



Canadian Base Network, Level 1 Product Specifications

Edition 1.0

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GeoBase®

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FUTURE WORK

Key word	Description

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ACRONYMS AND ABBREVIATIONS

CACS	Canadian Active Control Systems
CBN1	Canadian Base Network, Level 1
CGVD28	Canadian Geodetic Vertical Datum 1928
CSRS	Canadian Spatial Reference System
GSD	Geodetic Survey Division
GPS	Global Positioning System
ITRF	International Terrestrial Reference Frames
NAD27	North America Datum 1927
NAD83	North America Datum 1983
UTM	Universal Transverse Mercator

TERMS AND DEFINITIONS

CGVD28

Canadian Geodetic Vertical Datum 1928, mean sea level. (Adopted, public vertical reference system.). The average height of the surface of the sea for all stages of the tide. Usually determined by averaging height readings observed hourly over a minimum period of 19 years.

NAD27

North American Datum 1927. A non-geocentric horizontal control datum for the U.S., Canada and Mexico, defined by a location and azimuth on the Clarke spheroid of 1866, with origin at Meades Ranch.

NAD83

North American Datum 1983. (Public horizontal reference system). The horizontal control datum for the U.S., Canada, Mexico, and Central America, based on the Geodetic Reference System 1980 (GRS80) geocentric reference ellipsoid.

NAD83CSRS

North American Datum 1983 Canadian Spatial Reference System (3-D coordinate system). An adjustment of the Canadian Base Network and high-order GPS tied to the Canadian Active Control System (CACS). Reference ellipsoid is GRS80. These coordinates may not be compatible with NAD83 public values.

1 Overview

With a new focus on positioning from space, Geodetic Survey has created a dynamic infrastructure to serve both present and future needs for positioning. The Canadian Base Network, Level 1 (CBN1) is designed to serve as the new ground segment of monumented survey control in the Canadian Spatial Reference System (CSRS).

The CBN1 is a network of pillar monuments with forced-centring plates, positioned three-dimensionally with GPS to centimetre-level accuracy with respect to the Canadian Active Control System (CACS). It provides the link between the existing framework and the CACS. The network consists of an array of pillars at an average spacing of 200 km in the built-up areas of southern Canada, 500 km in the middle regions of Canada, and 1000 km in the northern areas. As well as being a GPS control network, the CBN1 can serve as a monitoring network for deformation studies of the Canadian landmass.

The data format of the CBN1 information could be GML (ASCII) or SHAPE. CBN1 information would include geographic, UTM and cartesian coordinates; ellipsoid height and geoids undulation; orthometric elevation; station monumentation, location description and inspection data.

2 Data Identification

2.1 Spatial resolution (“scale”)

The network consists of an array of pillars (approximately 150) at an average spacing of 200 km in the built-up areas of southern Canada, 500 km in the middle regions, and 1000 km in the northern areas.

2.2 Language

The main language used in the dataset (points) is English, although some French is also used.

2.3 Character set

The character coding standard used for the dataset is ISO-8859-1.

2.4 Topic category

The CBN1 is designed to serve as a fundamental 3-D reference framework for spatial positioning in Canada (the geodetic Canadian Spatial Reference System - CSRS).

According to the GCMD¹ (Global Change Master Directory) thesauri, CBN1 can be classified into Science keywords structured using a 4 levels hierarchy: category > topic > term > variable. The following list indicates which have been retained for Canadian Base Network, Level 1.

CATEGORY > TOPIC > TERM > VARIABLE

- EARTH SCIENCE > SOLID EARTH > GEODETIC > CONTROL SURVEYS
- EARTH SCIENCE > SOLID EARTH > GEODETIC > REFERENCE SYSTEMS
- EARTH SCIENCE > HUMAN DIMENSIONS > BOUNDARIES > SURVEYS

¹ Information about the NASA Global Change Master Directory (GCMD) can be found at:
<http://gcmd.nasa.gov>.

Other topics related to CBN1 are: Global Positioning System, GPS, Canadian Spatial Reference System, CSRS, NAD83CSRS, Horizontal, Vertical, Elevation, Latitude, Longitude, Ellipsoidal Height, Canadian Base Network, CBN.

2.5 Geographic box

The geographic box or minimum bounding rectangle (MBR) delineating the coverage of all existing CBN1 geodetic points in Canada is:

- West Bounding Coordinate: 141° West (or -140°)
- East Bounding Coordinate: 52° West (or -52°)
- North Bounding Coordinate: 84° North (or 84°)
- South Bounding Coordinate: 41.5° North (or 41.5°)

2.6 Geographic description

Data are available for the entire Canadian landmass at a spacing of 200 km in the built-up areas of Southern Canada, 500 km in the middle regions of Canada, and 1000 km in the northern areas.

2.7 Extent

The elevation extent (minimum value and maximum value) for the CBN1 is categorized according to two reference systems.

1) Mean sea level height

- Minimum elevation value is 5.
- Maximum elevation value is 2128.
- Unit of measure for elevation is the metre.
- Datum used to determine the elevation is Canadian Geodetic Vertical Datum of 1928 (CGVD28).

2) Ellipsoid height

- Minimum elevation value is -32.
- Maximum elevation value is 2125.
- Unit of measure for elevation is the metre.
- Datum used to determine the elevation is Geodetic Reference System of 1980 (GRS80).

3 Geospatial Characteristics

3.1 Spatial representation type

The method used to spatially represent CBN1 is vector data.

3.2 Spatial representation (VD) (GD)

The CBN1 are 3-D spatial points. The set of CBN1 points forms a geodetic network.

3.3 Coverage and continuity

The CBN1 is seamless across Canada.

3.4 Data segmentation (VD)

NOT APPLICABLE

4 Data Model (VD)

4.1 Data modelling schema used (VD)

The data-modelling schema used is UML.

4.2 Application schema (Conceptual model) (VD)

Canadian Base Network, Level 1 (CBN1) data are represented in GeoBase as a point feature. Each CBN1 feature is unique and independent. There is no relationship or association between CBN1 features or with other external feature.

CBN1 FEATURE
UNIQUE NUMBER
MARKER GROUP
REPORT DATE
NAME
ESTABLISHING AGENCY
PROVINCE
PROVINCE IDENTIFIER **
HORIZONTAL DATUM **
HORIZONTAL METHOD
LATITUDE
LONGITUDE
LATITUDE STANDARD DEVIATION **
LONGITUDE STANDARD DEVIATION **
NTS MAP NO
UTM ZONE
UTM NORTHING
UTM EASTING
HORIZONTAL COORDINATE EPOCH **
HORIZONTAL COORDINATE PUBLISHED BY **
HORIZONTAL ADJUSTMENT NETWORK **
GEOID MODEL **
GEOID HEIGHT **
ELLIPSOIDAL HEIGHT **
ELLIPSOIDAL HEIGHT STANDARD DEVIATION **
X COORDINATE **
Y COORDINATE **
Z COORDINATE **
VERTICAL DATUM **
VERTICAL ORDER **
VERTICAL METHOD **
ELEVATION **
ELEVATION PUBLISHED YEAR **
VERTICAL ADJUSTMENT NETWORK **
MARKER TYPE
INSPECTION DATE
MARKER CONDITION
INSPECTION COMMENTS **
TRANSPORTATION MODE **
WALKING DISTANCE **
MARKER LOCALITY **
ENGLISH LOCATION DESCRIPTION **
FRENCH LOCATION DESCRIPTION **
REFERENCE STATIONS INFORMATION **
HISTORICAL COORDINATES **
PROJECT IDENTIFIERS

NOTE: ** Attribute not always available.

5 Data Dictionary / Feature Catalogue (VD)

The CBN1 feature attributes listed below are a subset of the *Canadian Spatial Reference System Database (CSRS DB)*. The *CSRS DB Data Model and Data Dictionary* document² presents the data-modelling schema in the form of an Entity-Relationship diagram adjusted for GeoBase.

ATTRIBUTE NAME	CORRESPONDING CSRS DB TABLE – COLUMN - DATA TYPE	DATA TYPE (OUTPUT FORMAT)	DESCRIPTION
UNIQUE NUMBER	STATION_MARKS - STATION_NO - VARCHAR2(8)	STRING	The unique station identifier of a survey monument, which may comprise of between 5 to 8 alpha/numeric characters. For more information on "Unique Numbers" and its coding see Appendix A of <i>CSRS DB Data Model and Data Dictionary</i>
MARKER GROUP	Returned on output according to its group	STRING	The name identifying a group of geodetic markers. Possible Marker Groups are listed below.
REPORT DATE	Returned on output according to computer system date	STRING (DD-MMM-YYYY)	The date the data is queried out of GSD's CSRS database.
NAME	STATION_MARKS - STATION_NAME - VARCHAR2(16)	STRING	The station name. There could be several stations with the same name. The "Name" could be what is stamped on the monument or another agency's identifier or a local name for the area.
ESTABLISHING AGENCY	STATION_MARKS - AGENCY - NUMBER(3) → <u>CODE</u> ³ AGENCIES – ENGLISH_DESCRIPTION – VARCHAR2(60)	STRING	The name of the agency that established the survey monument.
PROVINCE	STATION_MARKS - PROVINCE - VARCHAR2(2)	STRING	The province in which the monument is located. Canada Post and ISO3166 codes are used. Possible Province Codes are listed below.
PROVINCE IDENTIFIER	STATION_NAMES - NAME - VARCHAR2(20)	STRING	The identifier used by the province in which the monument is located, if different from GSD's Unique Number.
HORIZONTAL DATUM	ADJUSTMENT_PROJECTS - REFERENCE_SYSTEM - VARCHAR2(10)	STRING	The geodetic datum specifying the coordinate system in which horizontal control points are located. It's also called horizontal datum.
HORIZONTAL METHOD	GEODETIC_COORDS - HORIZONTAL_METHOD - VARCHAR2(1) → <u>CODE</u> HORIZONTAL_METHODS – ENGLISH_DESCRIPTION – VARCHAR2(60)	STRING	The method of survey in which the horizontal coordinate were derived.

² This document can be found at <http://www.geobase.ca/> - in the Data section.

³ Attribute code field described in another table of the database.

ATTRIBUTE NAME	CORRESPONDING CSRS DB TABLE – COLUMN - DATA TYPE	DATA TYPE (OUTPUT FORMAT)	DESCRIPTION
LATITUDE	GEODETIC_COORDS - NUMBER(12,6)	STRING (N99° 99' 99.9999")	The angular distance north or south of the earth's equator, measured in degrees, minutes and seconds along a meridian.
LONGITUDE	GEODETIC_COORDS - LONGITUDE - NUMBER(13,6)	STRING (W999° 99' 9999")	The angular distance on the earth's surface, measured east or west from the prime meridian at Greenwich, to the meridian passing through a position, measured in degrees, minutes, and seconds.
LATITUDE STANDARD DEVIATION	GEODETIC_COORDS - LATITUDE_SD - NUMBER(10,4)	NUMBER(4,3) (9.999)	The standard deviation in metre of the latitude in the NAD83CSRS system.
LONGITUDE STANDARD DEVIATION	GEODETIC_COORDS - LONGITUDE_SD - NUMBER(10,4)	NUMBER(4,3) (9.999)	The standard deviation in metre of the longitude in the NAD83CSRS system.
NTS MAP NO	Computed on output using the Latitude and Longitude	STRING (999A99)	The National Topographic System (NTS) map sheets number in which the coordinates for the monument fall.
UTM ZONE	Computed on output using the Latitude and Longitude	NUMBER(2) (99)	UTM zone. A series of central meridians defined by 6 degrees of longitude zones starting at 180 degrees west.
UTM NORTHING	Computed on output using the Latitude and Longitude	NUMBER(9,2) (9999999,99)	UTM Northing. The distance from the equator in metres.
UTM EASTING	Computed on output using the Latitude and Longitude	NUMBER(8,2) (999999,99)	UTM Easting. Eastings are measured from a separate point for each zone, namely, an imaginary line lying 500 000 metres west of the zone's central meridian.
HORIZONTAL COORDINATE EPOCH	ADJUSTMENT_PROJECTS - BELONGS_EPOCH - VARCHAR2(10)	STRING (YYYY)	The particular instant in time from which an adjustment(s) are calculated. This date (year) coincides with the ITRF realization used in the adjustment.
HORIZONTAL COORDINATE PUBLISHED BY	ADJUSTMENT_PROJECTS - AGENCY - NUMBER(3) → <u>CODE</u> AGENCIES – ENGLISH_DESCRIPTION – VARCHAR2(60)	STRING	The name of the agency responsible for the adjusted horizontal coordinates.
HORIZONTAL ADJUSTMENT NETWORK	GEODETIC_COORDS - ADJUSTMENT_PROJ_ID - VARCHAR2(10)	STRING	The adjustment network identifying a group of stations whose horizontal or 3D coordinates were derived from the same least-square adjustment.
GEOID MODEL	Returned on output as constant	STRING	The name identifying the model from which the geoids height is computed, currently it is HTv2.0.
GEOID HEIGHT	Computed on output using the Latitude and Longitude.	NUMBER(6,3) (±999.999)	The height of the geoids above the reference ellipsoid. Currently it is the separation between the NAD83CSRS ellipsoid and the CGVD28 levelling datum. The formula to calculate the ellipsoidal (h) or orthometric (H) height is: h (GPS) = H (Levelling) + N (Geoids Height).

ATTRIBUTE NAME	CORRESPONDING CSRS DB TABLE – COLUMN - DATA TYPE	DATA TYPE (OUTPUT FORMAT)	DESCRIPTION
ELLIPSOIDAL HEIGHT	GEODETIC_COORDS - ELLIPSOIDAL_HEIGHT - NUMBER(9,4)	NUMBER(5,2) (999.99)	The height above the reference ellipsoid. There are only Ellipsoidal Heights for stations with published NAD83CSRS coordinates.
ELLIPSOIDAL HEIGHT STANDARD DEVIATION	GEODETIC_COORDS - ELLIPSOID_HEIGHT_SD - NUMBER(9,4)	NUMBER(4,3) (9.999)	The standard deviation in metre of the ellipsoidal height in the NAD83CSRS system.
X COORDINATE	Computed on output using the latitude, longitude and ellipsoidal height	NUMBER(9,2) (±9999999.99)	Cartesian Coordinates (X) allow for Geodetic quality three-dimensional positioning (in metres) on an earth-centred ellipsoid.
Y COORDINATE	Computed on output using the latitude, longitude and ellipsoidal height	NUMBER(9,2) (±9999999.99)	Cartesian Coordinates (Y) allow for Geodetic quality three-dimensional positioning (in metres) on an earth-centred ellipsoid.
Z COORDINATE	Computed on output using the latitude and ellipsoidal height	NUMBER(9,2) (±9999999.99)	Cartesian Coordinates (Z) allow for Geodetic quality three-dimensional positioning (in metres) on an earth-centred ellipsoid.
VERTICAL DATUM	ADJUSTMENT_PROJECTS - REFERENCE_SYSTEM - VARCHAR2(10)	STRING	The geodetic datum specifying the system on which vertical values are reference too.
VERTICAL ORDER	VERT_COORDS - VERTICAL_ORDER - VARCHAR2(1) → <u>CODE</u> VERTICAL_ORDERS – ENGLISH_DESCRIPTION – VARCHAR2(60)	STRING	An accuracy indicator given to the orthometric elevation according to Mean sea Level (MSL).
VERTICAL METHOD	VERT_COORDS - VERTICAL_METHOD - VARCHAR2(1) → <u>CODE</u> VERTICAL_METHODS – ENGLISH_DESCRIPTION – VARCHAR2(60)	STRING	The method of survey in which the orthometric elevation was derived.
ELEVATION	VERT_COORDS - ORTHO_HEIGHT - NUMBER(14,9)	NUMBER(7,3) (9999.999)	The elevation in metres above a reference datum.
ELEVATION PUBLISHED YEAR	VERT_COORDS - PUBLISHED – DATE	STRING (YYYY)	The year the adjusted orthometric elevation was published.
VERTICAL ADJUSTMENT NETWORK	VERT_COORDS - ADJUSTMENT_PROJ_ID - VARCHAR2(10)	STRING	The vertical adjustment network identifies a group of stations whose orthometric elevation was derived from the same least-square adjustment.
MARKER TYPE	STATION_MARKS - MARKER_TYPE - VARCHAR2(2) → <u>CODE</u> MARKER_TYPES – ENGLISH_DESCRIPTION – VARCHAR2(60)	STRING	The type of marker left behind to identify the survey monument.

ATTRIBUTE NAME	CORRESPONDING CSRS DB TABLE – COLUMN - DATA TYPE	DATA TYPE (OUTPUT FORMAT)	DESCRIPTION
INSPECTION DATE	INSPECTIONS - REPORTED_ON - DATE	STRING (YYYY)	The date the survey monument was last inspected.
MARKER CONDITION	INSPECTIONS - MARKER_CONDITION - NUMBER(1) → <u>CODE</u> MARKER_CONDITIONS – ENGLISH_DESCRIPTION – VARCHAR2(25)	STRING	The condition in which the survey monument was found on its last inspection.
INSPECTION COMMENTS	INSPECTIONS - REPORT_TEXT - VARCHAR2(240)	STRING	The comments made by the inspector on the condition of the survey monument.
TRANSPORTATION MODE	ACCESSIBILITIES - TRANSPORTATION - VARCHAR2(1) → <u>CODE</u> TRANSPORTATIONS – ENGLISH_DESCRIPTION – VARCHAR2(40)	STRING	The type of transportation used to get to the survey monument.
WALKING DISTANCE	ACCESSIBILITIES - DISTANCE - NUMBER(2) → <u>CODE</u> DISTANCES – ENGLISH_DESCRIPTION – VARCHAR2(60)	STRING	The distance walked from the type of transportation used to the survey monument.
MARKER LOCALITY	ENGLISH_DESCRIPTIONS - TEXT - VARCHAR2(60)	STRING	The nearest town to the survey monument.
ENGLISH LOCATION DESCRIPTION	ENGLISH_DESCRIPTIONS - TEXT - VARCHAR2(60)	STRING	The English station description describing how to re-locate the survey monument.
FRENCH LOCATION DESCRIPTION	FRENCH_DESCRIPTIONS – TEXT - VARCHAR2(60)	STRING	The French station description describing how to re-locate the survey monument.
REFERENCE STATIONS INFORMATION	STA_REFERENCES - REFERENCE_NAME VARCHAR2(30), MARKER_TYPE VARCHAR2(2), AZ_OR_DISTANCE NUMBER(8,1), DISTANCE – NUMBER(11,3), DISTANCE_CODE CHAR(1), DIFF_IN_ELEVATION NUMBER(5)	STRING	Some geodetic markers have up to three reference markers near by. Their name, magnetic bearing, slope or horizontal distance, and difference in elevation are listed.

ATTRIBUTE NAME	CORRESPONDING CSRS DB TABLE – COLUMN - DATA TYPE	DATA TYPE (OUTPUT FORMAT)	DESCRIPTION
HISTORICAL COORDINATES	GEODETIC_COORDS – LATITUDE NUMBER(12,6), LONGITUDE NUMBER(12,6), HORIZONTAL_METHOD VARCHAR2(1) – ADJUST_PROJ_ID VARCHAR2(10), ADJUSTMENT_PROJECTS - REFERENCE_SYSTEM - VARCHAR2(10) – ADJUST_PROJ_ID VARCHAR2(10), HORIZONTAL_METHODS - ENGLISH VARCHAR2(60) - HORIZONTAL_METHOD VARCHAR2(1)	STRING	Previously published latitude, longitude with their UTM coordinates, survey method and datum (NAD27 or NAD83).
PROJECT IDENTIFIERS	OTHER_PROJECT_STATI ONS – OTHER_PROJ_ID - VARCHAR2(10)	STRING	The name of projects the marker has been part of.

Marker Groups

- Canadian Base Network (NAD83CSRS)
- Horizontal Control Network 2-D (NAD83)
- Primary Vertical Control Network (CGVD28)
- Special Purpose 3-D Network (NAD83CSRS)

Province Codes

- | | | | |
|-----------|-----------------------|-----------|----------------------|
| AB | Alberta | NU | Nunavut |
| BC | British Columbia | ON | Ontario |
| MB | Manitoba | PE | Prince Edward Island |
| NB | New Brunswick | PQ | Quebec |
| NF | Newfoundland | SK | Saskatchewan |
| NS | Nova Scotia | YT | Yukon Territory |
| NT | Northwest Territories | | |

States and Countries

- | | | | |
|-----------|--------------------------|-----------|--------------|
| AK | Alaska | NY | New York |
| ID | Idaho | ND | North Dakota |
| ME | Maine | OH | Ohio |
| MI | Michigan | PA | Pennsylvania |
| MN | Minnesota | VT | Vermont |
| MT | Montana | WA | Washington |
| NH | New Hampshire | WI | Wisconsin |
| DK | Groenland | | |
| FR | Saint-Pierre-et-Miquelon | | |
| US | (State Unknown) | | |

Marker Conditions

- Damaged
- Destroyed
- Good
- Inaccessible
- Marker displaced
- Not found
- Repaired
- Special equipment required
- Unreliable

6 Coordinate Reference System

Geodetic 3-dimensional coordinate reference system (Φ , λ , h); Geocentric 3-dimensional reference system (latitude, longitude, ellipsoid height).

6.1 Horizontal reference system

NAD83CSRS - North American Datum 1983 Canadian Spatial Reference System (3-D coordinate system). An adjustment of the Canadian Base Network and high-order GPS tied to the Canadian Active Control System (CACS). Reference ellipsoid is GRS80. These coordinates may not be compatible with NAD83 public values.

6.1.1 Horizontal coordinate system

Data is stored in latitude (Φ) and longitude (λ) geographic coordinates.

6.1.2 Unit of measure (coordinate system axis units)

The unit of measure for storing horizontal spatial data is decimal of seconds, given to 4 significant digits after the decimal (1×10^{-4}).

6.2 Vertical reference system

CGVD28 Canadian Geodetic Vertical Datum 1928, mean sea level. (Adopted, public vertical reference system.). The average height of the surface of the sea for all stages of the tide. Usually determined by averaging height readings observed hourly over a minimum period of 19 years.

6.2.1 Unit of measure (coordinate system axis units)

The unit of measure for storing vertical spatial data is the metre (m), given 3 significant digit after the decimal (1×10^{-3}).

7 Data Quality

7.1 Scope

NOT APPLICABLE

7.2 Lineage

Primary Reference Layer

7.3 Completeness

NOT APPLICABLE

7.4 Logical consistency

NOT APPLICABLE

7.5 Positional accuracy

Absolute accuracy is few centimetres.

Relative accuracy is few centimetres.

Gridded data position accuracy is few centimetres.

7.6 Temporal accuracy

Because of the dynamic nature of the data, it is current at the time of retrieval.

7.7 Thematic (attributes) accuracy

NOT APPLICABLE

8 Metadata

There are usually 2 levels of metadata to describe a product, as shown in following figure: collection and product/dataset. The higher level of metadata covers the entire data collection: it applies to the series of available datasets (group of features), database, etc. The other level, called product level metadata, gives specific information about each dataset.

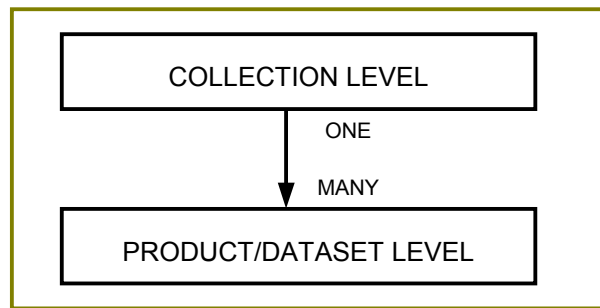


Figure 1: Metadata Levels

For the Canadian Base Network, Level 1 metadata exist only for the entire collection. There is no product-level metadata because all CBN1 features are part of a unique source database.

CBN1 metadata are available via GeoBase Portal (in the Data section at <http://www.geobase.ca>) and GeoConnections Discovery Portal (in the Data section at <http://geodiscover.cgdi.ca>).

9 Data Portrayal / Data Transfer Format / Physical Model

9.1 Conversion process

The CBN1 data is stored in an Oracle database and is converted to GML or to SHAPE formats.

9.2 Files

NOT APPLICABLE

9.3 Directories

NOT APPLICABLE

9.4 Point entities (VD)

NOT APPLICABLE

9.5 Linear entities (VD)

NOT APPLICABLE

9.6 Surficial entities (VD)

NOT APPLICABLE

10 Data Delivery

10.1 Format information

The available output file formats for the product are: GML (Geography Markup Language) in ASCII and SHAPE (ESRI™). Appendix A presents the name and data type of each attribute in both formats. An example of a dataset in GML (ASCII) format is presented in Appendix B.

10.2 Medium information

The datasets are available on-line via an FTP site. The customer is informed by e-mail when the process is complete and the file is available for transfer.

10.3 Constraints information

The constraints information for data access and data use are defined in the GeoBase Unrestricted Use Licence Agreement (<http://www.geobase.ca/> - in the Data section).

11 Data Capture and Maintenance

Data are maintained as needed.

Update scope – re-observed lines.

APPENDIX A: Attributes in GML and in SHAPE Formats

CBN1 ATTRIBUTE NAME	GML ⁴ ATTRIBUTE NAME	SHAPE ATTRIBUTE NAME	SHAPE DATA TYPE
UNIQUE NUMBER	uniqueNumber	UNIQUENO	char(8)
MARKER GROUP	markerGroup	GROUP	char(41)
REPORT DATE	reportDate	REPORTDATE	char(11)
NAME	name	NAME	char(16)
ESTABLISHING AGENCY	establishingAgency	AGENCY	char(60)
PROVINCE	province	PROVINCE	char(2)
PROVINCE IDENTIFIER **	provinceIdentifier	PROVINCEID	char(20)
HORIZONTAL DATUM **	horizontalDatum	HORIZDATUM	char(10)
HORIZONTAL METHOD	horizontalMethod	HORIZMETH	char(60)
LATITUDE	latitude	LATITUDE	char(17)
LONGITUDE	longitude	LONGITUDE	char(18)
LATITUDE STANDARD DEVIATION **	latitudeStandardDeviation	LATSTDDEV	number(4,3)
LONGITUDE STANDARD DEVIATION **	longitudeStandardDeviation	LONSTDDEV	number(4,3)
NTS MAP NO	ntsMapNo	NTSMAPNO	char(6)
UTM ZONE	utmZone	UTMZONE	number(2)
UTM NORTHING	utmNorthing	UTMNORTH	number(9,2)
UTM EASTING	utmEasting	UTMSOUTH	number(8,2)
HORIZONTAL COORDINATE EPOCH **	horizontalCoordinateEpoch	HORIZEPOCH	char(4)
HORIZONTAL COORDINATE PUBLISHED BY **	horizontalCoordinatePublishedBy	HPUBLISHER	char(60)
HORIZONTAL ADJUSTMENT NETWORK **	horizontalAdjustmentNetwork	HADJUSNET	char(10)
GEOID MODEL **	geoidModel	GEOIDMODEL	char(6)
GEOID HEIGHT **	geoidHeight	GEOIDHT	number(6,3)
ELLIPSOIDAL HEIGHT **	ellipsoidalHeight	ELLHEIGHT	number(5,2)
ELLIPSOIDAL HEIGHT STANDARD DEVIATION **	ellipsoidalHeightStandardDeviation	ELLSTDDEV	number(4,3)
X COORDINATE **	xCoordinate	XCOORD	number(9,2)
Y COORDINATE **	yCoordinate	YCOORD	number(9,2)
Z COORDINATE **	zCoordinate	ZCOORD	number(9,2)
VERTICAL DATUM **	verticalDatum	VERTDATUM	char(10)
VERTICAL ORDER **	verticalOrder	VERTORDER	char(60)
VERTICAL METHOD **	verticalMethod	VERTMETH	char(60)
ELEVATION **	elevation	ELEVATION	number(7,3)
ELEVATION PUBLISHED YEAR **	elevationPublishedYear	ELEPUBYEAR	char(4)

NOTE: ** This attribute is not always available.

⁴ For GML format data type is always TEXT (STRING).

APPENDIX A: Attributes in GML and in SHAPE Formats (Continued)

CBN1 ATTRIBUTE NAME	GML⁵ ATTRIBUTE NAME	SHAPE ATTRIBUTE NAME	SHAPE DATA TYPE
VERTICAL ADJUSTMENT NETWORK **	verticalAdjustmentNetwork	VADJUSTNET	char(10)
MARKER TYPE	markerType	MARKERTYPE	char(60)
INSPECTION DATE	inspectionDate	INSPECDATE	char(4)
MARKER CONDITION	markerCondition	STATUS	char(25)
INSPECTION COMMENTS **	inspectionComments	COMMENTS	char(240)
TRANSPORTATION MODE **	transportationMode	TRANSMODE	char(40)
WALKING DISTANCE **	walkingDistance	WALKDIST	char(60)
MARKER LOCALITY **	markerLocality	LOCALITY	char(60)
ENGLISH LOCATION DESCRIPTION **	englishLocationDescription	ENGLISHLOC	char(255)
FRENCH LOCATION DESCRIPTION **	frenchLocationDescription	FRENCHLOC	char(255)
REFERENCE STATIONS INFORMATION **	referenceStationsInformation	REFINFO	char(255)
HISTORICAL COORDINATES **	historicalCoordinates	HISTORICAL	char(255)
PROJECT IDENTIFIERS	projectIdentifier	PROJECTIDS	char(187)

NOTE: ** This attribute is not always available.

⁵ For GML format data type is always TEXT (STRING).

APPENDIX B: Example of CBN1 Dataset in GML Format

Extract from a GML file – CBN1 Geodetic Marker 963021

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<gsd:GSDCollection xmlns:gsd="http://www.geobase.ca/gsd"
xmlns:gml="http://www.opengis.net/gml"
xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.geobase.ca/gsd geodeticMarker.xsd">
<gml:description>Natural Resources Canada - Geodetic Survey Division -
Geodetic markers description </gml:description>
<gml:name>[963021]</gml:name>
<gml:boundedBy>
<gml:Box srsName="http://www.opengis.net/gml/srs/epsg.xml#4326">
<gml:coordinates/>
</gml:Box>
</gml:boundedBy>
<gml:featureMember>
<gsd:GeodeticMarker><gsd:uniqueNumber>963021</gsd:uniqueNumber>
<gsd:markerGroup>Canadian Base Network (NAD83CSRS)</gsd:markerGroup>
<gsd:reportDate>24-Jan-2003</gsd:reportDate>
<gsd:name>PETERBOROUGH</gsd:name>
<gsd:establishingAgency>Geodetic Survey Division -
Nrcan</gsd:establishingAgency>
<gsd:province>ON</gsd:province>
<gsd:provinceIdentifier>None</gsd:provinceIdentifier>
<gsd:horizontalDatum>NAD83CSRS</gsd:horizontalDatum>
<gsd:horizontalMethod>Global Positioning System</gsd:horizontalMethod>
<gsd:latitude>N44° 18' 38.7774"</gsd:latitude>
<gsd:longitude>W78° 18' 10.4488"</gsd:longitude>
<gsd:latitudeStandardDeviation
units="meters">0.001</gsd:latitudeStandardDeviation>
<gsd:longitudeStandardDeviation
units="meters">0.001</gsd:longitudeStandardDeviation>
<gsd:ntsMapNo>031D08</gsd:ntsMapNo>
<gsd:utmZone>17</gsd:utmZone>
<gsd:utmNorthing units="meters">4909928.51</gsd:utmNorthing>
<gsd:utmEasting units="meters">715107.54</gsd:utmEasting>
<gsd:horizontalCoordinateEpoch>1997</gsd:horizontalCoordinateEpoch>
<gsd:horizontalCoordinatePublishedBy>Geodetic Survey Division -
Nrcan</gsd:horizontalCoordinatePublishedBy>
<gsd:horizontalAdjustmentNetwork>M01707</gsd:horizontalAdjustmentNetwork>
<gsd:geoidModel>HTv2.0</gsd:geoidModel>
<gsd:geoidHeight units="meters">-35.497</gsd:geoidHeight>
<gsd:ellipsoidalHeight units="meters">208.25</gsd:ellipsoidalHeight>
<gsd:ellipsoidalHeightStandardDeviation
units="meters">0.006</gsd:ellipsoidalHeightStandardDeviation>
<gsd:xCoordinate units="meters">926829.66</gsd:xCoordinate>
<gsd:yCoordinate units="meters">-4476633.12</gsd:yCoordinate>
<gsd:zCoordinate
units="meters">4433011.76</gsd:zCoordinate><gsd:verticalDatum>CGVD28</gsd:vert
icalDatum>
```

Extract from a GML file – CBN1 Geodetic Marker 963021 (Continued)

```
<gsd:verticalOrder>First Order</gsd:verticalOrder>
<gsd:verticalMethod>Differential</gsd:verticalMethod>
<gsd:elevation units="meters">243.742</gsd:elevation>
<gsd:elevationPublishedYear>1999</gsd:elevationPublishedYear>
<gsd:verticalAdjustmentNetwork>N22U99</gsd:verticalAdjustmentNetwork>
<gsd:markerType>Self Centering Plate</gsd:markerType>
<gsd:inspectionDate>1999</gsd:inspectionDate>
<gsd:markerCondition>Good</gsd:markerCondition>
<gsd:inspectionComments>No inspection text on file</gsd:inspectionComments>
<gsd:transportationMode>passenger car or light truck</gsd:transportationMode>
<gsd:walkingDistance>walk of less than 50 m</gsd:walkingDistance>
<gsd:markerLocality>PETERBOROUGH</gsd:markerLocality>
<gsd:englishLocationDescription>PETERBOROUGH CONCRETE PILLAR WITH STEEL TOP
PLATE IN GROUNDS OF ASHBURNHAM MEMORIAL PARK, IMMEDIATELY NORTH OF
PETERBOROUGH CENTENIAL MUSEUM AND ARCHIVES (CIVIC NO. 300 HUNTER STREET),
ABOUT 355 M NORTH (MEASURED ALONG ACCESS ROAD TO PARK AND MUSEUM) FROM CENTRE
OF HUNTER STREET, 123.4 M NORTHEAST OF NORTHEAST CORNER OF MUSEUM, 36.8 M
SOUTHWEST OF SOUTHWEST CORNER OF KIWANIS CLUB OF SCOTT'S PLAINS MONUMENT
(SQUARE CONCRETE PIER WITH COMPASS-CARD ON TOP), 21.3 M WEST OF CENTRE OF ROAD
TO LOOKOUT. ELEVATION TAKEN ON TOP AT CENTRE OF MAIN CIRCULAR PLATE ANCHORED
ON TOP OF PILLAR. </gsd:englishLocationDescription>
<gsd:projectIdentifiers>GPS CBN VA290U60 44078 </gsd:projectIdentifiers>
<gml:location>
<gml:Point>
<gml:coordinates>-78.302902453,44.310771491</gml:coordinates>
</gml:Point>
</gml:location>
</gsd:GeodeticMarker>
</gml:featureMember>
</gsd:GSDCollection>
```