

STANDARD OPERATING PROCEDURE

MINISTRY OF SUSTAINABLE RESOURCE MANAGEMENT

Appendix D

Recommendations of the Provincial Corporate Base Map
Governance report by RLS & Associates

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Provincial Corporate Base Map

Governance

Prepared for

Ministry of Sustainable Resource Management

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Introduction

This document is a component of a project which itself is one of a trilogy of projects commissioned by the former Land Use Coordination Office (LUCO) of the Province of British Columbia (now part of the Ministry of Sustainable Resource Management (MSRM)) to explore land and resource information systems. The two earlier projects have analyzed:

- Resources inventory information systems
- Registries recording legal rights and encumbrances related to both Crown and private land and natural resources

The current project is designed to explore the key components of a corporate base map for British Columbia and to review current governance issues regarding the management of corporate base map data. Sierra Systems was contracted to undertake the “Key Components” part of the project, while RLS & Associates Consulting Inc. was assigned the task of addressing governance issues.

This document explores the latter task – reviewing governance issues regarding management of corporate base map data. It will explore issues concerning responsibility for developing and maintaining base maps and authority to set standards associated with base maps and base map data. It does not address, in any detail, issues such as access to base maps and base map data or pricing policy; however, they might be referenced in relation to other issues.

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Background

In non-technical terms, a base map can be defined as a map that serves as a foundation upon which a number of users can plot additional data to meet their own operational needs. Generally, the base map portrays the spatial location and relation of both natural and man-made features on the earth's surface. The users should have no need to adjust any of the components/features of the base map, nor should their data become an integral part of the base map. For example, a base map might include land elevation and contours, rivers and lakes and other natural features. A government wildlife program would use that base map to plot the location of populations of grizzly bears, mountain goats, etc. The program agency would have no need or authority to adjust the base map components; nor would its information (wildlife populations) become a feature of the base map.

Base maps traditionally were paper products; however, as technology has evolved, base maps have become digital, enabling users to conveniently choose features from the base map so they can spatially reference their own data to know locations on the earth's surface.. Base maps are evolving from a set map, containing an inflexible collection of components, to a system allowing a user to draw from a catalogue of standardized data sets to create a customized base map containing the components required by the user for its business needs. Regardless of the changing nature of the shape and composition of a base map, the fundamental issues of governance remain. What organization is responsible for developing, maintaining and distributing base maps or base map data and, related to that responsibility, what organization is responsible for setting standards associated with base map data?

Both the federal and provincial governments are involved in the development of maps that could be considered base maps. The federal government is responsible for the smaller scale base maps (e.g 1:50 000, 1:250 000) while the provinces are responsible for the larger scale base maps (e.g.1:20 000, 1:10 000, etc.). In recent years, the provinces have in general made significant investments in digital base mapping largely as a result of their ownership of natural resources and the necessity of developing more sophisticated base maps to manage resources and resource development.

Within British Columbia, responsibility for base mapping is assigned to the Base Mapping and Geomatics Services Branch (BMGSB), the successor to Geographic Data B.C. and earlier similar organizations. BMGSB and its predecessors have had a long history of responsibility for managing base map activities and standards. At various points in the past, the Branch was also combined with the Surveyor General (SG) Office. Like the broader Crown land functions, base mapping responsibilities have been associated with several different ministries including: Ministry of Environment, Lands and Parks; Ministry of Crown Lands; Ministry of Forests and Lands; Ministry of Lands, Parks and Housing. Currently, BMGSB is part of the Business and Information Services Division of MSRM.

In 1986, the B.C. government launched a major initiative. The TRIM (Terrain Resource Information Management) program was designed to address fundamental base mapping needs of government and industry in B.C. Responsibility for TRIM was vested with a predecessor to BMGSB. The original TRIM program was completed in 1996. By 1998, the TRIM budget was reduced to \$0.00. The introduction of the Forest Practices Code in 1995 created new demands for base map products that were not contemplated when TRIM was originally launched (1986) and the manmade features component (roads, buildings, etc.) was growing out-of-date.. To meet these requirements, as well as the on going need to update the data, a new program, TRIM II, was launched. Initial funding was provided by Forest Renewal B.C. The new program also adopted new technology including geodetic controls using GPS on the aircraft taking the aerial photographs, digital photogrammetry, ortho-photo images and a number of other new mapping methods.

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However, since the TRIM II budget is now totally dependent on partnership funding, it has been difficult to mount a coordinated effort across the province. In some areas, a high degree of cooperation and collaboration exists between BMGSB, other government agencies and the private sector. In other areas, there is no corporate coordination and efforts, where they exist, are driven by local initiatives. The resulting products do not reflect provincial government corporate standards and often are not easily integrated with other corporate data, which can lead to duplication of effort, misuse of information and errors in analysis.

In June 2001, base mapping responsibility, along with several related activities from other ministries, was transferred to the new MSRM. The new ministry has responsibility for a range of activities that relate to, and are primary users of, base mapping, including land and resource planning. The consolidation of these activities within one ministry was designed to achieve province-wide coordination and the efficient and effective delivery of land and resource information.

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Issues

A number of issues emerge from a review of the management of corporate base maps and related data.

- Clients for base maps
- Differing perspectives of what is a base map
- Standards
- Relationship between standards and base maps
- Coordination of base mapping activities
- Funding
- Data Exchanges
- Drivers – corporate or program
- Custodianship and clear lines of responsibility
- Distribution of base maps
- Relationship between the Base Mapping and Geomatics Services Branch and the Surveyor-General

1. Clients for Base Maps

At one time, clients for both base maps and base map data were a relatively narrow audience primarily consisting of engineers, surveyors and cartographers. While many other groups and individuals might have used the maps, these maps were derived products produced by these professionals from base maps which generally included data such as elevation, contours, rivers, lakes, coastlines, etc. The evolution of technology, allowing cross sectoral use and data integration, has resulted in many sectors becoming direct clients for both the base maps and related base map data.

a) Resource and Land Management

- forestry
- recreation & tourism
- fish and wildlife
- environmental
- mining
- energy
- land management
- land development

b) Infrastructure Management

- transportation
- telecommunications
- sewer and water
- oil and gas
- electricity

c) Community Information and Services

- on line information services
- emergency measures management
- emergency response (911 & 211)
- hospitality and retail
- tourism and travel

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All of these clients have a need for base maps and base map data. They might define a base map differently, but all need a foundation product upon which they can plot information of importance to their business requirements. They have no need or desire to maintain and update the base map themselves; however, they do want a product that is being managed by an organization they are confident will undertake the maintenance, updating and distribution tasks effectively and efficiently in a manner that meets their business needs.

2. Differing Perspectives on What Constitutes a Base Map

As indicated in #1, different users might define a base map differently. Three types of base maps tend to be requested by various users:

- a) Topographic Base Map – geographic data, natural features (e.g. contours, elevation, hydrographic data) and major man-made features (e.g. roads, railways, dams)
- b) Ortho-Image Base Map – photographic or satellite images that are merged to create a seamless image map
- c) Cadastre Base Map – indicating boundaries (administrative and legal)

To add to the complexity, some users require data from each of these general base maps. For example, a utility company might require certain topographical data, the cadastre base and ortho-images in order to prepare plans to provide services to a new development.

3. Standards

All mapping should be based on recognized corporate standards to ensure that the base map data is consistent and accurate and that multiple users are able to correctly position their own data. In addition, common base map standards are critical to allow users to exchange and integrate data.

A very simplistic, non-technical example might be the use of a three-ring binder to layer several transparencies, each with a separate set of information. One transparency will show rivers, another roads and a third bridges. If the holes in the transparencies do not exactly match the rings and if the plotting and scale on each transparency is different, the roads, rivers and bridges won't match and the combined product will be of little use.

There can be hundreds of standards; however, a distinction can be made between corporate and operational standards. Effective georeferencing is based on positionally correct points, lines and polygons for various geographical data captured within specified limits of accuracy (i.e. less than 30 m, 10 m, 1 m, down to centimeters).

Standards to collect or derive positionally correct points, lines and polygons to define corporate data and to achieve certain accuracies is a corporate responsibility serving all clients, whether government, the private sector, other governments or the general public.

An operational program will set their own operational standards and guidelines based on a specific business need by determining what data it needs to collect, how it is collected (e.g. defining if it is the center of a stream or the left or right bank that is to be measured), how often a feature needs to be surveyed, and to what accuracy. However, if the survey is based on a point, line or polygon data structure, the corporate standards must be adhered to.

A number of programs within and outside of government have set their own standards in areas where corporate standards should be used. There are two problems when operational

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programs create their own standards with respect to base mapping. First, a number of programs within and outside of government have collected their own business data not referenced to the corporate base map. The result is data collected by one organization cannot be integrated with information from another organization. Second, in some instances the information being collected is base map or related data, but is not collected to corporate standard.

4. Relationship between Geospatial Referencing (GSR) Framework, Standards and Base Maps

The corporate standards referred to in #3 are part of an integrated system flowing from the GSR framework through base mapping standards to the actual base maps.

The GSR framework is the foundation upon which all mapping standards are based and by which all base maps are referenced to their actual position on the earth's surface. The conventional approach to GSR was the basic land survey system that was dependent on thousands of geodetic controls (monuments governing land surveys). This system is still used by most land surveyors. However, technology is changing the GSR framework. Surveys using GPS technology are becoming the standard mode for GSR used by many of the clients referenced in #1. A major national initiative – Canadian Differential GPS Project (CDGPS) – is underway. In British Columbia BMGSB is leading this initiative on behalf of the many partners involved. Likewise, BMGSB is leading the development of a Municipal GPS based service for the Capital Regional District (CRD) and the Greater Vancouver Regional District (GVRD).

The corporate standards for georeferencing spatial data referred to in #3 must conform to the GSR framework. Base maps and base map products, in turn, must be based on the corporate standards. Indeed, the base map itself, based on corporate standards and GSR, in essence, becomes a standard in its own right that all users will normally use to geo-reference their own business data so it can be conveniently shared with others and easily integrated (spatially) with other's business data.

In summary, the relationship between GSR, corporate standards and base maps is so interrelated that it is difficult to separate the functions and responsibilities associated with each component.

5. Coordination of Base Mapping Activities

Most users interviewed as part of this project (see Sierra Systems report on Content and Standards Review) acknowledge BMGSB as the custodian of topographic and ortho-image base maps and expect it to set and enforce standards, update and maintain currency of the information and provide easy access.

However, with the demise of TRIM I funding and the new model for acquiring data for TRIM II, there has been a lack of coordination of base mapping activity. As indicated in #3, other government agencies and external organizations are collecting base map information and related data using non-corporate standards.

Sufficient authority has not been vested in one organization to ensure that corporate standards are met and that the data collected is coordinated with existing base map data to provide continuous updating.

6. Funding

There is currently no funding for maintaining and updating base maps. BMGSB funds TRIM II by seeking partnerships with industry. Funding for these partnerships generally is sourced

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from FRBC. However, not all FRBC funding for base mapping is coordinated through BMGSB. Some funding is made available to industry to carry out its own base mapping activities without the requirement to meet corporate standards or to provide the information derived from these activities to BMGSB in order to upgrade the base maps.

Without funding or any ability to influence the activity of other agencies or companies undertaking base mapping activities, development of a coordinated, province-wide program to update and maintain base maps is extremely difficult.

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7. Data Exchanges

The lack of funding for base map activities has spurred greater efforts to seek data through data exchanges with private companies and other governments. However, to encourage data exchanges and for data generated by other organizations to be useful, two preconditions must be present.

First, the province must have something to offer in exchange or some leverage to exercise to encourage the other party to provide data. In the absence of dollars, the exchange commodity is likely to be other data. Another alternative might be to require a company (e.g. a forest company) to undertake certain mapping activities as part of its tenure responsibilities and to provide the data to the province.

Second, common mapping standards must be in place and accepted by the external organizations in order that the data provided by these organizations is useable without complex and expensive reformatting.

8. Drivers – Corporate or Program

An ongoing debate will inevitably occur concerning whether the business driver for base mapping should be corporate or program objectives. Program managers will argue that unless base maps are driven by program needs, their value might not be maximized. Similar arguments might be made with respect to corporate standards.

The obvious question, however, is which program? Is it a government land management program or a resources inventory program? Is it just government programs? What about private sector needs such as resource companies, utilities, the construction industry, land surveyors? Other governments and non-profit organizations will also have needs that might rely on base maps and mapping standards.

The challenge government faces is that if the management of base maps is driven by one or two program needs, the result might be base maps or standards that are not very beneficial to other organizations inside or external to the provincial government.

9. Custodianship and Clear Lines of Responsibility

Custodianship of base maps and base map data is generally perceived as residing with BMGSB. That perception is only accurate to a point. As has been indicated in the foregoing sections, other organizations inside and outside of the provincial government carry out base mapping activities and maintain base map data separate from BMGSB. To some extent, the practicality of consolidating all responsibility into one agency might not be realistic. However, there does not currently appear to be a firmly established assignment of overall custodianship to BMGSB. Nor does there appear to be clear lines of responsibility for those organizations that should, or do, maintain certain data required for a base map.

10. Distribution of Base Maps

The current process of distributing the TRIM base map has raised a number of questions. First, while the LandData BC (LDBC) electronic distribution channel operated by BMGSB has been the primary distribution vehicle, it is somewhat inflexible. The base map product available via LandData BC is not customizable to the client's specific business needs, is not integrated with the Ortho-Image component and the cadastral product available via LDBC is out of date. In addition, pricing policy has been raised as a barrier to access for base maps. Currently, the TRIM base map is available free of charge to provincial government organizations (a policy instituted recently) but at a fee to external organizations.

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Pricing is an issue beyond the scope of this paper. It is being addressed through a separate project within MSRM.

11. Relationship between BMGSB and SG

The relationship between surveys and mapping is one that frequently can result in confusion of mandate between BMGSB and SG. The situation is particularly acute with respect to responsibility for managing the Geospatial Reference (GSR) Framework referred to in #4.

The Surveyor General and its clients, the land surveyors, are primary users of the 40,000 ground survey monuments. Yet the responsibility for maintaining the database of the monuments rests with BMGSB. However, as indicated in #4, the GSR is rapidly shifting from one based on thousands of ground based monuments to one based on GPS satellites linked to 10 Active Control System (ACS) ground stations. As well, the Municipal GSR, as is being delivered to the CRD and GVRD, is based on GPS technology. This GPS/ACS network is managed by BMGSB. Most of the clients referenced in #1, other than the land surveyors, deal primarily with BMGSB. Furthermore, land surveyors are increasingly utilizing GPS survey technology relying on services from BMGSB.

An added issue, as indicated in #4, is that the GSR framework is an integral part of the entire base mapping function. It provides the foundation upon which is based corporate mapping standards, which are critical to maintaining common base map products.

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Conclusions

1. Clients

Clients for base maps and base map data are spread across many sectors both within and outside of government. These clients have diverse interests and requirements.

2. Type of Base Maps Required

Clients require three types of base maps:

- Topographic
- Ortho-Image
- Cadastral

Topographic and Ortho-Image base maps are available through BMGSB. A comprehensive Cadastral base map, including both provincial and municipal cadastral information is being developed by a public-private partnership, the Integrated Cadastral Information (ICI) Society. The province should ensure that all three types of base maps are developed and maintained and that links are developed between them to allow clients to access the information required from each.

3. Standards

Corporate standards are critical to develop and maintain base maps and to provide for effective and efficient use by clients. Corporate standards must be developed and enforced by the province.

4. Relationship Between Geospatial Referencing (GSR), Standards and Base Maps

The relationship between GSR, corporate standards and base maps is so interrelated that it is difficult to separate the functions and responsibilities associated with each component.

5. Coordination of Base Mapping Activities

There is a critical need to better coordinate the base mapping activities currently being undertaken by both government and private organizations. In this regard, there is a broad recognition and acceptance by both internal and external organizations of TRIM as the base map for all resource georeferencing in the Province.

6. Funding

Funding by ministries and FRBC for base mapping activities is not effectively coordinated leading to duplication of effort, waste of resources and lack of cooperation. The primary lever to bring about coordination is through authority over funding.

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7. Exchanges

Exchanges of base mapping information will become an increasingly important vehicle to maintain the currency of the base maps. However, exchanges will not be viable or effective unless common corporate standards are in place and utilized and the exchanges are coordinated through a single clearing house.

8. Drivers

To meet the many and diverse needs of the broad range of clients for base maps and base map data, the business driver for base mapping should be corporate rather than program objectives.

9. Custodianship and Clear Lines of Responsibility

There is not a clearly established assignment of custodianship for base maps to one single organization although BMGSB is the primary source of base maps. Also, there do not appear to be clear lines of responsibility and accountability for other organizations that might be engaged in collecting information for incorporation into the base maps.

10. Distribution

The LandData BC electronic distribution channel will require upgrading or replacement if it is to meet the needs of clients for a single window to access base map data.

11. Relationship Between BMGSB and SG

There is some confusion between BMGSB and SG concerning their respective mandates and responsibilities.

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Recommendations

1. Corporate standards must be established and enforced by the province for base mapping activities carried out by provincial agencies or by private organizations.
2. Base mapping should be a corporate program driven by corporate needs and should be situated within a division with corporate rather than program responsibilities.
3. One organization within government should be assigned responsibility for coordination of base mapping activity. To the extent possible, that organization should have responsibility for management of base map data. Where another organization has responsibility for some component of base map data, clear lines of responsibility and accountability should be established. Necessary changes to legislation and government operating policy required to improve and make effective the governance associated with base mapping in the Province need to be identified and implemented.
4. Government funding for all base map related activities, including FRBC funding, should be coordinated through a single organization to ensure corporate standards are applied and the data collected is provided to the organization responsible for base mapping.
5. The Base Mapping and Geomatics Services Branch of MSRM should be assigned responsibility for base mapping including:
 - Establishment of corporate standards;
 - Management of all aspects of GSR (including geodetic control monuments and ACS);
 - Development and management of the Topographic and Ortho-Images components of the corporate base map;
 - Review of funding for base map activities with a view to implementing central coordination of funding for base mapping activities (see Recommendation 4);
 - All base map data exchanges between the provincial agencies and external organizations; and
 - Provision of Topographic and Ortho-Image Base Maps for distribution..
6. ICI should assume responsibility for the Cadastral Base Map; however, a close relationship should exist between ICI and BMGSB including the Director of BMGSB serving on the ICI Board of Directors. A medium term objective should be to enable clients to integrate data from the base maps managed by both organizations.
7. An early priority of BMGSB and the Business and Information Services Division should be to improve the electronic distribution systems for base maps and related data and encourage users to use digital rather than hard copy maps.
8. Formally establish TRIM as the official base map for the Province to which all resource data must be referenced.
9. The respective mandates and responsibilities of BMGSB and SG should be clarified and consideration given to merging the two organizations.