MVLWB

Guideline for Geographic Information Systems (GIS) Submission Standard

DATE

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

Mackenzie Valley Land and Water Board

Revision Summary Table

Date	Description
March, 2012	Date of Implementation
January 2016	New sections: Application (Section 2) Map (Section 3) Attribute Data (Section 4.3) Appendix A GIS Standard Checklist

Table of Contents

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
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
Permittee	Holder of a land use permit
Raster data	Cell based data e.g. aerial photographs, satellite imageries, scanned maps etc.
Shapefile	A format to store geographic information, shape, and attribute data of features
Tagged Image File Format (TIFF)	A file format that stores raster images
Topographic	Features of the land e.g. mountains, valleys etc.
Toponymy	Study of place names
Vector data	Data using point, lines, and polygon to represent features

1.0 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). Maps and Geographic Information System (GIS) data are required to support the regulatory process for applications and/or final plans, and other project initiatives. The purpose of this guideline is to outline the standard expectation of the Boards with respect to project location description, map, and GIS 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 document is granted under sections 65 of the *Mackenzie Valley Resource Management Act*. The Boards have developed the following guideline to ensure that maps and GIS data submissions are complete, accurate, and consistent across all the Boards to support an efficient and effective regulatory process.

All project features detailed in Section 3.2 are required to follow this standard. **If assistance is required for maps and GIS data submission, contact Board Staff before submitting your application or final plan.** The Boards may also request GIS data at other stages during the project.

2.0 Application

The application forms for permits and licences indicate that the location of the project must be provided. This includes the maximum and minimum latitude and longitude geographic coordinates, map sheet number[2] (e.g. 106I), and the datum (NAD 27 or 83). Latitude and longitude geographic coordinates should be provided for important project activities (e.g. campsite, water source, well site, fuel cache etc.). Significant components of the application must be described in detail, created, and referenced as geospatial data, which may include points, lines, and polygons (see Appendix A ii for example).

The coordinates should be in the following format:

Format	Degree, minutes, seconds [a] (DMS)	Decimal degrees [b] (D)
Longitude, Latitude[c]	DDD˚MM'SS.SS" W, DDD˚MM'SS.SS"N	-/+D.DDDD˚ , -/+D.DDDD˚
Longitude Range	(0 to 180)˚ (0 to 59)' (0 to 59)"	-180˚ to 180 ˚
Latitude Range	(0 to 90)˚ (0 to 59)' (0 to 59)"	-90˚ to 90 ˚
Unit symbols [d]	D (˚), M ('), S (")	D (˚)
Direction	W(est), N(orth)	-(west), +(north)
Example	128°38'20.773"W, 66°15'28.522"N	-128.639104˚, 66.257923˚

[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'èezhìi Land and Water Board

[2] Map sheet number can be identified on the Natural Resource Canada's Maps of National Topographic System of Canada- Canada's North

3.0 Map Submission

Map submission must accurately reflect all stages of the projects. At least two maps must be submitted - one regional scale map to show the overview of the project (Appendix A iii) and one or more local scale map(s) (Appendix A v & vi) to show the operations in detail.

3.1 *Map Scale*

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

3.2 *Map Features*

Maps submitted should include detailed topography of the project area and 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. The following example is a more extensive, but not exhaustive list of features that should be included:

Project 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.
Others	historical, archaeological sites, burial sites, trap lines and cabins that may be affected by operations etc.
Hydrography	lakes, rivers, streams etc.
Vegetation	wooded area, wetlands etc.
Boundaries	municipal, federal and non-federal managed lands, aboriginal settlement lands, land claim regions 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, Krast topography, eskers, ice patches etc.

3.3 *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. See Appendix A iii for examples.

3.4 *Map Projection*

All maps and GIS data must be in the following projection:

Name: NAD83 / NWT Lambert
EPSG Code: CRS 3580
Projection: Lambert Conformal Conic
Datum: NAD83
1st standard parallel: 62.0
2nd standard parallel: 70.0
Central meridian: -112.0
Latitude of origin: 0.0
False easting: 0
False northing: 0
Scale Factor 1

4.0 GIS Data

GIS data must be submitted with applications and/or final plans. As outlined in Section 3.2, all features associated with project operations must be included in the dataset.

4.1 *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 including the main file (.shp), index file (.shx), and dBase table (.dbf) (see Section 4.3) are required. Submission of other files such as Coordinate system file (.prj) are encouraged. AutoCAD drawings (.dwg) are not acceptable.

Image (Raster) Data (satellite imagery, aerial photography, DEMs): Tagged Image File Format (TIFF) GeoTIFF (.tif, .tiff and .tff), ortho-corrected and georeferenced

4.2 *Projection (See Section 3.4.)*

4.3 *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 iv)

- Company name
- Project / data set description
- Scale of data set compilation (e.g. 1:20,000)
- Datum and projection of data set compilation
- Data set creation date and date and details of any updates
- Data source (e.g. GPS, airphoto etc.)
- Agency and person responsible for the data set and contact information
- ***List of attributes, description of the attributes and acronyms***

4.4 *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) (Section 4.3). The attributes can vary depending on the type of project. The level of details 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
- Type of operation
- Status
- Date/season
- Area/length/width/depth
- Capacity/volume
- Note (for other description)

See Appendix A iv 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.

Application (Section 2.0)
☐ Maximum and minimum coordinates (project area)
☐ Map sheet number
☐ Datum
☐ Coordinates of project activities
☐ Coordinate units in degree (˚), minutes (’), seconds (”) or decimal degrees (˚)

Maps (Section 3.0)
☐ 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)

GIS Data (Section 4.0)
☐ Data format: compatible with latest ArcMap Desktop
Vector: .shp, .shx, .dbf
Raster: .GeoTIFF
☐ Projection: NAD83 / NWT Lambert
☐ Metadata (.xml)
☐ Attribute data (.dbf)

Husky Oil Operation Ltd.'s Water Licence S13L1-006 and Land Use Permit S13X-003 are used as examples to demonstrate the standard for the application, GIS data and maps. Corrections to the application, maps and GIS data are illustrated in red text, highlights or textboxes.

All degree, minutes and seconds should be explicitly demonstrated in the maximum and minimum latitude and longitude in the application forms (Section 2.0 Application):

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**	

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. In other words, what is described in the application should be included in the map and as GIS data (Section 3.2 Map Features). For example, the following highlighted features described in the application form should be included in the map and GIS data.

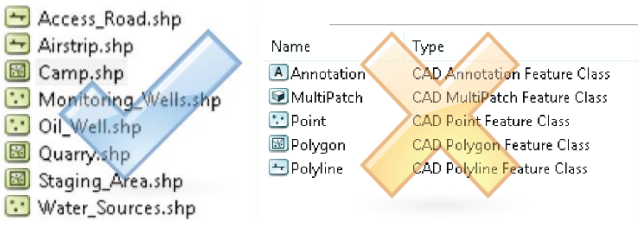
Common activities that have been identified as "Site Wide Services" within the project management structure include:

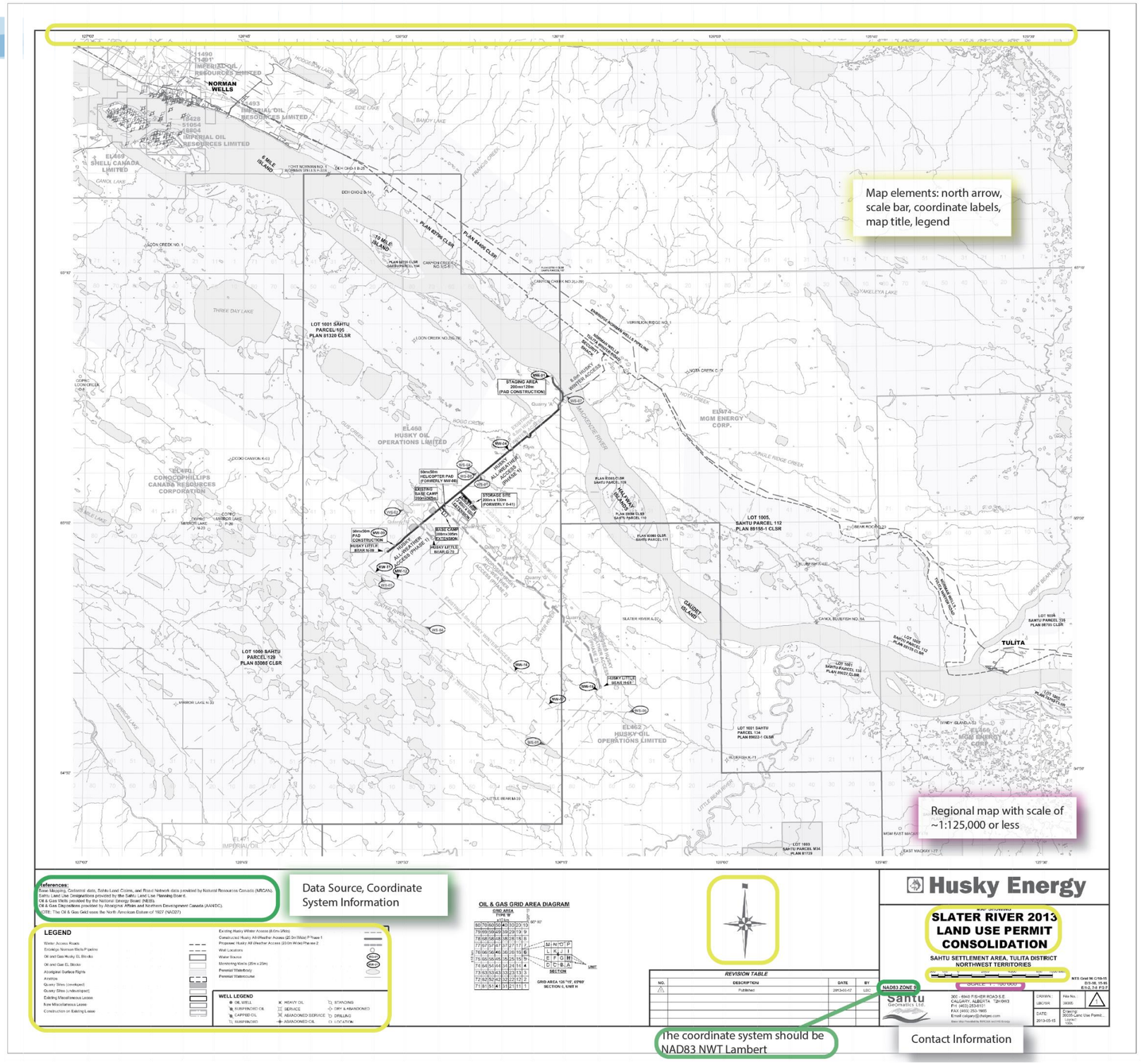
- **Construction and maintenance of winter access road and ice bridge and use of staging area and security station;**
- **Operation of a camp that will accommodate personnel working on all related exploration projects (drilling, completions, seismic surveying, maintenance, etc.);**
- **Operation of storage 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.**

In addition to the consolidation of the above authorizations, Husky is also requesting changes and additions to its support operations. These consist of:

- **Expansion of the camp/storage site by 6.1 hectares (ha);**
- **Increasing the camp accommodations to permit a maximum camp occupancy of 400 persons;**
- **Install a 25m communications tower (will be located beside the camp);**
- **Increasing the fuel storage capacity from 610,000 litres to 1,200,000 litres;**
- **Construct all-weather pad on the former MW-06 groundwater wellsite for use as a helipad adjacent to the campsite;**

Vector data is accepted in shapefile (.shp, .shx & .dbf), but not in CAD drawing. (.dwg) (Section 4.1 Data Format)




Map elements: north arrow, scale bar, coordinate labels, map title, legend
Regional map with scale of ~1:125,000 or less
Data Source, Coordinate System Information
The coordinate system should be NAD83 NWT Lambert
Contact Information
Husky Energy
SLATER RIVER 2013 LAND USE PERMIT CONSOLIDATION
SAHTU SETTLEMENT AREA, TULITA DISTRICT
NORTHWEST TERRITORIES
NORMAN WELLS
TULITA
LOT 1001 SAHTU PARCEL 135 PLAN 81320 CLSR
LOT 1000 SAHTU PARCEL 129 PLAN 83086 CLSR
LOT 1005, SAHTU PARCEL 112 PLAN 89155-1 CLSR
LOT 1001 SAHTU PARCEL 134 PLAN 89027-1 CLSR
LOT 1003 SAHTU PARCEL M34 PLAN 81729
EL469 SHELL CANADA LIMITED
EL468 HUSKY OIL OPERATIONS LIMITED
EL470 CONOCOPHILLIPS CANADA RESOURCES CORPORATION
EL473 MGM ENERGY CORP.
EL471 IMPERIAL OIL
EL462 HUSKY OIL OPERATIONS LIMITED
EL466 MGM ENERGY CORP.
STAGING AREA 200mx120m (PAD CONSTRUCTION)
STORAGE SITE 200m x 130m (FORMERLY I-5-41)
EXISTING BASE CAMP 200mx200m
BASE CAMP 200mx200m EXTENSION
50mx50m HELICOPTER PAD (FORMERLY MW-06)
50mx50m PAD CONSTRUCTION HUSKY LITTLE P-09
HUSKY ALL-WEATHER ACCESS (PHASE 1)
HUSKY WINTER ACCESS
HUSKY LITTLE BEAR M-59
LEGEND
WELL LEGEND
OIL AND GAS GRID AREA DIAGRAM
REVISION TABLE
NAD83 ZONE 9
Sahtu Geomatics Ltd.

The application should include detailed information about the operational features. The following example demonstrates how the camp feature's properties such as dimension, coordinates, maximum occupancy, type of camp etc. described in this application should be transformed into maps and attribute table (dBase table) of the GIS data.

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

Section 4.4 Attribute Table:

	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

A list of attributes and its description should be included in the metadata (.xml file) as described in Section 4.3 Metadata. The following are some examples of the labels and their descriptions.

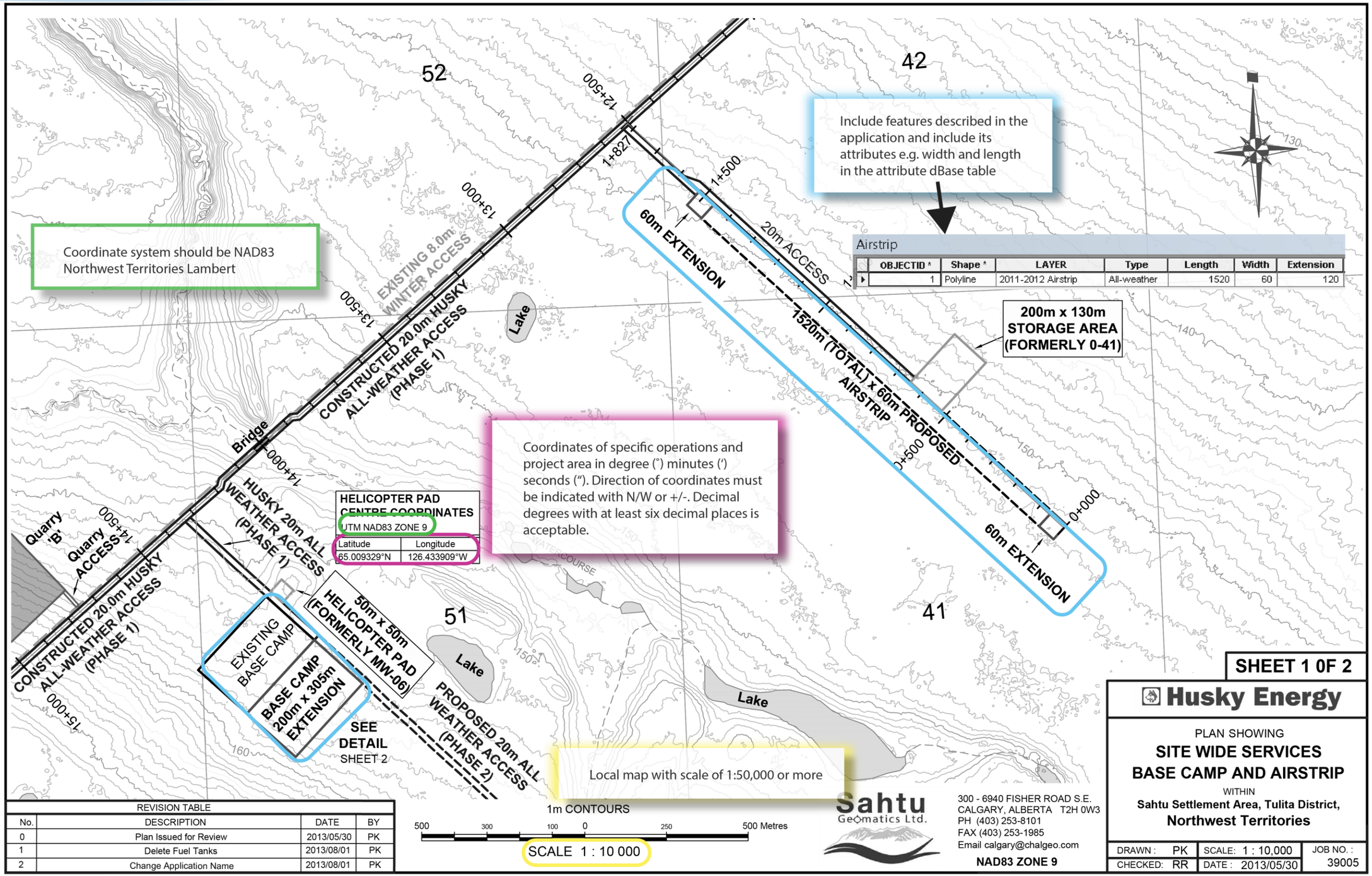
FIELD length ▶
FIELD DESCRIPTION
Length of camp in metres

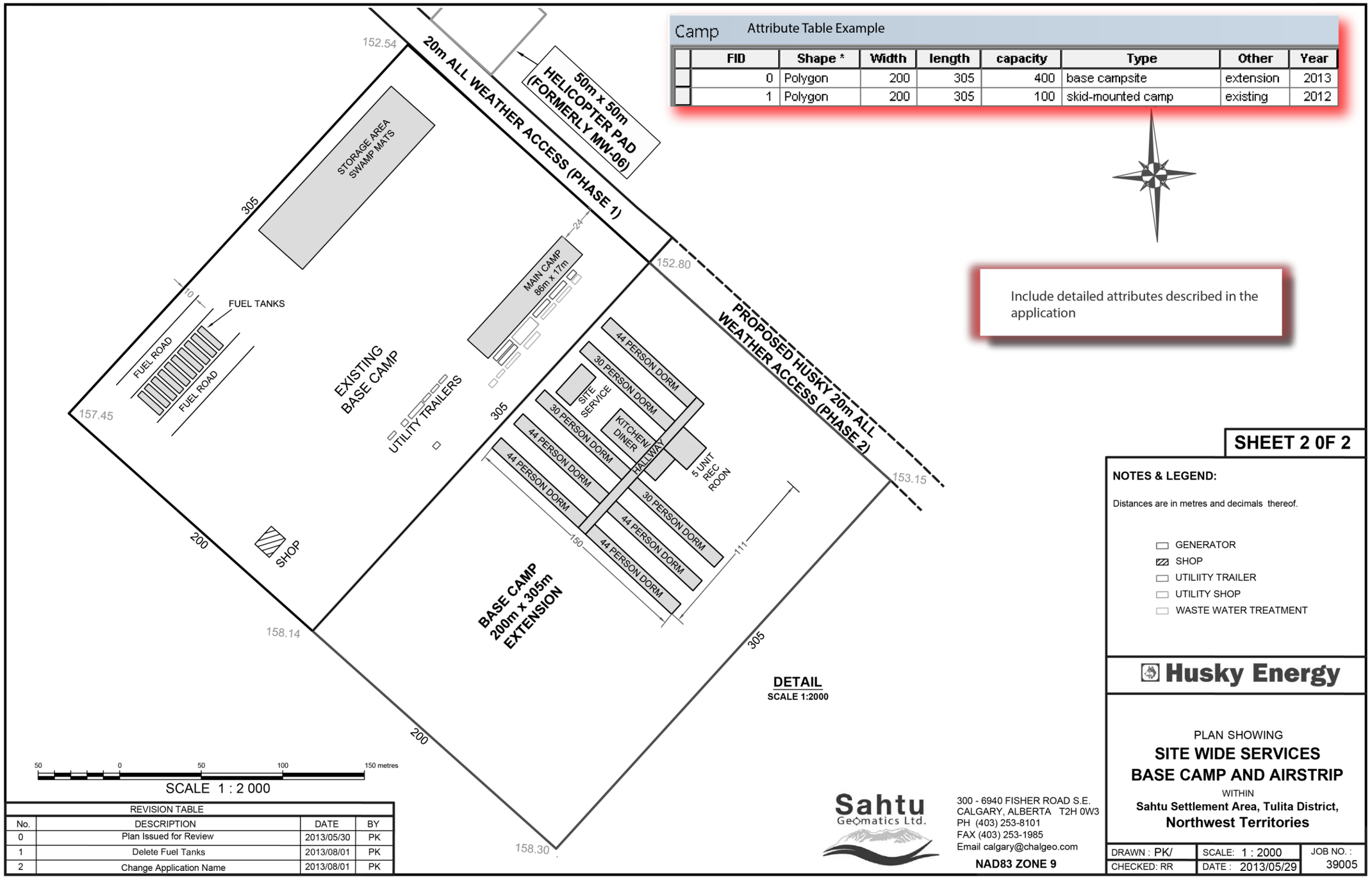
Hide Field length ▲

FIELD capacity ▶
FIELD DESCRIPTION
maximum occupancy of the camp

Hide Field capacity ▲

FIELD Type ▶
FIELD DESCRIPTION
Type of camp


Include features described in the application and include its attributes e.g. width and length in the attribute dBase table
Coordinate system should be NAD83 Northwest Territories Lambert
Coordinates of specific operations and project area in degree (°) minutes (') seconds ("). Direction of coordinates must be indicated with N/W or +/-. Decimal degrees with at least six decimal places is acceptable.
Local map with scale of 1:50,000 or more
Airstrip
OBJECTID * | Shape * | LAYER | Type | Length | Width | Extension
1 | Polyline | 2011-2012 Airstrip | All-weather | 1520 | 60 | 120
HELICOPTER PAD CENTRE COORDINATES
UTM NAD83 ZONE 9
Latitude | Longitude
65.009329°N | 126.433909°W
52
42
51
41
Lake
Bridge
Quarry 'B'
Quarry ACCESS
EXISTING 8.0m WINTER ACCESS
CONSTRUCTED 20.0m HUSKY ALL-WEATHER ACCESS (PHASE 1)
HUSKY 20m ALL WEATHER ACCESS (PHASE 1)
EXISTING BASE CAMP
BASE CAMP 200m x 305m EXTENSION
50m x 50m HELICOPTER PAD (FORMERLY MW-06)
SEE DETAIL SHEET 2
PROPOSED 20m ALL WEATHER ACCESS (PHASE 2)
60m EXTENSION
20m ACCESS
1520m (TOTAL) x 60m PROPOSED AIRSTRIP
200m x 130m STORAGE AREA (FORMERLY 0-41)
60m EXTENSION
1m CONTOURS
500 300 100 0 250 500 Metres
SCALE 1 : 10 000
REVISION TABLE
No. | DESCRIPTION | DATE | BY
0 | Plan Issued for Review | 2013/05/30 | PK
1 | Delete Fuel Tanks | 2013/08/01 | PK
2 | Change Application Name | 2013/08/01 | PK
Sahtu Geomatics Ltd.
300 - 6940 FISHER ROAD S.E.
CALGARY, ALBERTA T2H 0W3
PH (403) 253-8101
FAX (403) 253-1985
Email calgary@chalgeo.com
NAD83 ZONE 9
SHEET 1 0F 2
Husky Energy
PLAN SHOWING
SITE WIDE SERVICES
BASE CAMP AND AIRSTRIP
WITHIN
Sahtu Settlement Area, Tulita District,
Northwest Territories
DRAWN : PK
CHECKED: RR
SCALE: 1 : 10,000
DATE : 2013/05/30
JOB NO. : 39005



Camp — Attribute Table Example

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

Include detailed attributes described in the application

DETAIL
SCALE 1:2000

REVISION TABLE			
No.	DESCRIPTION	DATE	BY
0	Plan Issued for Review	2013/05/30	PK
1	Delete Fuel Tanks	2013/08/01	PK
2	Change Application Name	2013/08/01	PK

SHEET 2 0F 2

NOTES & LEGEND:

Distances are in metres and decimals thereof.

- GENERATOR
- SHOP
- UTILIITY TRAILER
- UTILITY SHOP
- WASTE WATER TREATMENT

Husky Energy

PLAN SHOWING
SITE WIDE SERVICES
BASE CAMP AND AIRSTRIP
WITHIN
Sahtu Settlement Area, Tulita District,
Northwest Territories

Sahtu Geomatics Ltd.
300 - 6940 FISHER ROAD S.E.
CALGARY, ALBERTA T2H 0W3
PH (403) 253-8101
FAX (403) 253-1985
Email calgary@chalgeo.com

NAD83 ZONE 9

DRAWN : PK/	SCALE: 1 : 2000	JOB NO. : 39005
CHECKED: RR	DATE : 2013/05/29	

The Mackenzie Valley Land and Water Board

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