MVLWB

Guideline for Geographic Information Systems (GIS) Submission Standard

November 23, 2016

Mackenzie Valley Land and Water Board
Gwich'in Land and Water Board
Sahtu Land and Water Board
Wek'èezhìı Land and Water Board

Mackenzie Valley Land and Water Board

Revision Summary Table

Date	Description
March, 2012	Date of Implementation
November 23, 2016	**New sections:** Development of the Guideline (Section 1.3) Application of the Guideline (Section 1.4) Geographic Coordinates (Section 2) Application Form (Section 3) Map Submission (Section 4) Copyright (Section 5.1) Attribute Data (Section 5.5) Appendix A- GIS Standard Checklist Appendix B- Application Form Example Appendix C- Map Submission Example Appendix D- GIS data Example

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Definitions and Acronyms:

TERM	DEFINITION
ArcMap for Desktop	ArcMap is an ESRI software use to create maps and conduct spatial queries
Attribute data	Geographic description of the features in form of tabular data
Boards	Land and Water Boards of the Mackenzie Valley, as established by the *Mackenzie Valley Resource Management Act*
Coordinate system	A coordinate reference system (CRS) that defines the map projection
Coordinates	A set of horizontal axis (x) and vertical axis (y) values that defines a location
Datum	A model that measures locations relative to centre of the earth
dBase table (dbf)	A file format that stores the attribute data
Degree, minutes, seconds (DMS)	A unit used for describing latitude and longitude coordinates (1 degree = 60 minutes; 1 minute = 60 seconds)
Digital elevation model (DEM)	Raster data model that shows terrain relief
ESRI	A company that supplies geographic information system software e.g. ArcMap for Desktop.
EPSG code	Codes developed by European Petroleum Survey Group (EPSG) that identify coordinate system
Extensible Markup Language (XML)	A stand-alone file format for sharing metadata
FGDC	Federal Geographic Data Committee (FGDC)
Final plans	A final plan is required to be submitted to the Board by a Permittee within 60 days after the completion of a land use operation or the expiration of the Land Use Permit (MVLUR Section 29)
Geographic Information System (GIS)	A collection of spatial and non-spatial data for understanding land use permit or water licence applications in a geographic context
Georeferenced	A raster image associated with a coordinate system
Geospatial data	Information of a location and shapes of geographic features
GeoTiff	Tiff files that contain spatial reference information
Graticules labels	Labels along the data frame that show the longitude and latitude
Latitude	Parallel lines running east to west of the earth
Longitude	Meridian lines that intersect the equator and pass through the North and South Poles
Map projection	Transforms coordinates on spherical earth to a flat and planar map
Map sheet number	The index on the grid of the National Topographic System
Metadata	Information of the GIS data that describes its content, source, projection, scale, etc.
MVLUR	Mackenzie Valley Land Use Regulations (MVLUR)
North American Datum (NAD)	NAD 83 is based on Geodetic Reference System 1980 ellipsoid with its measurement obtained from terrestrial and satellite data. NAD 83 is gradually replacing NAD 27, which was used in the United States during the twentieth century
Raster data	Grid of cells/pixels based data e.g. aerial photographs, satellite imageries, scanned maps, etc.
Shapefile	A format to store geographic information, shape, and attribute data of features
Tabular Data	Descriptive information that is stored in rows and columns in a database and can be linked to spatial data.
Tagged Image File Format (TIFF)	A file format that stores raster images
Topography	Features of the land surfaces e.g. elevations, and position of natural and constructed features.
Toponymy	Study of place names (toponyms)
Vector data	Data using point, lines, and polygon to represent features

1. Introduction

1.1. *Purpose*

The Land and Water Boards of the Mackenzie Valley[1] (the Boards) regulate the use of land and water and the deposit of waste through the issuance of land use permits (permits) and water licences (licences). Geospatial data such as coordinates, maps, and Geographic Information System (GIS) data are essential to support the regulatory process e.g. confirming status of mineral claims, determining transboundary applications, assessing cumulative impacts of developments, etc. The purpose of this Guideline is to outline the standard expectation of the Boards with respect to geospatial data submission requirements. The geospatial data provided must capture all components of an application to the Boards that can be referenced to the submitted application, management plan, or final plan.

1.2. *Authority*

The Boards' authority to develop this Guideline is granted under section 65 of the *Mackenzie Valley Resource Management Act (MVRMA)*. The Boards have developed the following Guideline to ensure that geospatial data submissions are complete, accurate, and consistent across all Boards to support an efficient and effective regulatory process.

1.3. *Development of the Guideline*

This Guideline was developed to clarify the *Standards for Geographic Information Systems (GIS) Submissions* released by the Boards on March 1, 2012. The GIS Guideline is developed to emphasize the technical aspects of geospatial data properties. The draft GIS Guideline was reviewed by Board Staff and the public from May to July of 2016. The Guideline was approved by the Board of Executive Directors on November 7, 2016 and approved by the Chairs' Committee on November 23, 2016.

1.4. *Application of the Guideline*

This Guideline applies to any geospatial data submitted to the Boards. Any submissions associated with features listed in Section 4.2 are required to follow this Guideline. **If assistance is required for submitting coordinates, map, and GIS data, contact Board Staff before submission.** The Boards may request geospatial data at any stages during the project. For example, any change of geospatial data in an application should be resubmitted after Board approval to accurately reflect the most current activities.

2. Geographic Coordinates

Any geographic coordinates submitted should be in the format of degree, minutes, seconds or decimal degrees as shown in Table 1:

Table 1 Format of geographic coordinates

Format	Degree, minutes, seconds [a] (DMS)	Decimal degrees [b] (D)
Example	128°38'20.773"W, 66°15'28.522"N	-128.639104˚, 66.257923˚
Longitude, Latitude [c]	DDD˚MM'SS.SS" W, DDD˚MM'SS.SS"N	-/+D.DDDD˚ , -/+D.DDDD˚
Unit symbols [d]	D (˚), M ('), S (")	D (˚)
Direction (West, North)	W, N	-, +

[a] The seconds in DMS must be to a precision of at least two decimal places

[b] The decimal degrees must be to a precision of at least four decimal places

[c] Coordinates should be consistently in either DMS or decimal degrees, **other coordinate systems are not accepted**

[d] If using DMS, indicate the degree (˚), minutes ('), seconds (") by specifying their unit symbol

[1] The Land and Water Boards of the Mackenzie Valley include the Mackenzie Valley Land and Water Board, Gwich'in Land and Water Board, Sahtu Land and Water Board, and Wek'èezhìı Land and Water Board

3. Application Form

The application forms for permits and licences indicate that the location of the project must be provided. The location includes:

- the maximum and minimum latitude and longitude geographic coordinates (see Section 2),
- map sheet number[2] (e.g. 106I), and
- the datum (NAD 27 or 83).

Important project features, as listed in Section 4.2 (e.g. campsite, water source, well site, fuel cache, etc.), of the application must be described in detail, created, and referenced as geospatial data including coordinates, maps, and GIS data (see Appendix B for example).

4. Map Submission

Submissions should include overview and detailed maps. See Appendix C for examples.

4.1. Map Scale

The overview map (Figure 2) should be scaled at 1:250,000 or less (e.g. 1:500,000) to show the location of the project area. Detailed maps (Figure 3) should be scaled at 1:50,000 or more (e.g. 1:5,000) to show local geographic features, structures, and operations of the project. Multiple detailed maps may be required if the project extends across a large geographic area.

4.2. Geographical Features

In addition to base map features (e.g. topography, place names, administrative boundaries, etc.), maps submitted should also include all project features of interest (e.g. proposed facilities including temporary structures). At a minimum, features listed under paragraphs 19(3)(b) and 29(1)(b) of the MVLUR should be included. See Table 2 for a more extensive, but not exhaustive list of features that should be included:

Table 2 Geographic Features

Project Features (Submit as GIS data)	
Operations	campsites, fuel and supply storage sites, waste disposal sites, sewage, –water sources, SNP locations, water treatment plant, docks, landfarms, lodges, logging, planned area to be logged, quarries, staging areas, sumps, etc.
Transportation	existing/new lines, right-of-way, cleared areas, access roads, ice roads, trails, bridges, airports, etc.
Mining	mills, mining infrastructure, pits, tailing storage facilities, waste rock storage, etc.
Oil and gas	borrow pits, central processing facilities, flare stacks, gathering facilities, hydrocarbon storage sites, pipeline/flowlines, produced water storage sites, seismic lines, well pads, well sites, etc.
Infrastructures	buildings, structures, transmission line, communication towers, etc.
Base Map Features	
Others	historical, archaeological sites, burial sites, trap lines and cabins that may be affected by operations, etc.
Hydrography	lakes, rivers, streams, watersheds (sub-basins and major-basins), etc.
Vegetation	wooded area, wetlands, etc.
Administrative	municipal, federal and non-federal managed lands, aboriginal settlement lands, land claim regions, land withdrawal areas, NWT Protected Areas Strategy, etc.
Toponymy	place names, water features names, boundary names, etc.
Sensitive species and features	rare or maybe-at-risk plants, hot and warm springs, mineral licks, Karst topography, eskers, ice patches, etc.

[2]Map sheet number can be identified on the Board's Map of National Topographic System of Canada under the Maps section on each Boards' website

4.3. Map Elements

The maps should include elements such as a map title, north arrow, map scale (scale text and/or scale bar), latitude/longitude graticules labels, data source, and disclaimers. See Figure 2 for example.

4.4. Map Projection

All maps and GIS data must be in one of the following projections:

- Lambert Conformal Conic: NAD83/NWT Northwest Territories Lambert; or
- Transverse Mercator: NAD83 UTM Zone #N (zone number between 8N to 12N should be clearly indicated)

5. GIS Data

GIS data must be submitted with applications and final plans. As outlined in Section 4.2, all project features (e.g. operations, transportation, mining, oil and gas, other temporary structures, etc.) must be included in the dataset as individual files (See Appendix D for examples). Base map features such as topography or administrative boundaries are not required to be submitted as GIS data.

5.1. Copyright

Submitted GIS data are posted on the public registry. For GIS data under database release agreement (e.g. sensitive datasets), proponent should follow the conditions of the agreement when sharing data (e.g. acquire written consent to share data). For non-transferable GIS data, please provide the source of the database such as citation and contact information.

5.2. Data Format

GIS data must be submitted in a format compatible with the latest version of ArcMap Desktop. The Boards will accept the following formats:

- Vector Data:
  - Shapefiles with main file (.shp), index file (.shx), and dBase table (.dbf) (see Section 5.5) are required. Submission of other files such as Coordinate system file (.prj) are encouraged;
  - **AutoCAD drawings (.dwg) are not acceptable.** External footprint is sufficient. Internal structure is not required; and
  - Submit different features as individual shapefiles.
- Raster Data:
  - Images: satellite imagery, aerial photography, digital elevation models (DEMs);
  - Tagged Image File Format (TIFF) GeoTIFF (.tif, .tiff and .tff); and
  - ortho-corrected and georeferenced;
- Contact Board Staff for other file formats; and
- **Use.zip file to consolidate multiple file for a single submission**.

5.3. Projection (See Section 4.4)

5.4. Metadata

The datasets must include basic metadata in the format and standard of Extensible Markup Language (XML). Proponent can use one of the Federal Geographic Data Committee (FGDC) approved metadata standards to fill out the ESRI metadata stylesheet. The documentation must include, at a minimum, the following (See Appendix D for example):

- Proponent name;
- Project/data set description;
- Scale of data set compilation (e.g. 1:20,000);
- Datum and projection of data set compilation;
- Citation information e.g. originator;
- Date of creation and any updates;
- Data source (e.g. GPS, airphoto, etc.) with resolution;
- Data quality and accuracy;
- Agency and person responsible for the data set and contact information;
- Restrictions and limitations; and
- **List of attributes, description of the attributes and acronyms.**

5.5. Attribute Data

The dBase table (.dbf) is commonly created along with a shapefile. The dBase table should consist of attribute fields used to describe each entity in each dataset. Acronyms in the attribute table should be identified in the metadata (.xml). The attributes can vary depending on the type of project. The level of detail in the attribute table should reflect the description in the application. In addition to the default fields such as Object ID and Shape (point, polyline, polygon), the attribute table should include fields, if applicable, such as:

- Name/Site ID e.g. well site ID
- Type of operation e.g. camp, access road, etc.
- Status e.g. active, suspended, inactive, etc.
- Date/season e.g. sampling date
- Area/length/width/depth e.g. airstrip dimension
- Capacity/volume e.g. campsite capacity
- Note (for other description)

See Appendix D for examples.

Appendix A- GIS Standard Checklist

Proponents should use the following checklist to ensure that the minimum requirements have been incorporated into the application.

Geographic Coordinates (Section 2.0)

☐ Coordinate units in degree (˚), minutes (’), seconds (”) or decimal degrees (˚)

Application Form (Section 3.0)

☐ Maximum and minimum coordinates (project area) (see Appendix B)
☐ Coordinates of project activities
☐ 1:250,000 Map sheet number
☐ Datum (NAD27 or NAD83)

Map Submission (Section 4.0)

☐ Regional map: 1: 250,000 or less
☐ Detail map(s): 1: 5,000 or more
☐ Topographic and operational features (including temporary facilities)
☐ Map elements: Title, north arrow, graticule labels, scale, and data source
☐ Map projection: NAD83/NWT Lambert or NAD83 UTM Zone # (indicate zone number)

GIS Data (Section 5.0)

☐ Data format: compatible with latest ArcMap Desktop
    Vector: .shp, .shx, .dbf
    Raster: .GeoTIFF
☐ Different features illustrated as individual files and combine all files in a single .ZIP file
☐ Projection: NAD83 / NWT Lambert or NAD83 UTM Zone # (indicate zone number)
☐ Metadata (.xml)
☐ Attribute data (.dbf)

Appendix B- Application Form Examples

- File example[3]: Husky Oil Operation Ltd.'s Water Licence S13L1-006 and Land Use Permit S13X-003;
- Emphases to the Husky example are illustrated in **red text**, highlights or textboxes;
- Degree, minutes, and seconds of coordinates should be explicitly indicated in the application form as shown in Table 3:

Table 3 Example of Husky's project area coordinates and map sheet number in the application form

16. Location of activities by map co-ordinates (attached maps and sketches)	
Minimum latitude (degrees, minutes, seconds) **64˚35'8.3140"**	Maximum latitude (degrees, minutes, seconds) **65˚15'3.32"**
Minimum longitude (degrees, minutes, seconds) **-125˚40'16.96"**	Maximum longitude (degrees, minutes, seconds) **-126˚50'14.511"**
Map Sheet no. **96C, 96 D, 96E, 96F**	

Appendix C- Map Submission Examples

- Geographic Feature Examples (Section 4.2)
- Significant components of the application must be described in detail, created, and referenced as geospatial data in shapefiles (points, lines, and polygons) or raster data;
- Features described in the application (highlighted) as shown in Figure 1 should be submitted as map and GIS data as shown in Figure 2 and 3.

Figure 1 Highlighted features in an application that should be reflected on map submissions.

Common activities that have been identified as "Site Wide Services" within the project management structure include:

- **Construction and maintenance of winter access road and ice bridge and use of staging area and security station;**
- **Operation of a camp that will accommodate personnel working on all related exploration projects (drilling, completions, seismic surveying, maintenance, etc.);**
- **Operation of storage and staging areas;**
- **Storage of fuel in a tank farm co-located with the camp/storage site;**
- **Operation and maintenance of an all-weather airstrip;**
- **Construction and maintenance of the all-weather road (including quarrying); and,**
- **Supply of water for the camp, winter access construction, and road maintenance use.**

[3] Permission was granted by Husky Oil Operation Ltd. for the publication of details of the applications for Water Licence S13L1-006 and Land Use Permit S13X-003 as examples for use in this Guideline.

Figure 2 Husky's map example demonstrating the map elements that should be included.

Map Submission Example

Map elements:
1. Map Title
2. Legend
3. North Arrow
4. Scale bar/text, regional map scaled at less than 1:250,000
5. Date of creation, contact information etc.
6. Graticules labels

7. Data source,
8. Coordinate system information (zone number clearly indicated in the NAD83 UTM projection).

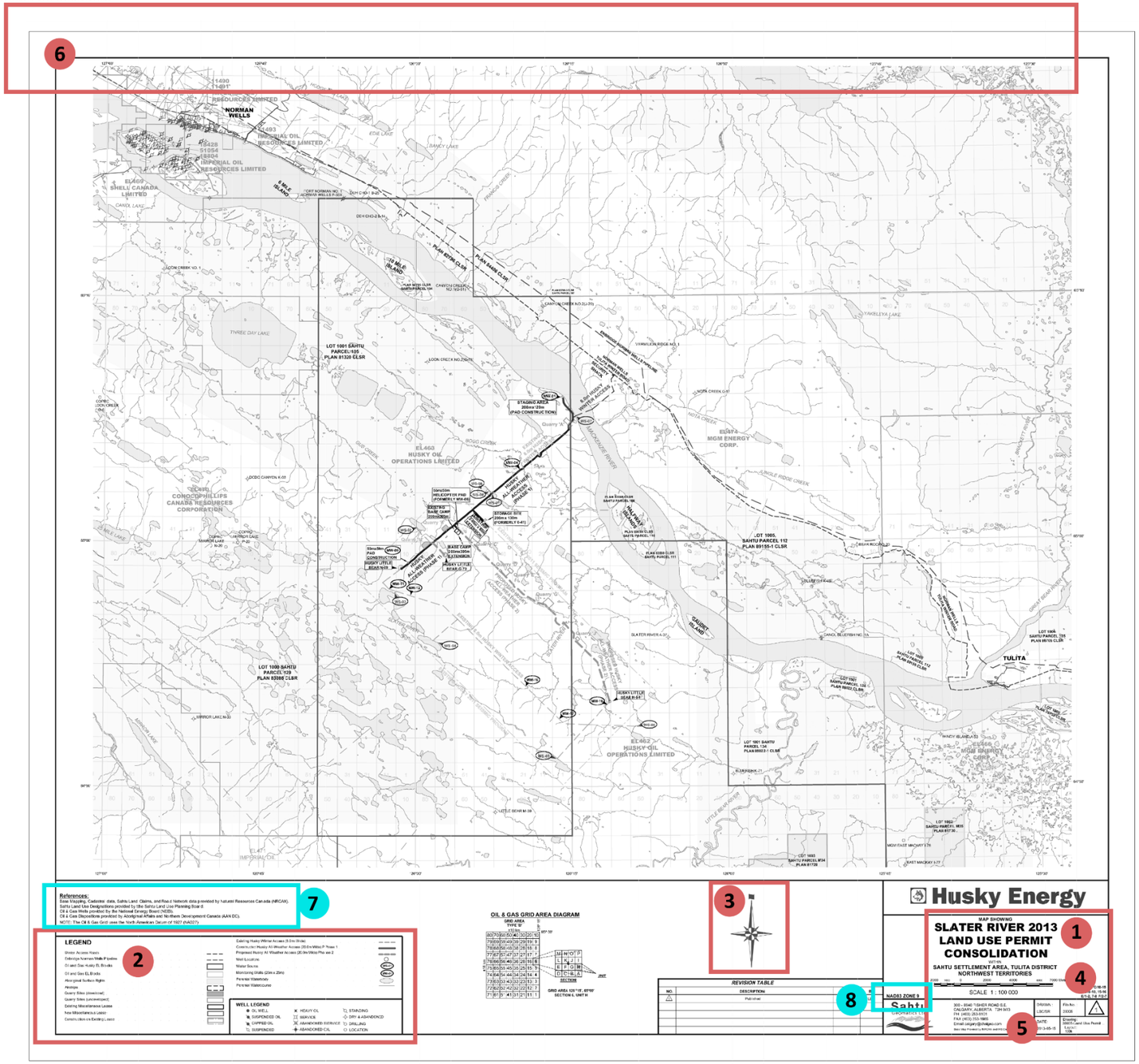
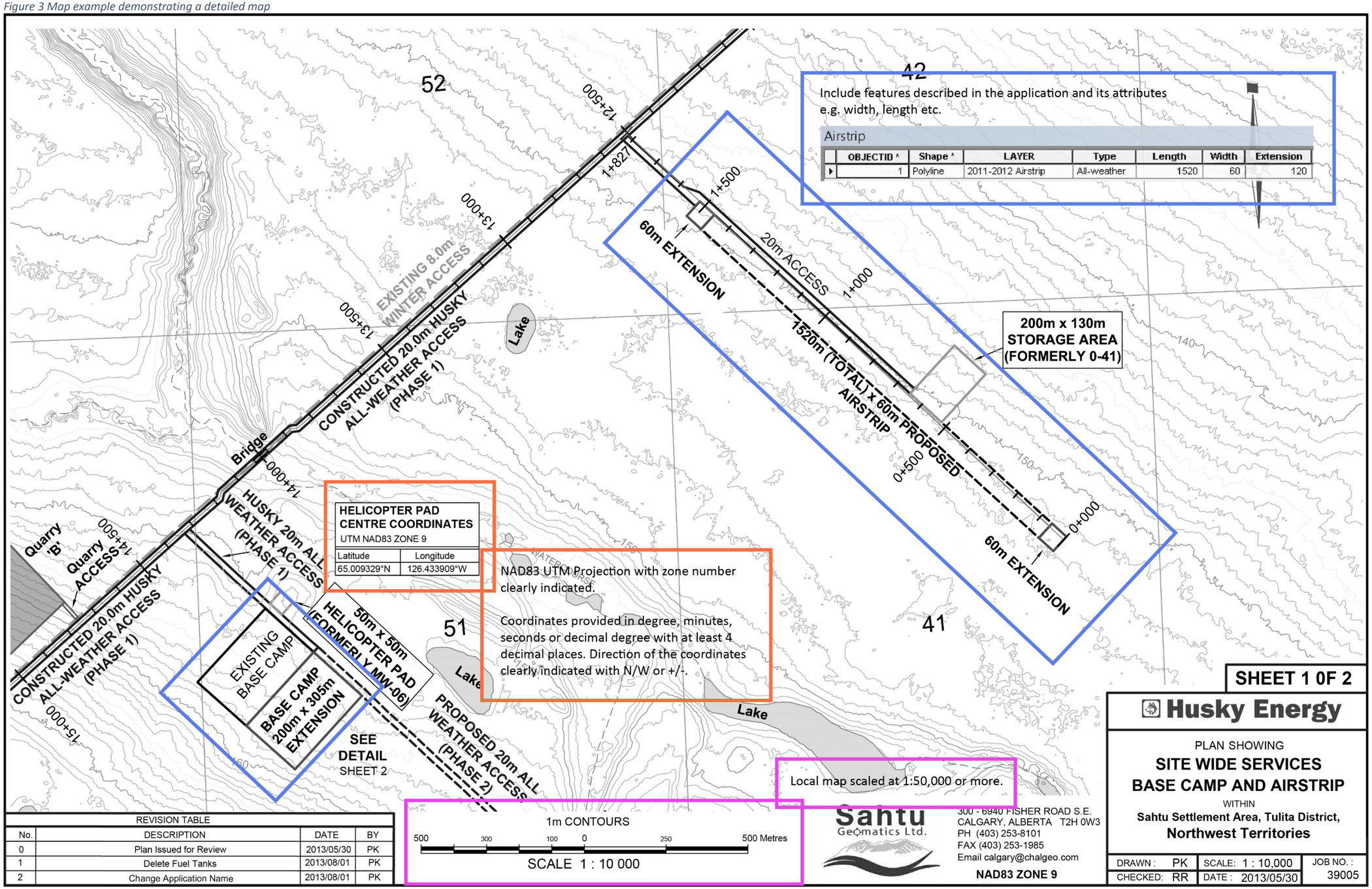


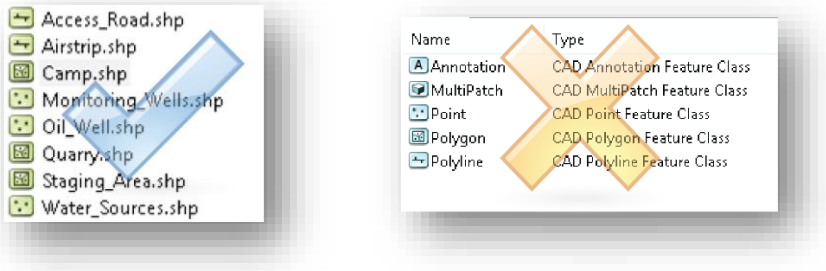
Figure 3 Map example demonstrating a detailed map



Appendix D- GIS Data Examples

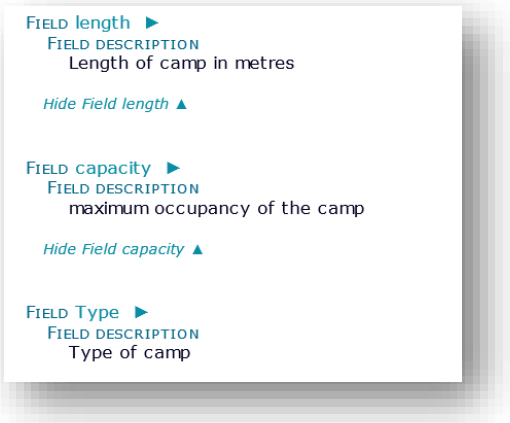
- Date Format Example (Section 5.2)
- Vector data is accepted in shapefile (.shp, .shx & .dbf), but not in CAD drawing (.dwg) as shown in Figure 4; and
- Different features should be organized into individual shapefiles, and submit multiple shapefiles in a single .ZIP file.

Figure 4 Examples of shapefiles of different features that should submitted individually, and CAD data are not accepted.



- Metadata Example (Section 5.4)
- A list of attributes and its description should be included in the metadata (.xml file) as described in metadata as shown in Figure 5.

Figure 5 Example of a metadata data



- Attribute Table Example (Section 5.5)
- External footprints of operation features should be reflected in maps as shown in Figure 3.
- Feature properties such as dimension, coordinates, maximum occupancy, type of camp, etc. described in the application should be reflect in the attribute table (dBase table) of the GIS data as shown in Figure 6;
- Submission of external footprint are sufficient. Maps or CAD data of internal structure are not required.

Figure 6: How a project description in an application should be reflected in the attribute table.

4.1 Camp/Storage Sites

4.1.1 Site Expansion

The current camp/storage site has dimensions of 200m by 305m and encompasses an area of 6.1ha. To accommodate anticipated storage requirements and a 400 person camp, an additional 6.1ha will be required. A 200 x 305m area will be cleared and padded adjacent to the current camp/storage site along the southeast boundary (refer to Pre-disturbance Assessment report and photos in **Appendix 1-C**) using the same construction methods employed and described in the LUP application for S12F-007. These include:

- Clearing of trees and shrubbery using mechanical mulchers or low ground pressure crawler tractors (dozers), however, any merchantable timber will be harvested and be made available to the communities;
- Placement of geo-textile over the material;
- Placement of a minimum of 1m fill over the geo-textile; and,
- Compacting and levelling the site to promote drainage.

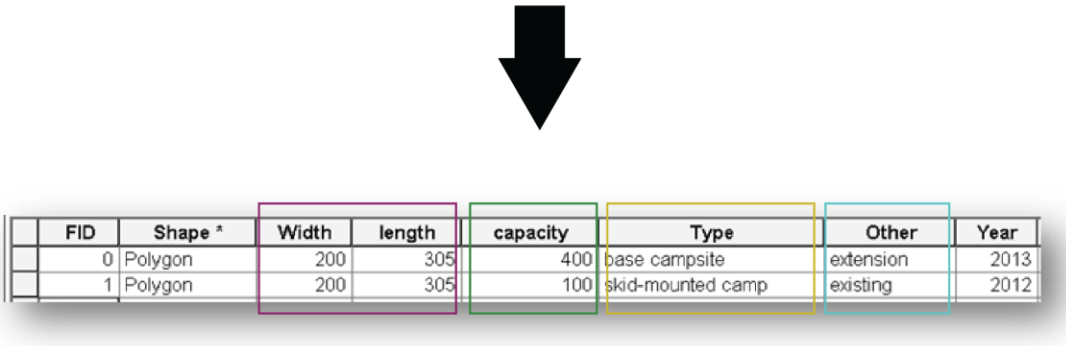
Approximately 82,500m^3 of fill will be required which will be obtained from Quarry "B" and/or Quarry "M" and/or another approved Quarry.

Table 4-1: Base Campsite Location

Location Name	Coordinates (NAD83 Zone 9)			
	Latitude	Longitude	Northing (m)	Easting (m)
Base Campsite	65.007681°N	126.435543°W	7211569	620875

4.1.2 Camp

The camp that is currently located on the base camp/storage site is configured as a 103-person skid-mounted camp; however Husky will not exceed the maximum occupancy of 100-persons as authorized under LUP S12F-007 and WL S11L3-002. Husky proposes to install a second camp with an estimated occupancy of 226 persons after which the current camp will be demobilized. However to accommodate future project needs, this application is requesting a maximum occupancy of 400 persons. This gives Husky the flexibility to add additional accommodation if project activities warrant. The new camp will be sited on pilings at the camp/storage site expansion and adjacent to the current camp (see Site Sketch in **Appendix 2**). The camp will be equipped with portable water treatment and waste water treatment plants appropriately sized to handle camp requirements. A 25m tall communications tower will be erected to provide improved communications for the camp. A pole-mounted antenna may be installed as a temporary measure prior to and during the tower installation.



	FID	Shape *	Width	length	capacity	Type	Other	Year
	0	Polygon	200	305	400	base campsite	extension	2013
	1	Polygon	200	305	100	skid-mounted camp	existing	2012

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