring/dspPage.aspx?page=home Ontario Ministry of Natural Resources http://www.mnr.gov.on.ca/en/STEL02_168321.html or http://www.mnr.gov.on.ca/fr/199180.html Quebec Natural Resources and Wildlife a) http://www.mrnf.gouv.qc.ca/english/mines/rights/rights-gestim.jsp b) https://gestim.mines.gouv.qc.ca/ftp//cartes/carte_quebec.asp (French only)
	Aboriginal Group Dehcho Land Use Planning Committee http://www.dehcholands.org/home.htm

Aboriginal Territories

<table>
<tr><td>Description:</td><td colspan="2">The Aboriginal Territories sub-class includes all datasets and maps related to delineation and description of the land holdings and traditional territories of Aboriginal groups.</td></tr>
<tr><td rowspan="3">Data:</td><td>Category: Thematic
Class: Administrative/Development</td><td>Records: 41 of 912 thematic data (4.5%)</td></tr>
<tr><td>Resolution:
▪ Provincial/Territorial (28)
▪ Local (7)
▪ Regional (6)</td><td>Sources: *
▪ Aboriginal Group (31)
▪ Provincial/Territorial Government (8)
▪ Industry (2)
▪ Federal Government (1)
*Note: some data from multiple sources</td></tr>
<tr><td colspan="2">Costs:
▪ 41 of 41 = No</td></tr>
<tr><td colspan="3">Example datasets (used at different scales)</td></tr>
<tr><td rowspan="8"></td><td colspan="2">National</td></tr>
<tr><td>▪ N/A</td><td></td></tr>
<tr><td colspan="2">Provincial/Territorial</td></tr>
<tr><td>▪ Community Boundary
▪ Dehcho Territory
▪ First Nation
▪ First Nations Reserve Land
▪ Indian Reserve
▪ Inuit Owned Lands
▪ K'asho Got'ine District boundary
▪ Reserve</td><td>▪ Sahtu District Boundaries
▪ Sahtu Settlement Area Boundary
▪ Territorial Boundary
▪ Traditional Territory
▪ Treaty boundaries (Government of Canada)
▪ Treaty Boundary
▪ Unsettled Land Claims</td></tr>
<tr><td colspan="2">Region</td></tr>
<tr><td>▪ Gwaii Haanas Boundary
▪ Land Use Zones
▪ Sahtu Settlement Lands</td><td>▪ Territorial Boundary
▪ Thcho Lands</td></tr>
<tr><td colspan="2">Local</td></tr>
<tr><td>▪ BCTS Chart Area
▪ Fee simple and Indian Reserves
▪ Indian Reserve
▪ KTMA boundary</td><td>▪ Trilateral Agreement Territory boundary
▪ TWN Indian Reserve
▪ TWN Traditional Territory</td></tr>
<tr><td>Map Applications</td><td colspan="2">National
▪ N/A</td></tr>
<tr><td colspan="2">Provincial/Territorial
▪ Eco-regions
▪ First Nations Protected Areas
▪ K'asho Got'ine District Dene Placenames
▪ Major Watersheds
▪ Monumental, Archeological and Cultural Cedar Forest Resource Value Areas
▪ Sahtu Land Use Plan Draft 1
▪ Sahtu Settlement Lands Surface and Subsurface Ownership
▪ The Dehcho Territory
▪ Traditional Territory
▪ Treaty areas and traditional Dene lands
▪ Tulita District Dene Placenames</td></tr>
</table>

Map Applications (Cont'd.)	**Regional** ▪ Existing Uses ▪ Land Use Zones
	Local ▪ Administrative Units ▪ Community of the Watershed ▪ Location of the KTMA within the Province of Quebec and the Trilateral Agreement Territory
Data Providers (By source type)	**Federal Government** Government of Canada Centre for Topographic Information http://www.geogratis.ca/geogratis/en/option/select.do?id=1015
	Provincial/Territorial Government Ontario Ministry of Natural Resources http://www.mnr.gov.on.ca/en/STEL02_168321.html or http://www.mnr.gov.on.ca/fr/199180.html GNWT Spatial Data Warehouse/NWT-PAS http://maps.gnwtgeomatics.nt.ca/portal/index.jsp Integrated Land Management Bureau, BC: http://ilmbwww.gov.bc.ca/ BC Ministry of Forests Resources Inventory Branch
	Aboriginal Group Dehcho Land Use Planning Committee http://www.dehcholands.org/home.htm Nunavut Tunngavik Inc. www.tunngavik.com - Miguel Chenier, 1-867-983-5614 Poplar River First Nation http://www.poplarriverfirstnation.ca/ Sahtu GIS sahtugis@gov.nt.ca http://www.sahtu.ca/ Tsleil-Waututh Nation http://www.burrardband.com/ Whitefeather Forest Management Corporation http://www.whitefeatherforest.com/
	Industry Arbex Forest Resource Consultants Ltd. http://www.arbex.ca/

Forestry

<table>
<tr><td>Description:</td><td colspan="2">The Forestry sub-class covers all aspects of the forest industry, forest products and silviculture.</td></tr>
<tr><td rowspan="3">Data:</td><td>Category: Thematic
Class:
Administrative/Development</td><td>Records: 95 of 912 thematic data (10.4%)</td></tr>
<tr><td>Resolution:
▪ Regional (41)
▪ Local (34)
▪ Provincial/Territorial (20)</td><td>Sources: *
▪ Provincial/Territorial Government (69)
▪ Aboriginal Group (15)
▪ Industry (10)
▪ Federal Government (5)
*Note: some data from multiple sources</td></tr>
<tr><td colspan="2">Costs:
▪ 93 of 95 = No
▪ 2 of 95 = Unknown</td></tr>
<tr><td colspan="3">Example datasets (used at different scales)</td></tr>
<tr><td rowspan="4"></td><td colspan="2">Provincial/Territorial</td></tr>
<tr><td>▪ Age Class
▪ Conifer Merchantability
▪ Defoliation Severity
▪ Enduring Landscape Features
▪ Firewood priority areas Forest Areas Older than 120 Years
▪ Forest Cover
▪ Forest Planning Area
▪ Forest Productivity</td><td>▪ Landscape Unit Boundary
▪ Landscape Units and Watersheds
▪ Limits of coniferous forest
▪ Logged Area
▪ Non-Forest Cover
▪ Potential
▪ Saw-log Areas
▪ Significant Non-Timber Forest Product Sites</td></tr>
<tr><td colspan="2">Region</td></tr>
<tr><td>▪ Biophysical Classification with Initial Forestry Potential
▪ Cedar Areas
▪ Cedar Percentage
▪ Drieman Vegetation Classification
▪ Existing Silviculture Roads
▪ Forest forecasting data
▪ Forest Seral Stages
▪ Forest Tenures
▪ Forestry / Logging
▪ Forestry Depots
▪ Forestry Inventory
▪ Forestry Plots
▪ Leading Species Locations of Commercial Harvesting Activities</td><td>▪ Monumental, Archeological and Cultural Cedar Forest Resource Value Areas Old Growth Forest
▪ Past Cutovers
▪ Proposed Harvest Units
▪ Proposed Planting
▪ Proposed Planting Areas
▪ Proposed Resource Roads
▪ Proposed Silviculture Areas
▪ Proposed Silviculture Roads
▪ Resource Roads
▪ Stand Boundaries
▪ Timber Harvesting Land Base
▪ Trails and Extraction Roads</td></tr>
<tr><td colspan="2">Local</td></tr>
</table>

	▪ Timber harvesting land base ▪ Forest tenures ▪ Leading species ▪ Forest age class ▪ Forest productivity	▪ Forest age class seral stage ▪ Forest tenures ▪ Conservation Suitability Analysis classifications
Map Applications	**Provincial/Territorial** ▪ Age Class ▪ Forest Areas Older than 120 Years ▪ Forest Productivity Rating ▪ Forestry ▪ Forestry Potential ▪ Merchantable Timber ▪ Non-Timber Forest Products ▪ Priority Areas for Firewood and Cut Logs ▪ Spruce Budworm Distribution by White Spruce Defoliation	
	Regional ▪ Forest Management District Proposed Activity ▪ Locations of Commercial Harvesting Activities ▪ Proposed Harvest Units ▪ Proposed Roads ▪ Proposed Silviculture Areas	
	Local ▪ Community of the Watershed ▪ Eligible harvest area ▪ Forest Age Class ▪ Forest Leading Species ▪ Forest Tenures ▪ Forestry Potential ▪ Location of top conservation values ▪ Timber Harvesting Land Base	
Data Providers (By source type)	**Federal Government** Canada's National Forest Inventory Reports: Canadian Forest Service, Victoria, http://bookstore.cfs.nrcan.gc.ca/detail_e.php?catalog=19609 Land Type Database: Canadian Forest Service, Victoria http://cfs.nrcan.gc.ca/ National Forestry Database Program (NFDP): Natural Resources Canada http://nfdp.ccfm.org/index_e.php Provincial Forest Resources Inventory: Ministry of Sustainable Resource Management, Resource Information Department, Victoria http://srmwww.gov.bc.ca/car/resinv/index.html	
	Provincial/Territorial Government BC Ministry of Forests and Range http://www.for.gov.bc.ca/hfp/sof/2006/13.htm BC, Provincial Forest Resources Inventory: Ministry of Sustainable Resource Management, Resource Information, Department, Victoria, BC Canada's National Forest Inventory Reports: Canadian Forest Service, Victoria, http://www.pfc.forestry.ca/monitoring/inventory/nfi_e.html DFRA (Department of Forest Resources and Agrifoods Newfoundland and Labrador) http://www.nr.gov.nl.ca/nr/ Integrated Land Management Bureau, BC, http://ilmbwww.gov.bc.ca/ Land Type Database: Canadian Forest Service, Victoria, BC Manitoba Forestry Branch https://mli2.gov.mb.ca// National Forestry Database Program (NFDP): Natural Resources Canada http://nfdp.ccfm.org/index_e.php Northwest Territories, Forest Management Division, (807) 874-2009 Nova Scotia Department of Natural Resources: http://gov.ns.ca/NATR/forestry/GIS/data.htm Ontario Ministry of Natural Resources http://www.mnr.gov.on.ca/en/STEL02_168321.html or http://www.mnr.gov.on.ca/fr/199180.html	

	Aboriginal Group Dehcho Land Use Planning Committee http://www.dehcholands.org/home.htm Whitefeather Forest Management Corporation http://www.whitefeatherforest.com/
	Industry Arbex Forest Resource Consultants Ltd. http://www.arbex.ca/ Silva Ecosystems Consultants, 3301 Koch Siding, Winlaw, British Columbia, V0G 2J0. Telephone: 250 226 7222