Canadian Digital Elevation Data, Level 1
Product Specifications

Edition 1.0

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REVISION HISTORY

Date	Version	Description
January - 2003	1.0	Original version

FUTURE WORK

Key word	Description

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ACRONYMS AND ABBREVIATIONS

CDED1	Canadian Digital Elevation Data, Level 1
CTI	Centre for Topographic Information
DEM	Digital Elevation Model
DTED	Digital Terrain Elevation Data
FTP	File Transfer Protocol
GIS	Geographic Information System
MBR	Minimum-bounding Rectangle
MSL	Mean Sea Level
NAD	North American Datum
NATO STANAG	North Atlantic Treaty Organization Standardization Agreement
NTDB	National Topographic Data Base
NTS	National Topographic System
USDMA	United States Defense Mapping Agency
USGS	United States Geological Survey
WGS	World Geodetic System

TERMS AND DEFINITIONS

Break line

A created line that marks a sudden change in a surface characteristic, i.e. a vertical inflection line on the hillside of a mountain: also called a lateral ridge.

Contour line

An imaginary line on the ground connecting an infinite number of points of equal elevation recorded in metres relative to Mean Sea Level (MSL) based on the North American Datum 1983 horizontal reference datum. The four principle types of contours are: index, intermediate, approximate and depression.

Data set

The source data that originates from the scanned hypsographic and hydrographic elements of 1:50 000 and 1:250 000 NTS maps or various scaled positional data acquired from the provinces and territories.

DEM

A numerical representation of the earth's surface based on a collection of elevations. A DEM is a sub-set of a Digital Terrain Model (DTM).

Drain line

A created line that marks the course followed by the natural flow of water on the earth's surface, draining an area or another body of water. A drain line is similar to a stream but is added to the data set as an enhancement. Drain lines are opposites of break lines.

Edge matching

Edge matching is a process of matching elevation values along quadrangle edges or at the CDED1 file limits.

Map

The organizational unit of the National Topographic System (NTS). Under the NTS, Canada is divided into numbered primary quadrangles, each 4º latitude by 8º longitude south of 80º, and 4º latitude by 16º longitude north of 80º. One whole primary quadrangle constitutes a 1:1 000 000 component: there are 16 1:250 000 in a primary quadrangle and 16 1:50 000 in a 1:250 000 component.

Neatline

The outer extremity of the map, which is primarily positioned by a series of coordinates corresponding to the four corners of an NTS map and the centre of the upper and lower lines of latitude. These coordinates (supplied by CTI) must remain fixed at all times.

Ridge line

A line of high ground with minor variations in elevations along its crest. The ridge is not simply a line of hills: all points on the ridge are higher than the ground on either side of the ridge.

Spot height

A point feature on the map, indicating the position of an elevation that has been photogrammetrically determined.

1 Overview

The Canadian Digital Elevation Data, Level 1 (CDED1) consists of an ordered array of ground elevations at regularly spaced intervals. The CDED1 is based on National Topographic Data Base (NTDB) digital files at scales of 1:50 000 and 1:250 000 or various scaled positional data acquired from the provinces and territories, according to the National Topographic System (NTS).

The coverage for every file corresponds to half an NTS map, which means that there are western and eastern parts to the CDED1 for each NTS map. The grid spacing is based on geographic coordinates at a maximum and minimum resolution of 0.75 and 3 arc seconds for the 1:50 000, and 3 and 12 arc seconds for the 1:250 000 respectively, depending on latitude. A CDED1 file consists of elevation data recorded in metres relative to Mean Sea Level (MSL) based on the North American Datum 1983 (NAD83) horizontal reference datum. The Centre for Topographic Information (CTI) jointly produces the CDED1 with federal, provincial and territorial government agencies as well as the private sector, using terrain-modelling software.

CDED1 has assumed a major role in digital mapping. The data is used in Geographic Information Systems (GIS) for land-management applications. CDED1 plays the same role as contours and relief shading on conventional paper maps but is more powerful analytically. In addition to providing estimated values of elevation points, CDED1 can be used to determine orientation and the slope of each point when used in GIS applications. CDED1 can also be used for terrain modelling, for calculating the influence of the terrain on line-of-sight, for radar imaging, for simulating flooding and similar applications.

CDED1 files are delivered in ASCII format for either DOS or UNIX operating systems and are available via the File Transfer Protocol (FTP). The data should be compatible with all translators designed for the United States Geological Survey (USGS) Digital Terrain Elevation Data (DTED). The files are compressed using the PKZIP compression software.

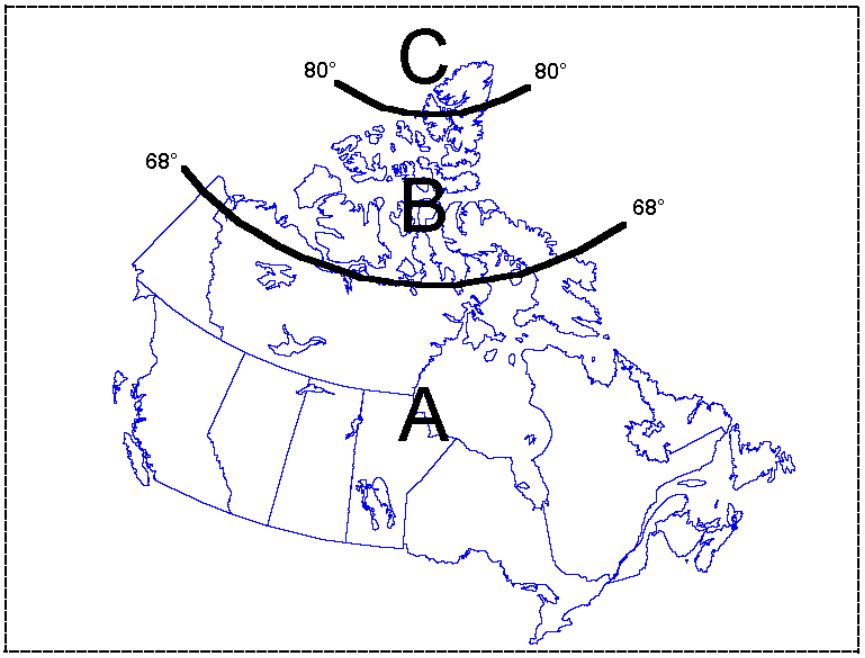
2 Data Identification

2.1 Spatial resolution (“scale”)

NTS maps at scales of 1:50 000 and 1:250 000 normally cover two CDED1 cells: an eastern and a western cell.

Cell coverage varies according to three geographic areas (A, B, C). All cells contain the same number of nodes (elevations). All profiles are oriented north south and contain 1201 elevation points. Each cell holds 1201 profiles, for a total of 1 442 401 elevation points.

Coverage of the Three Geographic Areas



1:50 000 CDED1 cell coverage according to the Three Geographic Areas

GEOGRAPHIC AREA	LATITUDE		SPACING (latitude and longitude in arc seconds)		SPACING (in metres, approximate)		CELL COVERAGE (latitude - longitude)		
	from	to	lat.	long.	N.-S.	E.-W.			
A	—	68°	0.75"	0.75"	23 m	16-11 m	15'	x	15'
B	68°	80°	0.75"	1.5"	23 m	17-8 m	15'	x	30'
C	80°	90°	0.75"	3"	23 m	17-8 m	15'	x	1°

1:250 000 CDED1 cell coverage according to the Three Geographic Areas

GEOGRAPHIC AREA	LATITUDE		SPACING (latitude and longitude in arc seconds)		SPACING (in metres, approximate)		CELL COVERAGE (latitude - longitude)		
	from	to	lat.	long.	N.-S.	E.-W.			
A	—	68°	3"	3"	93 m	65-35 m	1°	x	1°
B	68°	80°	3"	6"	93 m	69-32 m	1°	x	2°
C	80°	90°	3"	12"	93 m	65-32 m	1°	x	4°

2.2 Language

The language used within the dataset is English.

2.3 Character set

Data is written as ANSI Standard ASCII characters (ISO 646 US) and recorded in IBM Standards fixed-block format. This format is very similar to the ASCII version for the USGS DTED (see Type A Logical Record in Appendix B for information relative to the data). The data should be compatible with all translators designed for USGS DTED.

2.4 Topic category

Elevations/heights above or below sea level relates to: altitude, bathymetry, digital elevation models, slope and derived products.

2.5 Geographic box

The geographic box or minimum-bounding rectangle (MBR) delineating the coverage of all existing and planned CDED1 in Canada is:

- West-bounding coordinate: 141° West (or -141°)
- East-bounding coordinate: 52° West (or -52°)
- North-bounding coordinate: 84° North (or 84°)
- South-bounding coordinate: 41° North (or 41°)

2.6 Geographic description

The CDED1 consists of an ordered array of ground elevations at regularly spaced intervals.

The 1:250 000 CDED1 provides complete seamless coverage of the entire Canadian landmass while the 1:50 000 CDED1 provides only partial coverage for now, with an anticipated full coverage in the future.

2.7 Extent

The temporal extent for the content of the data is from 1945 to present.

The vertical domain of the data set identifies the lowest and highest vertical extent contained within the data. The vertical extent is expressed in metres and for the most part, can vary from 0 metres (Mean Sea

Level) to 5,959 metres (Mount Logan) for Canada. The Canadian coastline as well as all water areas off the coast will have a value of 0 metres.

CDED1 data sets may only contain void areas (NO DATA) when they include areas adjacent to the Canadian landmass (e.g., USA, France and Denmark). These areas will have a value of either 0 or -32767. Other negative values can be found in certain areas of Canada (e.g., lower mainland British-Columbia) that naturally lie below main sea level.

NAD83 is used as the reference system. Elevations are orthometric and expressed in reference to Mean Sea Level (Canadian Vertical Geodetic Datum of 1928 (CVGD28)).

2.8 Comparison of CDED1 to Existing DTED (Digital Terrain Elevation Data)

ITEMS	DTED Level 1	1:50 000 CDED1	1:250 000 CDED1
Vertical and horizontal datum	WGS84 and NAD27 Mean Sea Level (MSL)	NAD83 Mean Sea Level (MSL)	NAD83 Mean Sea Level (MSL)
File format	USDMA (United States Defence Mapping Agency) DTED 1 cell/file	Modified version of USGS DTED 1 cell/file	Modified version of USGS DTED 1 cell/file
File or cell coverage	1° x 1°	15’ x 15’, 15’ x 30’, 15’ x 1°	1° x 1°, 1° x 2°, 1° x 4°
Number of profiles	1201, 601, 401, 301 or 201	1201	1201
Number of elevation points per profile	1201	1201	1201
Number of geographic areas	5	3	3
Spacing between elevation points	3" x 3", 3" x 6", 3" x 9", 3" x 12", 3" x 18"	0.75" x 0.75", 0.75" x 1.5", 0.75" x 3"	3" x 3", 3" x 6", 3" x 12"
File naming convention	Latitude and longitude of SW corner (ex.: /w0770000/n430000.dtn)	For explanations, refer to Appendix A.	For explanations, refer to Appendix A.
Write formats	ASCII and binary	ASCII only	ASCII only
Logical records	A, B and C	A (modified) and B	A (modified) and B

3 Geospatial Characteristics

3.1 Spatial representation type

Grid data is used to represent geographic data.

3.2 Spatial representation

All cells contain the same number of nodes (elevations). All profiles are oriented north south and contain 1201 elevation points. Each cell holds 1201 profiles, for a total of 1 442 401 elevation points. This number is constant for all the files although cell coverage varies according to the three geographic areas.

3.3 Coverage and continuity

The 1:250 000 CDED1 provides complete seamless coverage of the entire country, including edge matching and matching with 1:250 000 NTDB elements to improve the alignment of ridges and drains and overall topography shaping and representation (for areas inside Canada's borders). The 1:50 000 CDED1 provides partial coverage of the country for now, with an anticipated full coverage in the future.

The coverage of every file corresponds to half an NTS map, which means that there are western and eastern parts to the CDED1 for every NTS map when necessary.

To provide overlap between adjacent data files, CDED1 cell coverage includes the limits of half NTS maps. Each profile has one point of overlap with the cell above it (to the North) and one with the cell below it (to the South), while the first and last profile of the CDED1 cells respectively coincide with the last and first profile of the adjacent CDED1 cells (east and west). Since cell coverage increases from south to north, the percentage of overlapping decreases from south to north.

The spatial area covered by the CDED1 is 1201 profiles by 1201 points.

3.4 Data segmentation

NOT APPLICABLE

4 Data Model

NOT APPLICABLE

5 Data Dictionary / Feature Catalogue

NOT APPLICABLE

6 Coordinate Reference System

CDED1 uses a geocentric 3-dimensional reference system (X, Y, Z).

6.1 Horizontal reference system

North American Datum 1983 (NAD83) is used as the horizontal reference system.

6.1.1 Horizontal coordinate system

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

6.1.2 Unit of measure (coordinate system axis units)

The unit of measure for storing horizontal spatial data is arc seconds, given 4 significant digits after the decimal (1×10^{-4}). Coordinates are expressed in real values (always with positive latitudes and negative longitudes) using the following format: SDDMMSS.SSSS, e.g. –624500.0000.

6.2 Vertical reference system

Elevations are orthometric and expressed in reference to Mean Sea Level (Canadian Vertical Geodetic Datum of 1928 (CVGD28)).

6.2.1 Unit of measure (coordinate system axis units)

The unit of measure for storing vertical spatial data is the metre (m). Coordinates are expressed as integers.

7 Data Quality

7.1 Scope

This information applies to the data set and covers the spatial (ground horizontal coordinates) and vertical (elevations) extent of each data set.

7.2 Lineage

The 1:250 000 CDED1 provides complete seamless coverage of the entire country while the 1:50 000 CDED1 provides only partial coverage for now, with an anticipated full coverage in the future.

The CDED1 source data originates from the scanned hypsographic and hydrographic elements of 1:50 000 and 1:250 000 NTS maps or various scaled positional data acquired from the provinces and territories. Special care was taken with regard to watercourse direction of flow and the flatness of the water surface and surrounding area.

The horizontal reference system is North American Datum 1983: the vertical reference system is Canadian Vertical Geodetic Datum of 1928 (CVGD28)).

7.3 Completeness

The content of the CDED1 data sets is constant since the number of elevation points per profile and the number of profiles per cell are constant for all CDED1 files (1201 x 1201).

7.4 Logical consistency

Waterbodies are naturally occurring areas of constant elevation (lakes) or having a small slope (rivers). Oceans and estuaries at Mean Sea Level are assigned an elevation value of zero metre. All other waterbodies are assigned their known elevations or estimated values. In the case of large bodies of water, the file is not empty but contains an estimated elevation. A body of water of unknown elevation is assigned an interpolated elevation that should be roughly equal to that of its shores. Waterbodies are represented flatter and lower than the surrounding terrain. The shore must be clearly discernible.

The purpose of CDED1 production is to produce DEM data sets that accurately represent slope and elevation. Slope data is more critical to certain scientific applications than elevation data. Consequently, quality control must assure that the CDED1 is smooth within the grid and continuous from node to node, except at natural break points such as streams, cliffs, and craters.

The CDED1 production process provides for drainage patterns. The methodology used to create the CDED1 is based on the USGS DTED and terrain-modelling software, which pays close attention to watercourse direction of flow. In addition, quality control is carried out to eliminate nonsense drainage activity especially along file edges.

7.5 Positional accuracy

Elevation values are contained on a grid, spaced according to latitude. For the 1:50 000 scale, the spacing is always 0.75 arc second along a profile in the north-south direction and varies from 0.75 to 3 arc seconds in the east-west direction, depending upon the appropriate elevation grid spacing for the latitude zone. The spacing in metres is about 23 metres in the north-south direction and varies from approximately 8 to 17 metres between profiles (east-west direction), depending upon the latitude. The elevation grid spacing for the 1:250 000 scale is always 3 arc seconds in the north-south direction along a profile and varies from 3 to 12 arc seconds in the east-west direction, depending upon the appropriate

elevation grid spacing for the latitude zone. The spacing in metres is about 93 metres in the north-south direction and varies from approximately 30 to 70 metres between profiles (east-west direction), depending upon the latitude.

In some NTDB data sets, horizontal inaccuracy can vary up to 100 metres for the 1:50 000 scale and 500 metres for the 1:250 000 scale. This should not give rise to any confusion about data accuracy. The close spacing does not mean, for example, that the horizontal accuracy is equivalent to about half of the distance between two elevation points. The reason for this density is to better describe the terrain and to enhance data consistency. Data accuracy also depends on the level of detail or grid refinement that can be attained with the source material. In forming a grid, precise points must be transferred, which may alter the apparent position upon display of the point or original vector-data source. This reduces the ability to recover the positions of specific features whose dimensions are less than the internal grid cell spacing.

The only measurable or perceivable errors in the CDED1 are vertical errors that may be partially attributable to horizontal errors inherent in the source data. Since conversion errors are cumulative, sometimes the data quality might be somewhat lower than that of the source data.

Accuracy depends on the original source data. The current system used to classify the NTS map is based on the North Atlantic Treaty Organization (NATO) Standardization Agreement (STANAG) 2215, Edition 5.

Although contours can be regenerated from the CDED1, the source data should be used for higher accuracy and to preserve as much detail as possible.

Example of Data Quality Information:

- Edition Source File 1
- Version Source File 0
- Altimetric Accuracy (metre) 5
- Planimetric Accuracy (metre) 25

7.6 Temporal accuracy

No time measurement is available for the CDED1 as it is associated with the data capture date.

7.7 Thematic (attributes) accuracy

NOT APPLICABLE

8 Metadata

There are 2 levels of metadata to describe CDED1, as shown in figure 1: collection and product/dataset. The higher level of metadata covers the entire data collection: it applies to the series of available datasets. The lower level, called product/dataset metadata gives specific information about each dataset.

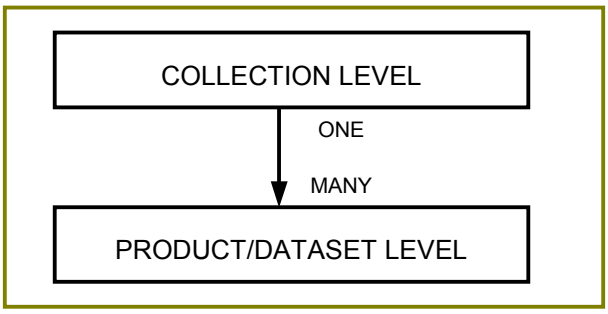


Figure 1: Metadata levels

CDED1 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

NOT APPLICABLE

10 Data Delivery

10.1 Format information

The directory and file name conventions for CDED1 datasets are described in Appendix A. The ASCII CDED1 file format is presented in Appendix B.

The packaging method specifies how the item is to be packaged before delivery. Currently two package methods are available, for Windows and for UNIX. PKZIP compression software is used to reduce file size.

10.2 Medium information

The CDED1 datasets are available on-line directly by computer linkage via an FTP site. The client 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 (in the Data section at http://www.geobase.ca/).

11 Data Capture and Maintenance

CDED1 data capture and maintenance is currently under negotiations with present and potential provincial and territorial partners.

Appendix A: CDED1 Directory and File Name Conventions

Two distinct and possible cases can be encountered with CDED1 directories and files. The first case is encountered when a client places a purchase order through the Customer Support Group of the Centre for Topographic Information in Sherbrooke (CTIS). The second case happens when a client places a request to process data, directly on line, through the CTIS web site, like in the case of a subscriber for instance. In both cases, a physical volume may contain many data sets.

First case (examples)

Name of the directory associated to a data set: **031k01_d**
Name of a CDED1 file associated to a data set: **031k01_w.dem**

In the first case, a directory identified by the NTS number, followed by the characters "_d" is created for each data set contained in the physical volume (e.g. 031k01_d). All CDED1 files relating to this specific data set are then stored into this directory. Since a NTS sheet normally covers two CDED1 cells, namely eastern and western cells, therefore the directory generally includes the two corresponding CDED1 files. CDED1 file names correspond to the NTS sheet number, followed by two characters indicating in which part of the NTS (east or west) the file is located, followed and completed by the file extension ".dem". For example, cells 031k01_e.dem and 031k01_w.dem respectively cover eastern and western parts of the NTS sheet 031k01 at the scale of 1:50 000. CDED1 files at the 1:250 000 scale are named similarly. For example, cells 031k_e.dem and 031k_w.dem respectively cover eastern and western parts of the NTS sheet 031k at the scale of 1:250 000.

Second case (examples)

Name of the directory associated to the CDED1 product: **DNEC_CDED**
Name of the "container" type file associated to a data set: **031k01_000000000001.zip**
Name of a CDED1 file associated to a data set: **031k01_0100_demw**

In the second case, a directory identified by the product name allows for the grouping of data that belong to the same product. For CDED1 product, this directory's name is "DNEC_CDED". All CDED1 files relating to the same data set are then compressed (using PKZIP compression software) together in one file, which name corresponds to the NTS sheet number, followed by a underscore "_" character, itself followed by a unique twelve-character identifier (automatically generated), and completed by the file extension ".zip" (e.g. 031k01_000000000001.zip). All CDED1 files relating to this data set are stored into this file. The name of the CDED1 files included in this ".zip" file refers to the NTS sheet number, followed by a underscore "_" character, itself followed by two characters specifying the CDED1 data set edition, followed by two characters specifying the CDED1 data set version, followed by the four-character string "_dem", and completed by one character indicating which of the eastern and western part of the NTS sheet the file is in. For example, cells 031k01_0100_deme and 031k01_0100_demw respectively cover eastern and western parts of the NTS sheet 031k01 at the scale of 1:50 000. CDED1 files at the 1:250 000 scale are named similarly. For example, cells 031k_0101_deme and 031k_0101_demw respectively cover eastern and western parts of the NTS sheet 031k at the scale of 1:250 000.

Appendix B: CDED1 File Format

CDED1 format is very similar to the ASCII version of the USGS DTED. All the information relative to the data is given in the *Type A Logical Record*. The data is written in the same manner as in the USGS version of the DTED.

B.1 Physical Structure of the CDED1 File

Data is written as ANSI Standard ASCII characters and is recorded in IBM Standards fixed-block format.

Physical record size is 1024 bytes. No more than one logical record type (A or B) can be recorded in any 1024 byte record. However, more than one 1024 byte record is usually required to store a single record type B. Logical records are padded with blanks if necessary to fill to the end of the 1024 bytes of the physical record.

There is only one *Type A Logical Record* for each CDED1 file, and it appears as the first record in the data file. The *Type B Logical Record* contains elevation data and associated header information. All type B records of the CDED1 files are made up of data from one-dimensional bands called profiles. Therefore, the number of profiles covering the CDED1 area is the same as the number of type B records in the CDED1.

The following special conventions will be observed for the population of data fields in the A and B logical record elements:

- All character fields must be in upper case. Character field of no data value must be blank, ASCII space (binary 0010 0000);
- All integer or character flagged fields of no data value but which default to zero must be ASCII zero (binary 0011 0000);
- All real (non-integer) numeric fields must be populated. Default zero fill will respect the following convention:

1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	**Byte position, left justified**
				.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	D	+	0	0	**Standard format specified is D24.15. Zero values listed are common machine dependant numeric default for real zeros.**
			0	.	0																			
			0	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	D	+	0	0	
				.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				

B.2 Type A Logical Record

Note: For the majority of information fields the value is right justified.

Data Element	Contents	Format Type (Fortran)	ASCII (Fortran)	Comments
1	File name	ALPHA	A40	Ex: 31a01DEMw
1	Producer of data, Free format text (e.g.: CFS-SSM)	ALPHA	A60	Free format descriptor, containing information about the data producer.
1	Filler		9 bytes	Blank fill
1	SW geographic corner	INTEGER*2 REAL*8	2(I4,I2,F7.4)	SW geographic quadrangle corner ordered as: Long. = SDDDMMSS.SSSS Lat. = SDDDMMSS.SSSS
1	Process Code	ALPHA	A1	8 = ANUDEM™ 9 = FME™ for LINUX, build 842 A = TopoGrid™
1	Filler		1 byte	Blank fill
1	Sectional indicator	ALPHA	A3	Not used in this case.
2	Origin code	ALPHA	A4	NTDB = National Topographic Data Base BC = British Columbia MB = Manitoba NB = New Brunswick NL = Newfoundland/ Labrador NS = Nova Scotia NT = Northwest Territories NU = Nunavut ON = Ontario PE = Prince Edward Island AB = Alberta QC = Quebec SK = Saskatchewan YT = Yukon Territory MULT = Multiple Sources
3	DEM level code	INTEGER*2	I6	Code 1 = DEM-1 2 = DEM-2 3 = DEM-3 Set to Code 1 for 1:50 000 and 1:250 000 CDED1.

B.2 Type A Logical Record (Continued)

Data Element	Contents	Format Type (Fortran)	ASCII (Fortran)	Comments
4	Code defining the elevation pattern (regular or random).	INTEGER*2	I6	Code 1 = regular 2 = random Set to Code 1.
5	Code defining the ground horizontal reference system.	INTEGER*2	I6	Code 0 = Geographic 1 = UTM 2 = state plane Normally set to the code representing the geographic (lat/long) system for 1:50 000 CDED1. Set to code 0.
6	Code defining the zone in the ground horizontal reference system.	INTEGER*2	I6	Code is set to 0 for 1:50 000 and 1:250 000 CDED1.
7	Map projection parameters	REAL*8	15D24.15	All 15 fields of this element are set to zero and should be ignored when geographic.
8	Code defining the unit of measure for the ground horizontal coordinates throughout the file.	INTEGER*2	I6	Code 0 = radians 1 = feet 2 = metres 3 = arc seconds Set to Code 3.
9	Code defining the unit of measure for the (vertical) elevation coordinates throughout the file.	INTEGER*2	I6	Code 1 = feet 2 = metres Set to Code 2.
10	Number of sides in the polygon that defines the coverage of the CDED1 file.	INTEGER*2	I6	Usually n = 4
11	A 4,2 array containing the ground geographic coordinates of the four corners of the CDED1.	REAL*8	4(2D24.15)	The coordinates of the quadrangle corners are ordered clockwise beginning with the southwest corner. The array is stored row-wise as pairs of decimal longitude and latitude.
12	A two-element array containing minimum and maximum elevations for the CDED1.	REAL*8	2D24.15	The values are in the unit of measure given by data element 9 in this record (min., max.).

B.2 Type A Logical Record (Continued)

Data Element	Contents	Format Type (Fortran)	ASCII (Fortran)	Comments
13	Counter clockwise angle (in radians) from the primary axis of the ground horizontal reference to the primary axis of the CDED1 horizontal local reference system.	REAL*8	D24.15	Normally set to zero to align with the coordinate system specified in element 5. Expressed in radians.
14	Accuracy code for elevations	INTEGER*2	I6	When set to 0, this indicates that a record does not exist and that no Type C record will follow. Always “0” because there is no “C” record for this product (CDED1).
15	A three-element array containing CDED1 spatial resolution (x, y, z). Units of measure for these resolution elements are consistent with those indicated by data elements 8 and 9 in this record.	REAL*4	3E12.6	These elements are usually set to 0.75,0.75,1; 0.75,1.5,1; or 0.75,3,1 (depending on latitude) for 1:50 000 CDED1, and 3,3,1; 3,6,1; or 3,12,1 for 1:250 000 CDED1. These units should not be confused with data accuracy.
16	A two-element array containing the number of rows and columns (m, n) of profiles in the CDED1.	INTEGER*2	2I6	Normally, the row value m is set to 1. Thus, the n value normally describes the number of columns in the CDED1 file (1201).
17	Largest primary contour interval.	INTEGER*2	I5	Present only if two or more primary intervals exist. *This field is left empty*.
18	Largest source contour interval unit.	INTEGER*1	I1	Correspond to the unit of the source data largest primary contour interval 0 = NA, 1 = Feet, 2 = Metres. *This field is left empty.*
19	Smallest primary contour interval.	INTEGER*2	I5	Smallest or only primary contour interval. *This field is left empty.*
20	Smallest source contour interval unit.	INTEGER*1	I1	Corresponds to the unit of the source data smallest primary contour interval 1 = feet, 2 = metres. *This field is left empty.*

B.2 Type A Logical Record (Continued)

Data Element	Contents	Format Type (Fortran)	ASCII (Fortran)	Comments
21	Data source date.	INTEGER*2	I4	YYMM: two-digit year and two-digit month. MM = 00 for source having year only. *This field is left empty.*
22	Data inspection/revision date	INTEGER*2	I4	YYMM: two-digit year and two-digit month. *This field is left empty.*
23	Inspection/revision flag	ALPHA*1	A1	"I" or "R". *This field is left empty.*
24	Data validation flag	INTEGER*1	I1	0 = No validation performed 1 = RMSE computed from test points, no quantitative test, no interactive CDED1 editing or review. 2 = Batch process waterbody edit and RMSE computed from test points. 3 = Review and edit, including water edit; no RMSE computed from test points. 4 = CDED1 reviewed and edited. Includes waterbody editing RMSE computed from test points. *This field is left empty.*
25	Suspect and void area flag	INTEGER*1	I2	0 = none 1 = suspect areas 2 = void areas 3 = suspect and void areas *This field is left empty.*
26	Vertical datum	INTEGER*1	I2	1 = local Mean Sea Level (MSL) 2 = National Geodetic Vertical Datum 1929 (NGVD29) 3 = North American Vertical Datum 1988 (NAVD88) *This field is set to "1".*
27	Horizontal datum	INTEGER*1	I2	1 = NAD27 2 = WGS72 3 = WGS84 4 = NAD83 *This field is set to "4".*

B.2 Type A Logical Record (Continued)

Data Element	Contents	Format Type (Fortran)	ASCII (Fortran)	Comments
28	Data edition	INTEGER*2	I4	Normally set to 1. *This field is left empty.*
29	Percent void	INTEGER*2	I4	If element 25 indicates a void, this field (right justified) contains the percentage of nodes in the files set to void. *This field is left empty.*
30	Edge-match flag	INTEGER*1	4I2	Edge-match status flag. Ordered West, North, East, and South. Explanation of codes: 1 = Edge-Matched 3 = Edge is external, no match required *This field is left empty.*
31	Vertical datum shift	REAL*8	F7.2	Vertical datum shift; normally set to 0. *This field is left empty.*

B.3 Type B Logical Record

Note: For the majority of information fields the value is right justified.

Data Element	Contents	Format Type (Fortran)	ASCII (Fortran)	Comments
1	A two-element array containing the row and column identification number of the CDED1 profile contained in this record.	INTEGER*2	2I6	The identification number ranges from 1 to m (rows) and from 1 to n (columns or profiles). Rows are normally set to 1 and should be disregarded. The column identification is the profile sequence number.
2	A two-element array containing the number of rows and columns (m, n) of elevations in the CDED1 profile.	INTEGER*2	2I6	This first element in the field corresponds to the number of rows or nodes in the profile (1201). The second element in this field is normally set to 1, specifying 1 column per profile.
3	A two-element array containing the ground horizontal coordinates of the first elevation in the profile.	REAL*8	2D24.15	Ground horizontal coordinates (latitude and longitude) in arc seconds according to element 8 in Logical Record Type A.
4	Elevation of local vertical datum for the profile.	REAL*8	D24.15	The values are in the units of measure given by data element 9 in Logical Record Type A. Always 0 for 1 degree CDED1 (reference is MSL).
5	A two-element array of minimum and maximum elevations for the profile.	REAL*8	2D24.15	The values are in the units of measure given by data element 9 in Logical Record Type A.
6	The array of m x n elevations for the profile. Elevations are expressed in units of resolution elements (metres).	INTEGER*2	mn (I6)	A value in this array would be multiplied by the spatial resolution value and added to the elevation of the local elevation datum for the profile to obtain the elevation for the point.