CANADIAN COUNCIL ON GEOMATICS

STANDARD FILE EXCHANGE FORMAT FOR DIGITAL SPATIAL DATA

VERSION 2.3

OCTOBER, 1994

OUTLINE OF MAJOR CHANGES

The present version of the CCOGIF standard differs from the preceding version in the following:

The standard now allows the creation of CCOGIF ASCII files on disk.

The evolution of computer tools makes it now easier and more acceptable to exchange data in the form of ASCII files. An increasing demand for the exchange of CCOGIF data on diskette or electronic network paved the way for this new approach. We refer to this method as the **"exchange of CCOGIF ASCII data on disk".**

We can now create a CCOGIF ASCII file on disk, compress it and write it on media by using a utility command of the operating system. However, to exchange data in this manner, both parties must use the same compression and writing utility commands on media.

Users interested in modifying their CCOGIF interfaces may easily do so if they have used the CCOGIF routines. The STEP3 software (writing module) has been modified so as to add the "file writing from disk" option. The STEP4 (reading module) software also now features the "file reading from disk" option.

We will also be able to continue exchanging CCOGIF data as in the previous version of the standard (v2.2). We refer to this method as the **"exchange of CCOGIF ASCII on tape"** . Version 2.3 of the CCOGIF standard will describe and support both methods.

STANDARD EXCHANGE FORMAT FOR DIGITAL SPATIAL DATA

TABLE OF CONTENTS

.

EXECUTIVE SUMMARY

1 Scope of the Standard

This standard specifies the format for the exchange of digital spatial data via machine-readable media among Canadian survey and mapping agencies. It will enable spatial information from federal, provincial and private organizations to be considered as an integrated body of data, thus reducing duplication of data, and minimizing the effort required to exchange data. The main purpose of this EDP file format is to provide a national standard for the exchange of digital spatial data, which preserves the accuracy and content of the information, and is machine and language independent.

This format is not modelled on any known existing standard, but meets the requirements that are felt to be representative of the spatial data domain of the above-mentioned organizations.

The intended user requirements and data domain described in Chapter 2 are guidelines only. It is the user's responsibility to determine the suitability of this standard for a specific application.

2 History of the Standard

The following is the chronological order of the history of the development of the national standards for the exchange of digital spatial data.

May 1978:

The Task Force on National Surveying and Mapping recommended: "As soon as possible, Topographical Survey should create mechanisms for the formulation of standards for digital mapping, including the storage and retrieval of digital map data involving federal, provincial and municipal governments, the universities and the private sector."

October 1978:

CCSM resolved to initiate the Task Force recommendation.

December 1978:

Topographical Survey Division, Surveys and Mapping, EMR Canada, convened a meeting of epresentatives from CCSM and the Canadian Association of Aerial Surveyors (CAAS). It was decided that these national standards should be developed by three Technical Committees:

I - Standards for the classification of topographic features;
II - Standards for the quality evaluation of topographic data;
III - EDP standards applied to digital topographic data.

April 1979:

Technical Committees formed from representatives of federal and provincial government departments, and private sector.

April 1982:

Publication of the first draft of the national standards.

Volume I: Topographic feature classification and coding, and a dictionary for topographic feature definition.
Volume II: Evaluation of digital topographic data accuracy, basic data parameters, data acquisition methods and accuracy.
VolumeIII: EDP file format.

October 1983:

An internal revised version of the first draft was prepared with feedback solicited from more than 700 national and international organizations.

July 1984:

Publication of the revised standards.

Volume I, Part I: Classification and coding of features
Volume I, Part II: Quality evaluation of digital topographic data
Volume I, Part III: EDP file format for data exchange
Volume II Topographic feature codes and the dictionary of feature definitions.

The developed file format (Volume I, part III, published in July 1984) was not so fortunate. For its development, the Committee used the Computer Compatible Tape (CCT) Superstructure concept, as defined by the LGSOWG (Landsat Ground Station Operation Working Group). The CCT superstructure is a self defining format, and as such contains some very rigid specifications. It contains significant detail about the specific files of data to permit the reading of the information without prior knowledge of its source.

This flexibility was accompanied by a certain degree of complexity, which added additional constraints towards the acceptance of the CCSM file format. In addition to the difficulties encountered with the CCT superstructure concept, the developed file format lacked the existence of an efficient mechanism for the transfer of the topological information between topographic features. To remedy this situation, the following steps were undertaken:

October 1984:

A subcommittee of representatives from the federal and provincial Surveys and Mapping Branches, the Canada Centre for Remote Sensing (CCRS) and Statistics Canada met, to discuss questions related to the development of a CCSM file format (Volume I, Part III) and to evaluate a proposal by the Ontario Ministry of Natural Resources for a revised national interchange format.

November 1984:

This subcommittee recommended that:

1. A technical subcommittee, Working Group #1 be formed, to develop a model for digital topographic data, containing at least, topography, attributes text and topology;
2. The federal Surveys and Mapping Branch should examine the developed CCSM EDP file format for data exchange published in July 1984 (Vol. I, Part III) and extend it to include topology and attributes to allow for bulk, batch-mode data transfer.

September 1985

Subcommittee Working Group #1, with representatives from the federal Surveys and Mapping Branch, Statistics Canada and CCRS, produced the Digital Topographic Information Model (DTIM) Report, in fulfillment of Recommendation 1.

Working Group #1 contracted for the revision of the EDP File Format Document in fulfillment of Recommendation 2, resulting in the version 0.0 of the CCSM file format.

June 1986:

The CCSM committee resolved that “the operational and economic evaluation of the standard take place through pilot data transfer projects”. Canada Centre for Geomatics developed the necessary EDP file exchange software package.

November 1987 to November 1988:

After a serie of bench mark tests and discussions at different provincial and federal digital mapping agencies, some modifications were made to the format to better meet the needs of

the users of the standard EDP file exchange format. The standard was revised, resulting in version 1.0, October 1988 of the CCSM file format; minor corrections finally led to version 1.1, November 1988.

January 1989:

An other minor modification has been identified which led to version 1.2, January 1989.

September 1989:

The CCSM committee changes its name for CCOG which stands for the Canadian Council on Geomatics.

June 1991:

The CCOGIF technical committee proposed to modify the standard to allow other media to be used to support the CCOGIF format. This modification led to the version 2.0, October 1991 of the standard. Furthermore, the committee decided that CCOGIF codification would not be supported anymore. This increase flexibility of data codification used under the standard.

March 1992:

The CCOGIF technical committee proposed to modify the standard to permit the creation of a CCOGIF format on 9 tracks magnetic media using a density of 6250 bpi. This modification led to the version 2.1, March 1992 of the standard.

August 1992:

The CCOGIF technical committee proposed to modify the standard to permit the creation of a CCOGIF format on additional stream magnetic tape media. The media tk50 and tk70 cartridge, 6150 data cartridge and 8 mm data cartridge. This modification led to the version 2.2, March 1992 of the standard.

June 1993:

The CCOGIF technical committee proposed modifying the standard to permit the creation of a CCOGIF ASII file on disk. The creation of the CCOG file format on interchange media is left to the discretion of the user. The modification has led to the version 2.3, June 1993 of the standard. So the exchange of spatial data via user-selected media is now possible. Also, the CCOG software no longer needs to support specific media. In order to ensure maximum flexibility in performing the exchange of spatial data, the former procedure (described in the CCOGIF v2.2 standard) remains possible.

CHAPTER 1

INTRODUCTION

This document describes the CCOG standard format for the exchange of digital spatial data. It also describes its representation on supported magnetic media (Appendix D).

The expected data domain for this standard is map data conforming to the Digital Topographic Information Model (DTIM) specified in the DTIM Report produced by Working Group #1 of the CCOG Technical Subcommittee. This does not include raster data and symbolization information.

The user requirements for the design of this standard were (in priority order) machine independence, simplicity, standardization, flexibility, upgradability, and efficiency.

To ease data exchange in certain environments, the CCOGIF ASCII data exchange option on disk has been added in the standard's version 2.3. When exchanging data, the user must therefore ensure the compatibility of the media and commands used for writing data on media.

The present standard addresses questions on three levels: the superstructure level where the placement of various types of files on physical support is examined; the file structure level where the placement of records within each type of file is examined; and the data structure level where the components of the different record types are examined. Both transfer methods are presented: CCOGIF ASCII data exchange on tape, and CCOGIF ASCII data exchange on disk.

This standard specifies that entities (spatial and attribute information) be combined according to their type and attribute descriptors into data themes, which are then combined into data groups, which are in turn combined geographically into data sets, which are finally combined into a logical volume.

The format is documented at two levels. For the user/manager/public an overview is given in chapter 3 of this document and more details can be found in the DTIM report.

For programmers, responsible for implementing the format, detailed specification of the format byte-by-byte description, file and data structures and functional specifications of the required access software are included in the Detailed Specification of the Format (Appendix A).

An example data set is described in CCOGIF ASCII on disk format at Appendix B.

Proposed attribute descriptor records are provided in Appendix C

Media specifications for the CCOGIF ASCII on tape are described in Appendix D

CHAPTER 2

DESIGN ISSUES FOR A SPATIAL DATA EXCHANGE FORMAT

To use any standard format properly, it is necessary to understand its underlying design philosophy. The user of a format should be aware of the **requirements**, or needs, of the organizations exchanging data and of the **constraints**, or limitations, placed on the possible solutions.

It is also necessary to be fully cognizant of the **data domain** representable with a data exchange format, so as not to misunderstand or misuse that format

This chapter details the requirements of this Spatial Data Exchange format (Section 2.1), outlines some of the constraints placed on the design process (Section 2.2), and describes the domain of the data to be exchanged with this format (Section 2.3).

2.1 Major Requirements

For the development of the digital spatial data exchange format, the following requirements, listed in order of priority, were considered:

1 MACHINE INDEPENDENCE
Machine independence takes precedence over all other issues.

2 SIMPLICITY
Simplicity is paramount to all considerations except machine independence.

3 STANDARDIZATION
Standardization addresses the acceptance of a simple, machine independent format by the users.

4 FLEXIBILITY
Flexibility addresses the domain-specific, application independence issues required for standardization.

5 UPGRADABILITY
Upgradability addresses the expansion issues required for standardization.

6 EFFICIENCY
Efficiency of both space and time will be optimized whenever it is possible to do so without sacrificing machine independence, simplicity, standardization, flexibility or upgradability.

2.2 Additional Constraints

The design of an exchange format is limited by the following constraints:

1. All data must be in ASCII characters to assure complete machine independence.

2. A logical volume can be divided in several physicals volumes.

3. The format must be able to be read in a one-pass sequential operation (example: sequential read, no rewind on tape), to allow transmission by electronic communication links. Therefore all structural formatting information must be known BEFORE the write operation has started and written in headers rather than trailers.

4. A constant record length will be used for headers, when possible. This constraint is to enable easier media reading. Header type will be determined by a record type code within each header record.

2.3 Spatial Data Domain

The domain of spatial data to be represented in this format was given in detail in the Standards for a Digital Topographic Information Model (section 2.3.1) by Working Group #1 of the Technical Subcommittee of CCOG. It encompasses:

> topographic data which can be represented on maps as point, line and area features, all of which may have attributes or text, and spatial relationships. In addition, it includes as a second priority, thematic data, i.e. forestry, geology, cadastral, land use, etc. with locational and attribute components and spatial relationships.

In general, the standard deals with topographic and cultural phenomena on the surface of the earth normally represented by three coordinates (x,y,z).

In the current version of the format, grid data, raster data and symbolization aspects of spatial data, are not considered. However, appendix C deals with proposed attribute descriptor records for textual information and non-primitive entity types.

The data model defines the following mandatory information for each single piece of data, or entity:

1. Spatial data type. Allowable types are point, line and area.

2. Spatial data. A point is represented by a single coordinate triplet, a line is represented by two or more coordinate triplets, and an area is defined spatially by the lines that bound it.

3. A feature classification code, which is free to the user.

In addition, there are three optional information components for each entity:

4. User-defined attributes.

5. Spatial relationships (topology). Points may be connected to zero or more lines; lines may be connected to zero, one or two points; lines may be adjacent to zero, one or two areas; areas must be adjacent to at least one (boundary) line, explicitly known to the area or not.

6. Identification Numbers (IDs) are necessary for topologically referenced entities.

CHAPTER 3

STRUCTURAL OVERVIEW OF THE EXCHANGE FORMAT

3.1 Glossary of exchange format terms

Superstructure
Concerns the placement of labels, files and their marks on the physical support.

File structure
The issues of form and placement of records within files.

Data structures
The issues of the contents of the fields within records.

Coordinate triplet
A set of three data values (x, y, z) describing a location in three dimensional space. These values are of specified types and units, relative to a specified origin. Typically, x and y represent earth surface coordinates and are of the same type and units, while z represents elevation and may be of a different type and units.

Collocation
The sharing of the same coordinates by two or more lines.

Entity
A data structure represents a single physical structure, and can be put together with other entities of the same type and attributes to form a data theme. The entity types of point, line and area each consist of a spatial description plus a set of attribute values.

A **point** is an entity consisting of a single (x,y,z) coordinate triplet, and the possibility of a set of attribute values. A point that is topologically related to (is an end point of) one or more lines is called a node.

A **line** is an entity consisting of a string of connected coordinate triplets and the possibility of a set of attribute values. A line that is topologically related to (is a border of) one or two areas is called a boundary line.

An **area** (polygon) is an entity consisting of a closed region defined by a set of at least one boundary line and the possibility of a set of attribute values. However, an area may be explicitly connected to its boundary line(s) or be defined through the use of line to area topology (left area, right area).

Data theme

A collection of **entities** organized in such a way to save storage space. The organization must meet the following:

- all entities are of the same type, either point, line or area;
- all entities have the same **attribute fields** hence share the same attribute descriptors;
- all entities are in the same geographic area, such as a map sheet.

Data group

A collection of one or more **data themes** organized in order to meet user grouping criteria and where:

- there may be more than one data theme of each entity type in a data group, as long as the order {point themes, line themes, area themes} is maintained: all point themes are followed by all line themes which are followed by all area themes.

Data set

A collection of one or more data groups where:

- the data groups are from the same geographic area, such as a map sheet.

Logical Volume

A collection of one or more data sets.

In summary:

A logical volume is a collection of data sets, each of which is a geographically-related collection of data groups, each of which is a user defined collection of data themes, each of which is a collection of entities of the same type (point, line or area) and same attribute fields.

3.2 Structure of the Exchange Format

Figure 1, below, shows the general structure of one data set in a logical volume. Each data group contains a number of data themes which in turn contain an (optional) attribute dictionary and any number of entities of the same type and attribute fields. All details of the structure can be found in Appendix A, Detailed Specification of the Exchange Format (For Programmers).

VOLUME DIRECTORY
DATA SET HEADER 1
DATA GROUP $_{1,1}$*
DATA GROUP $_{1,2}$
:
DATA GROUP $_{1, G1}$**
DATA SET HEADER 2
DATA GROUP $_{2,1}$
DATA GROUP $_{2,2}$
:
DATA GROUP $_{2,G2}$
END OF VOLUME

FIGURE 1: OVERVIEW OF THE EXCHANGE FORMAT STRUCTURE

* DATA GROUP $_{i,j}$ stands the j th data group of the I th data set
** G_i stands for the number of data groups in the ith data set

CHAPTER 4

RECOMMENDED SUPPORT FOR THE EXCHANGE FORMAT

4.1 Format Updates: Preserving Upgradability

This format defines a specific set of rules for representing, ordering and grouping spatial data. A canonical set of entity types, namely point, line and area, were chosen as primitives from which representations of all required spatial entities can be constructed. In addition, connectivity and adjacency can be explicitly represented. At this time, representation of gridded data and raster are neither explicity nor implicitly provided, although they have not been precluded in the structure.

Since the representation of non-primitive entity types and the computation of topological relationships may be non-trivial given the primitives and relationships explicitly defined, it is understandable that formal extensions to this format may be desirable in the future. This is especially so if the donor has a rich data representation that the recipient desires without having to perform undue re-computation.

Extensions can be classified into two categories:

1. the definition of a new entity type;
2. the definition of a new data group type and its rules of order.

In each case extensions must be sensitive to the constraints and principles used in originally designing this format. This format can be taken as a formal notation for writing attributed spatial data to a computer-independent medium. Strict limitations of the alphabet (entity types), grammar (order of data themes within groups) and sentences (data groups) exist so that unambiguous data structures will result.

The designer of an extension will want to preserve:

- simplicity of alphabet (do not add redundant entity types, such as ‘node’, that can be implemented in one of the existing types);
- simplicity of grammar (do not allow for arbitrary ordering of themes within a data group, since the recipient’s software must ‘parse’ this);
- simplicity of sentences (allow only the most parsimonious group representation using the requisite sets of entity types).

Every extension must be upwardly compatible (expandable). To meet this requirement:

- old software must be able to verify the software release identifier to ensure the compatibility between software and data.
- new software must be able to read old and new volumes.

APPENDIX A

DETAILED SPECIFICATION OF THE EXCHANGE FORMAT

Standard 2.3 presents two (2) format structures: CCOGIF ASCII on tape and CCOGIF ASCII on disk. The structure of the first case is identical to the standard's version 2.2. The second structure is practically identical to the first one except for the file structure. The file structure is replaced by a concatenation of the information in one single file.

In one case as in the other, the format structure can be examined at three levels: the superstructure level, the file structure level, and the data structure level.

Enclosed are figures describing these different levels on pages 18 and 19. The end-of-file marks have been removed to represent a CCOGIF ASCII file on disk.

Section A.1.1 addresses the superstructure level: file position and file marks in a logical volume for CCOGIF ASCII on tape, while section A.1.2 presents the superstructure for CCOGIF ASCII on disk.

Section A.2.1 addresses the file structure level: position of logical records in each CCOGIF ASCI file on tape. Section A.2.2 presents the information for the CCOGIF ASCII file on disk.

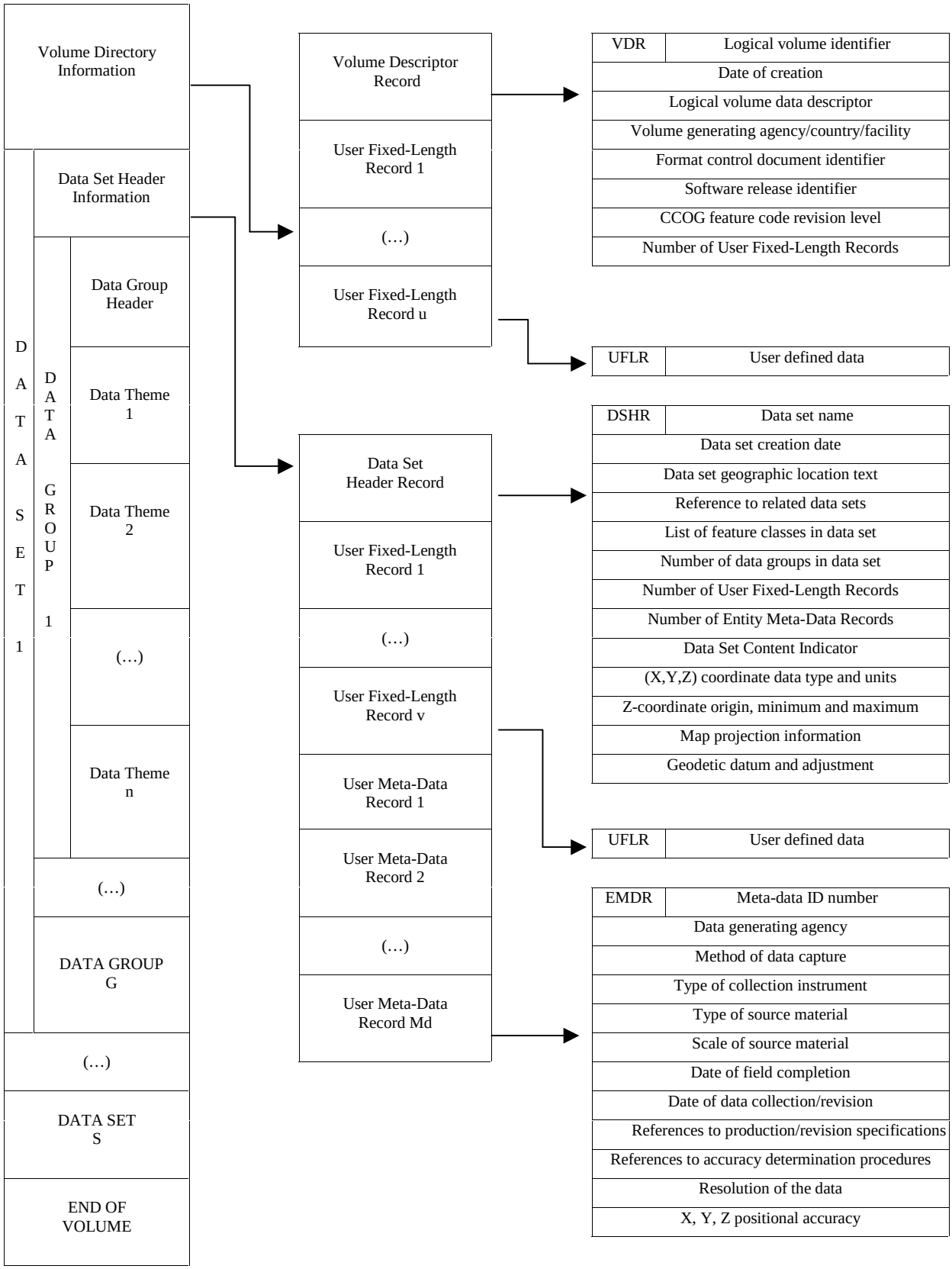
Section A.3 addresses the data structure level: length, content and position of data fields in each logical record. The data structure is identical for CCOGIF ASCII files on tape or on disk.

Section A.4 addresses data types and representation.

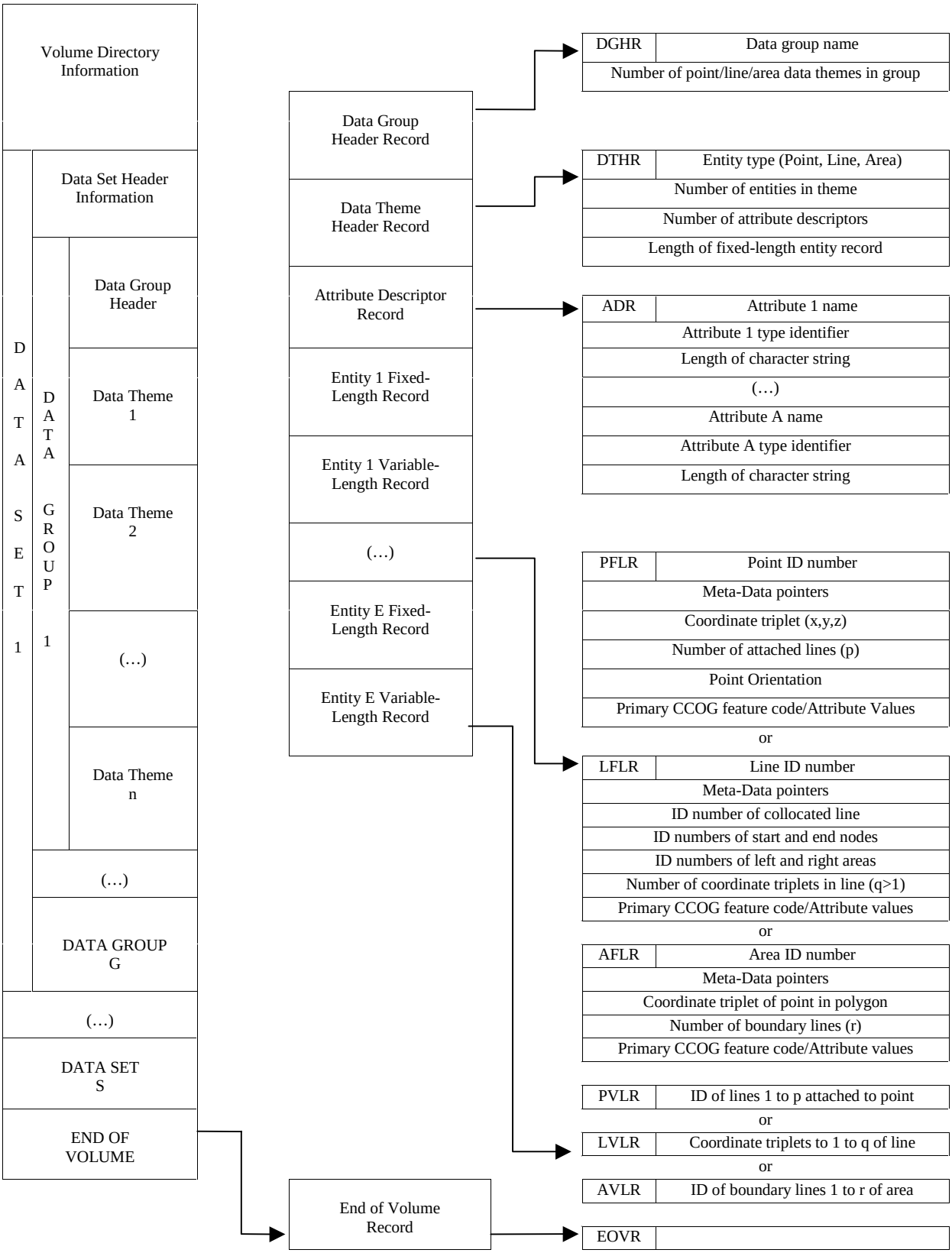
The following labels are used throughout this appendix:

S - number of Data Sets in a logical volume
Md - number of Entity Meta-Data Records following a Data Set Header Record
G - number of Data Groups in a Data Set
T - number of Data Themes in a Data Group
A - number of Attribute Descriptors in a Data Theme
E - number of Entities in a Data Theme
p - number of lines attached to a point entity
q - number of coordinate triplets comprising a line entity
r - number of lines bounding an area entity
u - number of User Fixed-Length Records following a Volume Directory Record
v - number of User Fixed-Length Records following a Data Set Header Record

SUPERSTRUCTURE FILE STRUCTURE DATA STRUCTURE



SUPERSTRUCTURE FILE STRUCTURE DATA STRUCTURE



A.1 Superstructure

A.1.1 Superstructure for CCOGIF ASCII Files on Tape

The volume directory file identifies the logical volume. It is repeated at the beginning of each physical volume (i.e. medium), the "number of the physical volume within the logical volume" field indicating the volume's position considered in the suite.

Since a physical volume cannot contain more than one logical volume, the volume directory file appears only as the first file of each physical volume (i.e. medium).

Data set headers and data groups constitute separate files; they are separated by end-of-file marks and recognized at the file structure level.

Each logical volume ends with an end-of-volume file.

FILE NUMBER	NUMBER OF RECORDS	DESCRIPTION
001	001 + u	Volume Directory File
002	001 + v + Md	Data Set Header File
003	$1+2T_1^{*}+2\sum E_{1,i}^{**}$, for i=1 to T_1	Data Group File 1
004	$1+2T_2^{*}+2\sum E_{2,i}^{**}$, for i=1 to T_2	Data Group File 2
:	:	:
G+2	$1+2T_G^{*}+2\sum E_{G,i}^{**}$, for i=1 to T_G	Data Group File G
G+3	001	End of Volume File

Note: The above table illustrates a logical volume which contains a single data set and is written to a single physical volume. A logical volume may however contain multiple data sets, each one having its own Data Set Header File and Data Group Files. A logical volume may also spread over more than one physical volume, in which case Volume Directory Files would be inserted in the structure to indicate the beginning of every new media.

* true if each data theme has both Data Theme Header Record and Attribute Descriptor Record; T_i stands for the number of data themes in the i^{th} data group

** true if each entity has both fixed-length and variable-length records; $E_{i,j}$ stands for the number of entities in the j^{th} data theme of i^{th} data group

A.1.2 Superstructure for CCOGIF ASCII Files on Disk

The different files allowing to create a CCOGIF volume on magnetic tape are contained in a single CCOGIF ASCII file on disk. The volume directory identifies the logical volume.

The data set header record identifies each CCOGIF data set contained in this file. A logical volume can contain several data sets and each one will have its own data set header record.

The "data group" record identifies the spatial entities contained in the data set. Several records can be associated with a data set.

Each logical volume ends with an end-of-volume mark.

FILE NUMBER	NUMBER OF RECORDS	DESCRIPTION
001	001 + u	Volume Directory Record
002	001 + v + Md	Data Set Header Record
003	$1+2T_1^{*}+2\sum E_{1,i}^{**}$, for i=1 to T_1	Data Group Record 1
004	$1+2T_2^{*}+2\sum E_{2,i}^{**}$, for i=1 to T_2	Data Group Record 2
:	:	:
G+2	$1+2T_G^{*}+2\sum E_{G,i}^{**}$, for i=1 to T_G	Data Group Record G
G+3	001	End of Volume Record

* true if each data theme has both Data Theme HeaderRecord and Attribute Descriptor Record; T_i stands for the number of data themes in the i^{th} data group

** true if each entity has both fixed-length records; $E_{i,j}$ stands for the number of entities in the j^{th} data theme of i^{th} data group

A.2 File Structure

A.2.1 File Structure CCOGIF ASCII on tape

A.2.1.1 Volume Directory File

There is one Volume Directory File at the beginning of each physical volume.

RECORD NUMBER	LENGTH (BYTES)	DESCRIPTION
001	2048	Volume Descriptor Record
002	2048	User Fixed-Length Record 1
003	2048	User Fixed-Length Record 2
:	:	:
u+1	2048	User Fixed-Length Record u

A.2.1.2 Data Set Header File

There is one Data Set Header File at the beginning of each data set. There can be any number of data sets in a logical volume.

RECORD NUMBER	LENGTH (BYTES)	DESCRIPTION
001	2048	Data Set Header Record
002	2048	User Fixed-Length Record 1
003	2048	User Fixed-Length Record 2
:	:	:
v+1	2048	User Fixed-Length Record v
v+2	2048	Entity Meta-Data Record 1
v+3	2048	Entity Meta-Data Record 2
:	:	:
v+1+Md	2048	Entity Meta-Data Record Md

A.2.1.3 Data Group File

There is one Data Group File for each data group. There can be any number of data groups per data set.

RECORD NUMBER	LENGTH (BYTES)	DESCRIPTION
001	256	Data Group Header Record
002	256	Data Theme Header Record 1
003	$60A_1+4$	Attribute Descriptor Record 1 (Descriptors 1 to A_1)*
004	fixed	Entity 1, 1 Fixed-Length Record**
005	variable	Entity 1, 1 Variable-Length Record***
006	fixed	Entity 1, 2 Fixed-Length Record
007	variable	Entity 1, 2 Variable-Length Record***
:	:	:
$2E_1+2$	fixed	Entity 1, E_1 Fixed-Length Record****
$2E_1+3$	variable	Entity 1, E_1 Fixed-Length Record***
$2E_1+4$	256	Data Theme Header Record 2
$2E_1+5$	$60A_2+4$	Attribute Descriptor Record 2 (Descriptors 1 to A_2)
$2E_1+6$	fixed	Entity 2, 1 fixed-Length Record
$2E_1+7$	variable	Entity 2, 1 Variable-Length Record***
:	:	:
$2E_1+\ldots+2E_{T-1}+2(T-1)+1$	256	Data Theme Header Record T
$2E_1+\ldots+2E_{T-1}+2(T-1)+2$	$60A_T+4$	Attribute Descriptor Record T (Descriptors 1 to A_T)
:	:	:
$2E_1+\ldots+2E_T+_1+2T$	fixed	Entity T, E_T fixed-Length Record
$2E_1+\ldots+2E_T+_1+2T+1$	variable	Entity T, E_T Variable-Length Record***

* A_i stands for the number of attribute descriptors in the Attribute Descriptor Record of the i^{th} data theme

** Entity i,j stands for the j^{th} entity of the i^{th} data theme

*** Not always required

**** E_i stands for the number of entities in the i^{th} data theme

A.2.1.4 End of volume File

There is one End of Volume File at the end of a logical volume.

RECORD NUMBER	LENGTH (BYTES)	DESCRIPTION
001	2048	End of Volume Record

A.2.2 Structure of CCOGIF ASCII Files on Disk

The different files allowing to create a CCOGIF volume on magnetic tape are contained in a single CCOGIF ASCII file on disk. The CCOGIF ASCII file on disk has the following characteristics:

The volume directory record (VDR) is followed by u (u>=0) user fixed-length record (UFLR).

A data set header record (DSHR) is followed by:
- v (v>=0) user fixed-length record (UFLR) and by:
- 1 to “Md” entity method data record (EMDR)

A data group begins with a data group header record (DGHR) containing a data group name and the number of point themes, line themes and area themes.

A data theme comprises a data theme header record (DTHR) followed by A (A>=0) attribute descriptor record (ADR) and a minimum of one (1) record containing an entity. Such entity can be a point, line or area (PFLR, LFLR or AFLR fixed-length record). These records can be followed by their associated points, lines or areas (PVLR, LVLR, or AVLR variable-length record).

Each data theme contains the same type of spatial entity (point, line or area). Within a theme each entity has the same attributes.

The VDR, UFLR, DSHR, EMDR and EOVR logical records have 2048 characters in length.

The DGHR, DTHR, ADR, PFLR, PVLR, LFLR, LVLR, AFLR and AVLR logical records are sequentially written in physical records of 9216 bytes in length. At the end of a data group, all of the record’s unused spaces, the physical record 9216 bytes in length, are filled with space characters (ASCII decimal code 32).

Note: There is no end-of-record physical delimiter in the CCOGIF ASCII file on disk.

RECORD NUMBER	LENGTH (BYTES)	DESCRIPTION
001	2048	Volume Descriptor Record
002	2048	User Fixed-Length Record 1
003	2048	User Fixed-Length Record 2
:	:	:
u+1	2048	User Fixed-Length Record u
u+1+1	2048	Data Set Header Record
002	2048	User Fixed-Length Record 1
003	2048	User Fixed-Length Record 2
:	:	:
v+1	2048	User Fixed-Length Record v
v+2	2048	Entity Meta-Data Record 1
v+3	2048	Entity Meta-Data Record 2
:	:	:
v+1+Md	2048	Entity Meta-Data Record Md
001	256	Data Group Header Record
002	256	Data Theme Header Record 1
003	$60A_1+4$	Attribute Descriptor Record 1 (Descriptors 1 to A_1)*
004	fixed	Entity 1, 1 Fixed-Length Record**
005	variable	Entity 1, 1 Variable-Length Record***
006	fixed	Entity 1, 2 Fixed-Length Record
007	variable	Entity 1, 2 Variable-Length Record***
:	:	:
$2E_1+2$	fixed	Entity 1, E_1 Fixed-Length Record****
$2E_1+3$	variable	Entity 1, E_1 Variable-Length Record***
$2E_1+4$	256	Data Theme Header Record 2
$2E_1+5$	$60A_2+4$	Attribute Descriptor Record 2 (Descriptors 1 to A_2)
$2E_1+6$	fixed	Entity 2, 1 Fixed-Length Record***
$2E_1+7$	variable	Entity 2, 1 Variable-Length Record***
:	:	:
$2E_1+\ldots+2E_{T-1}+2(T-1)+1$	256	Data Theme Header Record T
$2E_1+\ldots+2E_{T-1}+2(T-1)+2$	$60A_T+4$	Attribute Descriptor Record T (Descriptor 1 to A_T)*
:	:	:
$2E_1+\ldots+2E_T+2T$	fixed	Entity T, E_T Fixed-Length Record
$2E_1+\ldots+2E_T+2T+1$	variable	Entity T, E_T Variable-Length Record***
001	2048	End of Volume Record

* A_i stands for the number of attribute descriptors in the Attribute Descriptor Record of the i^{th} data theme

** Entity i,j stands for the j^{th} entity of the i^{th} data theme

*** Not always required

**** E_i stands for the number of entities in the i^{th} data theme

A.3 Data Structure

A thematic data set contains one single type of geometric entities (points, lines or areas) that share the same attribute fields.

Data groups making up a data set begin with a data group header record containing the name of the data group as well as the group's number of point thematic sets, line thematic sets, and area thematic sets.

Within a data group, the thematic data sets are lined in the following fashion: first, point thematic sets, then line thematic sets, and finally area thematic sets.

All logical records begin with a four-byte record code. The autorized record codes are the following:

VDR	:	Volume Descriptor Record
UFLR	:	User Fixed-Length Record
DSHR	:	Data Set Header Record
EMDR	:	Entity Meta-Data Record
DGHR	:	Data Group Header Record
DTHR	:	Data Theme Header Record
ADR	:	Attribute Descriptor Record
PFLR	:	Point Fixed-Length Record
LFLR	:	Line Fixed-Length Record
AFLR	:	Area Fixed-Length Record
PVLR	:	Point Variable-Length Record
LVLR	:	Line Variable-Length Record
AVLR	:	Area Variable-Length Record
EOVR	:	End of Volume Record

NOTE: There is no difference between the data structure of the CCOGIF ASCII files on tape and the CCOGIF ASCII files on disk. The files created in the first instance are stored one after the other in a single file to make up a CCOGIF ASCII format on disk.

A.3.1 Volume Descriptor Record

There is one Volume Descriptor Record per file.

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
001	004	CHAR	Record Code = 'VDR'
005	040	CHAR	Logical volume identifier (F)
045	016	INT	Physical volume number in this logical volume, where physical volumes are numbered sequentially starting from 1
061	008	DATE	Volume creation date
069	128	CHAR	Logical volume data description (F)
197	064	CHAR	Volume generating country (F)
261	064	CHAR	Volume generating agency (F)
325	064	CHAR	Volume generating facility (F)
389	064	CHAR	Format control document identifier
453	064	CHAR	Software release identifier
517	064	CHAR	Feature code revision level
581	016	INT	Number of User Fixed-Length Records following this Volume Directory Record: u ($u \geq 0$)
597	016	INT	Number of bytes left from last logical record of previous physical volume (0, if first physical volume)
613	1436		Spares
	2048		

A.3.2 User Fixed-Length Record

There may be any number of User Fixed-Length Records following a Volume Directory Record.

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
001	004	CHAR	Record Code = 'UFLR'
005	2044	CHAR	User defined data (F)
	2048		

"(F)" denotes a free text field

A.3.3 Data Set Header Record

There is one Data Set Header Record per data set.

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
001	004	CHAR	Record Code = 'DSHR'
… DATA SET GENERAL INFORMATION…			
005	064	CHAR	Data set name (F)
069	008	DATE	Data set creation date
077	064	CHAR	Data set geographic location text (F)
141	064	CHAR	Reference to other related data sets
205	308		Spares
… DATA SET CONTENT…			
513	032	CHAR	Ordered list of feature classes {'A' to 'K'} for data set. Use a blank if class is not present e.g., 'A..D..G H..J' if A, D, G, H and J are present (leave a blank for I, even if I is never used)
545	016	INT	Number of Data Groups in this Data Set: G ($G \geq 1$)
561	016	INT	Number of User Fixed-Length Records following this Data Set Header Record: v ($v \geq 0$)
577	016	INT	Number of Entity Meta-Data Records following this Data Set Header Record: Md ($Md \geq 1$)
593	016	CHAR	Data Set content indicator (see section A.3.3.1 for details)
609	160		Spares

… Data Set Header Record continued on next page…

"(F)" denotes a free text field

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
			…continuation of Data Set Header Record
	--- COORDINATE SYSTEM AND MAP PROJECTION ---		
769	004	CHAR	X-coordinate data type {'INT', 'REAL', 'DMS'}
773	004	CHAR	Y-coordinate data type {'INT', 'REAL', 'DMS'}
777	004	CHAR	Z-coordinate data type {'INT', 'REAL'}
781	016	CHAR	X-coordinate data units (e.g. METRES)
797	016	CHAR	Y-coordinate data units (e.g. METRES)
813	016	CHAR	Z-coordinate data units and origin (e.g. METRES ASL)
829	016	var	Z-coordinate minimum value (Z-type at byte 777)
845	016	var	Z-coordinate maximum value (Z-type at byte 777)
861	636	var	Map projection parameters for this data set, including origin of (x,y) coordinate data and bounding polygon (defined by up to twelve coordinate pairs) of the data set (see section A.3.3.1 for details)
1497	296		Spares
	--- GEODETIC DATUM AND ADJUSTMENT ---		
1793	016	CHAR	Geodetic Datum (F)
1809	016	CHAR	Adjustment Name (F)
1825	016	CHAR	Vertical Datum (F)
1841	208		Spares
	2048		

"var" denotes a variable field type
"(F)" denotes a free text field

A.3.3.1 Data Set Content Indicator

A 16 character field is used in the Data Set Header Record to provide information about some characteristics of the data and may have one of three values: T (true), F (false) or U (unknown).

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
			…continuation of Data Set Header
593	001	CHAR	Data is 3 dimensional; if 'false', z always equals zero
594	001	CHAR	Point to line topology exists in data set (points "know" the lines that connect to them)
595	001	CHAR	Line to point topology exists in data set (lines "know" their start and end points)
596	001	CHAR	Collocation exists in data set
597	001	CHAR	Line to area topology exists in data set (lines "know" their left and right areas)
598	001	CHAR	Area to line topology exists in data set (areas "know" the lines that bound them)
599	001	CHAR	There is a known point within each area
600	001	CHAR	Attributes are present in entity records
601	008		Spares
	016		

A.3.3.2 Map Projection Parameters

There is one set of map projection parameters in each Data Set Header Record. There are currently six (6) map projection defined: Latitude/Longitude, UTM, Mercator, Lambert Conformal, Stereographic and Polyconic.

Latitude/Longitude

This information is included in the "map projection parameters for this data set" field in the Data Set Header Record if the data is in a latitude/longitude format.

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
			…continuation of Data Set Header
861	004	CHAR	Projection ID: '0100'
865	032	CHAR	Projection Name: 'LATITUDE/LONGITUDE'
897	168		Spares
1065	016	DMS	Longitude origin for X coordinate
1081	016	DMS	Latitude origin for Y coordinate
1097	016	INT	Number of bounding coordinate pairs that form a bounding polygon for this data set
1113	032	DMS	1st bounding coordinate pair
1145	032	DMS	2nd bounding coordinate pair
:	:	:	:
1465	032	DMS	12th bounding coordinate pair
	636		

Transverse Mercator

This information is included in the "map projection parameters for this data set" field in the Data Set Header Record if the data is in a Transverse Mercator projection.

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
			…continuation of Data Set Header
861	004	CHAR	Projection ID: '0200'
865	032	CHAR	Projection Name: 'TRANSVERSE MERCATOR'
897	016	DMS	Central Meridian
913	016	DMS	Zone width (6^0 FOR UTM)
929	020	CHAR	Spheroid name
949	016	REAL	Semi major axis
965	016	REAL	Semi minor axis
981	016	REAL	Eccentricity
997	016	REAL	Scale factor
1013	004		Spares
1017	016	INT	False Easting (500000 M FOR UTM)
1033	016	INT	False Northing (0 OR 1000000 METRES FOR UTM)
1049	016	INT	Zone number
1065	016	var	Easting origin for X coordinate
1081	016	var	Northing origin for Y coordinate
1097	016	INT	Number of bounding coordinate pairs that form a bounding polygon for this data set
1113	032	var	1^{st} bounding coordinate pair (x,y)
1145	032	var	2^{nd} bounding coordinate pair (x,y)
:	:	:	:
1465	032	var	12^{th} bounding coordinate pair (x,y)
	636		

For all Transverse Mercator projections, the projections ID number will remain "0200" and the projection name will be 'TRANSVERSE MERCATOR'. The "zone width" field differentiates possible cases within the projection.

For instance, the Universal Transverse Mercator projection will have a projection ID of "0200", a projection name 'TRANSVERSE MERCATOR' and a zone width of 6. This projection has 60 zones of 6 degrees from 177 degrees West, numbered such that the central meridian is equal to the zone number times 6 minus 183. The central scale factor in 0.9996. The false Easting is 500000 metres and the false northing is zero for the Northern Hemisphere or 1000000 metres for the Southern Hemisphere.

"var" denotes a variable field type

Mercator

This information is included in the "map projection parameters for this data set" field in the Data Set Header Record if the data is in Mercator projection.

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
			…continuation of Data Set Header
861	004	CHAR	Projection ID: '0203'
865	032	CHAR	Projection Name: 'MERCATOR'
897	016	DMS	Mid Latitude
913	016		Spares
929	020	CHAR	Spheroid name
949	016	REAL	Semi major axis
965	016	REAL	Semi minor axis
981	016	REAL	Eccentricity
997	068		Spares
1065	016	var	Easting origin for X coordinate
1081	016	var	Northing origin for Y coordinate
1097	016	INT	Number of bounding coordinate pairs that form a bounding polygon for this data set
1113	032	var	1st bounding coordinate pair (x,y)
1145	032	var	2nd bounding coordinate pair (x,y)
:	:	:	:
1465	032	var	12th bounding coordinate pair (x,y)
	636		

"var" denotes a variable field type

Lambert Conformal

This information is included in the "map projection parameters for this data set" field in the Data Set Header Record if the data is in a Lambert Conformal projection.

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
			…continuation of Data Set Header
861	004	CHAR	Projection ID: '0300'
865	032	CHAR	Projection Name: 'LAMBERT CONFORMAL'
897	016	DMS	First Scaling Parallel
913	016	DMS	Second Scaling Parallel
929	020	CHAR	Spheroid name
949	016	REAL	Semi major axis
965	016	REAL	Semi minor axis
981	016	REAL	Eccentricity
997	068		Spares
1065	016	var	Easting origin for X coordinate
1081	016	var	Northing origin for Y coordinate
1097	016	INT	Number of bounding coordinate pairs that form a bounding polygon for this data set
1113	032	var	1st bounding coordinate pair (x,y)
1145	032	var	2nd bounding coordinate pair (x,y)
:	:	:	:
1465	032	var	12th bounding coordinate pair (x,y)
	636		

"var" denotes a variable field type

Stereographic

This information is included in the "map projection parameters for this data set" field in the Data Set Header Record if the data is in a Stereographic projection.

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
			…continuation of Data Set Header
861	004	CHAR	Projection ID: '0400'
865	032	CHAR	Projection Name: 'STEREOGRAPHIC'
897	016	DMS	Scaling Latitude'
913	016		Spares
929	020	CHAR	Spheroid name
949	016	REAL	Semi major axis
965	016	REAL	Semi minor axis
981	016	REAL	Eccentricity
997	068		Spares
1065	016	var	Easting origin for X coordinate
1081	016	var	Northing origin for Y coordinate
1097	016	INT	Number of bounding coordinate pairs that form a bounding polygon for this data set
1113	032	var	1st bounding coordinate pair (x,y)
1145	032	var	2nd bounding coordinate pair (x,y)
:	:	:	:
1465	032	var	12th bounding coordinate pair (x,y)
	636		

"var" denotes a variable field type

Polyconic

This information is included in the "map projection parameters for this data set" field in the Data Set Header Record if the data is in a Polyconic projection.

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
			…continuation of Data Set Header
861	004	CHAR	Projection ID: '0500'
865	032	CHAR	Projection Name: 'POLYCONIC'
897	016	DMS	Central Meridian
913	016		Spares
929	020	CHAR	Spheroid name
949	016	REAL	Semi major axis
965	016	REAL	Semi minor axis
981	016	REAL	Eccentricity
997	068		Spares
1065	016	var	Easting origin for X coordinate
1081	016	var	Northing origin for Y coordinate
1097	016	INT	Number of bounding coordinate pairs that form a bounding polygon for this data set
1113	032	var	1st bounding coordinate pair (x,y)
1145	032	var	2nd bounding coordinate pair (x,y)
:	:	:	:
1465	032	var	12th bounding coordinate pair (x,y)
	636		

"var" denotes a variable field type

A.3.4 User Fixed-Length Record

There may be any number of User Fixed-Length Records following a Data Set Header Record (Refer to A.3.2 for a record description).

A.3.5 Entity Meta-Data Record

There is at least one Entity Meta-Data Record following a Data Set Header Record. There may be as many Entity Meta-Data Records as required to describe varying sources and quality of the data contained in the data set. Every entity may reference two of these modules, the first relating to data capture time (initial or new compilation), the second to last revision/validation.

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
--- SOURCE AND MEASUREMENT INFORMATION ---			
001	004	CHAR	Record code = 'EMDR'
005	016	INT	Meta-Data ID number
021	064	CHAR	Data generating agency (F)
085	064	CHAR	Method of data capture/revision (F)
149	064	CHAR	Type of collection instrument (F)
213	064	CHAR	Type of source material (F)
277	064	CHAR	Scale of source material (F)
341	008	DATE	Date of source material
349	008	DATE	Date of field completion
357	008	DATE	Date of data capture/revision
365	192	CHAR	Reference to specification document on source material and collection/revision methods (F)
557	192	CHAR	Reference to specification document on feature coding and attribute assignment procedures (F)
749	192	CHAR	Reference to specification document on data structuring processes (F)
941	192	CHAR	Reference to specification document on quality control procedures (F)
1133	192	CHAR	Reference to specification document on transformations and generalization procedures (F)
1325	192	CHAR	Reference to specification document on field completion procedures (F)
1517	192	CHAR	Reference to specification document on accuracy determination procedures (F)
1709	064	CHAR	Resolution of data (F)
1773	016	REAL	X positional accuracy of the data
1789	016	REAL	Y positional accuracy of the data
1805	016	REAL	Z positional accuracy of the data
1821	228		Spares

2048

"(F)" denotes a free text field

A.3.6 Data Group Header Record

There is one Data Group Header Record at the beginning of each data group.

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
001	004	CHAR	Record code = 'DGHR'
005	064	CHAR	Data group name
069	016	INT	Number of point themes in this data group
085	016	INT	Number of line themes in this data group
101	016	INT	Number of area themes in this data group
117	140		Spares
	256		

A.3.7 Data Theme Header Record

There is one Data Theme Header Record at the beginning of each data theme.

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
001	004	CHAR	Record code = 'DTHR'
005	008	CHAR	Entity type (point, line, area) of this data theme
013	016	INT	Number of entities in this data theme
029	016	INT	Number of attribute descriptors (A) in the attribute descriptor record for this data theme
045	016	INT	Length of fixed-length entity records in this data theme, in bytes
061	196		Spares
	256		

A.3.8 Attribute Descriptor Record

The attribute description of each Data Theme consists of an Attribute Descriptor Record, where A is the number of Attribute Descriptors as specified in the Data Theme Header Record.

There is one-to-one correspondence between the attribute descriptors and the attribute value fields within the entity fixed-length records. The attribute descriptors appear in the attribute descriptor record in the same order in which their values appear in the entity records.

Each attribute is transmitted as ASCII characters and interpreted according to one of five types as defined in section A.4: integer, real, degrees/minutes/seconds, character or date. Note: c You may use any CCOG feature codes as attributes but they are secondary feature codes, as the primary feature code is an explicit field in each entity fixed-length record.

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
001	004	CHAR	Record code = ‘ADR’
005	060	var	Attribute 1 descriptor
065	060	var	Attribute 2 descriptor
:	:	:	:
60(A-1)+5	060	var	Attribute A descriptor
	60A+4		

Each of the 60 byte attribute descriptors contains:

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
offset+001	040	CHAR	Attribute name
offset+041	004	CHAR	Attribute type identifier: one of (‘INT’, ‘REAL’, ‘DMS’, ‘CHAR’, ‘DATE’)
offset+045	016	INT	String length if type = ‘CHAR’; zero otherwise
	060		

where the offset for the i^{th} attribute descriptor is 60(i-1)+4

“var” denotes a variable field type

A.3.9 Entity Records

Each entity may have two logical records:

A fixed-length record containing information that includes: an ID number, spatial information (for points), topological information (for lines), the primary feature code, and (optionally) attribute values; it also contains a field indicating the length of the associated variable-length record.

A variable-length record containing: for a point, the list of ID numbers of the lines attached to it, if any exist; for a line, the list of coordinate triplets that spatially define it, if the line is not collocated; for areas, a list of ID numbers of the lines that create its boundary, if they are explicitly know.

These two logical records have been created in order to manage variable-length records in a machine independent fashion. Points without attached lines, line collocated with other lines and areas without explicitly defined boundary lines only have fixed-length records.

All coordinate triplet values are relative to the origin defined by the map projection parameters in the Data Set Header Record.

The type {INT, REAL, DMS} is not specified for coordinate triplets, as it is dependent on the definition of the coordinate system. The ‘coordinate data type’ field in the Data Set Header Record contains a type identifier of ‘INT’, ‘REAL’ or ‘DMS’ for all three coordinates.

There is a list of proposed attribute dictionaries in appendix C for users who wish to carry other types than the 3 basic entity types (point, line and area). e.g. text, arcs, geometric figures, etc.

A.3.9.1 Point Fixed-Length Record

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
001	004	CHAR	Record code = 'PFLR'
005	016	INT	Point ID number
021	016	INT	Data collection meta-data pointer
037	016	INT	Data revision/validation meta-data pointer
053	048	var	Coordinate triplet (x, y, z) for this point (type and relative origin as defined in the Data Set Header)
101	016	INT	Number of lines attached to this point: p, ($p \geq 0$)
117	016	REAL	Orientation angle, in degrees from x-axis (counterclockwise)
133	012	CHAR	Primary feature code for this point
145		var	Attribute values, in the same order in which they appear in the attribute descriptor record

144+attlen

A.3.9.2 Point variable-Length Record

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
001	004	CHAR	Record code = 'PVLR'
005	016	INT	Attached line1 ID number
021	016	INT	Attached line2 ID number
:	:	:	:
16(p-1)+5	016	INT	Attached linep ID number

16p+4

"var" denotes a variable field type

A.3.9.3 Line Fixed-Length Record

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
001	004	CHAR	Record code = 'LFLR'
005	016	INT	Line ID number
021	016	INT	Data collection meta-data pointer
037	016	INT	Data revision/validation meta-data pointer
053	016	INT	ID number of collocated line (zero if not collocated)
069	016	INT	Start node ID number (zero if not defined)
085	016	INT	End node ID number (zero if not defined)
101	016	INT	Left area ID number (zero if not defined)
117	016	INT	Right area ID number (zero if not defined)
133	016	INT	Number of coordinate triplets in this line :q (q≥2)
149	012	CHAR	Primary feature code for this line
161		var	Attribute values, in the same order in which they appear in the attribute descriptor record

160+attlent

If this line is collocated with a line defined within this data set (i.e., field 5 is not zero), there will be no variable-length record for this line. The value of the 10^{th} field will be zero (no coordinate triplets).

A.3.9.4 Line Variable-Length Record

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
001	004	CHAR	Record code = 'LVLR'
005	048	var	Coordinate triplet 1 (x,y,z), relative to the origin defined in the Data Set Header
053	048	var	Coordinate triplet q (x,y,z) relative to the origin defined in the Data Set Header
:	:	:	:
48 (q-1)+5	048	var	Coordinate triplet 2 (x,y,z) relative to the origin defined in the Data Set Header

48q+4

"var" denotes a variable field type

A.3.9.5 Area Fixed-Length Record

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
001	004	CHAR	Record code = 'AFLR'
005	016	INT	Area ID number
021	016	INT	Data collection meta-data pointer
037	016	INT	Data revision/validation meta-data pointer
053	048	var	Coordinate triplet of a point inside this area (type and relative origin defined in the Data Set Header Record)
101	016	INT	Number of boundary lines for this area r($r \geq 0$)
117	012	CHAR	Primary feature code for this area
129		var	Attribute values, in the same order in which they appear in the Attribute Descriptor Record
	128+attlen		

A.3.9.6 Area Variable-Length Record

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
001	004	CHAR	Record code = 'AVLR'
005	016	INT	Boundary line 1 ID number
021	016	INT	Boundary line 2 ID number
:	:	:	:
16(r-1)+5	016	INT	Boundary line r ID number
	16r+4		

A.3.10 End of Volume Record

There is one end of Volume Record at the end of each logical volume

START BYTE	LENGTH (BYTES)	TYPE	DESCRIPTION
001	004	CHAR	Record type = 'EOVR'
005	2044		Spares
	2048		

"var" denotes a variable field type

A.4 Data Types and Formats

ALL DATA ARE TRANSMITTED AS ASCII CHARACTERS ONLY.

INTEGER NUMBERS: TYPE = 'INT'

Integer numbers are stored in base 10 as 16 ASCII characters: the sign followed by (up to) 15 integer digits.

±	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d

The integer number is right-justified in the field and the leading digits are filled with character zeros ('0').

Integer number

Example 1: -23 is encoded as

-	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3

Example 2: The maximum number that can be decoded as a 32-bit signed integer is 2 147 483 647 and it is encoded as

+	0	0	0	0	0	2	1	4	7	4	8	3	6	4	7

REAL NUMBERS: TYPE = 'REAL'

Real numbers are stored in base 10 exponential form as 16 ASCII characters: the sign of the mantissa, the first significant digit, a decimal point, the remaining nine digits of the mantissa, an 'E', the sign of the exponent, and the two digits of the exponent:

±	d	.	d	d	d	d	d	d	d	d	d	E	±	d	d

The decimal point is placed in the second character and the 'E' and sign of the exponent are placed in the thirteenth and fourteenth characters of the field. The trailing decimals of the mantissa and the leading digit of the exponent are filled with character zeros ('0') if necessary.

A 32-bit real typically has only 24 bits of mantissa precision. The ASCII format detailed here allows for 32 bits of precision in the mantissa, but 6 bits of this will be lost on conversion to 32-bit real.

Real Number

Example 1: -12.5 is encoded as

-	1	.	2	5	0	0	0	0	0	0	E	+	0	1

Example 2: 0.0000089654032 is encoded as

+	8	.	9	6	5	4	0	3	2	0	0	E	-	0	6

DEGREES, MINUTES, SECONDS: TYPE = 'DMS'

Numbers in degrees minutes and seconds are stored in base 10 as 16 ASCII characters: the sign of the angle (positive for a North latitude or an East longitude, negative for a South latitude or a West longitude), three degree digits, an ASCII blank, two minutes digits, an ASCII blank, two seconds, and decimal point, and five decimal places for seconds:

±	d	d	d		m	m		s	s	.	s	s	s	s	s

The positions of the ASCII blanks and the decimal point are fixed, therefore the degrees, minutes and integer seconds are right-justified while the decimal seconds are left-justified to the decimal point. All leading and trailing spaces within the areas allotted for numbers are filled with ASCII zeros (0).

Degrees, Minutes, Seconds

Example: 91º 42' 56.23" is encoded as

+	0	9	1		4	2		5	6	.	2	3	0	0	0

CHARACTER STRINGS: TYPE = 'CHAR'

Character strings are left-justified within their field and padded with ASCII blanks.

Character String

Example: 'National Capital Region' is placed in a 26-character field as:

N	a	t	i	o	n	a	l		C	a	p	i	t	a	l		R	e	g	i	o	n			

DATE TRINGS: TYPE = 'DATE'

Date strings are encoded in base 10 as 8 ASCII characters: four digits for the year, two digits for the month and two digits for the date:

y	y	y	y	m	m	d	d

Date String

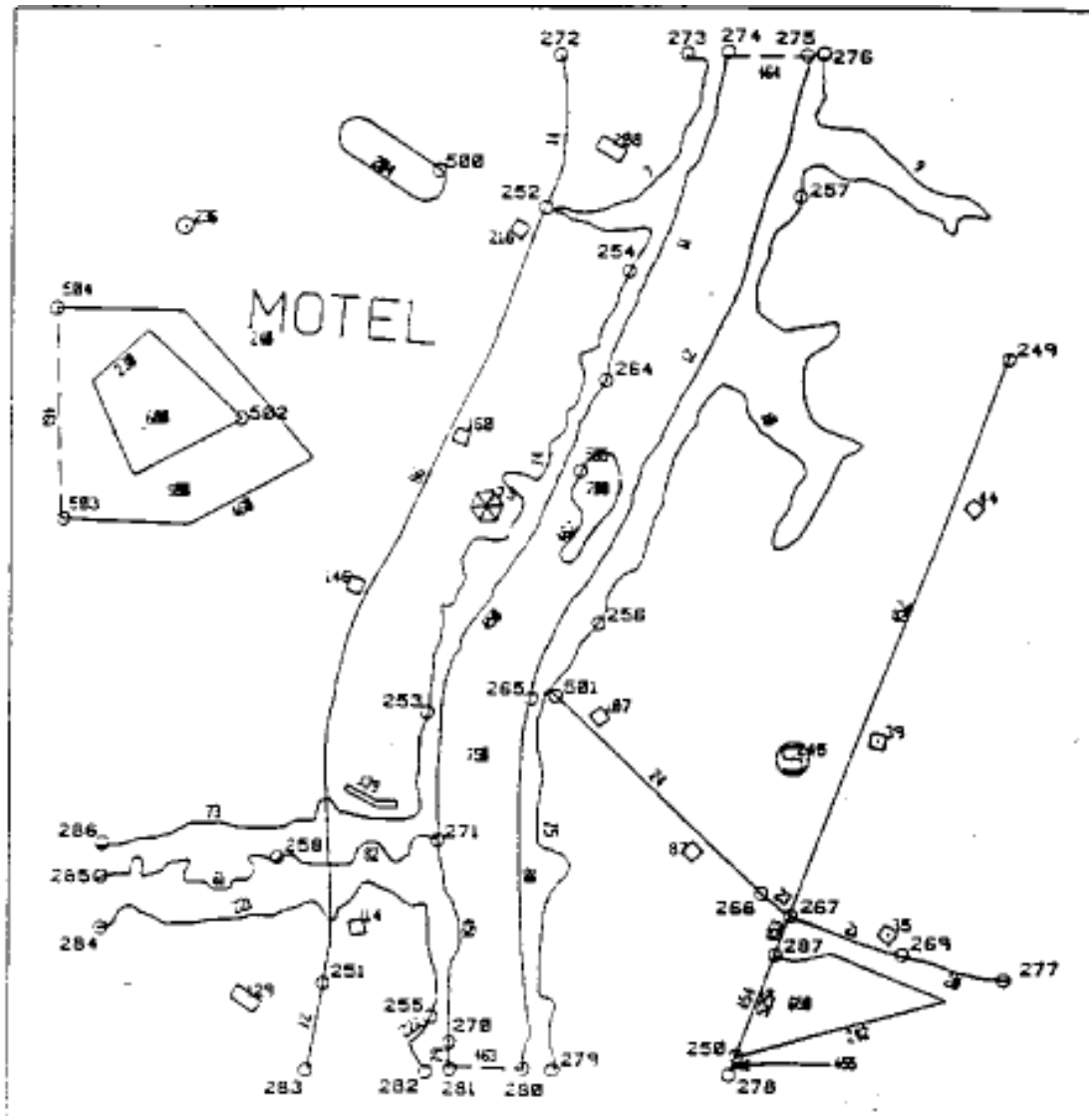
Example: March 26, 1986 is encoded as:

1	9	8	6	0	3	2	6

APPENDIX B

EXAMPLE DATA SET

The following benchmark test data set represents a portion of map sheet 31H10 (Saint-Hyacinthe in the province of Quebec), where fictional features and attributes have been added in order to meet all possibilities that could be encountered during a processing session. Information is divided in to six different groups that are: ROAD/RAILWAY, BUILDING/STRUCTURE, HYDROGRAPHY, HYPSOGRAPHY, LAND COVER, and finally DESIGNATED AREA. The use of topology, attributes and collocation has been considered in the present data set. All points (including nodes), lines and areas were numbered with a unique ID entity number. An overlap of ID entity numbers between entity types is allowed in the format, but led to ambiguities and confusion when viewing the accompanying black-and-white plots of data. The following data set example shows a CCOGIF ASCII on disk.



*Line 525 is collocated to line 454

[VOLUME DESCRIPTOR RECORD]

|VDR |APPENDIX |
|+000000000000001|
|19890310|
|LOGICAL VOLUME INCLUDING ONE DATA SET FOR THE PURPOSE OF APPENDIX B |
|CANADA |
|ENERGY, MINES AND RESOURCES CANADA |
|CANADA CENTRE FOR GEOMATICS-SHERBROOKE- |
|CCSM STANDARD FORMAT SPEC.-V.1.2-JANUARY 1989 |
|CCSM EDP SOFTWARE, V.2.0-JANUARY 1989 |
|CODES AND DICTIONARY OF TOPOGRAPHIC FEATURES, JULY 1984 |
|+000000000000001 |
|+000000000000000 |
|(1436 spares)|

*** PHYSICAL RECORD OF 2048 BYTES ***

[USER FIXED-LENGTH RECORD]

|UFLR|
|IN THIS VOLUME, ONE DATA SET HAS BEEN CREATED FROM MAP SHEET 31H10. SOME FEATURES HAVE BEEN REMOVED OR ADDED TO VIEW BETTER THE POSSIBILITIES OF THE CCSM FORMAT. NOTE THAT TOPOLOGY, ATTRIBUTES AND USER INFORMATION (SUCH AS THIS UFLR RECORD) ARE OPTIONAL. FOR MORE DETAILS ABOUT THE DATA, A USER INFORMATION RECORD AT THE DATA SET LEVEL DESCRIBES THE DATA STRUCTURE AND THE GROUP DEFINITIONS USED.
(plus spares for a total of 2044)|

*** PHYSICAL RECORD OF 2048 BYTES ***

[DATA SET HEADER RECORD]

| DSHR | DATASET SAMPLE FOR APPENDIX B |
| 1980227 |
| PORTION OF MAP SHEET 31H10, SAINT-HYACINTHE |
| NONE |
| (308 spares) |
| ABCD FGH JK |
| +000000000000006 | +000000000000001 |
| +000000000000002 | TTTTTTTT |
| (160 spares) |
INT	INT	INT
METRES	METRES	METRES	+000000000000000	+000000000030000
0200	TRANSVERSE MERCATOR
+075 00 00.00000	+006 00 00.00000
CLARKE 1866
+6.378206400E+06	+6.356583800E+06	+2.753592750E+11	+9.996000000E-01
(4 spares)
+000000000500000	+000000000000000	+000000000000018	+000000000000000	+000000000000000	+000000000000004
+000000000659827+000000005057255	+000000000659827+000000005058007
+000000000661265+000000005058007	+000000000661265+000000005057255
(256 BYTES FOR REMAINING POLYGON COORDINATES NOT USED)
(296 spares)
MAY-76	UNKNOWN	ABOVE SEA LEVEL
(208 spares)

*** PHYSICAL RECORD OF 2048 BYTES ***

[USER FIXED-LENGTH RECORD]

| UFLR |
| FEATURES ARE GROUPED TOGETHER INTO SIX DIFFERENT GROUPS, WHICH ARE: HYDROGRAPHY, HYPSOGRAPHY, LAND COVER, BUILDING/STRUCTURE, ROAD/RAILWAY AND DESIGNATED AREA. DATA ARE STRUCTURED TO BE TOPOLOGICALLY RELATED IN THEIR THREE DIMENSIONS. THIS MEANS THAT WHEN TWO ROADS INTERSECT, THE JUNCTION WILL BE CARRIED BY A NODE. IN THE CASE OF A ROAD CROSSING OVER A RIVER, NO SUCH JUNCTION IS CARRIED. IN THIS DATA SET, A POINT NODE MAY JOIN LINES OF DIFFERENT GROUPS. IN MANY CASES, ATTRIBUTES HAVE BEEN DEFINED AND ARE TOTALY FICTIONAL.
(plus spares for a total of 2048) |

*** PHYSICAL RECORD OF 2048 BYTES ***

[ENTITY META-DATA RECORD]

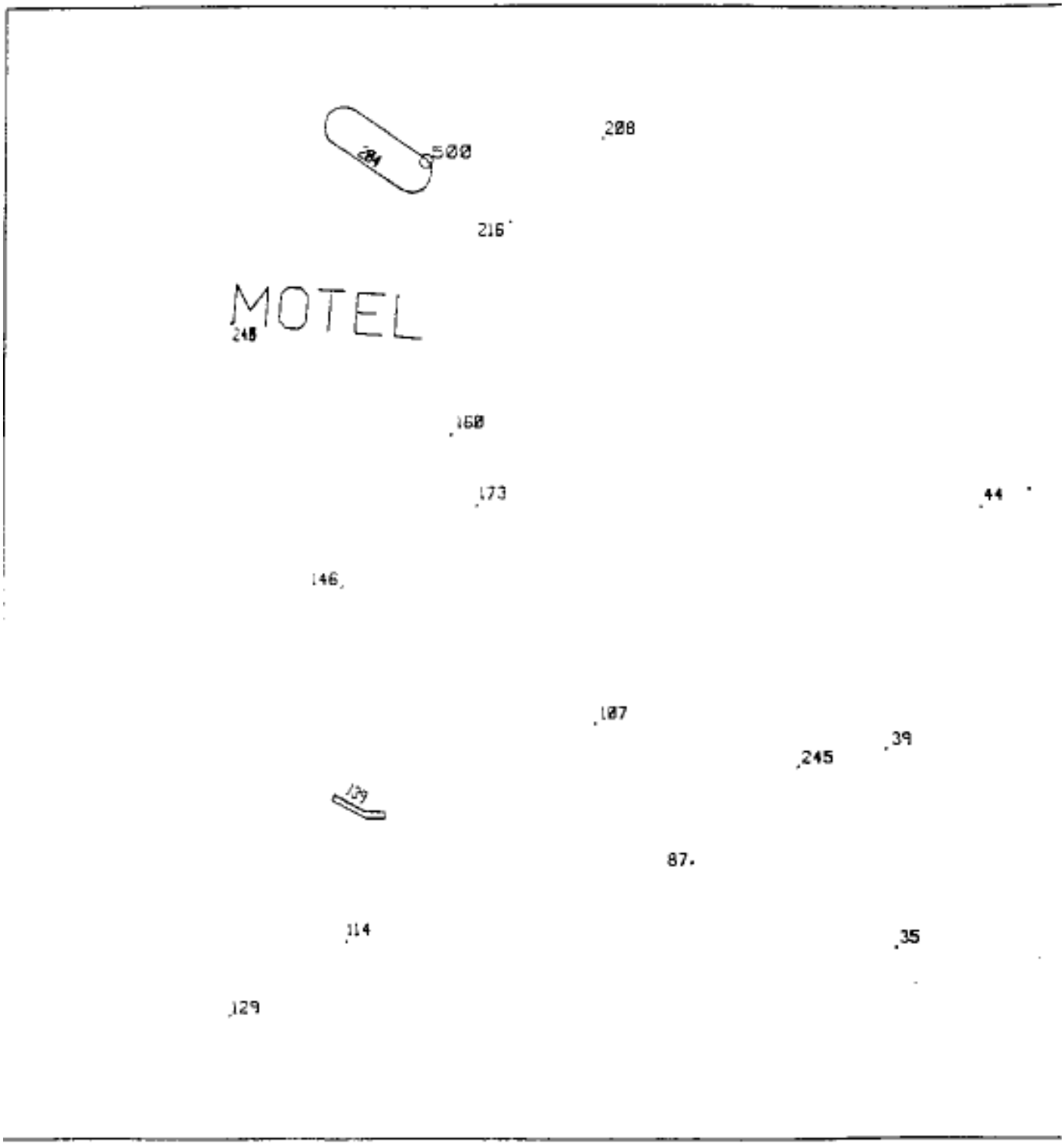
| EMDR | +000000000000001 |
| CANADA CENTRE FOR MAPPING, EMR |
| STEREO-COMPILATION |
| B-8 |
| AERIAL PHOTOGRAPHY |
| 1:60000 |
| 19810530 | 19810916 | 19820719 |
|SPECIFICATION FOR AERIAL SURVEY PHOTOGRAPHY, INTERDEPARTMENTAL COMMITTEE ON AIR SURVEYS, EMR, 1982 (a total of 192) |
| TOPOGRAPHIC CODES AND DICTIONNARY OF TOPOGRAPHIC FEATURES, VOLUME II OF THE NATIONAL STANDARDS FOR THE EXCHANGE OF DIGITAL TOPOGRAPHIC DATA JULY 1984 (a total of 192) |
| TOPOGRAPHIC MAPPING MANUAL OF COMPILATION SPECIFICATIONS AND INSTRUCTIONS, EMR, THIRD EDITION, 1974 (a total of 192) |
| UNKNOWN (a total of 192) |
| NONE (a total of 192) |
| MANUAL OF FIELD COMPLETION SURVEY, SURVEYING AND MAPPING BRANCH, EMR, 1976 (a total of 192) |
| DATA CLASSIFICATION, QUALITY EVALUATION AND EDP FILE FORMAT, VOLUME II OF THE NATIONAL STANDARDS FOR THE EXCHANGE OF DIGITAL TOPOGRAPHIC DATA, EMR, 1984 (a total of 192) |
| UNKNOWN |
| +5.000000000E+00 | +5.000000000E+00 | +4.000000000E+00 |
| (228 spares) |

*** PHYSICAL RECORD OF 2048 BYTES ***

[ENTITY META-DATA RECORD]

| EMDR | +000000000000002 |
| LAND INFORMATION SERVICES, QUEBEC |
| UNKNOWN |
| UNKNOWN |
| AERIAL PHOTO |
| 1:35000 |
| UNKNOWN |NONE |19870325|
| SPECIFICATION FOR AERIAL SURVEY PHOTOGRAPHY, INTERDEPARTMENTAL COMMITTEE ON AIR SURVEYS, EMR, 1982 (a total of 192) |
| TOPOGRAPHIC CODES AND DICTIONNARY OF TOPOGRAPHIC FEATURES, VOLUME II OF THE NATIONAL STANDARDS FOR THE EXCHANGE OF DIGITAL TOPOGRAPHIC DATA, JULY 1984 (a total of 192) |
| UNKNOWN (a total of 192) |
| UNKNOWN (a total of 192) |
| NONE (a total of 192) |
| NONE (a total of 192) |
| DATA CLASSIFICATION, QUALITY EVALUATION AND EDP FILE FORMAT, VOLUME II OF THE NATIONAL STANDARDS FOR THE EXCHANGE OF DIGITAL TOPOGRAPHIC DATA, EMR, 1984 (a total of 192) |
| HALF METER |
| +5.000000000E-01 | +5.000000000E-01 | +5.000000000E-01|
| (228 spares) |

*** PHYSICAL RECORD OF 2048 BYTES ***


208
500
216
MOTEL
248
160
173
44
146
107
39
245
87.
114
35
129

[DATA GROUP HEADER RECORD]

| DGHR |
| BUILDING/STRUCTURE |
| +000000000000002 | +00000000000002 | +00000000000000 |
| (140 spares) |

[DATA THEME HEADER RECORD]

| DTHR | POINT |
| +000000000000015 | +000000000000000 | +000000000000144 |
| (196 spares) |

[POINT FIXED-LENGTH RECORD]

| PFLR |
| +000000000000129 | +000000000000002 | +000000000000000 | +000000000660114 +000000005057363 +000000000000039 |
| +000000000000000 | +4.500000000E+01 | BA 01450 000 |

| PFLR |
| +000000000000208 | +000000000000002 | +000000000000000 | +000000000660661+000000005058654 +000000000000036 |
| +000000000000000 | +6.000000000E+01 | BA 01450 000 |

| PFLR |
| +000000000000173 | +000000000000002 | +000000000000000 | +000000000660476 +000000005058113 +000000000000034 |
| +000000000000000 | +0.000000000E+00 | BA 12600 000 |

| PFLR |
| +000000000000035 | +000000000000002 | +000000000000000 | +000000000661085 +000000005057463 +000000000000037 |
| +000000000000000 | +4.500000000E+01 | BR 03300 000 |

| PFLR |
| +000000000000039 | +000000000000002 | +000000000000000 | +000000000661070 +000000005057758 +000000000000037 |
| +000000000000000 | +6.500000000E+01 | BR 03300 000 |

| PFLR |
| +000000000000044 | +000000000000002 | +000000000000000 | +000000000661210 +000000005058112 +000000000000038 |
| +000000000000000 | +4.200000000E+01 | BR 03300 000 |

| PFLR |
| +000000000000087 | +000000000000002 | +000000000000000 | +000000000660791 +000000005057589 +000000000000036 |
| +000000000000000 | +3.500000000E+01 | BR 03300 000 |

| PFLR |
| +000000000000107 | +000000000000002 | +000000000000000 | +000000000660649 +000000005057794 +000000000000035 |
| +000000000000000 | +3.500000000E+01 | BR 03300 000 |

| PFLR |
| +000000000000114 | +000000000000002 | +000000000000000 | +000000000660285 +000000005057472 +000000000000037 |
| +000000000000000 | +1.050000000E+01 | BR 03300 000 |

| PFLR |
| +000000000000146 | +000000000000002 | +000000000000000 | +000000000660277+000000005057994+000000000000038 |
| +000000000000000 | +6.500000000E+01 | BR 03300 000 |

| PFLR |
| +000000000000160 | +000000000000002 | +000000000000000 | +000000000660438+000000005058218+000000000000036 |
| +000000000000000 | +6.000000000E+01 | BR 03300 000 |

| PFLR |
| +000000000000182 | +000000000000002 | +000000000000000 | +000000000660573+000000005058509+000000000000038 |
| +000000000000000 | +6.700000000E+01 | BR 03300 000 |

| PFLR |
| +000000000000216 | +000000000000002 | +000000000000000 | +000000000660525+000000005058532 +000000000000038 |
| +000000000000000 | +5.800000000E+01 | BR 03300 000 |

| PFLR |
| +000000000000245 | +000000000000002 | +000000000000000 | +000000000660942+000000005057731+000000000000045 |
| +000000000000000 | +0.000000000E+00 | CA 27500 000 |

| PFLR |
| +000000000000500 | +000000000000001 | +000000000000002 | +000000000660402+000000005058622+000000000000033 |
| +000000000000001 | +0.000000000E+00 | KD 27500 000 |

[POINT VARIABLE-LENGTH RECORD]

| PVLR | +000000000000204 |

[DATA THEME HEADER RECORD]

| DTHR | POINT |
| +000000000000001 | +000000000000006 | +000000000000288 |
| (196 spares) |

[ATTRIBUTE DESCRIPTOR RECORD]

| ADR |
JUSTIFICATION	CHAR	+000000000000016
FONT	CHAR	+000000000000016
TEXT HEIGHT	REAL	+000000000000000
TEXT WIDTH	REAL	+000000000000000
NUMBER OF CHARACTER(S)	INT	+000000000000000
TEXT STRING	CHAR	+000000000000064

[POINT FIXED-LENGTH RECORD]

| PFLR |
| +000000000000240 | +000000000000001 | +000000000000002 | +000000000660117+000000005058382+000000000000033 |
| +000000000000000 | +0.000000000E+00 | KA 07950 550 |
|UPPER RIGHT 20 +000000000000060+000000000000050+000000000000005MOTEL |

[DATA THEME HEADER RECORD]

| DTHR | LINE |
| +000000000000001 | +000000000000000 | +000000000000160 |
|(196 spares) |

[LINE FIXED-LENGTH RECORD]

|LFLR|
| +000000000000139 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000000 | +000000000000000 |
| +000000000000000 | +000000000000000 | +000000000000006 | BA 01450 000 |

[LINE VARIABLE-LENGTH RECORD]

| LVLR |
+000000000660268	+000000005057689	+000000000000036	+000000000660312+000000005057664+000000000000036
+000000000660342	+000000005057654	+000000000000036	+000000000660313+000000005057654+000000000000036
+000000000660263	+000000005057681	+000000000000036	+000000000660268+000000005057689+000000000000036

[DATA THEME HEADER RECORD]

| DTHR | LINE |
| +000000000000001 | +000000000000001 | +000000000000176 |
| (196 spares) |

[ATTRIBUTE DESCRIPTOR RECORD]

| ADR |
| TRACK LENGTH IN METERS | INT | +000000000000000 |

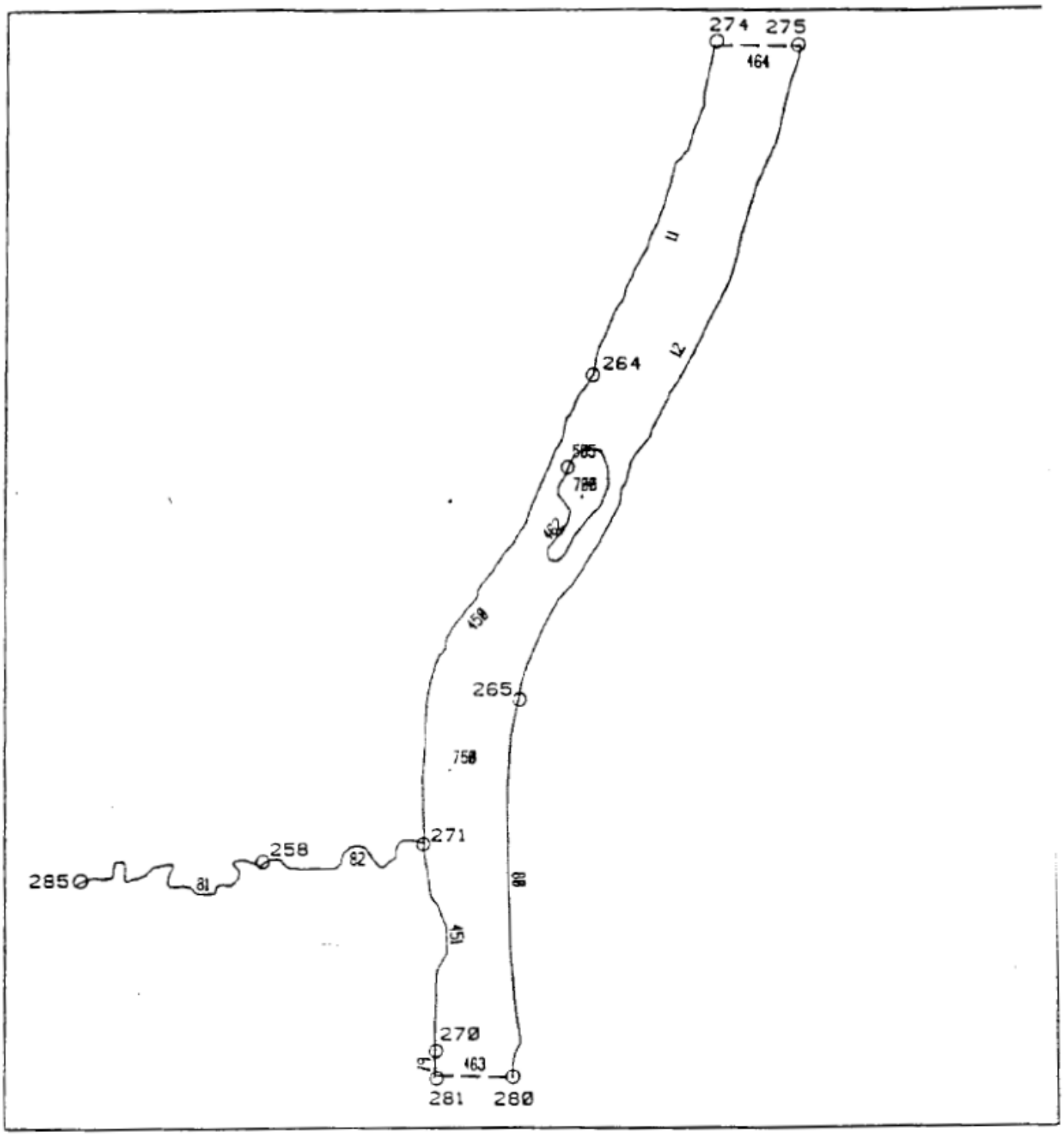
[LINE FIXED-LENGTH RECORD]

| LFLR |
| +000000000000204 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000500 | +000000000000500 |
| +000000000000000 | +000000000000000 | +000000000000007 | +AL 22650 110 | +000000000000400 |

[LINE VARIABLE-LENGTH RECORD]

| LVLR |
+000000000660402+000000005058622+000000000000033	+000000000660283+000000005058699+000000000000033
+000000000660255+000000005058691+000000000000033	+000000000660251+000000005058677+000000000000033
+000000000660399+000000005058582+000000000000033	+000000000660408+000000005058613+000000000000033
+000000000660402+000000005058622+000000000000033

*** PHYSICAL RECORD OF 9216 BYTES ***


274
275
164
264
265
271
258
285
270
163
281
280

[DATA GROUP HEADER RECORD]

| DGHR |
| HYDROGRAPHY |
| +000000000000001 | +000000000000002 | +000000000000001 |
| (140 spares) |

[DATA THEME HEADER RECORD]

| DTHR | POINT |
| +000000000000011 | +000000000000000 | +000000000000144 |
| (196 spares) |

[POINT FIXED-LENGTH RECORD]

| PFLR |
| +000000000000258 | +000000000000001 | +000000000000002 | +000000000660155+000000005057573+000000000000021 |
| +000000000000002 | +0.000000000E+00 | KD 19000 000 |

[POINT VARIABLE-LENGTH RECORD]

| PVLR | +000000000000081 | +000000000000082 |

| PFLR |
| +000000000000264 | +000000000000001 | +000000000000002 | +000000000660660+000000005058329+000000000000020 |
| +000000000000002 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000011 | +000000000000450 |

| PFLR |
| +000000000000265 | +000000000000001 | +000000000000002 | +000000000660543+000000005057818+000000000000018 |
| +000000000000002 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000012 | +000000000000080 |

| PFLR |
| +000000000000270 | +000000000000001 | +000000000000002 | +000000000660420+000000005057297+000000000000019 |
| +000000000000002 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000079 | +000000000000451 |

| PFLR |
| +000000000000271 | +000000000000001 | +000000000000002 | +000000000660403+000000005057606+000000000000019 |
| +000000000000003 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000450 | +0000000000000451 | +000000000000082 |

| PFLR |
| +000000000000274 | +000000000000001 | +000000000000002 | +000000000660837+000000005058794+000000000000020 |
| +000000000000002 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000011 | +000000000000464 |

| PFLR |
| +000000000000275 | +000000000000001 | +000000000000002 | +000000000660964+000000005058794+000000000000018 |
| +000000000000002 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000464 | +000000000000012|

| PFLR |
| +000000000000280 | +000000000000001 | +000000000000002 | +000000000660534+000000005057255+000000000000018 |
| +000000000000002 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000463 | +000000000000080 |

| PFLR |
| +000000000000281 | +000000000000001 | +000000000000002 | +000000000660419+000000005057255+000000000000019 |
| +000000000000002 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000079 | +000000000000463 |

| PFLR |
| +000000000000285 | +000000000000001 | +000000000000002 | +000000000659893+000000005057547+000000000000021 |
| +000000000000001 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000081|

| PFLR |
| +000000000000505 | +000000000000001 | +000000000000002 | +000000000660616+000000005058156+000000000000020 |
| +000000000000001 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000462 |

[DATA THEME HEADER RECORD]

| DTHR | LINE |
| +000000000000009 | +000000000000000 | +000000000000160 |
| (196 spares) |

[LINE FIXED-LENGTH RECORD]

| LFLR |
| +000000000000463 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000281 | +000000000000280 |
| +000000000000750 | +000000000000000 | +000000000000002 | FD 32825 000 |

| LVLR | +000000000660419+000000005057255+000000000000019 |+000000000660534+000000005057255+000000000000018 |

| LFLR |
| +000000000000464 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000274 | +000000000000275 |
| +000000000000000 | +000000000000750 | +000000000000002 | FD 32825 000 |

| LVLR | +000000000660837+000000005058794+000000000000018 | +000000000660964+000000005058794+000000000000020 |

| LFLR |
| +000000000000011 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000264 | +000000000000274 |
| +000000000000000 | +000000000000750 | +000000000000010 | GA 27110 000 |

LVLR	+000000000660660+000000005058329+000000000000020	+000000000660688+000000005058397+000000000000020
+000000000660715+000000005058451+000000000000020	+000000000660726+000000005058476+000000000000020
+000000000660747+000000005058521+000000000000020	+000000000660765+000000005058567+000000000000020
+000000000660780+000000005058620+000000000000020	+000000000660809+000000005058672+000000000000020
+000000000660830+000000005058753+000000000000020	+000000000660837+000000005058794+000000000000020

| LFLR |
| +000000000000012 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000275 | +000000000000265 |
| +000000000000000 | +000000000000750 | +000000000000007 | GA 27110 000 |

LVLR	+000000000660964+000000005058794+000000000000018	+000000000660934+000000005058675+000000000000018
+000000000660848+000000005058420+000000000000018	+000000000660770+000000005058277+000000000000018
+000000000660719+000000005058186+000000000000018	+000000000660662+000000005058050+000000000000018
+000000000660543+000000005057818+000000000000018

| LFLR |
| +000000000000079 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000281 | +000000000000270 |
| +000000000000000 | +000000000000750 | +000000000000003 | GA 27110 000 |

| LVLR | +000000000660419+000000005057255+000000000000020 | +000000000660420+000000005057292+000000000000020 |
| +000000000660420+000000005057297+000000000000020 |

| LFLR |
| +000000000000080 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000265 | +000000000000280 |
| +000000000000000 | +000000000000750 | +000000000000007 | GA 27110 000 |

LVLR	+000000000660543+000000005057818+000000000000018	+000000000660529+000000005057711+000000000000018
+000000000660528+000000005057604+000000000000018	+000000000660530+000000005057498+000000000000018
+000000000660535+000000005057397+000000000000018	+000000000660545+000000005057311+000000000000018
+000000000660534+000000005057272+000000000000018

| LFLR |
| +000000000000450 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000271 | +000000000000264 |
| +000000000000000 | +000000000000750 | +000000000000009 | GA 27110 000 |

LVLR	+000000000660404+000000005057606+000000000000019	+000000000660403+000000005057631+000000000000019
+000000000660403+000000005057717+000000000000019	+000000000660421+000000005057871+000000000000019
+000000000660497+000000005058001+000000000000019	+000000000660582+000000005058150+000000000000019
+000000000660637+000000005058277+000000000000020	+000000000660659+000000005058316+000000000000020
+000000000660660+000000005058329+000000000000020

| LFLR |
| +000000000000451 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000270 | +000000000000271 |
| +000000000000000 | +000000000000750 | +000000000000006 | GA 27110 000 |

LVLR	+000000000660420+000000005057296+000000000000020	+000000000660421+000000005057357+000000000000021
+000000000660422+000000005057397+000000000000021	+000000000660437+000000005057467+000000000000019
+000000000660414+000000005057527+000000000000019	+000000000660404+000000005057606+000000000000019

| LFLR |
| +000000000000462 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000505 | +000000000000505 |
| +000000000000000 | +000000000000700 | +000000000000005 | GE 14850 000 |

| LVLR | +000000000660616+000000005058156+000000000000020 | +000000000660620+000000005058169+000000000000020 |
| +000000000660618+000000005058084+000000000000020 | +000000000660603+000000005058126+000000000000020 |
| +000000000660616+000000005058156+000000000000020 |

[DATA GROUP HEADER RECORD]

| DTHR | LINE |
| +000000000000002 | +000000000000001 | +000000000000180 |
| (196 spares) |

[ATTRIBUTE DESCRIPTOR RECORD]

| ADR |
| FEATURE NAME | CHAR | +000000000000020 |

[LINE FIXED-LENGTH RECORD]

| LFLR |
| +000000000000081 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000285 | +000000000000258 |
| +000000000000000 | +000000000000000 | +000000000000006 | GA 24850 000 | DECHARGE DES QUINZE |

[LINE VARIABLE-LENGTH RECORD]

LVLR	+000000000659893+000000005057547+000000000000021	+000000000659906+000000005057553+000000000000021
+000000000659957+000000005057580+000000000000021	+000000000660030+000000005057571+000000000000021
+000000000660115+000000005057544+000000000000021	+000000000660155+000000005057573+000000000000021

| LFLR |
| +000000000000082 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000258 | +000000000000271 |
| +000000000000000 | +000000000000000 | +000000000000005 | GA 24850 000 | DECHARGE DES QUINZE |

| LVLR | +000000000660155+000000005057573+000000000000021 | +000000000660159+000000005057572+000000000000021 |
| +000000000660268+000000005057568+000000000000019 | +000000000660360+000000005057583+000000000000020 |
| +000000000660403+000000005057606+000000000000020 |

[DATA THEME HEADER RECORD]

| DTHR |AREA |
| +000000000000002 | +000000000000001 | +000000000000148 |
| (196 spares) |

[ATTRIBUTE DESCRIPTOR RECORD]

| ADR | FEATURE NAME | CHAR | +000000000000020 |

[AREA FIXED-LENGTH RECORD]

| AFLR |
| +000000000000750 | +000000000000001 | +000000000000000 | +000000000660442+000000005057715+000000000000020 |
| +000000000000009 | GA 24850 000 | RIVIERE YAMASKA |

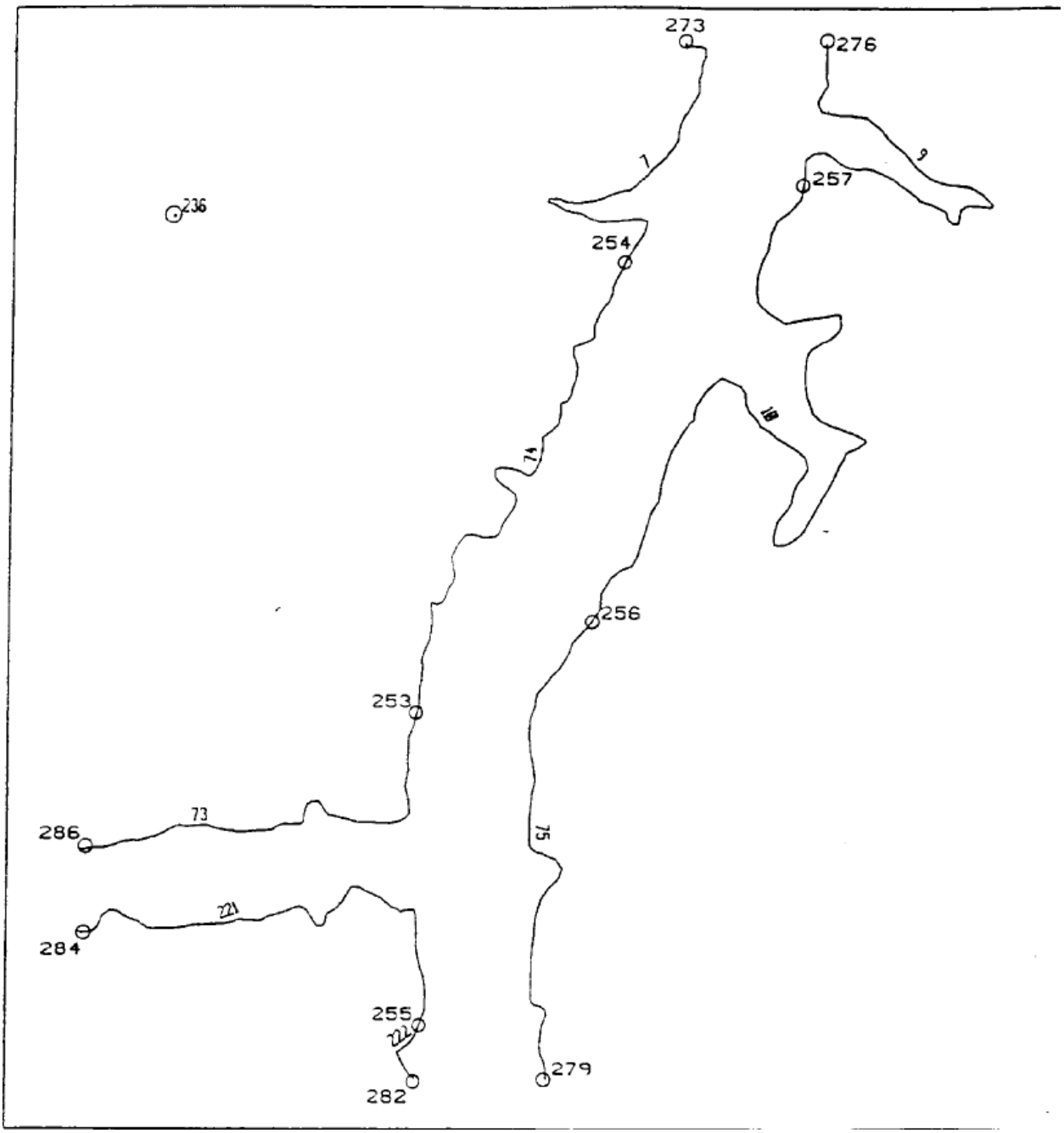
[AREA VARIABLE-LENGTH RECORD]

| AVLR | +000000000000463 | +000000000000080 | +000000000000012 | +000000000000464 | +000000000000011 |
| +000000000000450 | +000000000000451 | +000000000000079 | +000000000000462 |

| AFLR |
| +000000000000700 | +000000000000001 | +00000000000000 | +000000000660639+000000005057715+000000000000020 |
| +000000000000001 | GE14850 000 | GROSSE ISLE |

| AVRL | +000000000000462 |

*** PHYSICAL RECORD OF 9216 BYTES ***


273
276
1
9
257
236
254
74
18
256
253
73
286
75
221
284
255
22
282
279

[DATA GROUP HEADER RECORD]

| DGHR | HYPSOGRAPHY |
| +000000000000002 | +000000000000001 | +000000000000000 |
| (140 spares) |

[DATA THEME HEADER RECORD]

| DTHR | POINT |
| +000000000000011 | +000000000000000 | +000000000000144 |
| (196 spares) |

[POINT FIXED-LENGTH RECORD]

| PFLR |
| +000000000000253 | +000000000000001 | +000000000000000 | +000000000660390+000000005057807+000000000000030 |
| +000000000000002 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000073 | +000000000000074 |

| PFLR |
| +000000000000254 | +000000000000001 | +000000000000000 | +000000000660695+000000005058482+000000000000030 |
| +000000000000002 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000007 | +000000000000074 |

| PFLR |
| +000000000000255 | +000000000000001 | +000000000000000 | +000000000660395+000000005057337+000000000000030 |
| +000000000000002 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000221 | +000000000000222 |

| PFLR |
| +000000000000256 | +000000000000001 | +000000000000000 | +000000000660650+000000005057943+000000000000030 |
| +00000000000002 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000010 | +000000000000075 |

| PFLR |
| +000000000000257 | +000000000000001 | +000000000000002 | +000000000660953+000000005058592+000000000000030 |
| +000000000000002 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000009 | +000000000000010 |

| PFLR |
| +000000000000273 | +000000000000001 | +000000000000000 | +000000000660779+000000005058794+000000000000030 |
| +000000000000001 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000007 |

| PFLR |
| +000000000000276 | +000000000000001 | +000000000000000 | +000000000660985+000000005058794+000000000000030 |
| +000000000000001 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000009 |

|

| PFLR |
| +000000000000279 | +000000000000001 | +000000000000000 | +000000000660581+000000005057255+000000000000030 |
| +000000000000001 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000075

| PFLR |
| +000000000000282 | +000000000000001 | +000000000000000 | +000000000660387+000000005057255+000000000000030 |
| +000000000000001 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000222 |

| PFLR |
| +000000000000284 | +000000000000001 | +000000000000000 | +000000000659893+000000005057472+000000000000030 |
| +000000000000001 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000221 |

| PFLR |
| +000000000000286 | +000000000000001 | +000000000000000 | +000000000659893+000000005057596+000000000000030 |
| +000000000000001 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000073 |

[DATA THEME HEADER RECORD]

| DTHR | POINT |
| +000000000000001 | +000000000000001 | +000000000000160 |
| (196 spares) |

[ATTRIBUTE DESCRIPTOR RECORD]

| ADR | ELEVATION |INT | +000000000000000 |

[POINT FIXED-LENGTH RECORD]

| PFLR |
| +000000000000236 | +000000000000001 | +000000000000000 | +000000000660018+000000005058539+000000000000033 |
| +000000000000000 | +0.000000000E+00 | HA 28700 000 | +000000000000033 |

[DATA THEME HEADER RECORD]

| DTHR | LINE |
| +000000000000008 | +000000000000001 | +000000000000176 |
| (196 spares) |

[ATTRIBUTE DESCRIPTOR RECORD]

| ADR | ELEVATION | INT | +000000000000000 |

[LINE FIXED-LENGTH RECORD]

| LFLR |
| +000000000000007 | +000000000000001 | +000000000000000 | +000000000000000 | +000000000000254 | +000000000000273 |
| +000000000000000 | +000000000000000 | +000000000000010 | HA 06300 000 | +000000000000030 |

LVLR	+000000000660695+000000005058475+000000000000030	+000000000660719+000000005058512+000000000000030
+000000000660723+000000005058524+000000000000030	+000000000660641+000000005058534+000000000000030
+000000000660578+000000005058559+000000000000030	+000000000660657+000000005058565+000000000000030
+000000000660714+000000005058592+000000000000030	+000000000660769+000000005058654+000000000000030
+000000000660809+000000005058776+000000000000030	+000000000660779+000000005058794+000000000000030

| LFLR |
| +000000000000009 | +000000000000001 | +000000000000000 | +000000000000000 | +000000000000276 | +000000000000257 |
| +000000000000000 | +000000000000000 | +000000000000009 | HA 06300 000 | +000000000000030 |

LVLR	+000000000660985+000000005058794+000000000000030	+000000000660985+000000005058792+000000000000030
+000000000660987+000000005058734+000000000000030	+000000000660978+000000005058692+000000000000030
+000000000661182+000000005058549+000000000000030	+000000000661121+000000005058564+000000000000030
+000000000661039+000000005058611+000000000000030	+000000000660965+000000005058630+000000000000030
+000000000660953+000000005058592+000000000000030

| LFLR |
| +000000000000010 | +000000000000001 | +000000000000000 | +000000000000000 | +000000000000257 | +000000000000256 |
| +000000000000000 | +000000000000000 | +000000000000011 | HA 06300 000 | +000000000000030 |

LVLR	+000000000660953+000000005058592+000000000000030	+000000000660950+000000005058576+000000000000030
+000000000660893+000000005058473+000000000000030	+000000000661008+000000005058378+000000000000030
+000000000661033+000000005058214+000000000000030	+000000000660991+000000005058137+000000000000030
+000000000660911+000000005058063+000000000000030	+000000000660961+000000005058164+000000000000030
+000000000660794+000000005058236+000000000000030	+000000000660726+000000005058077+000000000000030
+000000000660650+000000005057943+000000000000030

| LFLR |
| +000000000000073 | +000000000000001 | +000000000000000 | +000000000000000 | +000000000000286 | +000000000000253 |
| +000000000000000 | +000000000000000 | +000000000000008 | HA 06300 000 | +000000000000030 |

LVLR	+000000000659893+000000005057596+000000000000030	+000000000659912+000000005057599+000000000000030
+000000000660000+000000005057615+000000000000030	+000000000660091+000000005057627+000000000000030
+000000000660220+000000005057639+000000000000030	+000000000660302+000000005057637+000000000000030
+000000000660375+000000005057716+000000000000030	+000000000660390+000000005057807+000000000000030

| LFLR |
| +000000000000074 | +000000000000001 | +000000000000000 | +000000000000000 | +000000000000253 | +000000000000254 |
| +000000000000000 | +000000000000000 | +000000000000007 | HA 06300 000 | +000000000000030 |

LVLR	+000000000660390+000000005057807+000000000000030	+000000000660398+000000005057892+000000000000030
+000000000660435+000000005057988+000000000000030	+000000000660510+000000005058071+000000000000030
+000000000660538+000000005058159+000000000000030	+000000000660656+000000005058396+000000000000030
+000000000660687+000000005058458+000000000000030

| LFLR |
| +000000000000075 | +000000000000001 | +000000000000000 | +000000000000000 | +000000000000256 | +000000000000279 |
| +000000000000000 | +000000000000000 | +000000000000006 | HA 06300 000 | +000000000000030 |

LVLR	+000000000660650+000000005057943+000000000000030	+000000000660598+000000005057865+000000000000030
+000000000660555+000000005057613+000000000000030	+000000000660563+000000005057470+000000000000030
+000000000660581+000000005057257+000000000000030	+000000000660581+000000005057255+000000000000030

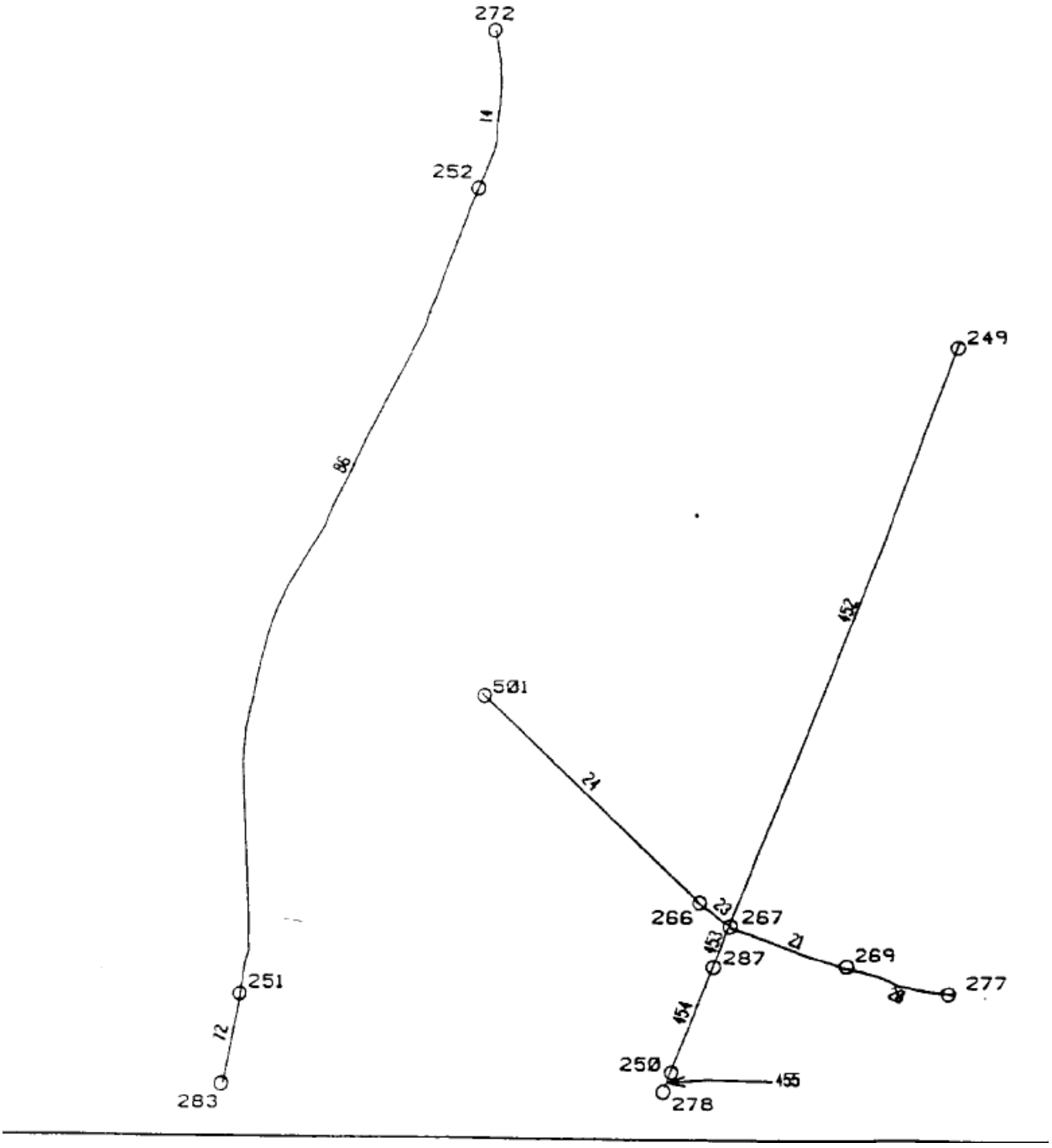
| LFLR |
| +000000000000221 | +000000000000001 | +000000000000000 | +000000000000000 | +000000000000255 | +000000000000284 |
| +000000000000000 | +000000000000000 | +000000000000012 | HA 06300 000 | +000000000000030 |

LVLR	+000000000660395+000000005057337+000000000000030	+000000000660400+000000005057352+000000000000030
+000000000660399+000000005057407+000000000000030	+000000000660384+000000005057507+000000000000030
+000000000660335+000000005057525+000000000000030	+000000000660276+000000005057516+000000000000030
+000000000660241+000000005057482+000000000000030	+000000000660156+000000005057490+000000000000030
+000000000660026+000000005057479+000000000000030	+000000000659955+000000005057497+000000000000030
+000000000659900+000000005057473+000000000000030	+000000000659893+000000005057472+000000000000030

| LFLR |
| +000000000000222 | +000000000000001 | +000000000000000 | +000000000000000 | +000000000000282 | +000000000000255 |
| +000000000000000 | +000000000000000 | +000000000000005 | HA 06300 000 | +000000000000030 |

| LVLR | +000000000660387+000000005057255+000000000000030 | +000000000660368+000000005057278+000000000000030 |
| +000000000660376+000000005057305+000000000000030 | +000000000660393+000000005057335+000000000000030 |
| +000000000660395+000000005057337+000000000000030 |

*** PHYSICAL RECORD OF 9216 BYTES ***


272
11
252
86
249
152
501
24
266
23
267
153
287
21
269
277
251
12
154
250
155
278
283

[DATA GROUP HEADER RECORD]

| DGHR | ROAD/RAILWAY |
| +000000000000001 | +000000000000001 | +000000000000000 |
| (140 spares) |

[DATA THEME HEADER RECORD]

| DTHR | POINT |
| +000000000000013 | +000000000000000 | +000000000000144 |
| (196 spares) |

[POINT FIXED-LENGTH RECORD]

| PFLR |
| +000000000000249 | +000000000000001 | +000000000000002 | +000000000661262+000000005058346+000000000000033 |
| +000000000000001 | +0.000000000E+00 | KD 19000 000 |

[POINT VARIABLE-LENGTH RECORD]

| PVLR | +000000000000452 |

| PFLR |
| +000000000000250 | +000000000000001 | +000000000000002 | +000000000660853+000000005057274+000000000000035 |
| +000000000000004 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000455 | +000000000000242 | +000000000000454 | +000000000000525 |

| PFLR |
| +000000000000251 | +000000000000001 | +000000000000002 | +000000000660233+000000005057381+000000000000032 |
| +000000000000002 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000072 | +000000000000086 |

| PFLR |
| +000000000000252 | +000000000000001 | +000000000000002 | +000000000660562+000000005058561+000000000000031 |
| +000000000000002 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000014 | +000000000000086 |

| PFLR |
| +000000000000266 | +000000000000001 | +000000000000002 | +000000000660892+000000005057527+000000000000032 |
| +00000000000000 2| +0.000000000E+00 | KD 19000 000 |

|PVLR | +000000000000023| +000000000000024 |

| PFLR |
| +000000000000267 | +000000000000001 | +000000000000002 | +000000000660932+000000005057496+000000000000033 |
| +000000000000004 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000452 | +000000000000023 | +000000000000021 | +000000000000453 |

| PFLR |
| +000000000000269 | +000000000000001 | +000000000000002 | +000000000661110+000000005057428+000000000000033 |
| +000000000000002 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000020 | +000000000000021 |

| PFLR |
| +000000000000272 | +000000000000001 | +000000000000002 | +000000000660586+000000005058794+000000000000032 |
| +000000000000001 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000014 |

| PFLR |
| +000000000000277 | +000000000000001 | +000000000000002 | +000000000661262+000000005057392+000000000000033 |
| +000000000000001 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000020 |

| PFLR |
| +000000000000278 | +000000000000001 | +000000000000002 | +000000000660848+000000005057255+000000000000036 |
| +000000000000001 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000455 |

| PFLR |
| +000000000000283 | +000000000000001 | +000000000000002 | +000000000660209+000000005057255+000000000000035 |
| +000000000000001 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000072 |

| PFLR |
| +000000000000287 | +000000000000001 | +000000000000002 | +000000000660915+000000005057430+000000000000035 |
| +000000000000004 | +0.000000000E+00 | KD 19000 000 |

| PVLR | +000000000000453 | +000000000000242 | +000000000000454 | +000000000000525 |

| PFLR |
| +000000000000501 | +000000000000001 | +000000000000002 | +000000000660585+000000005057820+000000000000031 |
| +000000000000001 | +0.000000000E+00 |KD 19000 000 |

| PVLR | +000000000000024 |

[DATA THEME HEADER RECORD]

| DTHR | LINE |
| +000000000000011 | +000000000000004 | +000000000000213 |
| (196 spares) |

[ATTRIBUTE DESCRIPTOR RECORD]

| ADR |
NAME	CHAR	+000000000000012
ROUTE NUMBER	CHAR	+000000000000005
ADMINISTRATING AUTHORITY	CHAR	+000000000000020
YEAR OF CONSTRUCTION	INT	+000000000000000

[LINE FIXED-LENGTH RECORD]

| LFLR |
+000000000000086	+000000000000001	+000000000000002	+000000000000000	+000000000000251	+000000000000252
+000000000000000	+000000000000000	+000000000000005
DA 25100 000	NONE 240 MUNICIPALITY 1978

[LINE VARIABLE-LENGTH RECORD]

| LVLR | +000000000660233+000000005057381+000000000000032 | +000000000660235+000000005057401+000000000000033 |
| +000000000660233+000000005057721+000000000000031 | +000000000660284+000000005057958+000000000000032 |
| +000000000660562+000000005058561+000000000000031 |

| LFLR |
+000000000000020	+000000000000001	+000000000000002	+000000000000000	+000000000000269	+000000000000277
+000000000000000	+000000000000000	+000000000000006
DA 25100 120	CHEMIN McDONALD NONE MUNICIPALITY 1984

LVLR	+000000000661108+000000005057430+000000000000033	+000000000661129+000000005057424+000000000000033
+000000000661183+000000005057405+000000000000033	+000000000661206+000000005057400+000000000000033
+000000000661224+000000005057396+000000000000033	+000000000661262+000000005057392+000000000000033

| LFLR |
| +000000000000014 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000252 | +000000000000272 |
| +000000000000000 | +000000000000000 | +000000000000007 | DA 25100 130 |
|CHEMIN LEVESQUE NONE MUNICIPALITY 1976 |

LVLR	+000000000660562+000000005058561+000000000000031	+000000000660583+000000005058614+000000000000032
+000000000660590+000000005058657+000000000000032	+000000000660594+000000005058686+000000000000032
+000000000660595+000000005058711+000000000000032	+000000000660594+000000005058736+000000000000032
+000000000660586+000000005058794+000000000000032

| LFLR |
| +000000000000021 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000269 | +000000000000267 |
| +000000000000000 | +000000000000000 | +000000000000004 | DA 25100 130 |
| CHEMIN McDONALD NONE MUNICIPALITY 1984 |

| LVLR | +000000000661110+000000005057428+000000000000033 | +000000000661036+000000005057452+000000000000033 |
| +000000000661035+000000005057453+000000000000033 | +000000000660940+000000005057489+000000000000033 |

| LFLR |
| +000000000000023 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000267 | +000000000000266 |
| +000000000000000 | +000000000000000 | +000000000000004| DA 25100 130 |
| CHEMIN McDONALD NONE MUNICIPALITY 1984 |

| LVLR | +000000000660940+000000005057492+000000000000033 | +000000000660932+000000005057496+000000000000033 |
| +000000000660903+000000005057517+00000000000032 | +000000000660892+000000005057527+000000000000032 |

| LFLR |
| +000000000000024 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000501 | +000000000000266 |
| +000000000000000 | +000000000000000 | +000000000000003 | DA 25100 130 |
| CHEMIN McDONALD NONE MUNICIPALITY 1984 |

| LVLR | +000000000660585+000000005057820+000000000000031 | +000000000660710+000000005057702+000000000000032 |
| +000000000660899+000000005057520+00000000000032 |

| LFLR |
| +000000000000072 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000283 | +000000000000251 |
| +000000000000000 | +000000000000000 | +000000000000002 | DA 25100 130 |
| CHEMIN LEVESQUE NONE MUNICIPALITY 1984 |

| LVLR | +000000000660209+000000005057255+000000000000035 | +000000000660232+000000005057380+000000000000035 |

| LFLR |
| +000000000000452 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000267 | +000000000000249 |
| +000000000000000 | +000000000000000 | +000000000000004 | DA 25100 130 |
| AUCUN 240 MUNICIPALITY 1978 |

| LVLR | +000000000660932+000000005057496+000000000000033 | +000000000660147+000000005058036+000000000000033 |
| +000000000661225+000000005058246+00000000000033 | +000000000661262+000000005058346+000000000000033 |

| LFLR |
| +000000000000453 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000267 | +000000000000287 |
| +000000000000000 | +00000000000000 0| +000000000000002 | DA 25100 130 |
| AUCUN 240 MUNICIPALITY 1978 |

| LVLR | +000000000660932+000000005057496+000000000000033 | +000000000660915+000000005057430+000000000000035 |

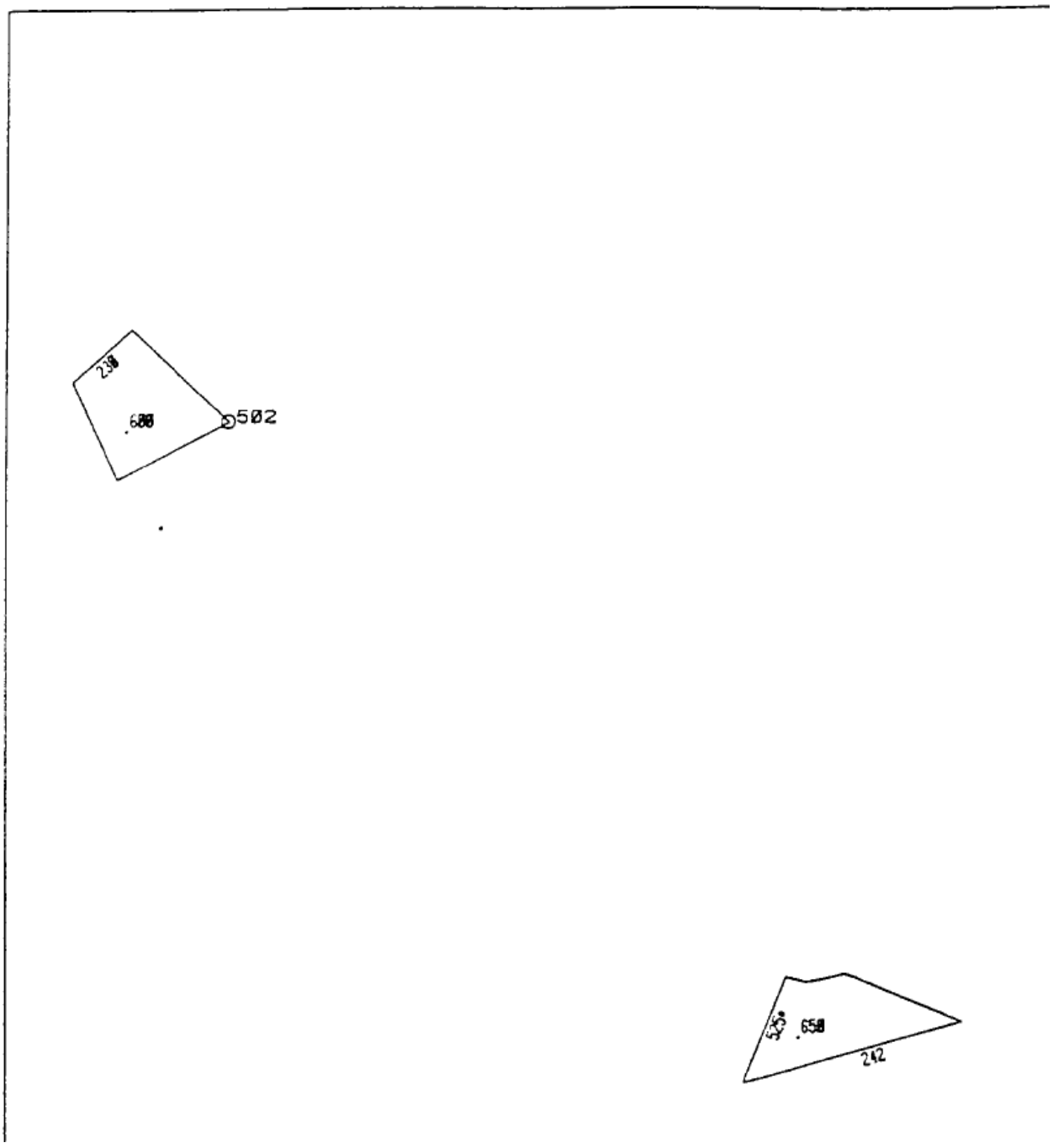
| LFLR |
| +000000000000454 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000287 | +000000000000250 |
| +000000000000000 | +000000000000000 | +000000000000002 | DA 25100 130 |
| AUCUN 240 MUNICIPALITY 1978 |

| LVLR | +000000000660915+000000005057430+000000000000035 | +000000000660853+000000005057274+000000000000035 |

| LFLR |
| +000000000000455 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000250 | +000000000000278 |
| +000000000000000 | +000000000000000 | +000000000000002| DA 25100 130 |
| AUCUN 240 MUNICIPALITY 1978 |

| LVLR | +000000000660853+000000005057274+000000000000035 | +000000000660848+000000005057255+000000000000036 |

*** PHYSICAL RECORD OF 9216 BYTES ***


502
242

[DATA GROUP HEADER RECORD]

| DGHR | LAND COVER |
| +000000000000001 | +000000000000001 | +000000000000001 |
| (140 spares)|

[DATA THEME HEADER RECORD]

| DTHR | POINT |
| +000000000000001 | +000000000000001 | +000000000000144 |
| (196 spares) |

[POINT FIXED-LENGTH RECORD]

| PFLR |
| +000000000000502 | +000000000000001 | +000000000000002 | +000000000660105+000000005058246+000000000000032 |
| +000000000000001 | +0.000000000E+00 | KD 19000 000 |

[POINT VARIABLE-LENGTH RECORD]

| PVLR | +000000000000230 |

[DATA THEME HEADER RECORD]

| DTHR | LINE |
| +000000000000003 | +000000000000000 | +000000000000160 |
| (196 spares) |

[LINE FIXED-LENGTH RECORD]

| LFLR |
| +000000000000230 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000502| +000000000000502 |
| +000000000000000 | +000000000000600 | +000000000000004 | JA 33750 000 |

[LINE VARIABLE-LENGTH RECORD]

| LVLR | +000000000660150+000000005058246+000000000000032 | +000000000659944+000000005058161+000000000000032 |
| +000000000659881+000000005058305+000000000000032 | +000000000660105+000000005058246+000000000000032 |

| LFLR |
| +000000000000242 | +000000000000001 | +000000000000002 | +000000000000000 | +000000000000287 | +000000000000250 |
| +000000000000000 | +000000000000650 | +000000000000004 | JA 33750 000 |

| LVLR | +000000000660915+000000005057430+000000000000035 | +000000000006610000+000000005057434+000000000000035 |
| +000000000661167+000000005057362+00000000000035 | +000000000660853+000000005057274+000000000000035 |

| LFLR |
| +000000000000525 | +000000000000001 | +000000000000002 | +000000000000454 | +000000000000287 | +000000000000250 |
| +000000000000650 | +000000000000000 | +000000000000000 | JA 33750 000 |

[DATA THEME HEADER RECORD]

| DTHR | AREA |
| +000000000000002 | +000000000000002 | +000000000000156 |
| (196 spares) |

[ATTRIBUTE DESCRIPTOR RECORD]

| ADR |
| AREA | INT | +000000000000016 |
| VEGETATION TYPE | CHAR | +000000000000012 |

[AREA FIXED-LENGTH RECORD]

| AFLR |
| +000000000000600 | +000000000000001 | +000000000000000 | +0000000006599580000000005058232+000000000000032 |
| +000000000000001 | JA 33750 000 | +000000000251240 |

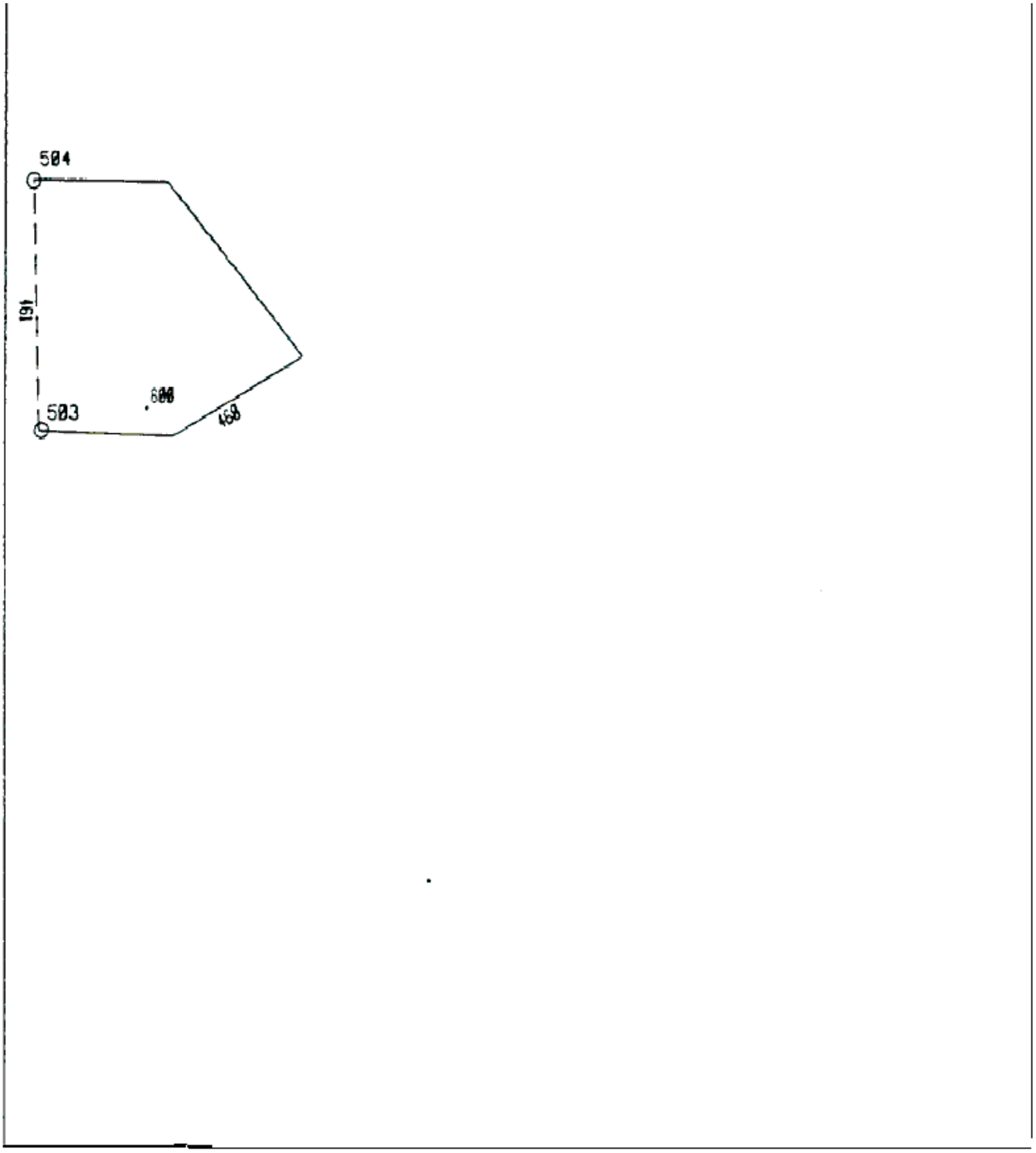
[AREA VARIABLE-LENGTH RECORD]

| AVLR | +000000000000230 |

| AFLR |
| +000000000000650 | +000000000000001 | +000000000000000 | +0000000066099320000000005057340+000000000000032 |
| +000000000000002 | JA 33750 000 | +000000000252240 |

| AVLR | +000000000000242 | +000000000000525 |

*** PHYSICAL RECORD OF 9216 BYTES ***


504
191
503

[DATA THEME HEADER RECORD]

| DGHR | DESIGNATE AREA |
| +000000000000001 | +000000000000001 | +000000000000001 |
| (140 spares) |

[DATA THEME HEADER RECORD]

| DTHR | POINT |
| +000000000000002 | +000000000000000 | +000000000000144 |
| (196 spares) |

[POINT FIXED-LENGTH RECORD]

| PFLR |
| +000000000000503 | +000000000000001 | +000000000000002 | +000000000669834+000000005058096+000000000000032 |
| +000000000000002 | +0.000000000E+00 | KD 19000 000 |

[POINT VARIABLE-LENGTH RECORD]

| PVLR | +000000000000460 | +000000000000461 |

|PFLR|
| +000000000000504 | +000000000000001 | +000000000000002 |+000000000659827+000000005058415+000000000000032 |
| +000000000000002 |+0.000000000E | +00KD 19000 000 |

| PVLR | +000000000000461 | +000000000000460 |

[DATA THEME HEADER RECORD]

| DTHR | LINE |
| +000000000000002| +000000000000000| +000000000000160 |
| (196 spares)|

[LINE FIXED-LENGTH RECORD]

| LFLR |
| +000000000000460 | +000000000000001 | +000000000000000 | +000000000000000 | +000000000000504 | +000000000000503 |
| +000000000000000 | +000000000000800 | +000000000000004 | AL 20150 000 |

[LINE VARIALBE-LENGTH RECORD]

| LVLR | +000000000659827+0000000050588415+000000000000032 | +000000000660018+000000005058410+000000000000032 |
| +000000000660025+000000005058087+0000000000000032 | +000000000659834+000000005058096+000000000000032 |

| LFLR |
| +000000000000461 | +000000000000001 | +000000000000000 | +000000000000000 | +000000000000503 | +000000000000504 |
| +000000000000000 | +000000000000800 | +000000000000002 | FD 32825 000 |

| LVLR | +000000000658934+000000005058096+000000000000032 | +000000000659827+000000005058415+000000000000032 |

[DATA THEME HEADER RECORD]

| DTHR | AREA |
| +000000000000001 | +000000000000003 | +000000000000176 |
| (196 spares) |

[ATTRIBUTE DESCRIPTOR RECORD]

| ADR |
NAME	CHAR	+000000000000024
TYPE OF FACILITIES	CHAR	+000000000000012
MONTHS OF OPERATIONS	CHAR	+000000000000012

[AREA FIXED-LENGTH RECORD]

| AFLR |
| +000000000000800 | +000000000000001 | +000000000000000 | +000000000659988+0000000005058123+000000000000032 |
| +000000000000002 | AL 20150 000 | PARC DES VOLTIGEURS UNKNOWN UNKNOWN |

[AREA VARIABLE-LENGTH RECORD]

| AFLR |
| +000000000000461 | +000000000000460 |

*** PHYSICAL RECORD 9216 BYTES ***

[END OF VOLUME RECORD|

| EOVR |
| (2044 spares) |

*** PHYSICAL RECORD 2048 BYTES ***

<EOF>

APPENDIX C

PROPOSED ATTRIBUTE DESCRIPTOR RECORDS

Some users have addressed the need to standardize the transfer of textual information and geometric figures. This can be performed by using the original format structure and by specifying the necessary parameters as attributes. In the case of geometric figures, the need emerged from the fact that, for legal purposes, the data required to be retained as collected. Attributes for spatial features are formatted through the Attribute Descriptor Records (ADR). This appendix proposes standard Attribute Descriptor Record (ADR) and, for the sake of uniformity, it is strongly suggested that they be adopted.

C.1 First Attribute

When this proposed standard Attribute Descriptor Record (ADR) option is chosen, the first attribute will be reserved for user defined element types providing an extension for the three primitive entity types: point, line and area. Each user element type is a 16 character length field defined through the first attribute descriptor in the Attribute Descriptor Record (ADR) as:

ATTRIBUTE NAME (40 bytes)	ATTRIBUTE TYPE IDENTIFIER (4 bytes)	STRING LENGTH (16 bytes)
ELEMENT TYPE	CHAR	16

C.2 Text

Users have indicated the need to standardize the transfer of textual information through standard attributes. The proposed Attribute Descriptor Record (ADR) provides for the attribute format but does not enforce the values that each attribute can hold.

Values allowed for text attributes must be user defined. Only attribute descriptors can be suggested for standardization and these will become a standard as the community accepts them by usage.

Textual information is transferred through the Point Fixed-Length Record (PFLR) structure with the first seven (7) attributes fixed.

The standard Attribute Descriptor Record (ADR) for textual information contains seven (7) 60-byte attribute descriptors defining the attribute name, type and string length (when applicable). The ADR is made of:

ATTRIBUTE NAME (40 bytes)	ATTRIBUTE TYPE IDENTIFIER (4 bytes)	TRING LENGTH 16 bytes)
ELEMENT TYPE	CHAR	16
JUSTIFICATION	CHAR	16
FONT	CHAR	16
TEXT HEIGHT	REAL	0
TEXT WIDTH	REAL	0
NUMBER OF CHARACTER(S)	INT	0
TEXT STRING	CHAR	var

Example:

The “OTTAWA RIVER” text string needs to be transferred. The user establishes conventions for attribute values. For instance, he will recognize the following values associated to attribute names in the ADR: “TEXT” for ELEMENT TYPE; “LC” (Left Centre) for JUSTIFICATION; “120” for FONT and so on.

Based on the attribute descriptors provided in the above Attribute Descriptor Record, the attribute values are:

ATTRIBUTE NAME IN ATTRIBUTE DESCRIPTOR	ATTRIBUTE 1 2 3 4 5 01234567890123456789012345678901234567890123456789
ELEMENT TYPE	| TEXT |
JUSTIFICATION	| LC |
FONT	| 120 |
TEXT HEIGHT	| +0.800000000E+02 |
TEXT WIDTH	| +0.800000000E+02|
NUMBER OF CHARACTERS	| +000000000000012 |
TEXT STRING	| OTTAWA RIVER |

The user can add more attribute descriptors, starting at the eighth (8) attribute descriptor.

C.3 Geometric Figures

Geometric figures such as arcs have been addressed to transfer legal boundaries for surveyed lots and blocks. These surveyed boundaries are stored, as is, in graphics systems. Users who want to keep the structure as collected, must use the line entity type placing parameters as attributes. These parameters are required to geometrically describe the figure. For all geometric figures using the line entity type, the start and end coordinate triplets are always found in the variable-length record in order to ensure a minimum definition for all lines. Other coordinates and parameters are carried as attribute.

The first proposed Attribute Descriptor Record for geometric figures applies to Arc or Ellipse element types.

Attribute descriptors are organized in the following manner:

ATTRIBUTE NAME (40 bytes)	ATTRIBUTE TYPE IDENTIFIER (4 bytes)	STRING LENGTH (16 bytes)
ELEMENT TYPE	CHAR	16
X COORDINATE ON ARC	var	0
Y COORDINATE ON ARC	var	0
Z COORDINATE ON ARC	var	0
X ORIGIN COORDINATE	var	0
Y ORIGIN COORDINATE	var	0
Z ORIGIN COORDINATE	var	0
PRIMARY AXIS LENGTH	REAL	0
SECONDARY AXIS LENGTH	REAL	
ANGLE (COUNTERCLOCKWISE) OF PRIMARY AXIS IN DECIMAL DEGREES	REAL	0

New Attribute Descriptor Records for other geometric figures can be added to this appendix as required. The above Attribute Descriptor Record has been included in the structure to facilitate the transfer of planimetric arcs or ellipses. Since the figure is a planimetric representation of the real data, the “Z” coordinates provided must not be used in its calculation.

“var” denotes a variable field type

APPENDIX D

SUPPORTED MEDIA SPECIFICATIONS

This appendix provides additional information on CCOGIF when data are transferred via the CCOGIF ASCII on tape method.

D.1 Media Characteristics

D.1.1 Nine-track Magnetic Tape

Tape Density
The standard supports 1600 and 6250 bpi densities. For physical storing, please refer to the ISO 3788 standard for 1600 or ISO 5652 for 6250, as well as other applicable standards.

Tape Length
The tape can measure 600, 1200 or 2400 feet.

D.1.2 Eight-millimiter Cartridge

Tape Density
The standard supports a fixed density of 43,200 bpi. For physical storing, please refer to the ISO 1319 standard and other applicable standards.

Tape Length
The tape can measure 15.54 or 112 meters.

D.1.3 TK50 Cartridge

Tape density
The standard supports a fixed density of 6667 bpi. For physical storing, please refer to the Digital standard for TK50 and other applicable standards.

Tape Length
The tape can measure 600 feet.

D.1.4 TK70 Cartridge

Tape density
The standard supports a fixed density of 10,000 bpi. For physical storing, please refer to the Digital standard for TK70 and other applicable standards.

Tape Length
The tape can measure 600 feet.

D.1.5 6150 Cartridge

Tape density
The standard supports a fixed density of 10,000 bpi. For physical storing, please refer to the QIC 150 standard and other applicable standards.

Tape Length
The tape can measure 600 feet.

D.2 Block Length

The standard supports blocks totalling 9216 bytes.

D.3 Physical Records

Only two physical record lengths on the tape are allowed: 2048 and 9216 bytes. Unused bytes will take on the decimal value 32 (one space).

D.4 End-of-volume Mark

The last physical record of a tape that does not constitute the end of a logical volume is followed by two end-of-file marks (<EOF>) indicating the end of information record.

D.5 End-of file Record

The structure of CCOGIF ASCII on tape implies a sequential series of files. These files are physically separated by ends of files (<EOF>). Please refer to the physical storing specifications and other applicable standards for a description of end-of-file.

D.6 Specifications for Implementing on Magnetic Tape

A volume directory file always begins with a volume directory record (VDR) followed, as the case may be, by user fixed-length records (UFLR) and an end-of-file mark (EOF).

A data set header file begins with a data set header record (DSHR) followed, as the case may be, by several user fixed-length record (UFLR), one to “Md” entity method data records (EMDR) and an end-of- file mark (EOF).

An end-of-volume file only contains an end-of-volume record (EOVR) followed by two end-of-file marks (EOF).

On the tape the logical records of the VDR, UFLR, DSHR and EOVR type total 2048 characters in length.

A data group begins with a data group header record (DGHR) followed by one or several thematic data sets and one end-of-file mark (EOF).

A thematic data set is made up of a data theme header record (DTHR) followed by an attribute descriptor record (ADR) and one or several entity records (points, lines or areas) of fixed length (PFLR, LFLR, AFLR) followed by, as the case may be, variable-length entity records (PVLR, LVLR, AVLR). Within the same thematic dataset, all entities must be of the same type (point, line or area). A THEMATIC DATASET DOES NOT CONSTITUTE A PHYSICAL FILE AND IS NOT FOLLOWED BY AN END-OF-FILE MARK. Thematic datasets are grouped to form data groups.

Logical records of the DGHR, DTHR, ADR, PFLR, PVLR, LFLR, LVLR, AFLR, and AVLR type are sequentially written in a buffer of 9216 characters. When the buffer is saturated, its content is recorded on the tape.

Several logical records may be recorded in a 9216-byte-capacity buffer. It may prove necessary to divide a logical record into several physical records in order to meet the constraint on the maximum length of these records, i.e. 9216 bytes.

At the end of a data group, the unused space in the buffer is filled with blanks and recorded on the tape followed by an end-of-file mark.

Logical records of the DGHR, DTHR, ADR, PFLR, PVLR, LFLR, LVLR, AFLR, and AVLR type may be distributed over several physical records and even over several physical volumes. In the latter case, the number of bytes remaining in the last logical record must be recorded in the following physical volume descriptor record. This procedure ensures direct access to the first logical record that follows the volume descriptor file. Logical records of the VDR, UFLR, DSHR, EMDR and EOVR type must appear in a single physical record.

APPENDIX E

FOR MORE INFORMATION

For any comments or further information, please contact:

Customer Support Group
Centre for Topographic Information
2144 King St. West, suite 010
Sherbrooke, Qc
J1J 2E8
Tel: (819) 564-5600
Fax:(819) 5645698
Internet: NTDB@CCG.NRCan.gc.ca