# ISSUES IN DIGITAL CARTOGRAPHIC DATA STANDARDS

Report #7

Digital Cartographic Data Standards:
A Report on Evaluation and
Empirical Testing

Harold Moellering, Editor

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National Committee for Digital Cartographic Data Standards
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# PREFACE

This report is the seventh in the series which describes the work of the National Committee for Digital Cartographic Data Standards. It contains five papers that describe the evaluation and testing of the Interim Proposed Standard that has taken place between April, 1985 and March, 1986. The first paper by Moellering describes the background information concerning this evaluation and testing. The second paper by the same author discusses the evaluation and testing of the cartographic objects along with several updates of those objects. The third paper edited by Timothy Nyerges describes the testing of the data exchange portion of the standard. This is perhaps the most complicated facet of the work. The paper also provides a description of the exchange modules as they are defined as of March, 1986. These exchange modules are the heart of the data exchange standard. If any reader desires a full length description of these exchange modules which will be ready in May of 1986, please send a request to Professor Moellering at Columbus headquarters and a copy will be sent to you. The fifth paper by Nicholas Chrisman describes the testing of the data quality portion of the standard. This section is perhaps the least changed of the four sections of the standard. The fifth paper edited by Robert Rugg and Warren Schmidt sets forth the testing of the cartographic features and provides a current listing of them as of March, 1986.

The Committee would like to recognize the cooperation and participation of the Standards Working Group of the Federal Interagency Coordinating Committee on Digital Cartography, Mr. Gale TeSelle, Chairman. This Group has provided many constructive comments and suggestions during the last two years. This Group is also developing and testing the Federal Geographic Data Format which is one of the three data exchange implementations.

It should be noted that this material is still in the process of being fully developed and polished by the Committee. However, the Committee strongly felt that the professional community should remain informed of the continuing work of the Committee so that informed comments can be sent back to the Committee while the work is still in progress. Comment forms are provided in the back of the report if you desire to respond to this report. It should also be noted that because this material is still being polished by the Committee, this updated material has not yet been officially voted on by the Steering Committee. That will take place again in August of 1986. However, the Committee is interested in hearing your comments on the work contained herein. Your comments would be most effective if they were returned to Columbus headquarters prior to June 20, 1986, so they can be properly distributed for comment. However, comments can be sent to the Committee at any time. Please send your comments to the Committee at the following address:

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Harold Moellering
Series Editor

TABLE OF CONTENTS

# 1.0 INTRODUCING THE EVALUATION AND TESTING OF THE INTERIM PROPOSED STANDARD

by

Harold Moellering

The National Committee for Digital Cartographic Data Standards was founded in 1982 to develop standards that would facilitate the use and exchange of digital cartographic data bases. The Committee operates under the auspices of the American Congress on Surveying and Mapping, the umbrella organization for the American Cartographic Association which is the premier cartographic society in the United States. The original mandate for this work in cartographic standards began with a memorandum of understanding between the National Bureau of Standards and the U.S. Geological Survey to develop earth science information standards. Subsequently, the mandate came from the Geological Survey to the Committee to develop digital cartographic data standards that will ultimately be proposed as Federal Information Processing Standards (FIPS). For a more detailed discussion of the situation, please refer to Section 1.0 of the supporting documentation of Report No. 6 (Moellering, 1985, pp. 45-48).

To date, the Committee has completed the first three cycles of work; the first defining the issues involved, the second examining the alternatives, and the third of developing the Interim Proposed Standard. For a review of this work, please review Committee Reports No. 3, No. 4, and No. 6 (Moellering, 1983, 1984, 1985). This report discusses the work of the first year of the fourth cycle, that of evaluating and empirically field testing the Interim Proposed Standard. The findings and results from this work are being shared with the cartographic profession at this time in an effort to keep everyone informed on the progress in developing these standards, and to provide an opportunity for members of the profession to comment on this body of work. The second year of cycle four will include the reformulation and polishing of the current standard that will be presented as the Proposed Standard in January of 1987.

## 1.1 EVALUATION AND FIELD TESTING OF THE STANDARDS

The first year of cycle four has involved the evaluation and empirical field testing of the Interim Proposed Standard. The year began in April, 1985 and during the Spring of that year each major section of the standard, cartographic objects, data exchange, data set quality, and cartographic features were evaluated by the Committee and by the Working Groups as a result of written comments pertaining to Report No. 6, comments made at the public hearings held at the Spring ACSM meeting held in March, 1985 in Washington, D.C., as a result of Committee discussion at the Spring meetings, and as a result of internal evaluations and discussions. During the Summer of 1985 the Working Groups conducted internal tests on their parts of the standard which included elements of the entire Committee. In the case of cartographic objects, the evaluations were conducted by elements of the Committee, Working Group I and some external evaluators. The primary goal for these tests and evaluations were twofold: first for the Working Groups to get the first results from field testing, and second for the Working Groups to use

these internal tests as a method of finalizing the testing procedures being developed for the external and Federal tests planned for the Fall.

During the Spring of 1985 and at the March meetings, public calls were made for expressions of interest to participate in the field tests to be conducted later in the year. It had earlier been determined by the Committee that a set of field tests had to be conducted outside of the Committee with the segments of the profession who would later be using the standards. All told, 26 non-Federal organizations expressed interest in participating in such tests. At the same time the FICCDC was asked to identify Federal agencies interested in participating in such tests in the Federal sector. During the late Spring and early Summer, the private sector testing candidates were sent further information providing more details of the testing methods and requirements. Estimated requirements of donated personnel, time and other resources that were necessary to carry out the tests were also provided. Discussion with the candidate testing participants continued into the Summer as effective matches of personnel, time and capabilities were further explored. In late July, a list was drawn up by the Executive Committee of the testing candidates to be invited to the Fall Committee meeting in Indianapolis to be interviewed by the Working Groups and by the Committee in general. All told, 10 testing candidates from the state and private sector and seven from the Federal sector were invited to the meetings in Indianapolis. From the interviews at Indianapolis and discussions with one or two groups who could not attend, a list of testing participants was drawn up by the Committee. Nine independent tests were being conducted by groups in the state and private sectors, and ten tests were scheduled to be conducted by agencies in the Federal sector, while a few informal tests were conducted as continuing Working Group tests or by the members of a Working Group. However, all official tests were conducted by groups external to the Committee itself, although it should be noted that in some cases some of the Federal agency personnel conducting tests did include individuals who were also members of the Committee.

The following groups participated in tests with the following Working Groups:

WORKING GROUP I - DATA ORGANIZATION

External tests
DuPage County Map Department
Geographic Technology, Inc.
City of Boston Assessing Department

Federal tests
National Ocean Service
Defense Mapping Agency
National Bureau of Standards
U.S. Geological Survey
Federal Emergency Management Agency

WORKING GROUP II - DATA SET QUALITY

External tests
Boise Cascade Corp.
BellSouth Services

Federal tests
Soil Conservation Service

WORKING GROUP III - CARTOGRAPHIC FEATURES

External tests
BellSouth Services
University of Minnesota Dept. of Geography
Perkin-Elmer Corporation
Synectics Corporation

Federal tests
Tennessee Valley Authority
Defense Mapping Agency
National Ocean Service
Federal Emergency Management Agency

It should be noted that the cartographic objects were field tested as part of the Working Group I tests and evaluated as described in Section 2 of this report. In all cases, these tests were conducted with the cooperation and consultation of the Standards Working Group of the Federal Interagency Coordinating Committee on Digital Cartography.

The time frame for these external and Federal field tests was from October, 1985 to February, 1986. During that time, the bulk of the field testing outside of the Committee was conducted. During February and early March, the results of these tests were compiled and sent to the Working Group members for evaluation. At the recent Spring, 1986 meeting of ACSM in Washington, D.C., the Committee met to discuss the results of the field tests and assess the implications for the standard. At that meeting was also scheduled a public session to present the findings of the field tests, and to provide members of the profession an opportunity to ask questions and to discuss the situation in more detail. In an effort to keep the corresponding members of the Committee informed as to its work, this Report No. 7 has been prepared and distributed. The report contains the results of the field tests and evaluations, discussion of written comments received by the Committee since Report No. 6 was issued, and sections of the standard that have been significantly updated and/or expanded for the corresponding members to study and comment on it. The reader is invited to evaluate this report and to send written comments to the Committee on the forms provided in the back of this report.

## 1.2 ORGANIZATION AND STRUCTURE OF THIS REPORT

This report contains six major sections. The first is the introduction and the last is a set of comment forms which are to be filled out and returned to

the Committee for internal evaluation and circulation. Section 2 contains the discussion on cartographic objects. These objects are defined for 0-, 1- and 2-dimensions and serve the needs for geometry only, geometry and topology, and topology only. Section 3 contains the discussion and evaluation by Working Group I on Data Organization. Most of their attention is focused on testing the cartographic exchange modules defined after Report No. 6 was issued, and on evaluating the methods of implementing such an exchange. Section 4 presents the results of the field tests of the efforts of Working Group II on Data Set Quality. This section of the standard has the fewest changes and updates in it. Section 5 discusses the efforts by Working Group III on Cartographic Features. This section is now much more fully fleshed out from Report No. 6, and it presents a large number of the finished feature definitions.

At this point it is very important to state that all of the material presented here that relates to updates, modifications and extensions of the standard are still in a draft stage and are currently being worked on and polished up by the Committee. Therefore, this report represents work in progress and not a final polished standard. This modified material has not yet been voted on by the Steering Committee. The material, in this state, is being shared with the cartographic community because it is strongly felt that all corresponding members should have the benefit of being informed about the testing phase of the work so that they can provide informed comments on this segment of the work by the Committee in a timely fashion so that those comments can be integrated into the thinking and evaluations of the Committee. It has now been a year since the Interim Proposed Standard was issued and the Committee has made considerable progress since that time. It is therefore the intent of the Committee to provide an additional opportunity for members of the cartographic profession to return comments and discussion of this work as it progresses.

## 1.3 LIST OF COMMENTS

The following is a list of the individuals who returned written comments to the Committee from the time that Report No. 6 was issued in January, 1985 to the Spring ACSM meetings in March, 1986. This list is being provided as a matter of record and specific comments will not be identified individually in the discussion contained in the following sections of the report. These comments were received external to the Committee meetings and any individual listed who happens to be a member of the Committee was providing such comments as a member of his/her organization or as an individual. Comments internal to the Committee are not listed here.

General

1. Dr. Gerald L. Greenberg, NCIC-W- U.S.G.S., National Mapping Division
2. Mr. Peter Scheffer, TVA, Div. Land & Economic Resources, Special Project Unit

Objects

1. Ms. Carolyn C. Weiss, Statistics Canada, Geocartographics Subdivision
2. Mr. J. Ives, Div. of Survey and Mapping Systems, Bureau of Land Mgmt.
3. Mr. Daniel Neumann, National Ocean Service
4. Mr. J. E. Gearhart, National Ocean Service
5. Mr. Richard Schiro, National Ocean Service
6. Dr. Richard A. Williams, Goodyear Aerospace Corp.
7. Mr. Gale W. TeSelle, Director, Cartography & Geographic Information Systems Div., U.S. Dept. of Agriculture, Soil Conservation Service
8. Mr. Matthew McGranaghan, Geography Department, SUNY - Buffalo
9. Mr. Richard Nicholson, Synercom Corp.
10. Mr. Robert W. Marx, Chief, Geography Division, Bureau of the Census
11. Mr. Denis White, Lab for Computer Graphics and Spatial Analysis, Harvard University
12. Mr. Jan W. van Roessel, Technique Development Section, Technicolor Government Services, Inc.
13. Prof. Mark Monmonier, Dept. of Geography, Syracuse University
14. Mr. Wallace Crisco, Bureau of Land Management

Working Group I

1. Dr. Kenneth J. Dueker, Acting Dean, School of Urban & Public Affairs, Portland State University
2. Mr. Lawrence W. Fritz, National Charting Research & Development Laboratory, NOAA/NOS
3. Mr. Erich Frey, Marine Chart Branch, NOAA/NOS
4. Mr. Daniel Neumann, NOAA/NOS
5. Mr. J. Ives, Div. of Survey & Mapping Systems, Bureau of Land Mgmt.
6. Mr. Gale W. TeSelle, Director, Cartography and Geographic Information Systems Div., U.S. Dept. of Agriculture, Soil Conservation Service

7. Mr. Bruce Palmer, Earth Resource Engineering, Digital Equipment Corp.

8. Mr. Dennis R. Boston, Alabama Power Company

Working Group II

1. Mr. Erich Frey, Marine Chart Branch, NOAA/NOS

2. Mr. Daniel Neumann, NOAA/NOS

3. Mr. J. Ives, Div. of Survey & Mapping Systems, Bureau of Land Mgmt.

4. Mr. Gale W. TeSelle, Director, Cartography & Geographic Information Systems Div., U.S. Dept. of Agriculture, Soil Conservation Service

Working Group III

1. Mr. Lawrence W. Fritz, National Charting Research & Development Laboratory, NOAA/NOS

2. Dr. Robert D. Thomson, Dept. of Geography, Frostburg State College

3. Ms. Carolyn C. Weiss, Statistics Canada, Geocartographics Subdivision

4. Mr. Erich Frey, Marine Chart Branch, NOAA/NOS

5. Mr. Daniel Neumann, NOAA/NOS

6. Mr. J. Ives, Div. of Survey & Mapping Systems, Bureau of Land Mgmt.

7. Mr. Gale W. TeSelle, Director, Cartography and Geographic Information Systems Div., U.S. Dept. of Agriculture, Soil Conservation Service

8. Dr. Richard A. Williams, Goodyear Aerospace Corp.

## 1.4 MEMBERSHIP OF THE COMMITTEE

The Committee is made up of a Steering Committee, three Working Groups and an Executive Committee. The Steering Committee is the primary organizational structure for the effort and its members are the ones who created the working groups in 1982 and defined the scope of their activities. The Steering Committee is also the group that formally votes on the standards according to the American National Standards Institute rules being followed. The Executive Committee is composed of the Chairs and Vice Chairs of the Working Groups and the Committee itself. This group leads the work of the Committee on a day to

day basis. The Working Groups focus on specific aspects of the standards problem and are composed of experts knowledgeable about those specific aspects of the problem.

The members of the Steering Committee are as follows:

Harold Moellering, Ohio State University, Chairman
Lawrence Fritz, National Ocean Service, Vice Chairman
Dennis Franklin, Defense Mapping Agency
Robert Marx, Bureau of the Census
Jerome Dobson, Oak Ridge National Laboratory
Dean Edson, E-Quad Associates
Jack Dangermond, Environmental Systems Research Institute
John Davis, Kansas Geological Survey
Paula Hagen, Computer Corporation of America
A. R. Boyle, University of Saskatchewan
Timothy Nyerges, University of Washington
Dean Merchant, Ohio State University
Hugh Calkins, SUNY Buffalo

Members of Working Group I, Data Organization are as follows:

Timothy Nyerges, University of Washington, Chairman
Bill Liles, Xerox Special Information Services, Vice Chairman
A. R. Boyle, University of Saskatchewan
Hugh Calkins, SUNY Buffalo
Fred Billingsley, Jet Propulsion Laboratory
Robin Fegeas, U.S. Geological Survey
David Pendleton, National Ocean Service
Clif McVay, Defense Mapping Agency
Jan van Roessel, EROS Data Center
Alfred Brooks, Information Interchange Inc.

Members of Working Group II, Data Set Quality are as follows:

Nicholas Chrisman, University of Wisconsin, Chairman
Charles Poeppelmeier, Defense Mapping Agency, Vice Chairman
Dean Merchant, Ohio State University
John Davis, Kansas Geological Survey
George Rosenfield, U.S. Geological Survey
George Johnson, National Ocean Survey
Wallace Crisco, Bureau of Land Management
Gunther Greulich, Survey Engineers of Boston
John Stout, Geological Consultant
David Meixler, Bureau of the Census
Frank Beck, U.S. Geological Survey

Members of Working Group III, Cartographic Features are as follows:

Warren Schmidt, Digital Mapping Unlimited, Chairman
Robert Rugg, Virginia Commonwealth University, Vice Chairman
Joel Morrison, U.S. Geological Survey
Walter Winn, National Ocean Service
Beth Driver, Technology Service Corporation
Frederick Tamm-Daniels, Tennessee Valley Authority
Mary Clawson, Naval Ocean R&D Activity
Billy Love, Defense Mapping Agency
Erich Frey, National Ocean Service
Mark Monmonier, Syracuse University

Note: Working Group IV on Terms and Definitions was inactivated and the members were directly assigned to the Working Groups with which they have been developing definitions. The work on cartographic objects has been conducted with the Committee as a whole because it has an impact on the work of each WG.

## 1.5 AMERICAN NATIONAL STANDARDS INSTITUTE PROCEDURES

The standards being developed by the Committee are planned to be ultimately proposed as Federal Information Processing Standards. However, during this formulation process, the Committee is following the ANSI procedures as they apply to the work of the Committee because these procedures are generally recognized as the most appropriate for an effort of this kind. As such, the Committee operates under the auspices of the American Congress on Surveying and Mapping with a mandate from the U.S. Geological Survey which originally came from the National Bureau of Standards to develop such standards. Therefore, the Committee is not an ANSI committee, but will follow ANSI Appendix A, "Model Procedures for an Accredited Standards Committee" as it applies to this effort (ANSI, 1982).

## 1.6 REFERENCES

American National Standards Institute. 1982, Procedures for the Development and Coordination of American National Standards, New York: American National Standards Institute, 24 pp.

Moellering, H., ed., 1983. Digital Cartographic Data Standards: Defining the Issues, Report No. 3, Columbus: National Committee for Digital Cartographic Data Standards, 49 pp.

_____, ed., 1984. Digital Cartographic Data Standards: Examining the Alternatives, Report No. 4, Columbus: National Committee for Digital Cartographic Data Standards, 102 pp.

_____, ed., 1985. Digital Cartographic Data Standards: An Interim Proposed Standard, Report No. 6, Columbus: National Committee for Digital Cartographic Data Standards, 164 pp.

# 2.0 EVALUATING AND TESTING THE INTERIM PROPOSED STANDARD FOR DIGITAL CARTOGRAPHIC OBJECTS

by

Harold Moellering

Prior to reading this section on cartographic objects, the reader is invited to review pages 19-27 in Report No. 4 on the alternatives (Moellering, 1984) and pages 37-39 and 147 to 154 in Report No. 6 on the Interim Proposed Standard (Moellering, 1985).

## 2.1 BACKGROUND

The definition and use of cartographic objects is fundamental to achieving the ability to analyze and display cartographic data, and to exchange digital cartographic data bases between machine systems. At the outset, one must consider the relationships between a cartographic feature, cartographic entity and a cartographic object as shown in Figure 2.1. The definitions used in the standard recognize the cartographic feature as the covering term for what exists both in the real world and in digital storage. The specific term

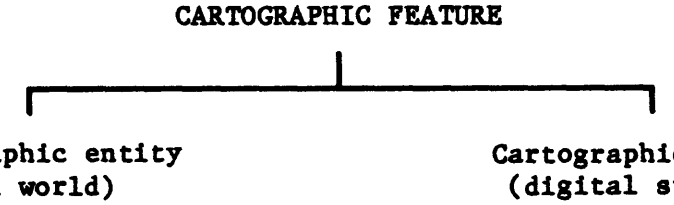



**Figure 2.1 Relationship Between Cartographic Feature, Entity and Object.**

for those things that exist in the real world is the cartographic entity. When that information is captured as a digital representation of an entity in digital storage, then it is defined as a cartographic object. In order to capture this information in an efficient digital manner, and in order to be able to manipulate it conveniently, it is important that cartographic objects be parsimoniously defined. Therefore, these 0-, 1-, and 2-dimensional objects must have the following properties: they must serve the tasks of geometry and topology in various combinations, they must be modular, they must work in both planar and curved coordinate systems, and they must be extendible.

In modern digital cartography, there is a distinct need to define objects that provide various capabilities and combinations of geometry and topology. For example, most of the early work in the 1960's included straight geometric drawings of map displays that were real maps and sometimes CRT images (virtual map type I). Creating objects out of points in a geometry only operation and the files associated with them came to be called spaghetti files. There is

still a need for geometry only objects today, but in relative terms, the need for them is declining. Most modern cartographic systems use data structures that are based on principles of both geometry and topology, and therefore, one must define objects that are not only locational, but also contain topological characteristics such as connectivity and contiguity. Therefore, a full set of cartographic objects must be defined that contain both geometric and topological properties. More recently, work has been conducted that involves objects that are topology only, such as that by White and Griffin (1979). Since the evaluation of the alternatives by the Committee in 1984, subsequent hearings, consideration of written comments, and oral discussion, it has become clear that classes of objects must be explicitly provided that are geometry only, and geometry and topology, whereas the capability must be provided such that topology only objects can be created by truncating the coordinates from the objects that utilize geometry and topology. At this stage in the development of digital cartography, a separate explicit class of topology only objects is not warranted. Table 2.1 shows the updated vector oriented objects and how they fall into the two explicitly defined classes, and the third implicit class of objects.

| | Geometry | Geometry and Topology | Topology Only |
|---|---|---|---|
| 0-D | point | node | (truncated node) |
| 1-D | line segment | link | link, chain |
| | string | directed link | directed link w/ truncated nodes |
| | arc | chain | |
| | ring (string or arc) | ring (link or chain) | ring (link or chain) w/truncated nodes |
| 2-D | simple polygon (string or arc) | simple polygon (link or chain) | simple polygon (link or chain w/truncated nodes) |
| | complex polygon (string or arc) | complex polygon (link or chain) | complex polygons (link or chain w/truncated nodes) |

Table 2.1 Intended Uses of Defined Cartographic Objects in Three Cartographic Settings.

A second major requirement is that the objects defined must be modular. There are several reasons for this requirement and all pertain to the needs of digital cartography. The first is that the lower dimensional objects are needed to define the higher dimensional objects. For example, various

combinations of points and nodes are used to define the linear objects, and they are then used to define the two dimensional objects. This process can only happen if the objects defined are truly modular. The second is that various primitive and simple objects are used to define compound and complex objects. For example, a polygonal tessellation (coverage) of soils is a compound object because it is made up of one fundamental kind of lower level object. A stream network is another example. A complex object is one that is made up of various combinations of lower level objects, and a county that contains roads, streams and other networks, areas of various land use, soils, planning zones and census areas, along with features such as buildings, water towers, etc., is such an example. As defined here, the county is a rather complex cartographic object. Another reason for the requirement for modularity of objects is that then things will more easily fit into various data structure modules such as chain modules, node modules, point modules, attribute modules, etc. A further reason is that if objects are modular, then it is possible to define a set of data exchange modules that can be used to transfer digital cartographic data from one system to another. By now it should be clear that modularity is a critical requirement for cartographic objects if modern data structures are to operate efficiently.

The third requirement is that the coordinates for the objects and the objects themselves must explicitly recognize that the entities that they represent can exist in both planar and curved coordinate systems. It is common for the designer of spatial data structures to assume that the coordinate system is planar, although the real world is not that simple. The underlying assumption is that the simple mathematical equations that operate in planar systems can be used. However, for a national standard, one must define the cartographic objects such that coordinate references such as latitude and longitude can be used on the sphere or ellipsoid. The objects here have been defined such that they are valid in both planar and curved coordinate systems.

The fourth requirement is that the set of cartographic objects be extendible, that is, could be expanded at a later date, if necessary. There are several areas where such a need could arise. It is possible in the future that further research could indicate that the raster related objects, pixel and grid cell, require expansion to incorporate more explicitly topological concepts. It turns out that the raster oriented objects are currently much less well developed in the literature than are the vector-based objects. Therefore, extension of the standard could be required in the future. Another possible candidate area is that of three dimensional objects. Currently, work is going on in that area, but to date no real consensus has emerged as to what those objects should be. One possibility is an object called a prism, but other objects would have to be invented. The concept behind the current standard is to systematize and harmonize the set of objects that have already been defined. The three dimensional objects are a task for the future. In all cases, it is very important that the current standard be clearly and concisely stated, as well as being tightly organized conceptually. If this is true, the current standard will work well now and serve as a foundation on which to build extensions in the future.

## 2.2 REVIEW OF COMMENTS RECEIVED SINCE REPORT NO. 6 WAS PUBLISHED

Since Report No. 6 on the Interim Proposed Standard was issued in January of 1985, a number of comments have been made relating to the cartographic objects as they were defined. Most questions have been raised in the public sessions organized by the Committee to present this material and provide opportunities for questions and discussion. At the public sessions the overwhelming majority of the questions relate to clarification on what is meant by a concept or definition. A much smaller fraction of questions and comments relate to suggested changes of definitions or perhaps objects. At the outset one should point out that an important typographical error occurred on page 37 of the first printing of Report No. 6. These reports were distributed from January to April 1985. The error concerns the optionality of the coordinates for points and nodes. The current standard is that coordinates are optional for nodes. Obviously, coordinates are required for the point, or it could not exist as an object. The reason that coordinates are optional for the node is so that they can be truncated, if necessary, to produce a purely topological object. Later printings sent out after April, 1985 have been corrected to state the definitions of the point and node correctly.

During the period since Report No. 6 was issued, 14 written comments were received at Columbus headquarters and circulated to various elements of the Committee. In general, the written comments fall into two broad classes: one being suggested updates to the definitions of the objects, and the other is the need to handle holes in polygons in a direct topological manner. In terms of polishing the definitions, a number of detailed suggestions were given. These suggestions were circulated in the Committee and were used in combination with the testing and evaluation results to improve the definitions. Improvements were suggested for definitions of the pixel, grid cell, polygon, arc, node, and a number of other objects. A summary of these improvements is given in Section 2.3.

The second set of comments dealt with the way in which holes are handled for polygons. The definitions in the Interim Proposed Standard does not provide a direct approach as part of the object definitions, but offers the user the flexibility to construct a solution in the data structure. A number of written comments pointed out the need for such a capability to be directly incorporated into the object definitions. It was pointed out that while many systems handle holes in polygons now, in the future most systems will have such a capability. Therefore, it is essential that the objects be defined such that this capability is explicitly recognized without complicating life for those who do not use such a capability. One or two correspondents even provided suggestions of how this might be accomplished. As a result of the testing and evaluation work, the notion of a ring has been added to the linear objects. A ring can serve as an outer boundary of a polygon or as a boundary of a hole in a polygon. Therefore, a polygon is formed from one outer ring and zero or more inner rings that define holes. This approach adds the capability to deal with holes directly without incurring any real added complexity. Please read the next section for more discussion.

## 2.3 EVALUATION AND TESTING

Table 2.2 shows the sources of evaluation and testing of the cartographic objects. The upper six methods resulted in written or verbal comments that

1) evaluation by written comment from Report #6
2) evaluation by comments from Spring 1985 and 1986 meetings
3) evaluation by individual Committee members
4) evaluation by comments from external evaluators
5) evaluation by Committee in Spring and Fall meetings
6) evaluation by comments from Federal Committee
7) testing in WG I exchange modules.

Table 2.2 Evaluation and Testing Methods Conducted on the Cartographic Objects

were integrated into the evaluation of the cartographic objects and the concepts that underlie them. Many suggestions were provided for polishing up and improving the definitions. One important suggested change was the addition of an improved approach to deal with holes in polygons.

The explicit testing involved an approach very different from the other evaluations. The objects were tested by Working Group I as part of their data exchange field testing. The basic units of data exchange for cartographic data are the objects, and in order to accomplish such an exchange several additional components are required. First, a set of exchange modules must be defined. The initial set of exchange modules was defined directly from the cartographic objects. A later revision of the exchange modules was devised to consolidate the objects by dimensional class, excluding arc, pixel and grid cell. Of the three proposed implementations, the ISO 8211 implementation was used for testing here. GDIL is intended primarily for raster data and FGEF was still under development by the Federal Committee. A further description of the data exchange testing is provided in Section 3.

The results of the evaluation from all sources and the field tests by Working Group I produced a number of changes and improvements to the wording of the definitions. The most significant change is the inclusion of the ring as a linear object, 2.4.2.7. A number of comments received during the evaluation phase of the work indicated rather strongly that a direct approach had to be provided to topologically handle holes in polygons. The result is the development of the object called the ring. A ring is a linear object that can form the outer boundary of a polygon or a hole in a polygon. It is the linear boundary and <u>not</u> the area inside the boundary. The linear trace that forms the ring is separate from the area contained by the ring. The ring can be created from string(s), links, chain(s) or arc(s). A polygon (2.4.3.1) is then formed from one or more rings, the first being the outer polygon boundary and any other rings being interior holes. It should be noted that a ring that defines a hole in a polygon could also define the object that fills that hole, an island in the middle of a lake, for example. This approach then provides the capability for processing polygons simply if no holes are present, or rather elegantly if holes are to be processed topologically. This approach recommended by the reviewers follows the principles advocated by White (1979), by Corbett (1979, 1985) and by Wilson (1985).

A second addition to the definitions is to distinguish between a pixel and a grid cell. It turns out that there has been concern for some time that the cellular information coming from a scanner and cells on the ground are not necessarily identical because rectification has taken place, and it is also possible that the pixels may have been agglomerated. Therefore, it has become clear that two separate raster objects are necessary, one oriented to the scanning instruments and the other oriented towards surfaces, usually the ground. It is possible that in some cases the pixel and the grid cell could be identical, but that situation would be an exceptional case because they are usually different due to coordinate rectification. The definitions have been adjusted accordingly.

A third major change is the addition of the Special Implementation Objects 2.4.4, requested by the Standards Working Group of the Federal Committee. It turns out that these objects are necessary to implement the Federal Geographic Exchange Format. The Federal Group felt that they should be clearly defined so that there would be no misunderstanding when those objects were discussed in the FGEG section. Actually, these objects are special applications of the general objects defined in the main definitions. For example, feature point, label point and area point do not change the general definition of a point, but rather indicate a special use of the point as a punctiform object. Similarly, the area chain, complete chain, and network chain are variations on the general chain with the difference being whether the nodes or right/left identifiers are actually used in the implementation. Since these special objects are very important to the Federal FGEF implementation, they have been added as a separate section.

Many other minor modifications have been made to the wording of the definitions to improve the clarity of the meaning. It is also hoped that these improvements will facilitate a better understanding of the objects, what they mean, and how they are to be used. All of the objects are listed below along with any improvements that have been made to the definitions.

0-dimensional objects

- point - no real change (typographical error fixed)
- node - improved wording; coordinates optional

1-dimensional objects

- line - added as a generic definition
- line segment - no real change
- link - no real change
- directed link - no real change
- string - improved wording
- chain - improved wording; reference to identifiers added
- arc - much improved wording
- ring - a newly added definition discussed above

2-dimensional objects

area - generic definition added
polygon - rewritten to reflect the addition of rings
simple polygon - new definition to reflect the addition of ring
complex polygon - new definition to reflect the addition of ring
pixel - improved definition
grid cell - new definition to complement the pixel

Special implementation object

Feature point, label point, area point, area chain, complete chain, network chain - new definitions added to support the FGEF implementation.

Together, these changes represent a significant improvement to the definitions of these cartographic objects. They are now more concisely and clearly defined in terms of wording and intended use. The current definitions are listed in the following subsection and have drawings included with them to facilitate understanding them.

## 2.4 DEFINITION OF CARTOGRAPHIC OBJECTS

NATIONAL COMMITTEE FOR DIGITAL CARTOGRAPHIC DATA STANDARDS
A PROPOSED STANDARD FOR CARTOGRAPHIC OBJECTS
Draft March 18, 1986
Including Federal Special Implementation Objects, January 1986

The cartographic objects specified in the following sections represent the basic objects required for digital cartographic processing which can be used to construct higher level objects that represent a more complex realization of the real world. The following definitions have been specified such that they are valid in planar, Euclidean geometry as well as simple curved surfaces such as the sphere or ellipsoid.

### 2.4.1 DEFINITION OF Ø-DIMENSIONAL CARTOGRAPHIC OBJECTS

2.4.1.1 •

point - A Ø-dimensional object that specifies geometric location. A set of coordinates specifies the location.

2.4.1.2 ✳

node - A Ø-dimensional object that is a topological junction and may specify geometric location. An optional set of coordinates specifies the location.

## 2.4.2 DEFINITION OF 1-DIMENSIONAL CARTOGRAPHIC OBJECTS

2.4.2.Ø line - A 1-dimensional object.

2.4.2.1  line segment - A 1-dimensional object that is a direct line between two points.

2.4.2.2  link - A 1-dimensional object that is a direct connection between two nodes. Alias: edge.

2.4.2.3  directed link - A link between two nodes with one direction specified.

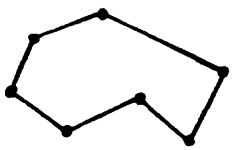
2.4.2.4  string - A sequence of line segments.

2.4.2.5  chain - A directed sequence of nonintersecting line segments with nodes at each end. Reference to left and right identifiers are optional.

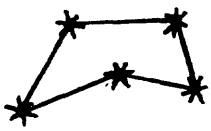
2.4.2.6 arc - A locus of points that forms a curve that is defined by a mathematical function.

2.4.2.7 ring - A sequence of nonintersecting chains, strings, links, or arcs with closure. (It represents a closed boundary, but not the area inside the closed boundary.) Alias: polygon boundary.

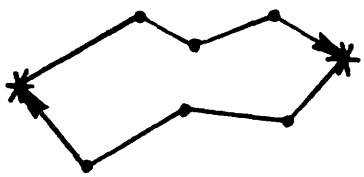
2.4.2.7.1 1) ring created from string(s).



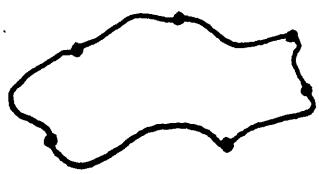
2.4.2.7.2 2) ring created from links.



2.4.2.7.3 3) ring created from chain(s).



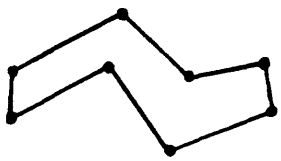
2.4.2.7.4 4) ring created from arc(s).



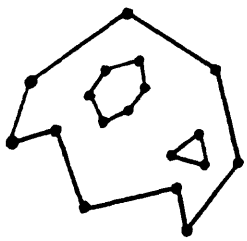
## 2.4.3 DEFINITION OF 2-DIMENSIONAL CARTOGRAPHIC OBJECTS

2.4.3.0 area - The interior of a continuous two dimensional object.

2.4.3.1 polygon - An area having one outer ring and zero or more nonintersecting inner rings.

2.4.3.1.1 

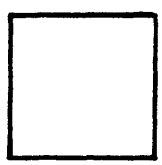
1) simple polygon - A polygon without inner rings.

2.4.3.1.2 

2) complex polygon - A polygon with one or more inner rings.

2.4.3.2 

pixel - A 2-dimensional picture element which is the smallest nondivisible element of an image.

2.4.3.3 

grid cell - A 2-dimensional object that represents an element of a regular or nearly regular tessellation of a surface.

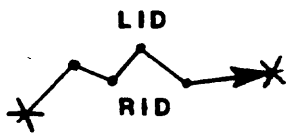
## 2.4.4 SPECIAL IMPLEMENTATION OBJECTS

2.4.4.1 • feature point - A point used principally for identifying the location of cartographic point feature, such as towers, buoys, gauging station, etc.

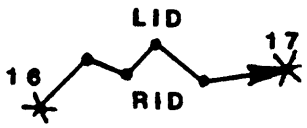
2.4.4.2 • label point - A point used principally for displaying map and chart text (feature names) to assist in feature identification.

2.4.4.3 • area point - A point within an area carrying attribute information about that area.

2.4.4.4 area chain - A chain with left and right identifiers but without node identifiers.




2.4.4.5 complete chain - A chain that has node identifiers and left and right identifiers.




2.4.4.6 network chain - A chain that has node pointers but without left and right identifiers.

## 2.5 REFERENCES


Corbett, J., 1979. Topological Principles of Cartography, Bureau of the Census Technical Paper 48, Washington: Government Printing Office, 50 pp.

_____, 1985. "A General Topological Model for Spatial Reference," SORSA Working Paper Series No. 1985-5.

Moellering, H., ed., 1984. Digital Cartographic Data Standards: Examining the Alternatives, Issues in Digital Cartographic Data Standards Report No. 4, Columbus, Ohio: National Committee for Digital Cartographic Data Standards, 102 pp.

_____, ed., 1985. Digital Cartographic Data Standards: An Interim Proposed Standard, Issues in Digital Cartographic Data Standards Report No. 6, Columbus, Ohio: National Committee for Digital Cartographic Data Standards, 164 pp.

White, M., 1979. "A Survey of the Mathematics of Maps," Proc. International Symposium on Computer-Assisted Cartography, AUTO-CARTO IV, Falls Church: ASP & ACSM, pp. 82-96.

White, M., and P. Griffin, 1979. "Mapping Without Coordinates," Proc. Urban and Regional Information Systems Association, pp. 431-442.

Wilson, P., 1985. "Euler Formulas and Geometric Modeling," IEEE Computer Graphics and Applications, August, pp. 24-36.

## 3.0 TESTING THE INTERIM PROPOSED STANDARD FOR CARTOGRAPHIC DATA EXCHANGE by Timothy Nyerges

### 3.1 Background

Members of Working Group I:

| | |
|---|---|
| Timothy Nyerges (Chair) | University of Washington |
| William Liles (Vice Chair) | Xerox Corporation |
| Frederick Billingsley | Jet Propulsion Laboratory |
| A. Raymond Boyle | University of Saskatchewan |
| Alfred A. Brooks Jr. | Information Interchange, Inc. |
| Hugh Calkins | State University of N. Y., Buffalo |
| Robin Fegeas | U. S. Geological Survey |
| Clif McVay | Defense Mapping Agency |
| Dave Pendleton | National Ocean Service |
| Jan van Roessel | Technicolor Government Services |

Observers:

| | |
|---|---|
| Donna Peuquet | Pennsylvania State University |
| James Upperman | National Bureau of Standards |
| Marvin White | Etak Corporation |

During cycle four of the work by the National Committee for Digital Cartographic Data Standards (NCDCDS), Working Group I refined and tested the Interim Proposed Standard for Cartographic Data Exchange. This portion of the NCDCDS Report 7 presents a summary of:

- the Interim Proposed Standard as documented in Report 6,
- comments received from Report 6,
- revisions to the Interim Proposed Standard,
- results from testing,
- implications for further revisions,
- and the current status of the Interim Proposed Standard.

During cycle two of committee work an assessment of alternatives for digital cartographic data exchange was undertaken. This resulted in a conclusion that none of the current strategies, hence formats or standards for graphical data exchange were suitable for acceptance as a cartographic data exchange standard. In particular, the two standards most closely evaluated were the GKS Graphics Metafile and IGES standards. The Metafile is not appropriate because it has a graphic symbolization orientation, whereas this committee's concern is with point, line, area and feature data, but not the multitude of symbolization which can be associated with these features. In addition, the metafile approach does not consider spatial topology and spatial referencing system information. The IGES standard is not appropriate because of the lack of spatial referencing system information, data quality information, raster and grid cell representations. Both standards would require significant enhancements to be used for a general digital cartographic data exchange standard that meets the needs of diverse applications in the cartographic community.

## 3.2 Review of the Comments on the Report 6 Interim Proposed Standard

NCDCDS Report 6 distributed before and discussed in public forum in March, 1985 contains a proposal to utilize (the then draft proposed, and now accepted) American National Standards / International Standards Organization (ANSI/ISO) 8211 Specification for a Data Descriptive File as a flexible means to transfer digital cartographic data. (This standard is still under review as a Federal Information Processing Standard - FIPS.) The ANSI/ISO 8211 standard is a specification for a data transfer mechanism by which data sets can be encoded and decoded, but does not specify the actual cartographic data fields that should be trasnsferred. The committee recognized that the interim proposed standard at that time had some serious shortcomings in terms of completeness.

Working Group I received written comments as a result of a public review of the Report 6 Interim Proposed Standard during the past year. The comments have been distilled into four primary themes listed below in the order of the volume of comments received:

- data field meaning
  The committee should define data meaning for points, lines and areas in a clear and simple fashion.

- data descriptive mechanism
  An internal data descriptive mechanism is a good idea, but may be too complex to be successful. An external, fixed format definition would be simpler.

- user community
  The committee should define the intended user community more clearly.

- conformance
  The committee should define when an organization is in conformance with the standard.

Many of the comments received are of diametrically opposing views on some issues. The use of an internal data descriptive mechanism versus defining fixed formats defined by exteranl documentation is one such example. The committee has considered all comments, incorporating their substance into committee deliberations.

As a result of both committee direction and comments, the draft interim proposed standard has been altered significantly to reflect this input. Effort has focused in the past year on formulating the description of the cartographic data field meaning rather than specifying a mechanism by which any data can be encoded and decode to implement a transfer. This new direction resulted in the creation of a draft interim proposed standard which defined a set of exchange modules closely aligned with the definitions of cartographic objects as defined by NCDCDS Working Group IV. An exchange module is a logical grouping of data

subfields required to represent a cartographic object or other important grouping of information to support data exchange.

Table 1 shows the status of the exchange modules as they appeared in the draft standard that was discussed at the September, 1985 meetings. The exchange modules are grouped at a higher level of abstraction into exchange forms. The five exchange forms that appear in Table 1 are: Global Information, Data Quality, Cartographic Object, Relational, and Raster.

Table 1
Exchange Modules and Exchange Forms

GLOBAL INFORMATION

Catalog
Identification
Security
Spatial Reference
Coverage
Map Projection
Control Points

DATA QUALITY

Lineage
Positional Accuracy
Attribute Accuracy
Logical Consistency
Completeness

CARTOGRAPHIC OBJECTS

Feature
Point
Node
Line Segment
Link
Directed Link
String
Chain
Arc
String Based Polygon
Link Based Polygon
Chain Based Polygon

Exchange Modules (Continued)

RELATIONAL

Feature/Element
Polygon/Boundary
Boundary/Chain
Polygon/Chain
Chain Topology
Chain/Point
Node/Chain
Node/Point
Label/Point
Point/XY
Attribute-Primary
Attribute-secondary

RASTER

Raster Logical Structure
Raster Ancillary Attribute
Raster Image Data

The Cartographic Object Form consists of exchange modules for point, line, area, and grid cell type representations that follows a logical data organization closely aligned with the "dictionary" definition of the objects. The Relational Form consists of relations that define point, line and area objects; hence the logical data organization is of a simpler form than in the Cartographic Object Form. The Raster Form consists of exchange modules used to represent imagery data.

The draft of the Interim Proposed Standard that appeared in Report 6 is now being called a "method for implementation" of the exchange modules. This is discussed in section 3.4.6.

## 3.3 Testing the Interim Proposed Standard

A public call for participation in testing the interim proposed standard went before the cartographic community in the Spring and Summer of 1985. The categories for participating in a test of the data exchange standard are: Federal and Non-federal. The Federal participants would be from the Federal Government Agencies. The Non-federal would be from academic and industry organizations, and state and local government agencies. The test categories were also subdivided into formal and informal tests. Participating in a formal test required that a report be submitted to the committee documenting all stages in the test. An informal test required no report, but the committeee did ask to be kept informed as to the outcome of the tests.

### 3.3.1 Test Participants

Participants agreeing to take part in a Formal Federal test were:

- Defense Mapping Agency in the Dept. of Defense, both Aerospace Center and Hydrographic/Topographic Center
- National Ocean Service of NOAA in the Dept. of Commerce
- U. S. Geological Survey in the Dept. of Interior

Participants agreeing to take part in the Formal Non-Federal test were:

- Assessing Department of the City of Boston, Massachusetts
- Map Department of DuPage County, Illinois
- Geographic Technology Inc. from Bellingham, Washington

Informal Tests were undertaken by members of the committee at:

- Jet Propulsion Laboratory from Pasadena, California
- U.S. Geological Survey at EROS Data Center from Sioux Falls, South Dakota

### 3.3.2 Test Methodology

A testing methodology was devised as a guideline to help testors perform similar functions and document their experience accordingly. Two levels of tests were undertaken: level 1 and level 2. A level 1 test is essentially a "pencil and paper" test to determine the suitability of the exchange modules in different application environments. This test included the first three steps of the eight step methodology listed below. A level 2 test consisted of all eight steps of the test methodology as listed below, including an automated portion in addition to the "pencil and paper" test. The steps in the testing methodology are as follows:

1. Source data base examined in terms of exchange modules.
   The source data base for an organization is to be examined as for the suitability of the exchange modules to transfer data from that source data base to another environment.

2. Manual mapping of source data base records, fields and subfields to target exchange module records, fields and subfields.
   Subfields in the source data base are to be matched against subfields in the exchange modules. This mapping of source to target is to documented.

3. Compile a report documenting the mapping.
   A report should contain the suitability of the exchange modules for use in the testors application environment. The report should contain the mapping of the source data subfields into the target data subfields.

4. Encode the source to target mapping in an implementation.
   The source to target mapping is to be encoded for inclusion in an automated test.

5. Load a data set into the exchange module/form using an export interface.
   A data set is loaded onto a transfer medium as per the encoding performed in the previous step.

6. Using the same data set, retrieve the data set from the encoded form back into the original fields using an import interface.
   The data should be retieved back into the original file structure.

7. Transfer the data set to a foreign environment and retrieve the data set via an import interface.
   A data set is to be transferred to a foreign environment which has a different file structure.

8. Compile a report documenting the procedures and conclusions.
   A report shoould include all findings from each step of the test. Conclusions should be developed as an assessment of the completeness of the interim proposed standard.

3.3.3 Test Results

All participants in the Formal Federal test completed their portion of the level 2 test. The Cartographic Object Form from the September draft standard was used. The full report appears in Appendix A. An implementation of ISO 8211 data descriptive file specification was used to operationalize the test.

The general conclusions from the Formal Federal test are as follows:

- The similarity of converted files is misleading because the same subfields in certain exchanges modules had a different interpretation of data field meaning among the organizations.

- An interchange requires knowledge of the other organizations mapping from source data base subfields to target exchange module subfields.

- A data exchange involving several modules would be sufficiently complex as to require more than one DDF and input file or a complex interface to the originating data base."

- The Interim Proposed Standard at the time tested requires more detail to be useful in an exchange environment of non-communicating organizations.

- The next stable version of the interim proposed standard should be tested.

The City of Boston Assessing Department completed a report on a "pencil and paper" level 1 test. The Cartographic Object Form from a December, 1985 draft was used in the test. The full report appears in Appendix B.

The general conclusions from the test are as follows:

- Reviewing the Interim Proposed Standard in terms of the City of Boston Data Base took the greatest amount of time in the test.

- Approximately three and one-half days were needed to perform the manual encoding from source to target subfields.

- The point and line modules are the most appropriate for the City's use since the majority of data is land parcel based. These modules are satisfactory for transferring City data.

- The arc module looked like it could be useful for transferring data, but no attempt was made to encode data.

The other participants were not able to complete tests due to shifts in priorities. However, mostly positive feedback was given when the material in the draft standard was clarified. This indicated that further detail is needed in the text of the standard.

### 3.3.4 Revisions as a Result of Testing

The tests provided considerable insight into the shortcomings of the draft standard. The document requires greater detail in explanation of the data subfields so that the intent and meaning of the subfields is clear. All modules are being clarified and further detailed to provide the necessary explanations.

## 3.4 Current Status of the Interim Proposed Standard

The Interim Proposed Standard is being revised currently to ameliorate the shortcomings uncovered during the testing stage. A summary of some of these changes is presented here.

The document is being rewritten in a style as close as possible to the ANSI Style Manual.

Repetitive sections of the document are being reduced, and generic explanations with respect to subfields are being included to simply the reading of the document.

Several exchange modules are being reviewed to bring them into closer coordination with the Federal Interagency Coordinating Committee on Digital Cartography (FICCDC) Standards Working Group. This includes all modules in the Global Information Grouping as well as all modules in the Cartographic Object Form.

### 3.4.1 Global Information Modules

The exchange modules in the Globals Information Grouping currrently in the standard are listed in Table 2.

Table 2.
Globals Information

Bootstrap - for describing how the data transfer is implemented
Catalog - 3 modules for directory, cross reference, and domain
Identification - identify the data set
Security - security level of the data set
Spatial Reference - spatial address parameters and orientation
Coverage - geographic extent of the data set
Map Projection - describe the projection used
Registration Points - register the data set to the earth

### 3.4.2 Data Quality Modules

The Data Quality modules have been simplified to include a general comment field only.

### 3.4.3 Cartographic Object Form

Modules in the Cartographic Object Form have been revised to reduce the number of modules by eliminating the redundancy in the data representations. The object representations for the FICCDC Standards Working Group and the NCDCDS Working Group I have been coordinated to produce a similar set of representations. Those object representations are listed in Table 3.

**NOTICE**

Readers desiring a copy of the full description of the cartographic object modules should write Prof. Moellering at Columbus headquarters. A copy of the object form descriptions will be available in late May, 1986. Please write to Prof. MOellering at the address given in the front of this report.

Table 3.
Cartographic Object Form
Modules and Object Representations

| Module Type | Object Representation | Representation Code |
|---|---|---|
| Point-Node | Point | X |
| | Feature Point | G |
| | Label Point | T |
| | Area Point | A |
| | Node | N |
| Line | String | S |
| | Link | Q |
| | Directed Link | B |
| | Chain | U |
| | Point Chain | E |
| | Area Chain | L |
| | Network Chain | W |
| Polygon-Ring | Polygon represented using line module(s) | P |
| | Polygon represented using ring(s) | R |
| | Polygon represented using spatial addresses | C |
| | Ring represented using line module(s) | D |
| | Ring represented using spatial addresses | V |
| Arc | Arc | Z |
| Grid-Definition | Straight encoding with cell values | I |
| | Straight encoding with attributes | J |
| | Run encoding with cell values | K |
| | Run encoding with attributes | M |
| Grid-Cell | Same as for Grid-Definition | |
| Feature | Feature | F |
| Attribute Description | Same as object to which attribute pertains | |

### 3.4.4 Relational Form

The description of the exchange modules in the Relational Form has been revised since the last draft to include a generic description of relations having the following content: type1/type2 and type/spatial_address. An additional schema exchange module has been added to the Form. These modules are listed in Table 4.

Table 4.
Relational Form

| Schema |
|---|
| type1/type2 |
| Feature/Element |
| Polygon/Ring |
| Polygon/Chain |
| Polygon/Point |
| Ring/Chain |
| Ring/Point |
| Chain/Point |
| Node/Chain |
| Node/Point |
| Label/Point |
| type/address |
| Polygon/Address |
| Ring/Address |
| Chain/Address |
| Node/Address |
| Point/Address |
| Chain-topology |
| Attribute-primary |
| Attribute-secondary |

### 3.4.5 Raster Form

The Raster Form contains three modules:

Raster Logical Structure

Raster Ancillary Attribute

Raster Image Data

### 3.4.6 Implementation of the Standard

The implementation of the cartographic data exchange standard can be done currently with three methods:

- ISO 8211 Data Descriptive File specification
- FICCDC delimiter specification
- NASA/JPL General Data Interchange Language

In the fall of 1985 the International Standards Organization adopted a method of encoding relational and hierarchical structured files call ISO 8211. This technique stores a data definition record as part of the information to be transferred with a file so that a receiving system can directly decode the file wihout resorting to external documentation. The Formal Federal test utilized an implementation of this specification to test transfer of exchange modules.

The Federal Interagency Coordinating Committee on Digital Cartography has proposed a method of delimiters for the encoding of subfields, fields and records of a data set. This will soon be tested to determine the feasibility of such an approach.

NASA has been funding a project at the Jet Propulsion Laboratory to define a means to encode and decode in a flexible manner real-time transfer, as well as archival transfer, of space image data. This effort has resulted in the specification of a general data interchange language operationalizing the transfer of data.

Each of the methods proposed for implementing the cartographic data exchange standard have their particular strong asnd weak points. Further testing will determine the advantages and disadvantages of each of the three methods.



(p.33 follows)

Appendix A

# Interim NCDCDS Testing Report

A. A. Brooks
J. V. Upperman

February 20, 1986

# Interim NCDCDS Testing Report

February 20, 1986


## Abstract

The NCDCDS (Sept 1985 version) was tested by constructing mapping tables and corresponding software for three data files: NOS/SDDEF, DMA/SLF and USGS/DLG. The procedure revealed that several data items in each file were not mapped into the NCDCDS in a well defined and unequivocably interpretable manner. This stemmed from both the outright lack of some fields or subfields in the NCDCDS and imprecise specifications. Also, data which users might consider as equivalent for many purposes was mapped into different locations, making interchange difficult. It is apparent that users are not sufficiently constrained by the NCDCDS document.

It is not clear that all of these difficulties will be removed by the new document (based on the NBS meeting of January 8-10, 1986). The solution may lie only in a smaller number of more robust interchange forms which will constrain users in the use of one form for similar data albeit some subfields would be null.


## Comments on the NCDCDS Interfaces

The goals of producing the best possible interfaces by knowledgeable users and, at the same time, evaluating how the standard will be interpreted by de novo users are mutually incompatible. Therefore, in order to make the testing of the NCDCDS and ISO 8211 as indicative as possible of its future viability in the hands of de novo users, the implementation and critique were done separately under the following guidelines:

1. When possible, the mappings as received from the source agencies were used without consultation. The implementor made as few changes as possible without contravening the NCDCDS proposed standard in its current form. Where consultation was necessary, it has been documented, in order to indicate where and how the de novo user might be misled by the standard.

2. The critique, on the other hand, has been constructed after consultation and used the best insight of all participants.

These guidelines assign all the misunderstandings and mistakes of the individual participants to the standard, to be

documented and corrected, if necessary. During the testing period, 9-15-86 thru 1-15-86, the NCDCDS proposed standard underwent numerous changes which were not completed before the end of the test period. Therefore, it was decided that the test should be concluded against the September 1985 draft. The changes to the standard either retained or expanded the conceptual capabilities of the NCDCDS proposed standard. It is not yet clear how the changes have affected the NCDCDS/ISO 8211 file structure or the specific implementations of the test.

The interfaces for the NOS/SDDEF, DMA/SLF and USGS/DLG standards to the NCDCDS, using ISO 8211 as the interchange vehicle, were programmed from the mapping information provided by the participating agencies. The tags, field names and labels were taken from the NCDCDS proposed standard with the following modifications:

1. The MODNAM subfield was dropped as there was no concensus about its contents and it seemed logically redundant to the field tag and field name.

2. The labels for the NCDCDS subfields that had no equivalent in the source standard were entered as null values with specified delimited subfields which were entered in the data records as null fields.

3. The NCDCDS field descriptions were truncated after the last subfield required by the source standard.

4. Fields, nonexistent in the NCDCDS yet essential to the acceptance of the source data, were defined. The details of these definitions are described under each interface.

5. The fixed format nature of the source data was preserved at the detail level and is reflected in the assigned ISO 8211 formats.

6. Since the NCDCDS does not specify a single specific latitude/longitude format, no attempt was made to convert the native formats at this time.

7. Since the NCDCDS does not specify a record and file structure, the implementor chose to use a single file structure. Logically, it is the most stringent test case and the test should be designed to reveal any problems. The sample files do not represent the structure of their parent files and it may be easier to produce an interchange file set from these files.

The adequacy of the NCDCDS proposed standard and ISO 8211 to

perform the interchange are discussed separately for each source file.

The USGS/DLG Interface

In evaluating this test, it should be remembered that the mapping was provided by Robin Fegeas, a WG1 member, knowledgeable about the NCDCDS proposed standard. The mapping he provided predated the test period.

The DLG file has eighty byte physical records with logical records spanning physical records as necessary.

The DLG interface was reasonably straightforward. Approximately 1500 bytes of source information was held in memory while the CATOLOG, IDENTIFICATION, SPATIAL REFERENCE, MAP PROJECTION, PROJECTION PARAMETERS, TRANSFORMATION PARAMETERS and CONTROL POINTS fields were constructed and placed into the first DDF data record. The data records were processed one at a time retaining only the brief (20 byte) control information from each header record in memory. The data was placed in the NODE, LINE ID LIST, CHAINED BASED POLYGON, CHAIN ID LIST, CHAIN POINT LIST and ATTRIBUTE fields as required.

The following are comments on this procedure:

1. No NCDCDS equivalent existed for the DLG NUMBER OF ISLANDS and none was generated.

2. No NCDCDS field for the DLG NODE-TO-LINE LINKAGE data existed and since this field was essential one was generated, LNID, formatted the same as CLST.

3. Four DLG fields (record 2: fields 2,3,4 and file accuracy records) were tentatively placed in the CATALOG/COMMENT field in an undifferentiated manner. This will require ad hoc processing on import. This can be avoided by defining CATALOG/COMMENT, not as a subfield, but as a tagged field. Since COMM is defined, it requires only approval of its use after CTLG.

4. One field was tentatively placed in IDENTIFICATION/BANNER.

5. The CATALOG field and to some extent the IDENTIFICATION field required several null fields. This is not considered a serious drawback.

The above items 1-4 should be considered as potentially serious in that other implementors, not in communication

with the exporter, might very well have assigned another location for this data. Certainly this is true for the LINE ID LIST field.

However, on the whole the mapping and implementation should be considered reasonably satisfactory for an interim standard. The test revealed only minor deficiencies in the NCDCDS proposed standard with respect to DLG.

The NOS/SDDEF Interface

The NOS/SDDEF file uses repetitive 80 byte records with a fixed format. The meaning of the data varies with field values and contiguous sets of records are logically related describing chains, splines, et cetera.

The documentation of the NOS/SDDEF (April 1, 1985) contains explicit details of the individual records but does not describe the interrecord structure implied by the data. The mapping instructions supplied much of this information but left some details in question. This was particularly true of ARCS, a topic about which NCDCDS is quite vague. Therefore, some additional discussion was necessary and is detailed in a letter (Al Brooks to Walt Winn dated 12/17/85; response dated 12/31/85). It exemplifies areas in which the NCDCDS proposed standard provides little guidance. A meeting between Al Brooks and Walt Winn was held on 1/7/86 to verify the mapping details.

After the meeting of 1/7/86, the interface software was completed with little trouble. The additional information retained in memory while forming the data fields was less than 80 bytes. Detail comments on this procedure are:

1. Several items from the UHL record (label) were placed in CTLG/COMMENT in an undifferentiated format. This is not desirable.

2. A new tag, ATTN, with subfields was defined to contain the added data about points, strings and arcs. There was no apparent location in the NCDCDS proposed standard for this information.

3. One field, CTLG, required 14 delimiters for null fields before reaching the COMMENT subfield where information was stored (see DLG comments). This is not serious but is not very elegant.

4. The question of where and how to place the spline information into ARCS raised fundamental questions about which the NCDCDS proposed standard does not provide much guidance.

Two methods suggest themselves:

a. Transmit the spline equation, its parameters and applicable range thus permitting the recipient to generate the intervening points.

b. Transmit the spline function and a set of points requiring the recipient to generate the spline parameters. This may be subject to computational precision problems. The spline function could be transmitted explicitedly or by reference to an external document.

In any case, the NCDCDS proposed standard does not specify an approach but leaves it to the varying ingenuity of the exporting users. Only the NOS point data and spline type were transmitted pending NCDCDS clarification.

All in all, the NOS/SDDEF conversion was technically straightforward and successful in that the fundamental data mapped successfully into the NCDCDS proposed standard. The variances were easily accommodated in the NCDCDS proposed standard and the ISO 8211 structure. Again, other mappers and implementors could have made other assignments.

The DMA/SLF Interface

The DMA/SLF file contains a greater variety of data belonging in Glogals and Data Quality than does the NOS and USGS files. Notation and practice in these areas does not seem to be at all standardized and it is not surprising that more mismatches existed between SLF and NCDCDS than with the other test files. Further evidence is that two independent mappings had several inconsistencies. These were reconciled but left several questions about NCDCDS data assignments. In many cases the implementor was asked to improvise and did so. In other cases, multiple elemental SLF data items were placed into a single NCDCDS subfield. This gives rise to unresolved data items. In certain cases the imlementor felt compelled to remedy this situation but could not always do so. A detailed itemization of problems follows:

1. The SLF file uses a blocked, spanned structure for logical records in 1980 byte physical blocks. The sample received did not contain spanning and blocking for the last two DSI groups. The DSI groups could be apportioned into the NCDCDS format without retaining more than 1980 bytes in main memory. The variable length DSI groups, DSRG and DSAG, can probably be processed with minor changes in the logic to accommodate control fields split across blocks. This group contained hexadecimal "00" as filler that was not specified

in the standard. These characters were replaced by "#" for printing purposes.

2. The following are notes on specific tags and fields:

a. IDEN - Relative few subfields used
b. SCUR - Retained the SLF fixed format in a single field
c. DLGC - Non NCDCDS tag for Date Source: questionable assignment
d. PROP - Scale was included as a parameter
e. DQLG - Multiple SLF fields were merged into both the STEP and SPEC subfields
f. DQPA - NCDCDS labels dropped as not appropriate
g. DQAA - NCDCDS labels changed as not appropriate
h. DSAG - Non NCDCDS tag for SLF DSAG group if present
i. CHN - Only the CHAINID subfield used; SLF assumes a different reconstruction process
j. ATTR - Dropped labels as inappropriate; field contains forty character blocks of SLF feature "header"
k. ELEM - Element type included with ELEMENID

The implementor received the impression that SLF was forced into the NCDCDS format in a not too satisfying manner with some data omitted. This was apparent from the differences in the original maps, the unanswered questions of the second map and the liberties allowed the implementor. It is clear that other implementors would make different assignments.

General Impressions and Comments

1. Any apparent similarity of the converted files based upon tags alone, or even subfield labels, is misleading. One must examine the subfield contents and meaning of the data to determine equivalence.

2. Interchange through the NCDCDS proposed standard, in its present (September 1985) state of specification, would require a knowledge of the source data file format and specifications. To be mapped into each other through the NCDCDS proposed standard, two files must be conceptually compatible with the NCDCDS format and with each other. Rather than using existing native interchange formats, the process should probably take place between the parent files.

3. The NCDCDS specifications were not precise enough to enable "mappers" to produce uniformly satisfactory "data maps" and this problem would be exacerbated if more than one implementation were involved or if test files of richer content had been used.

4. A large and complete interchange would very probably

require multiple interchange files which would best be produced by providing separate input files to the ISO 8211 implementation software and not by the single file approach used in the test. A greater flexibility for change will be attained by the multifile approach.

5. The NCDCDS proposed standard requires considerable enhancement before two noncommunicating implementations can exchange data. As it currently stands the receiving logic must be based at the tag/field level not at the file/record level. More detailed specifications for the meaning and use of the fields and subfields is required; more file and record specifications are required.

6. Testing of the September 1985 NCDCDS proposed standard has served its usefulness and the effort should be moved to the next "stable" version of the NCDCDS proposed standard as soon as it is made available.

## Potential for Interchange using the NCDCDS Proposed Standard

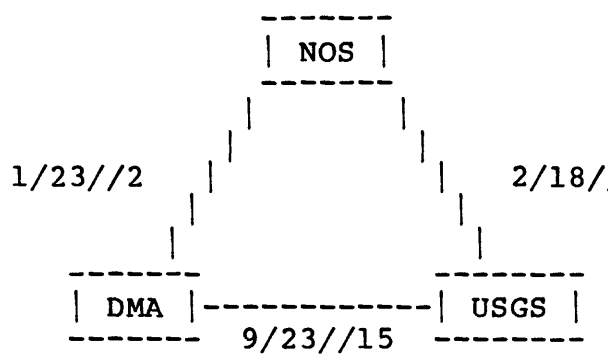
The potential for interchange by noncommunicating parties can be judged from the data represented in "Attachment 1" that illustrates the usage of tagged fields and subfields. This does not ensure that the fields were used with the same meaning or detailed data format. The tag overlap varies from 5 to 40 percent. The recipient would certainly need to know the origin of the interchange file. Undoubtly, a concensus on the use of the NCDCDS fields might improve matters. This may be attainable between noncommunicating users only by rigidly specifying a smaller set of more robust interchange forms thus constraining the user to place similar data into the same tagged field. In some cases, data forms would have globally null fields and a neutral terminology would need to be adopted. The data represented in "Attachment 2" illustrates the difficulty encountered when exporting a file to the NCDCDS format and then importing the same file back into its native format.

Attachment 1

NCDCDS (Sept. 1985) Tag usage table for NOS, DMA and USGS files

X = tag used; N/M = N out of M subfields in common;
? = private tag; # = varying meaning; * = repeating subfield,
additional field contents may have varying meaning

| TAG | NOS | DMA | USGS | COMMENTS |
|---|---|---|---|---|
| 0001 | X | X | X | DDF record ID |
| CTLG | X 1/1 | | X 1/3 | Comment subfield |
| PNT | X | | | |
| PLST | X 2/2 | X 2/3 | X 2/2 | |
| ARCS | X | | | |
| STRG | X | | | |
| ATTN ? | X | | | |
| IDEN | | X 0/2 | X 0/2 | |
| SCUR | | X | | |
| SREF | | X 3/13 | X 3/3 | |
| DLGC ? | | X | | |
| CVRG | | X | | |
| MPRJ | | X 0/2 | X 0/1 | |
| PROP | | X 1/* | X 1/* | |
| MTRG | | | X | |
| CPNT | | X 5/7 | X 5/5 | |
| DQLG | | X | | |
| DQPA | | X | | |
| DQAA | | X | | |
| CHN | | X 1/1 | X 1/5 | |
| NODE | | X 3/4 | X 3/3 | |
| FEAT | | X | | |
| ATTR | | X | X | # |
| ELEM | | X | | |
| DSAG ? | | X | | |
| LNID | | | X | |
| CPOL | | | X | |
| CLST | | | X | |




Summary
Fields in Common

N/M//S
N out of M fields
S subfields

## Attachment 2

## The Import Interfaces

The import interfaces (i.e., moving data from the ISO 8211 system back into their original file structures) have been constructed to evaluate the viability of the NCDCDS proposed standard to effect interchange between noncommunicating parties. This implies that the recipient has the following information:

1. The NCDCDS proposed standard and references
2. The ISO 8211 standard and references
3. The specificatiions of the target file (in this case, the original file)
4. The DDF data descriptive record

As it is easy to inadvertently make use of information not truly available to the user under the test guidelines, it is also useful to state specifically what information the target user does not have, namely:

1. The source file mapping table
2. Any privileged information of the export implementor

Under these conditions, foreign tags, fields and subfields as well as the nondocumented details of data structure within elementary ISO 8211 fields cannot be recovered from the interchange file. Or conversely, only those fields in the NCDCDS proposed standard which have readily apparent and unique equivalence in the source and target files will be recoverable with any certainty. Without the source mapping, any subjective decisions by the recipient will be cause for doubt about whether or not the sender made the same subjective decisions. Thus, not only must the NCDCDS proposed standard be sufficiently robust to accept a file, in the absence of the source mapping its specifications must leave the recipient no doubt as to the intent of the sender.

Under the above guidelines, the following comments apply to the tagged fields and subfields of the ISO 8211 files.

NOS.NCDCDS.DDF

1. CTLG/COMMENT - no target for DDF subfield
2. PNT/POINTID - no target for DDF subfield
   GEOQUAD - subfield not in NCDCDS
   X,Y - data format ambiguously defined in NCDCDS

3. ARCS/ARCID - no target for DDF subfield
ARCTYPE - no target for DDF subfield
4. STRG/STRINGID - no target for DDF subfield
5. PLST/GEOQUAD - subfield not in NCDCDS
X,Y - data format ambiguously defined in NCDCDS
6. ATTN - tag not in NCDCDS

USGS.NCDCDS.DDF

1. CTLG/LAYER - no target for DDF subfield
MAP - assignable in target file
COMMENT - no target for DDF subfield
2. IDEN - assignable in target file
3. SREF - assignable in target file
4. MPRJ - assignable in target file
5. PROP - assignable in target file
6. MTRG - assignable in target file
7. CPNT - assignable in target file
8. NODE - assignable in target file
9. LNID - tag not in NCDCDS
10. CPOL - assignable in target file
11. CLST - assignable in target file
12. CHN - assignable in target file
13. PLST - assignable in target file
14. ATTR - no target for DDF subfield

DMA.NCDCDS.DDF

1. IDEN - assignable in target file
2. SCUR - not NCDCDS usage
3. DLGC - tag not in NCDCDS
4. CVRG - not NCDCDS usage, lat/long unresolved
5. SREF - assignable in target file, -lat/long
6. MPRJ - assignable in target file
7. PROP - assignable in target file
8. CPNT - assignable in target file
9. DQLG/DATEREV - no apparent target
PROAGENCY - assignable in target file
SPEC - not NCDCDS usage, unresolved subfields
STEP - not NCDCDS usage, unresolved subfields
DATESOURCE- not NCDCDS usage
10. DQPA - not NCDCDS usage
11. DQAA - not NCDCDS usage
12. DSAG - tag not in NCDCDS
13. CHN - assignable in target file
14. PLST - assignable in target file
15. NODE - assignable in target file
16. FEAT - not NCDCDS usage
17. ATTR - not NCDCDS usage
18. ELEM - not NCDCDS usage

Appendix B

# REPORT
to

The National Committee for
Cartographic Data
Standards

Joseph M. Distefano
City of Boston
Assessing Department

MARCH 1986

## I. INTRODUCTION

The following test was undertaken for the National Committee for Cartographic Data Standards by the City of Boston Assessing Department .

The City of Boston is presently performing digital data base building through parcel line data capture. There are approximately 108,000 land parcels in the City within about 56 square miles.

The testing procedure as described in the National Committee's Testing Methodology memo (9/1/85) was followed. The test included a review of the Cartographic Object Form Exchange Modules and an evaluation of their appropriateness as transfer vehicles for Boston's graphic and related non-graphic attribute data. Since data capture is not complete in Boston, some assumptions were made as to what type and form data would be expected to be captured in the near future. Although all exchange modules were evaluated, only two(2) exchange modules were selected for manually encoding data from the Boston data base. The cartographic objects used for encoding were points(PNTS) and lines(LINE). These were chosen for two reasons. First, they were the most typical features captured as Boston builds its graphic data base. Second, points and lines represent the most probable data types that the City will be asked to share with others (i.e. municipal and regional utilities and State Agencies).

The "point" data chosen for encoding is the visual centroid of the land parcel. Simple text presently is placed at this point and attribute data including;

WARD

PRECINCT

BLOCK

STREET ADDRESS

LAND USE

PARCEL NUMBER

MAP NUMBER

TRACING NUMBER

have been associated with that graphic element.

The "lines" chosen for encoding are the parcel lines. While there are Arcs and Linestrings which also comprise these parcels, "lines" are by far the most dominant type. Attribute data including;

WARD

PRECINCT

BLOCK

BRA MAP

TRACING NUMBER

RECORDED DIMENSION

have been associated with that graphic element.

II. ENVIRONMENT

The City of Boston operates an Intergraph System, composed of a dedicated VAX 11/751, two(2) monochromatic dual screen high performance work stations, one(1) color dual screen high performance work station, one(1) monochromatic and one(1) color, single screen work stations, three(3) V80 11" raster plotters, a 34" raster bed plotter and a 34" pen plotter. The software presently on the system includes;

Interactive Graphics Design System

Coordinate Geometry

World Mapping

Land Records Management

Drawing Management Services

Grid Data Utilities

3-D Graphics

Graphic Polygon Processing Utilities

Only minimal non graphic data are kept on the system. The non

graphic data were selected for storage and maintenance on the system on the basis of its commonality as a City-wide data identifier and its potential as a display parameter for probable thematic and analytical applications.

## III. DATA ENCODING

The following testing methodology was used.

- Review the National Standards for Cartographic Object Form Exchange Modules

- Review internal methodologies of Cartographic and attribute data storage

- Select a subset of the Object Forms to encode

- Encode the subset of Objects and attribute data in accordance with the National Standards

- Review all the Cartographic Object Form Exchange Modules and evaluate:
    a) Suitability/appropriateness to Boston's data
    b) Sufficiency to transfer Boston's Data

Review of the Natonal Standards was the most time consumming activity, while review if internal methods of data storage was the next most time consumming. This was most likely a function of the testers unfamiliarity with the nature of cartographic objects' data formatting as any other factor. It is estimated that from three to four person days were required to prepare for the first manual encoding. Actual encoding time for the sample data was neglibible. The test was not structured to determine encoding times, however, it seems that programming resources needed to automate the encoding process would not be trivial.

It was found that both the point and the line Exchange Modules were appropriate as a data transfer medium for graphic and non graphic attribute data. The following Table A represents the results of evaluating the remaining Exchange Modules with regard to their being appropriate as data transfer mechanisms and/or whether the Exchange Module describes any cartographic object presently in the Boston data base.

## IV. SUMMARY AND CONCLUSIONS

Generally the National Committee for Cartographic Data Standards, Object Exchange Modules provide an adequate format for encoding parcel lines and parcel centroids graphics and non graphics attribute data found in the City of Boston's data base.

It is, however, unclear as to how much resources are required to perform large scale automated data encoding. It is the opinion of this tester that those resources would not be trivial. The need to develop the capability of data transfer here in Boston is becoming increasingly evident. As of this date two(2) public utilities have requested sample Municipal graphic data in order to determine if it is feasible to use these data as a component of their data capture process. While one of these utilities is presently operating a system manufactured by the same vendor the other utility has not yet chosen a vendor. Other utilities and State agencies have intitiated activity in purchasing automated mapping systems.

It is therefore quite probable that either the local utility and/or the State agencies will be faced with using various municipalities' data and will need to utilize a data transfer mechanism which will deal with the problems of compatability of multiple digital cartographic data storage systems.

TABLE A

| Evaluation Criteria / Exchange Module | Suitability to Boston's Data Base Environment | Sufficient to Transfer Data |
|---|---|---|
| POINT | | |
| Feature | NO | NA |
| Label | YES | YES |
| Area | YES | YES |
| Node | YES | YES |
| LINE | | |
| Segment | YES | YES |
| String | YES | YES |
| Link | NO | NA |
| Directed Link | NO | NA |
| Chain | NO | NA |
| Point Chain | NO | NA |
| Area Chain | NO | NA |
| Network Chain | NO | NA |
| POLYGON | | |
| Line Identifier | YES | YES |
| Polygon Identifier | YES | YES |
| Coordinates | YES | YES |
| ATTRIBUTES | | |
| ARCS | YES | YES |
| GRID | NO | NA |
| CELL | NO | NA |
| FEATURE | NO | NA |

| | | |
|---|---|---|
| TAG | LINE | |
| MODETYPE | L | |
| ENCODTYPE | S | |
| OBJID | | |
| NUMATT | 6 | |
| NUMCOORD | 2 | |
| ATTNAME | ATTVAL | ATTUNIT |
| WARD | 15 | |
| PRECINCT | 04 | |
| BLOCK | 005 | |
| BRA_MAP | 16N12E | |
| TRACING_NUM | 0015005 | |
| REC_DIM | 40.00 | FEET |
| X | 717042478000 | |
| y | 477639716000 | |
| Z | 0 | |
| X | 717074635000 | |
| y | 477663503000 | |
| Z | 0 | |

| | |
|---|---|
| TAG | PNTS |
| ENCODTYPE | A |
| OBJID | |
| X | 717088292000 |
| Y | 477611412000 |
| Z | 0 |
| NUMATT | 10 |

| ATTRIBNAM | ATTRFMT | ATTVAL |
|---|---|---|
| WARD | I2 | 15 |
| PRECINCT | I2 | 04 |
| BLOCK | I3 | 005 |
| STREET | A25 | FERNALD TER |
| ADDRESS | A6 | 3 |
| ADDRESS_SUFF | A3 | |
| LAND_USE | A5 | R-2 |
| PARCEL _NUM | I9 | 028870000 |
| BRA_MAP | A6 | 16N12E |
| TRACING_NUM | A8 | 0015005 |



(p. 53 follows)

# Testing the Interim Proposed Standard for Digital Cartographic Data Quality

Report of the testing phase, Cycle 4
National Committee for Digital Cartographic Data Standards
Working Group II on Data Set Quality

prepared by N. Chrisman

Membership of Working Group II on Data Set Quality:

| | |
|---|---|
| Nicholas Chrisman (chair) | University of Wisconsin-Madison |
| Charles Poeppelmeier (vice-chair) | Defense Mapping Agency |
| Frank Beck | U.S. Geological Survey |
| Wallace Crisco | Bureau of Land Management |
| John Davis | Kansas Geological Survey |
| Gunther Greulich | Survey Engineering of Boston |
| George Johnson | National Ocean Service NOAA |
| David Meixler | Bureau of the Census |
| Dean Merchant | The Ohio State University |
| George Rosenfield | U.S. Geological Survey |
| John Stout | private consultant |


**4.0 Background** Working Group II on Data Set Quality has the mission to develop standards for the quality components of digital cartographic data. Deliberations between 1982 and 1985 lead to the Interim Proposed Standard published in Report 6 of this series. For further information on the earlier activities, please refer to the previous reports. Over the past year, efforts have focused on testing the interim proposed standard. This report summarizes the results of the testing.

Quality standards can be defined in many ways. For a particular product, such as a large-scale topographic map or a cadastral survey, it is usual to set a performance standard - a fixed numerical threshold that all products must meet. In other cases, such as the approach applied to geodetic surveying until very recently, standards consist of specifications for the procedures that should lead to acceptable results. Both approaches are linked to specific products and identifiable uses. The mission of this committee is much broader. Digital cartographic data is a generic term for a broad range of products. Modern applications of digital cartographic data have also modified the expectations about end use. Producers can no longer predict the requirements of all the potential users.

The approach adopted by this Working Group is termed "**truth-in-labelling**". This approach places requirements on both the producer and the consumer. The producer must disclose all the information needed to evaluate the data, and the user must perform the evaluation of **fitness for use** relative to the particular application. For such a system to operate, a producer must have a guidelines for the items which must be transmitted to permit evaluation. This Working Group intends to create a standard for use by producers to create a **quality report**. Report 6 contained an Interim Proposed Standard which will be refined into a Proposed Standard for potential adoption in 1987. From the results of testing available, the contents of the quality report specified in Report 6 will probably not be radically altered in the standard proposed. However, our testing was only performed from the producer's end. The Working Group is relying on the readers of this report to evaluate the quality reports included to determine if they communicate adequate information to evaluate fitness for use.

**4.1 Response to comments** Since the publication of the Interim Proposed Standard, a number of comments have been offered in written form or at public hearings. A few of these were issues of clarity which will result in revised wording in the new draft of the standard. Most of the comments have dealt with terminology. The Working Group has examined these comments and has decided, in almost all cases, not to modify the terms proposed. One commentor urged the Working Group to adopt some of the approaches described in the literature on quality assurance and quality control (QA/QC). This literature formed a part of the examination of alternatives in Cyle 2, and is the origin of our fitness for use concept. Most of the QA/QC methods apply to circumstances in production flow where a consistent set of specifications and thresholds can be applied. By contrast, this Working Group is charged with the use of quality information in the exchange of data outside producing agencies. The interim proposed standard may increase the awareness of QA/QC inside producing agencies, but there is no intention to change internal procedures.

Another theme of comments concerns stringency. The Interim Proposed Standard can be read as a very detailed list of information to be transmitted. This might increase costs and difficulty. However, others found that the standard had been interpreted too liberally so that virtually any result complied with the standard. The difficult conclusion is that both comments are valid. The truth-in-labelling standard covers a broad range of information desired, and it also accepts an practical limits to complete realization. The proposed standard will frustrate those who want a specific list to apply to all products. No single list can cover the range of products in the committee's mandate. The Working Group considers that its approach combines sound theory and a practical implementation.

**4.2 Results of testing** Over the past year, the Working Group has conducted three kinds of tests of the Interim Proposed Standard, external, Federal, and internal. This section will review the process used and the results obtained. Two quality reports produced in this process are provided in as an appendix to this section of the report.

Internal tests are largely an extension of the functioning of the Working Group. Members of the group were chosen for their interest and expertise in the topic, so it is not surprising to find some continued efforts. The main work used in this phase of the standards process was in the form of prototype quality reports. After a few draft papers circulated around the committee, N. Chrisman produced a quality report for a digital product from his current research project. The Working Group accepted the report as a prototype at its meeting at Indianapolis. This quality report is the second appendix to this chapter.

Federal tests were arranged in cooperation with the Federal Interagency Coordinating Committee for Digital Cartography. The Soil Conservation Service (SCS) volunteered to carry out not simply a quality report, but a comprehensive survey based on the concepts of the standard. SCS, in its national office of Cartography and Geographic Information Systems, maintains a catalogue of all the data bases containing soils data derived from SCS surveys. Much of this effort has been carried out at the regional, state, or county level. The national office developed a questionaire to find out more about each digital data base. By the time of our meetings, SCS had been through a few drafts, and had received responses from the three states used as a trial run. SCS plans to refine this questionaire, then plans to send it to all states. Because the draft nature of this document, it is not included in this report. The questionaire demonstrates that the categories of the standard were useful for operating a data inventory, which is closely related to the intention of a quality report. A later version of the SCS questionaire may be included as an appendix to the Proposed Standard as a guideline for the issues which must be addressed to complete a quality report.

External tests are intended to provide reaction particularly from the private sector. From a small number of volunteers, two groups were selected to test the quality standard. Two individuals from the Timberland Cartographics operation of Boise Cascade Corp. were comissioned to produce a quality report for a project they planned to take on. By the time the testing should have been complete, these two had left Boise Cascade. No test report was obtained. This result should not reflect upon the standard; volunteer efforts depend on personal circumstances which can not always be perfectly predictable. The other test involved a digital land base developed for Bell South Services by Donohue Intelligraphics and subcontractor Aero-Metric Engineering. Earlier in the year, these contractors had delivered a land base for telephone utility management. Together, these three groups produced a quality report retrospectively. The product is presented as an appendix to this chapter. The Working Group believes that the Bell South product represents minimal compliance with the Interim Proposed Standard. To complete the process, readers should evaluate this quality report and determine if it communicates the basic information to allow a judgement on fitness for use.

The adoption of this standard will depend, in part, on the difficulty of compliance. Over the process of designing the standard, the Working Group has had to consider cost of implementation along with technical needs. The Bell South test provides some evidence that the standard will not create large dislocations. Because it was retrospective, the test shows that Donohue and Aero-Metric Engineering were able to assemble the information for the quality report from their existing archives. Thus, the information for this quality report did not add to the cost of constructing the land base. Writing the quality report did have a cost, but it amounted to a few person-days. Donohue reports that many customers require some form of quality information to be delivered. If the quality report becomes accepted as a standard, the uniform organization may simplify this task.

Another interesting result of the external test is that there was some form of information to enter into each section of the quality report. Even though the product was produced for a primarily graphic purpose, the kinds of checks usually associated with analytical applications had been applied to at least some part of the data.

# QUALITY REPORT FOR WILMINGTON-EAST DISTRICT BELLSOUTH DIGITAL LAND BASE

February 14, 1986

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in cooperation with

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## INTRODUCTION

This report summarizes the quality which can be expected from the digital land base of the Southern Bell Wilmington District, East section in the version delivered by BellSouth to Southern Bell. Appendix A indicates the area covered by the Wilmington-East District, an area of 1487.6 square miles in southeast North Carolina. The digital land base covers portions of four counties (Brunswick, Columbus, New Hanover, and Pender) and portions of 32 quadrangles (see Appendix B).

As suggested in the National Committee for Digital Cartographic Data Standards (NCDCDS) Interim Proposed Standard (IPS), a quality report is intended to communicate information about a digital product. Any users must evaluate the results to determine whether the data is suitable for a particular use.

This report consists of five parts: Lineage, Positional Accuracy, Attribute Accuracy, Logical Consistency, and Completeness (the components required by IPS).

**LINEAGE**

This section describes the history of the Wilmington-East digital land base from the original source materials to the final digital product. This description does not cover all aspects of production, but tries to cover any information with potential impact on quality.

A project design was jointly established by Donohue Intelligraphics and Aero-Metric Engineering. The main criteria was for a flexible digital land base that would meet an accuracy of plus or minus 50' while allowing for a timely and cost effective approach. The format selected was one that had previously been successfully completed and verified as having the ability to meet the project requirements.

The basic land base development process involves enlarging and rectifying quad sheets and aerial photography, constructing a composite of the quads and photography, digitizing, and editing. This process is described in detail below.

An East/West flight pattern was designed to allow for three flight lines per quadrangle. Each line covered approximately 1/3 of the quadrangle. This format allowed for a reasonable enlargement factor from the aerial negative to the final mylar rectified photo base. Each quadrangle flight line was further sub-divided into three panels to allow for a convenient working size image. Appendix B lists the quadrangles used for compilation of the land base.

The aerial photography was flown in February - April 1984 at elevations of approximately 10000-13000'. The camera (Zeiss Jena LMK 15/2323, Serial Number 244665A) produced 9x9" negatives using a 153 mm lens (6"). The scale of photography, therefore, is approximately 1:24000. The calibration report for the camera is indicated in Appendix C. The type film used was Kodak XX and Kodak Panatomic. Additional specifications relating to the aerial photography are listed in Appendix D. The original photographic negatives are stored at Aerometric Engineering.

The 7.5 minute (1:24000) quads are divided into nine panels and enlarged to 1"=400' (1:4800). This enlargement is produced on a mylar base, utilizing a Brown precision copy camera at Aerometric Engineering, Inc. in Sheboygan, Wisconsin. Tick marks were scribed into the original negative made of the quad to correspond with the UTM grid indicated on the quad.

The photographs were ratio rectified by Aero-Metric Engineering to remove the effects of tilt and a set of positive enlargements were made at a scale of 1"=400' (1:4800).

For three portions of the Wilmington-East district (areas covered by the Mooretown, Castle Hayne, and Wrightsville Beach 7.5 minute quadrangles), the USGS quad maps were not available. The process for preparing these areas for digitization involved the use of orthophotos, prepared by Aero-Metric Engineering.

Unless otherwise indicated, all remaining processes were performed at Donohue Intelligraphics in Sheboygan, Wisconsin.

The reconciliation of land features on the enlarged mylar were done by overlaying the quad mylar on top of the enlarged photographic positive. Corrections to streets, railroads and water features were added to the mylar overlay with a color coordinated system. Accuracy was maintained by local orientation of the two images.

Street names were numbered on the SAG (Street Address Guide) maps using a Street Name Index, supplied by Southern Bell. Numbers that represented street names were transferred from the SAG maps onto the mylar enlargement. The Street Name Index, that contains the corresponding street names and numbers, was then loaded into the Intergraph system for later loading into the digital graphics file.

Blind digitizing was performed on Calcomp digitizing tables using Donohue Intelligraphics software. The tables surface measures 30"x40" and has a .001" resolution. The corrected mylar enlargements were placed arbitrarily on the table and a "3D Conformal Coordinate Transformation", by Wolfe, was used to align the coordinate system to agree with the tick marks on the mylar acetates.

Appendix E lists the features digitized. Rights-of-way, however, were not digitized, but were generated by expanding the digitized centerline. Right-of-way lines, therefore, are not true rights-of-way but only an expanded centerline. ROW lines are represented as 72' width for primary roads, 48' for secondary roads, and 36' for 3rd class roads, as symbolized on the quad. Interpretation of road classification for the aerial photography updates attempted to follow the above USGS road classification scheme. The digitizer would enter the width of the ROW prior to digitizing the centerline of that ROW.

The centerlines of ROW's were "tagged" with the street name number through the use of a cursor data point input. Once transferred to the Intergraph System, the numeric street name numbers were replaced with the actual street names. The street names were then interactively edited to their proper orientation with their respective streets.

Once captured at the digitizing station, the digital features are stored as ASCII text files. These files were then transferred to the Intergraph system by a program written by

Donohue Intelligraphics. This transfer program expands centerlines to proper ROW widths, replaces numeric street name numbers with the actual street names, and assigns the line weights, line symbology, color, text height, and element type indicated in Appendix E to each facet.

After the digitized files have been transferred to the Intergraph, 1"=400' check plots were produced. These plots were then checked against the 400 scale mylar quad enlargements and known errors corrected.

Additional features were then added to each digital facet file. Wire center and exchange boundaries were created by copying to the appropriate levels those already digitized features which visually correspond to the wire center and exchange boundaries in the Southern Bell SAG maps. Digitizing of new lines may be performed in order to make boundary lines visually continuous. Other boundaries, such as municipal, county, parks, etc., were created in the same fashion. Additional annotations (eg. water names, railroad names, county names, park names, etc.) were also added to the facet file at this time.

A 5000 meter grid was generated to encompass a given wire center. Each facet file was then merged into the 5000 meter grid system until the entire grid system was filled. Edgematching of facets were completed as each facet was merged into the 5000 meter grid system and street names were checked to assure each street is labeled (i.e. named) at least once per 5000 meter grid.

After a wire center was merged together, 400 scale check plots were again produced. The plots were reviewed against the appropriate source documents and corrected for content, continuance (i.e. edge matching), and clarity.

A final quality review occurred by producing 1000 scale check plots. These plots were given a review primarily for text appearance and boundaries. Once the wire center was considered complete, a magnetic tape was created by Donohue Intelligraphics and sent to BellSouth.

Appendix F charts the major steps, which have been described above, in the production of the Wilmington-East digital land base.

## POSITIONAL ACCURACY

Positional accuracy of the digital product was estimated to be +/- 50'. This was based on calculations for the enlarged 7.5 minute USGS quads and added digitizing error. This estimate was also based on the past experience of Donohue Intelligraphics and Aero-Metric Engineering.

Testing of this estimate was performed by Donohue Intelligraphics and involved the overlaying of 1"=400" paper check plots on top of each enlarged mylar positive. Digitized centerlines which fell outside the width of the quad representation of the roads were investigated against the aerial photography and corrected when necessary.

## ATTRIBUTE ACCURACY

The only attributes contained in the digital land base are feature names (eg. streets, water, counties, wire centers, etc.). Testing the accuracy of these attributes was performed by Donohue Intelligraphics and involved manual edits using source documents (eg. Street Name Index, SAG maps, USGS maps, and county maps).

## LOGICAL CONSISTENCY

The Wilmington-East district, essentially created on and for Intergraph systems, is not a topological land base. Except for wire center and exchange boundaries, no features were checked for logical consistency. Since the specifications for wire center and exchange areas required they form closed polygons, these boundaries received added attention during the editing processes and were visually checked for closure. The logical consistency of the wire center and exchange boundaries were checked in subsequent processing of this product and the error rate was estimated to be no more than 5%.

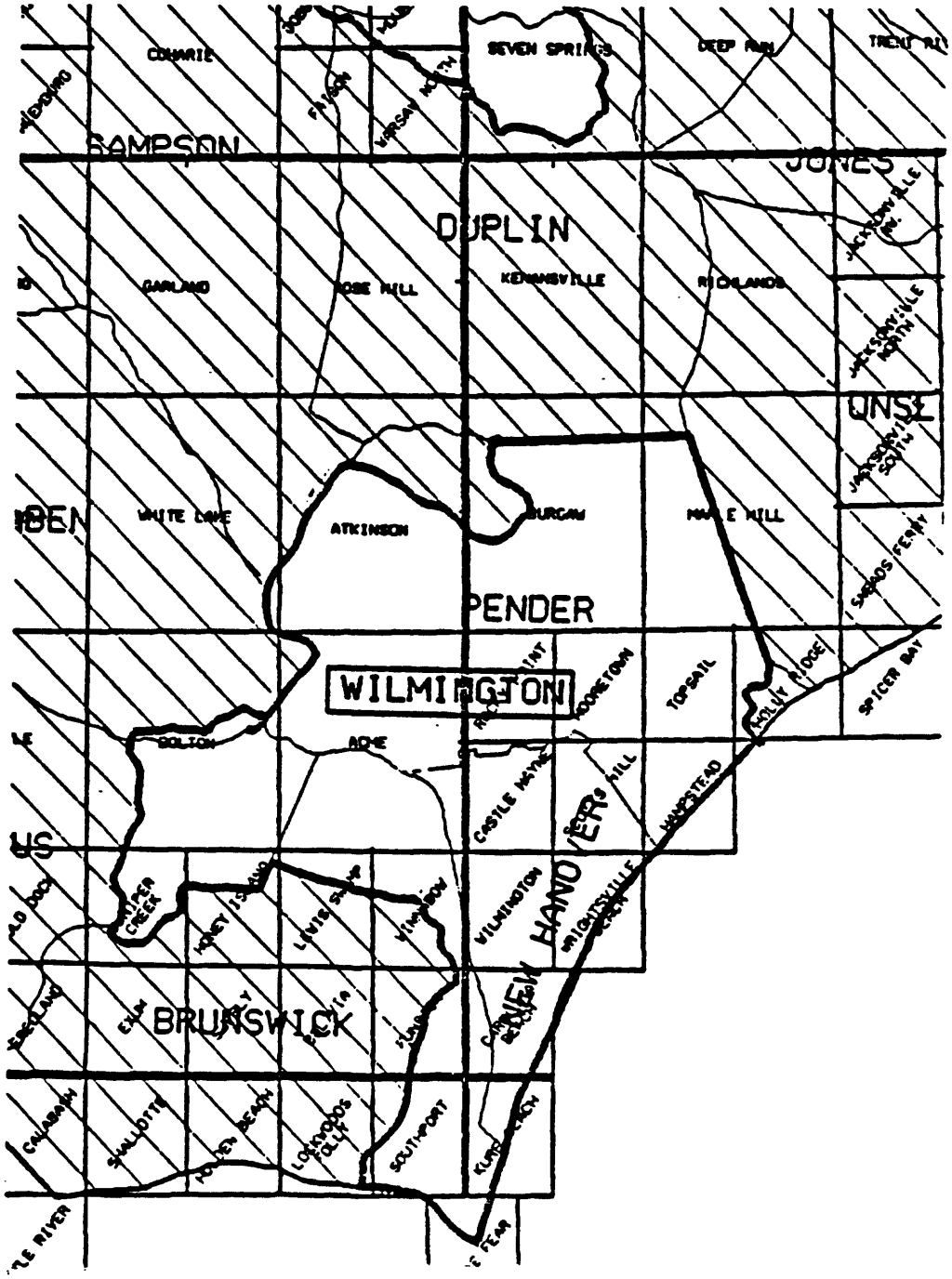
## COMPLETENESS

The completeness of most features and attributes were checked through the editing processes described previously. Street names, however, received special attention.

The source materials used for street naming were the SAG maps, Street Name Indexes, USGS maps, and county maps. An alphabetic listing of street names was prepared from the Street Name Indexes and a number assigned to each street. Each street name found on the SAG map was located in the alphabetic listing, highlighted on the listing, and the street name number coded to the SAG map. If the street name is not found in the listing, it is researched against other materials, a name assigned, and the name added to the listing (if required). At the end of this coding process, any uncoded streets on the SAG map or non-highlighted street names on the listing are researched and reconciled if possible. Any remaining unnamed streets were named NNA (no name available).

**APPENDIX A**

**WILMINGTON-EAST COVERAGE AREA**



## APPENDIX B

## WILMINGTON-EAST QUADRANGLES

| USGS Quad | Scale | Date Last Revised |
|---|---|---|
| Bolton (15) | 1:62500 | 1954 |
| Juniper Creek | 1:24000 | 1942 |
| White Lake | 1:62500 | 1954 |
| Honey Island | 1:24000 | 1943 |
| Atkinson | 1:62500 | 1955 |
| Acme | 1:62500 | 1954 |
| Lewis Swamp | 1:24000 | 1943 |
| Lockwoods Folly | 1:24000 | 1943 |
| Currie | 1:24000 | 1983 |
| Leland | 1:24000 | 1984 |
| Winnabow | 1:24000 | 1943 |
| Funston | 1:24000 | 1943 |
| Southport | 1:24000 | 1946 |
| Wallace East | 1:24000 | 1981 |
| Burgaw | 1:24000 | 1981 |
| Rocky Point | 1:24000 | 1970 |
| Castle Hayne | 1:24000 | 1980 |
| Wilmington | 1:24000 | 1979 |
| Carolina Beach | 1:24000 | 1970 |
| Kure Beach | 1:24000 | 1970 |
| Cate Fear | 1:24000 | 1970 |
| Pin Hook | 1:24000 | 1981 |
| Stag Park | 1:24000 | 1981 |
| Mooretown | 1:24000 | 1975 |
| Scotts Hill | 1:24000 | 1970 |
| Wrightsville Beach | 1:24000 | 1980 |
| Maple Hill | 1:24000 | 1981 |
| Maple Hill SW | 1:24000 | 1981 |
| Topsail | 1:24000 | 1970 |
| Hampstead | 1:24000 | 1970 |
| Folkstone | 1:24000 | 1981 |
| Holly Ridge | 1:24000 | 1970 |

T/T/EQ1

# APPENDIX C

## AERIAL PHOTOGRAPHY CAMERA CALIBRATION RECORD

# United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VA. 22092

REPORT OF CALIBRATION
of Aerial Mapping Camera

November 26, 1984

Camera type: Zeiss Jena LMK 15/2323
Lens type: Zeiss Jena Lamegon PI/C
Nominal focal length: 153 mm

Camera serial no.: 244665A
Lens serial no.: 7381334C
Maximum aperture: f/4.5
Test aperture: f/4.5

Submitted by: Aero-Metric Engineering, Inc.
Sheboygan, Wisconsin 53081

Reference: E. Coyote Enterprises, Inc., purchase order No. 2256, dated October 18, 1984.

These measurements were made on Kodak Micro-flat glass plates, 0.25 inch thick, with spectroscopic emulsion type V-F Panchromatic, developed in D-19 at 68° F for 3 minutes with continuous agitation. These photographic plates were exposed on a multicollimator camera calibrator using a white light source rated at approximately 5200K.

I. Calibrated Focal Length: 151.585 mm

This measurement is considered accurate within 0.005 mm

II. Radial Distortion

| Field angle | $\bar{D}_c$ | $D_c$ for azimuth angle | | | |
|---|---|---|---|---|---|
| | | 0° A-C | 90° A-D | 180° B-D | 270° B-C |
| degrees | um | um | um | um | um |
| 7.5 | 1 | 3 | 3 | 1 | -1 |
| 15 | 1 | 1 | 0 | -1 | 2 |
| 22.5 | -3 | -3 | -2 | -3 | -5 |
| 30 | -5 | -6 | -4 | -5 | -6 |
| 35 | -2 | 0 | -3 | -1 | -2 |
| 40 | 7 | 8 | 4 | 9 | 5 |

The radial distortion is measured for each of four radii of the focal plane separated by 90° in azimuth. To minimize plotting error due to distortion, a full least-squares solution is used to determine the calibrated focal length. $\bar{D}_c$ is the average distortion for a given field angle. Values of distortion $D_c$ based on the calibrated focal length referred to the calibrated principal point (point of symmetry) are listed for azimuths 0°, 90°, 180° and 270°. The radial distortion is given in micrometers and indicates the radial displacement away from the center of the field. These measurements are considered accurate within 5 um.

## III. Resolving Power in cycles/mm

Area-weighted average resolution: 86.8

| Field angle: | 0° | 7.5° | 15° | 22.5° | 30° | 35° | 40° |
|---|---|---|---|---|---|---|---|
| Radial lines | 95 | 95 | 95 | 95 | 113 | 80 | 80 |
| Tangential lines | 95 | 80 | 95 | 95 | 95 | 67 | 57 |

The resolving power is obtained by photographing a series of test bars and examining the resultant image with appropriate magnification to find the spatial frequency of the finest pattern in which the bars can be counted with reasonable confidence. The series of patterns has spatial frequencies from 5 to 268 cycles/mm in a geometric series having a ratio of the 4th root of 2. Radial lines are parallel to a radius from the center of the field, and tangential lines are perpendicular to a radius.

## IV. Filter Parallelism

The two surfaces of the 500 No. 50759A, the 550 No. 50779A, and the 350 No. 50738A filters accompanying this camera are within 10 seconds of being parallel. The 500 filter was used for the calibration.

## V. Shutter Calibration

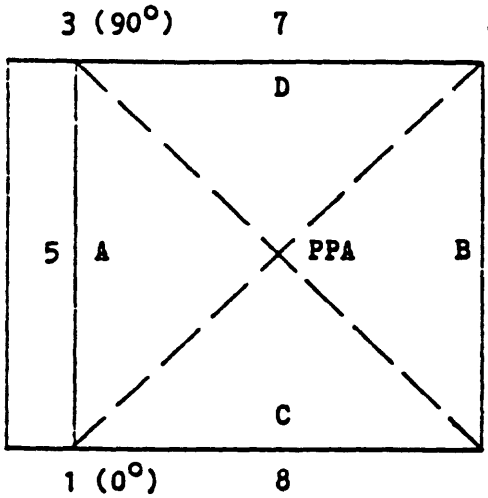
(Not applicable)

## VI. Magazine Platen

The platens mounted in LMK-K 24/120 film magazines No. 266458A and No. 266471A do not depart from a true plane by more than 13 um (0.0005 in).

These film magazines are equipped with identification markers that will register "266458" for magazine No. 266458A, and "266471" for magazine No. 266471A in the film edge for each exposure.

## VII. Principal Point and Fiducial Coordinates




Positions of all points are referenced to the principal point of autocollimation (PPA) as origin. The diagram indicates the orientation of the reference points when the camera is viewed from the back, or a contact positive with the emulsion up. The direction-of-flight fiducial marker or data strip is to the left.

| | X coordinate | Y coordinate |
|---|---|---|
| Indicated principal point, corner fiducials | 0.008 mm | -0.007 mm |
| Indicated principal point, midside fiducials | 0.007 | -0.004 |
| Principal point of autocollimation | 0.0 | 0.0 |
| Calibrated principal point (point of symmetry) | 0.018 | 0.000 |

| Fiducial Marks | | |
|---|---|---|
| 1 | -109.992 mm | -110.010 mm |
| 2 | 110.008 | 109.996 |
| 3 | -109.993 | 110.004 |
| 4 | 110.002 | -110.010 |
| 5 | -109.994 | 0.001 |
| 6 | 110.019 | -0.008 |
| 7 | 0.006 | 110.002 |
| 8 | 0.008 | -110.023 |

## VIII. Distances Between Fiducial Marks

Corner fiducials (diagonals)

1-2: 311.132 mm  3-4: 311.133 mm

Lines joining these markers intersect at an angle of 89° 59' 48"

Midside fiducials

5-6: 220.013 mm  7-8: 220.025 mm

Lines joining these markers intersect at an angle of 90° 00' 10"

Corner fiducials (perimeter)

1-3: 220.014 mm  2-3: 220.001 mm

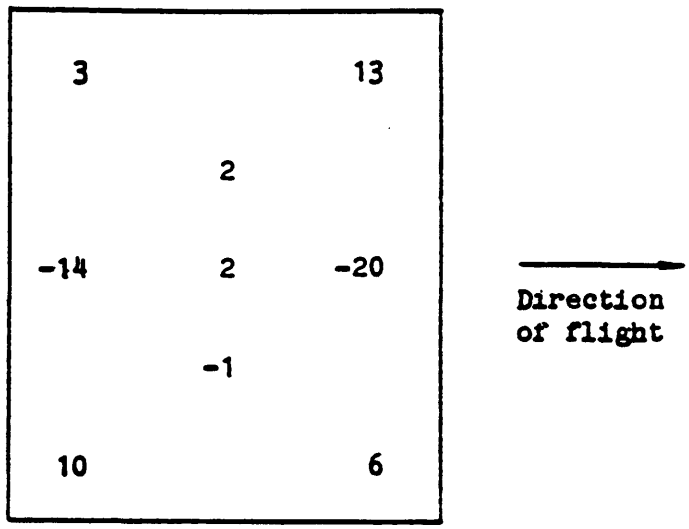
1-4: 219.994 mm  2-4: 220.007 mm

The method of measuring these distances is considered accurate within 0.005 mm

## IX. Stereomodel Flatness

Magazine No.: 266458A
Platen ID: 266458

Base/Height ratio: 0.6
Maximum angle of field tested: 40°




Stereomodel
Test point array
(values in micrometers)

The values shown on the diagram are the average departures from flatness (at negative scale) for two computer-simulated stereomodels based on comparator measurements on contact glass (Kodak Micro-flat) diapositives made from Kodak 2405 film exposures. These measurements are considered accurate within 5 um.

## X. Resolving Power in cycles/mm

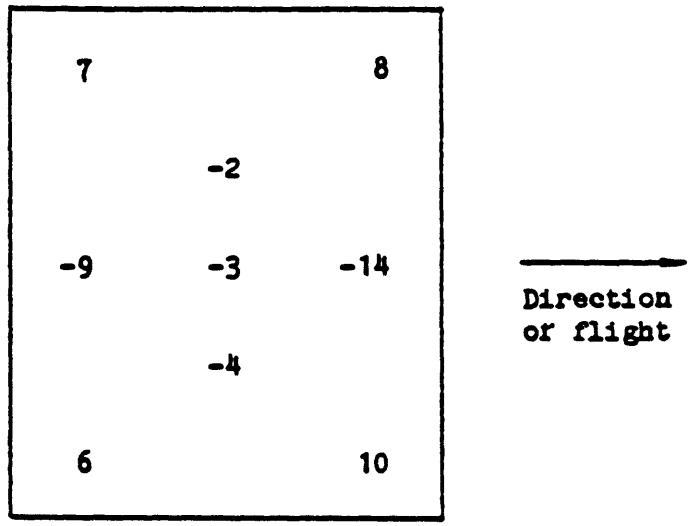
Area-weighted average resolution: 48.3 Film: Type 2405

| Field angle: | 0° | 7.5° | 15° | 22.5° | 30° | 35° | 40° |
|---|---|---|---|---|---|---|---|
| Radial lines | 57 | 57 | 57 | 57 | 57 | 48 | 48 |
| Tangential lines | 57 | 48 | 48 | 48 | 48 | 40 | 34 |

## IX. Stereomodel Flatness

Magazine No.: 266471A
Platen ID: 266471

Base/Height ratio: 0.6
Maximum angle of field tested: 40°




Stereomodel
Test point array
(values in micrometers)

The values shown on the diagram are the average departures from flatness (at negative scale) for two computer-simulated stereomodels based on comparator measurements on contact glass (Kodak Micro-flat) diapositives made from Kodak 2405 film exposures. These measurements are considered accurate within 5 um.

## X. Resolving Power in cycles/mm

Area-weighted average resolution: 48.3 Film: Type 2405

| Field angle: | 0° | 7.5° | 15° | 22.5° | 30° | 35° | 40° |
|---|---|---|---|---|---|---|---|
| Radial lines | 57 | 57 | 57 | 57 | 57 | 48 | 48 |
| Tangential lines | 57 | 48 | 48 | 48 | 48 | 40 | 34 |

Eberhard G. Schirmacher
Acting Chief, Optical Science Section
National Mapping Division

APPENDIX D AERIAL PHOTOGRAPHY SPECIFICATIONS

III. Specifications

A. Aerial photography

1. Cameras

a. Calibrated precision aerial cameras that can take serial photographs compatible with precision stereoscopic mapping instruments are required to be used.

b. Negative image shall be 9" x 9" (23cm x 23 cm)

c. Focal length

(1) Camera of nominal 6-inch focal length

(a) focal length 153mm + 3.0mm (Planigon, Pleogon, Aviogon, or equivalent)
(b) usable angular field at least 90
(c) minimum resolution no less than 15 lines/mm
(d) distortion in usable angular field not to exceed 0.015mm tangential and 0.030mm radial

(2) Cameras with focal lengths different from above to be approved by TBF.

d. Color - In the event color photography is used it must meet these specifications. Precision aerial cameras used for color and infrared photography shall be equipped with fully color-corrected lenses (ZEISS, RMK-4, WILD UNIVERSAL AVIOGON, or equivalent).

e. Calibration - In order for the camera to be accepted, the bidder must supply a current status report prepared by an approved testing organization on each camera used. Current certification by UNITED STATES GEOLOGICAL SURVEY will be acceptable evidence of each cameras suitability for taking photographs.

B. Aerial Film

1. Type - shall be dimensionally stable polyester base such as du Pont "Cronar", Eastman Kodak "ESTAR", or equivalent.

2. Negatives - shall be clear and sharp in detail and uniform in range of density. They shall be free from clouds, and cloud shadows, smoke, foliage, haze, light streaks, snow, static marks, excessive shadow, tears, scratches, and other blemished which would interfere with their intended purpose.

3. Scale - Film shall not depict more than 5% of the specified scale.

4. Numbering - No spool shall contain film from more than one project or one camera. All exposures on a spool must bear the same roll number.

5. Labels - The container, spool, and each roll of film must become the property of TBF. Each container shall be neatly lettered by the contractor with the required data.

C. Flight Lines and Height

1. Maps - Vendor shall supply an adequate map of the project area depicting flight lines; flight attitude of each line (above sea level) and flight height (above mean ground elevation); spacing between lines; and focal length of camera(s). TBF shall maintain the right to approve all flight lines prior to the flight.

2. Height - Departures from the specification of C-1 above shall not exceed 2% low or 5% high for all specified flight heights.

3. TBF shall at its option inspect the negatives in order to ascertain approximate flight height.

D. Crabbing and Tilt

1. Any photograph crabbed in excess of 10% as measured from the line of flight, or relative crab in excess of 10% between any two successive exposures is not acceptable.

2. Tilt shall not exceed 4 degrees, nor average more than 2 degrees in any 10 mile section of a flight line. Relative tilt exceeding 6 degrees between any two successive exposures may be cause for rejection of that portion of the flight lines.

E. Overlap

1. Minimum overlap end to end on each adjoining photography shall be 60%. ±3%

2. Minimum overlap side to side on each adjoining photography shall be 30%. ±3%

3. Overlap shall be judged on the usable portion of the field of the lens used.

F. Time of Photography

Photography shall be undertaken only when the lighting and weather conditions are such that acceptable negatives can be produced (see Section II.B.2). Photography shall be flown when the sun angle is greater than 30 degrees.

APPENDIX E

## LAND BASE FEATURES AND ATTRIBUTES

| | BELLSOUTH | | | | | | |
|---|---|---|---|---|---|---|---|
| | LV | WT | LC | CO | TX | TY | |
| CENTER LINES | 1 | 2 | 0 | 0 | | 4 | |
| ROW LINES | 2 | 2 | 0 | 0 | | 4 | |
| STREET NAMES | 4 | 2 | 0 | 0 | 100 | 7 | |
| AUX STREET NAMES | 3 | 2 | 0 | 0 | 100 | 7 | |
| FLOWING WATER | 5 | 2 | 0 | 0 | | 11 | |
| FLOWING WATER TEXT | 7 | 2 | 0 | 0 | 100 | 7 | |
| STANDING WATER | 8 | 2 | 0 | 0 | | 11 | |
| STANDING WATER TEXT | 10 | 2 | 0 | 0 | 100 | 7 | |
| RAILROADS | 11 | 2 | 0 | 0 | | 4 | |
| RAILROAD TEXT | 13 | 2 | 0 | 0 | 120 | 7 | |
| WIRE CENTER BNDRY | 16 | 5 | 0 | 14 | | 14 | |
| W.C. BNDRY TEXT | 18 | 4 | 0 | 14 | 120 | 7 | |
| FEDERAL BOUNDARY | 19 | 3 | 0 | 5 | | 4 | |
| FEDERAL BNDRY TEXT | 20 | 3 | 0 | 5 | 120 | 7 | |
| STATE BOUNDARY | 22 | 3 | 6 | 5 | | 4 | |
| STATE BNDRY TEXT | 23 | 3 | 0 | 5 | 120 | 7 | |
| COUNTY BOUNDARY | 24 | 3 | 7 | 5 | | 4 | |
| COUNTY BNDRY TEXT | 25 | 3 | 0 | 5 | 120 | 7 | |
| TOWNSHIP BOUNDARY | 26 | 3 | 2 | 5 | | 4 | |
| TOWNSHIP BNDRY TEXT | 27 | 3 | 0 | 5 | 120 | 7 | |
| MUNICIPAL BOUNDARY | 28 | 3 | 2 | 5 | | 4 | |
| MUNICIPAL BNDRY TXT | 29 | 3 | 0 | 5 | 120 | 7 | |
| CITY/CO LAND BNDRY | 32 | 2 | 3 | 2 | | 4 | |
| CITY/CO LAND BDRYTX | 33 | 2 | 0 | 2 | 100 | 7 | |
| STATE LAND BNDRY | 34 | 2 | 3 | 2 | | 4 | |
| ST. LAND BNDRY TEXT | 35 | 2 | 0 | 2 | 100 | 7 | |
| FEDERAL LAND BNDRY | 36 | 2 | 3 | 2 | | 4 | |
| FED LND BNDRY TEXT | 37 | 2 | 0 | 2 | 100 | 7 | |

BELLSOUTH

| | LV | WT | LC | CO | TX | TY | | |
|---|---|---|---|---|---|---|---|---|
| R R TUNNELS | 41 | 2 | 3 | 0 | | 4 | | |
| WATER THRU ROW | 42 | 2 | 0 | 0 | | 11 | | |
| BRIDGES | 43 | 2 | 0 | 0 | | 4 | | |
| BRIDGE TEXT | 44 | 2 | 0 | 0 | 100 | 7 | | |
| SCHOOLS | 45 | 1 | 0 | 0 | | 2 | | |
| SCHOOL TEXT | 46 | 1 | 0 | 0 | 100 | 7 | | |
| CHURCHES | 47 | 1 | 0 | 0 | | 2 | | |
| CHURCH TEXT | 48 | 1 | 0 | 0 | 100 | 7 | | |
| CEMETERIES | 49 | 1 | 2 | 0 | | 4 | | |
| CEMETERY TEXT | 50 | 1 | 0 | 0 | 100 | 7 | | |
| DAMS | 51 | 2 | 0 | 0 | | 6 | | |
| DAM TEXT | 52 | 2 | 0 | 0 | 100 | 7 | | |
| TOWER | 54 | 2 | 0 | 0 | | 2 | | |
| AIRPORT (RUNWAYS) | 55 | 2 | 0 | 0 | | 4 | | |
| AIRPORT TEXT | 56 | 2 | 0 | 0 | 100 | 7 | | |
| TOWNSHIP RANGE BND | 57 | 2 | 0 | 0 | | 3 | | |
| TOWN RANGE BND TEXT | 58 | 2 | 0 | 0 | 100 | 7 | | |
| BENCHMARK | 59 | 2 | 0 | 0 | | 2 | | |
| BENCHMARK TEXT | 60 | 2 | 0 | 0 | 100 | 7 | | |
| 5000 M GRID | 61 | 0 | 0 | 0 | | 3 | | |
| 5000 M GRID TEXT | 62 | 0 | 0 | 0 | 65 | 7 | | |
| RR ROW | | | | | | | | |

TYPE ELEMENTS:

2 CELL
3 LINE
4 LINE STRING
6 SHAPE
7 TEXT MODE
11 CURVE
12 COMPLEX STRING

APPENDIX F

WILMINGTON-EAST PROJECT APPROACH

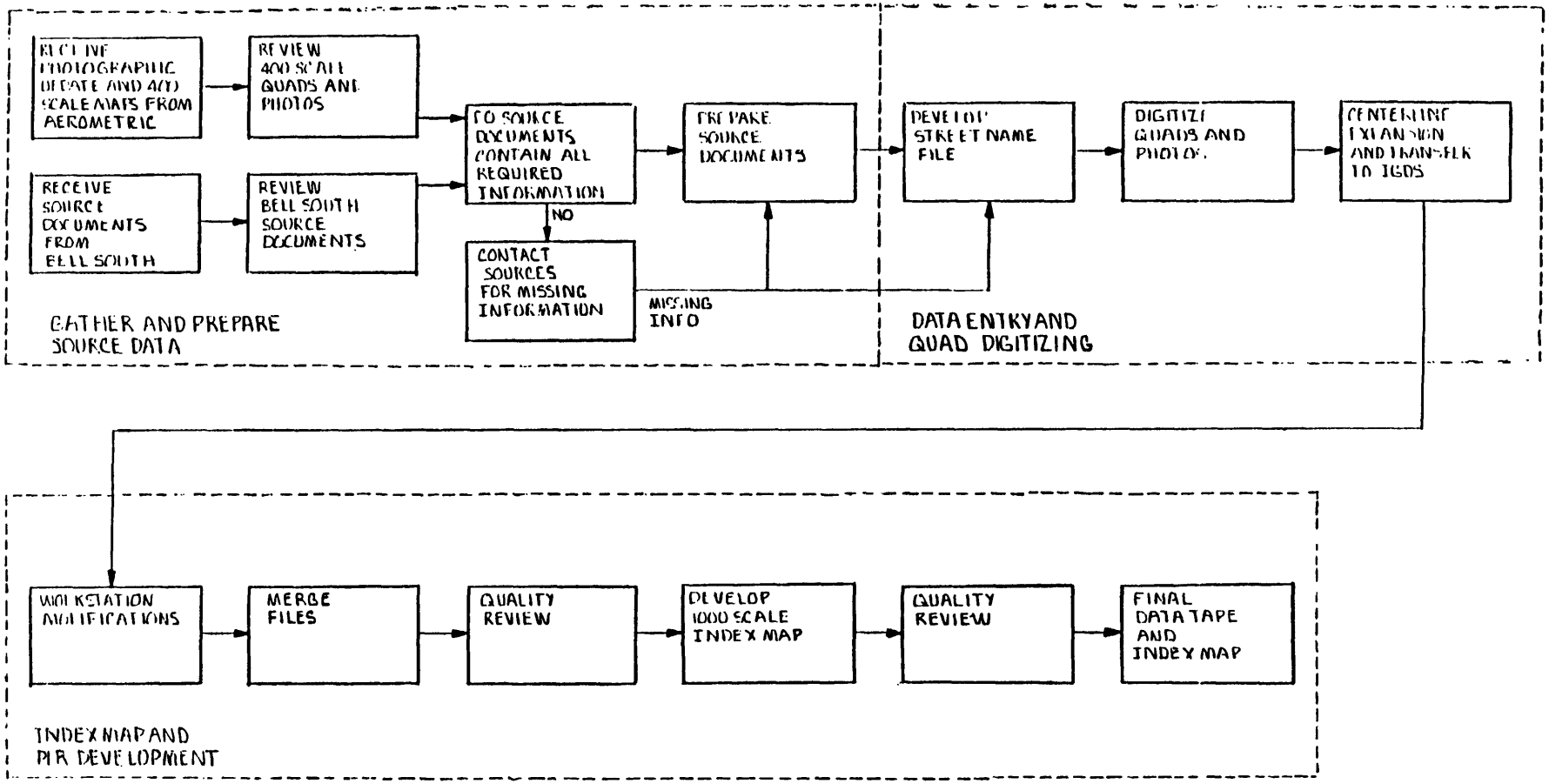



**Figure 6**

PROJECT APPROACH FOR BELL SOUTH
CADD MAPPING
(50' ACCURACY)

# Quality Report for Dane County Soil Survey digital files

Report prepared 3 September 1985
by N. Chrisman Dane County Land Records Project, UW- Madison
in cooperation with US Soil Conservation Service Wisconsin Office

This report summarizes the quality which can be expected from the digital records of the Dane County, Wisconsin soil survey in the version delivered by the Dane County Land Records Project (DCLRP) to the US Soil Conservation Service (SCS) National Cartographic Office in 1985. Dane County, Wisconsin occupies 1200 square miles in south central Wisconsin. The soil survey consists of 181 sheets reproduced at 1:15840, while the products delivered in digital form consist of parts of 34 quadrangles in the 7.5 minute series.

As suggested in the NCDCDS Interim Proposed Standard (IPS), a quality report is intended to communicate information about a digital product. Any users must evaluate the results to determine whether the data is suitable for a particular use.

This report consists of five parts: lineage, positional accuracy, attribute accuracy, logical consistency and completeness (the components required by IPS).

## Lineage

This section relates the history of the Dane County soil survey from the original materials to the final digital product. This account does not cover all aspects, but tries to cover any information with potential impact on quality.

Immediately inside the cover of the printed soil survey, a box contains this information:

> Major fieldwork for this soil survey was completed in the period 1966-1971. Soil names and descriptions were approved in 1972. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1972.

The actual history of the work is more complex, and it becomes rather difficult to assign a single date to the product.

The compilation of soils maps proceeds in two phases, from advance field sheets to the printed report. The advance field sheets were compiled on air photographs taken between June and August 1962. The field sheets show a range of dates from 1968-1972. A second flight with dates from August to October 1974 produced the photos for the printed report. The soil maps were compiled on the 1974 base using the field sheets and corrections. The printed report contains the legend "Issued January 1978". The Dane County Land Records Project took the final maps and converted them to digital form in the period 1983-1985.

No specific information is available about the 1962 photography. Since the field sheet data was recompiled, this may not be important.

The 1974 photography was flown at elevations of about 1300-1500'. The camera (serial number UAg 477) took 9X9" negatives with a 152.38 mm lens (6"). Originals of these photos are stored in the ASCS Aerial Photography Field Office in Salt Lake City, Utah. Diapositive copies were made for the DCLRP and are available from the SCS State Office. The correspondence of negatives to soil sheets is shown on Map 2.

The photographs were rectified to remove the effects of tilt, and a set of positive prints were made at publication scale (1:15840). The process was performed at the Lincoln, Nebraska regional office (now combined with the Fort Worth, Texas national facility). The DCLRP has not been able to determine the methods used to orient and scale the photos. However, by checks performed in transfering the soils data into known coordinates, the photos appear reasonably planimetric (although relief displacement is not corrected - see below). According to current SCS National Office guidelines, the soil maps are not sufficiently accurate to merit entry into the national digital data base. (see National Cartographic Manual, draft of 9/7/82; NHQ/CRS Issue Paper "digitizing detailed soil surveys from

accurate base maps versus inaccurate base maps" rev. 9/7/82) A direct test of this assumption is covered in the section on positional accuracy.

The soils boundaries were penciled onto enlargements of the 1974 photos (2.5 X to the publication scale of 1:15840). Presumably, the advance field sheets were used as a compilation source along with new field work. Some boundaries based on slope were determined with pocket stereo viewers, using adjacent photos.

A major process in soil mapping relates to the attribute system - the soil classification. In the advance field sheet stage, a three part numeric code was placed on the maps. The three parts have a correspondence to the three parts of the alphabetic code shown on the final maps: the four digit soil class became a two letter code, the numeric percent slope became the classes A .. E, and the eroded code of 2 or blank was retained. In the field process, the soil scientist could classify a particular area as a specific soil. In the office process, this soil could be reclassified into a cognate soil for a number of reasons, such as not having enough of the soil class in the county, or to enforce consistency between interpreters. There are also national directives to consolidate classification systems so that the effective date of 1972 is crucial to understand the type of soil classification used.

From the pencil product on the photobase, the published soil map was developed. A fresh mylar was pin registered, and the pencil lines were redrafted with a liquid ink drafting pen. In most cases, the pen width was about .01" (.25 mm), although there are variations in line quality. Although the map finisher primarily transfered the pencil lines, there were also cartographic rules applied to eliminate narrow areas or to simplify detail around roads and other features.

For the Dane County survey, the soil labels were applied with stickup lettering on a separate pin-registered mylar. Non-soil linear features, such as roads and drainage, were applied to the same overlay as the soils boundaries. (This separation has a bearing on the digital scanning process.)

A number of checks were built into the finishing process. Each sheet was "matched" with adjacent ones. Even though the photobases could be different due to different image centers, the soil lines were made to agree. Classifications across the sheet edges were also examined ( further information on the reliability of this process appears below under logical consistency).

Another check performed during map finishing consists of "coloring" the soil polygons to ensure that labels are consistent (no lines are missing) and that no unnecessary lines were left in. Considering the geometric complexity of some of the sheets (the driftless area leads to convoluted slope-based polygons),

this process was tedious and errors did persist to be detected in later stages (see logical consistency).

The map finisher also includes PLSS section corners and state plane coordinate tick marks. The printed maps have a printed caution nearly hidden in the binding of the volume:

> Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This caution is well-founded, and considered below under positional accuracy.

The published maps were printed from the mylar originals, but the printed maps have no direct relation to the digital product.

The DCLRP has undertaken two major soil digitizing efforts. The first, a manual one, digitized 66 soils sheets (out of 181) between June 1983 and January 1984. The second, based on an inexpensive scanner, is still under development, but its product will complete the county during 1986. This quality report is limited to the manually digitized products.

Digitizing began with direct positive copies of the soil map originals produced by a contact process at Master Blueprint in Madison, Wisconsin. The copies were made of the line work overlay and the label overlay, so that the line digitizing and point label digitizing were performed from the same product. In a few cases, the label layer original had been lost, so the printed map had to be used in those cases. The positional accuracy of the labels is not crucial to this process. The chemical residues of the copying process (perhaps due to incomplete fixation or washing) were sufficient to affect the electrical resistence on the digitizer surface and degrade accuracy. When washed in cold water, the problem abated.

Tick marks were placed on the mylar copies to bracket the image area. The tick marks were intended to form a rectangle 15" X 9", although hand placement could create errors of a few hundredths of an inch.

Digitizing was performed at two sites: UW Land Information and Computer Graphics Facility (LICGF), and Wisconsin Dept. of Natural Resources (WDNR) Bureau of Information Management. LICGF used a TALOS 660 backlight table connected to an ORION microprocessor. The ORION had a 512 X 512 pixel plasma screen and 8" floppy disk drives. (see Chrisman and Sullivan, 1983 for procedures used). The mylar sheet was placed arbitrarily on the table (intentionally at a diagonal to avoid a known bug in the digitizer firmware). Firmware in the TALOS (SMART 3.0) was used to rotate and translate the coordinate system to agree with the tick marks. The lower left was forced to (0,0) and the lower right was used to align the X axis. The upper right point was read to confirm a reading sufficiently close to (15,9). (Note that the manual location of the tick marks did not require

postional accuracy because the inch scaling of the device was unaltered). The TALOS floating point calculations seem to be accurate within the accuracy of the digitizer.

The manufacturer's specification of the device quotes a "repeatability" of .01 inch for this device. This figure could be interpreted as plus or minus .05 inch, which is the result obtained in some tests performed on this equipment by Mills (1982).

FORTRAN programs on the ORION controlled the process and wrote the results to the 8" disks. One program was used to capture the linework in unstructured form (as "spaghetti") and another for the label points. The plasma screen (8.5" X 8.5" with resolution of 512 X 512) provided almost the same line width as the original when the screen window covered one half of the soils sheet. The plasma screen also permitted selective erasure of lines if they were deleted. Graphic feedback allow some gross errors to be detected, but the screen was not registered to the map to detect the fidelity of linefollowing.

When the TALOS operated in point mode, the ORION could handle the data stream. (The problem was partially that the IO ports on the ORION could only operate at 2400 baud, and also that the FORTRAN code was not very fast on the obsolete 8 bit processor.) From tests of point mode line following, the operator was usually too stingy in recording the curvature of the soils boundaries. The SCS guidelines call for digitizing to recreate the graphic product within one linewidth, so line following mode was required. The TALOS controller was set to use distance sampling with a tolerance of .03 inch. This figure is a compromise between graphic fidelity and the communications between the TALOS and ORION. Even at this tolerance, the TALOS could get ahead of the ORION when the operator moved the cursor too fast. As there was no bell on the ORION to alert the operator, and as the operator was probably not looking at the screen, data was occassionally lost. The result was flat sections where curvature was missing. Where the flat sections detracted from the product at the checkplot stage, they were fixed in the final edit.

Once captured on the ORION, the lines were stored as binary reals (4 bytes). Each line was filtered by the Douglas-Peucker algorithm with a tolerance (half-band) of .005 inch. This reduced file size by about 50%. The data was converted to ASCII strings with coordinates sent under FORTRAN format F10.4 to send to a Digital VAX 11/780.

The second digitizing product was the set of labels. On a background of the linework (for graphic orientation), the operator digitized each soil unit label on the map. The operator entered the alphabetic identifier on the keyboard. The file was stored in ASCII and transmitted to the VAX.

The WDNR process performed essentially the same functions with somewhat different equipment. WDNR had a Bendix digitizer connected to a Data General minicomputer with a Tektronix 4014 for graphic feedback. Registration was limited to recording the coordinates of the tickmarks in the Bendix table coordinates. Software on the VAX converted this into the same system as the LICGF process.

The software on the Data General (GEdit, written by WDNR) provided a more flexible editing environment than the ORION. In addition, the operator could snap objects closed or trim off overshoots. These capabilities shortened the editing time, but did not affect the quality of the product. The Data General was able to keep up with the Bendix, so that fewer lines had to be fixed in the final inspection against the check plot.

Once transmitted to the VAX, the files were converted into ODYSSEY format with coordinates stored as 32 bit reals (this should have little impact as yet, since each sheet had its own origin). The ODYSSEY PENELOPE program (see Morehouse and Broekhuysen, 1982) was used to convert the spaghetti into a chain file. This processor detects all intersections and labels all polygons. A tolerance of .03 inch (or .02 inch for some of the DNR products) was needed to capture all of the intended intersections. This tolerance ensures that no smaller feature can occur in the file, and that no point comes within the tolerance of another. By this process, duplicate versions of a line, if within the tolerance, will be automatically removed. The numerical nature of the intersection processor has been discussed by Dougenik (1980) and by Chrisman (1983). The tolerance does not act as a traditional "filter" because it does not round off coordinate values; all coordinate positions were in the input file or come from calculated intersections. The intersection calculation is done in a local origin system with one of the points as (0,0) to ensure that precision is not lost.

The PENELOPE process produces an error report detailing the following kinds of errors: "dangling chain" caused by either undershoot, overshoot or lines missing, polygons with no labels or two conflicting labels caused by missing labels or lines or by extraneous lines. Each file was corrected using the HOMER editor until the error report had nothing further to report. Coordinates are copied through these processes without modification, in general. Missing lines were digitized on the TALOS using the process above, and shipped to the VAX. However, the correction of undershoots, for example, requires new coordinates. In some cases, a coordinate value was extracted from the feature that the undershoot should have touched, and in other cases a screen crosshair was used at large magnification. A final stage of editing for unlabelled polygons usually involved the PROTEUS processor aggregation function.

Once the file was topologically clean, a check plot was generated on mylar at the original scale. SCS examined each check plot and noted corrections required for geometric fidelity. In some cases, whole files were rejected for gross errors that can be attributed to hardware problems such as the chemical residues noted above or to personnel problems such as lack of training. After the corrections were made the file was archived as a true copy of the original survey.

The goal of the project was to make the soil survey compatible with local land records and other mapping bases, particularly the USGS topographic quadrangles. One part of the project examined the need for analytical removal of relief distortion using the USGS Digital Elevation Matrices (DEM) as a base. This report concerns the less complex approach using photoidentifiable points.

To control the conversion of the inch-space measurements on the soil sheet into a system of geodetically referencable coordinates, the ticks and section corner marks shown on the soil product were inadequate. The common procedure in such cases is to detect "well-defined" points, such as road intersections on both the soils map and on another planimetric base such as the USGS topographic quadrangles. The drawback of this approach is that cartographic generalization of roads and other features may degrade the accuracy of the fit. Also, the density of "well-defined" points may not be sufficient for a rigorous transformation, particularly in the rural areas where the soil map coverage is of the greatest interest.

In large portions of the United States, there is a uniformly spaced network of points used to define the Public Land Survey System. These section corners and quarter section corners formed the basis for the control of the Dane County products. Coordinates for the section corners were obtained by methods varying from direct observation with a Macrometer geopositioning receiver through traditional ground survey to manual digitizing from USGS topographic quadrangles (see quality report for USGS PLSS layer). This heterogeneous collection of coordinates is expected to improve over time, due to land surveying activities so that the quality of the control for the soil survey could also be improved.

The photobase for the soil survey is hardly detailed enough to permit the identification of survey monuments, even if they had been panelled. Instead, the position of the section corner was estimated by using the remonumentation record for each section corner and quarter section corner. This record includes a sketch showing the location of the marker with respect to street pavement, fences, etc. Control was only taken for points identified with reasonable certainty. The number of control points for each soil sheet varied from the maximum of 32 down to 6 when lakes removed large portions of the study area. For full sheets (not involving large amounts of water), the number of

control points ran between 15 and 25 in areas where coordinates existed for quarter section corners. In areas using the USGS PLSS, which was only reliable for section corners, the maximum was 12 and the typical values fell around 8. The exact numbers of control points are shown in the appended tables (Map?).

Using the control information, a transformation was calculated using a least squares fit to an affine (software written by Cliff Petersohn under the direction of Alan Vonderohe). All calculations were carried out in 64 bit double precision. The fit for each sheet was examined and often a few outliers were discarded. The resulting fits run between 20 and 40 feet of positional error (see figures appended). These values are small, considering the line width of the soil product.

Once the separate sheets were placed into a common coordinate system (either State Plane or UTM with a local offset), the adjacent sheets could be merged into a sheetless data base. At first this process was performed by the WHIRLPOOL polygon overlay processor (similar code to PENELOPE discussed above). No matter how well the sheets fit the control, this approach had problems resolving overlaps and gaps between the adjacent sheets. Much manual editing was required to clean up the slivers and overlaps. A new program (written by Kate Beard under the direction of N. Chrisman) was developed to "zip" these sheets together (see separate documentation).

The Dane County soil survey data is either delivered in state plane, UTM or geodetic coordinates (latitude, longitude). In all situations there is a local offset to preserve precision. Products in the quad sheet format were created by cutting a rectangle out of the file when stored in geodetic coordinates. This ensures that the sheet borders conform mathematically to the expectation. All conversions between state plane, UTM and geodetic coordinates are performed using software distributed by the National Geodetic Survey. This software contains disclaimer that it might not work, but these were ignored after samples proved sufficiently accurate. All calculations are carried out in 64 bit double precision, which is rather a bit of overkill for most of the coordinates processed.

## Positional Accuracy

The positional accuracy of the soil survey can be estimated from two considerations: the base and the interpretations. The base accuracy was estimated by the transformation process described in the lineage report. This does not constitute a test of the digital product, in the sense that the information obtained was used to remove systematic errors. The positional error at control points for each sheet is appended.

Positional accuracy of soil interpretations cannot be determined using the existing standards for positional accuracy tests, because very few points are "well defined". An attempt to test the accuracy of the soils maps was performed as a part of the Dane County Land Records Project (described in greater detail in the DCLRP final report). First, a set of likely areas to test (about 20) were selected. Third order control was established along nearby roads using inertial autosurveyor equipment and personnel loaned by the Bureau of Land Management. These surveys were tied to second order monuments set with Macrometer surveys. Then a field crew of one SCS area supervisor (T. Hoffman) and N. Chrisman constructed the soil map in the field. The soil scientist was told of the general nature of the soil map product for the area, but he did not reconstruct that map. Auger holes were drilled, usually upslope and downslope until the location of the transition could be approximated. A wood lathe was placed in the ground and an uncertainty (ranging from 10 to 50 feet) was estimated. After three full days in the field, only four sites were staked. Surveying crews located the lathes relative to the third order control using theodolite and electronic distance meters and using stadia observations as a cross check. The positional errors of the field data fall well within the tolerances specified by the soil scientist.

The results of the study are presented on the maps attached by overplotting the field survey data and the digital soils record. Some of the errors detected are of an attribute identification nature, and reported in the next section. No standard procedure is established to report the positional accuracy of complex curves of this nature when there are uncertainties about all positions. Furthermore, some of the differences are due to cartographic limits at the scale of 1:15840.

## Attribute Accuracy

The only testing performed was described above under positional accuracy. Due to the differences of soil naming procedures, the test was not carried out to the level of the specific soil series. The soil scientist would give the important distinguishing characteristic (drainage, slope, mineral/organic ...) and check back to determine if the soil map depicted the same distinction. Of the twenty soil mapping units tested, there were two problems of identification, where the unit was somewhat misclassified. In one case the underlying material (4 feet deep) was lake clay, not a beach deposit. This difference would not alter most surface interpretations of the soil, however. In the other case, the whole polygon belongs in a transition zone and it would be very hard to classify properly. Again, the classification assigned in the map would be approximately correct for many applications. In addition, in the one test of the slope classification, the determination of the higher slopes was marginal when the site was examined on the ground. There may be a bias towards land falling in the lower portions of a given slope class, not the middle. To determine this with more accuracy a more comprehensive test is required, perhaps in comparison to the USGS DEM data.

## Logical Consistency

The PENELOPE process and the sheet matching process provided substantial checking of logical consistency. The result is topologically clean as established in the guidelines to the NCDCDS IPS. Some of the errors detected in the PENELOPE process were latent errors from the compilation process, in spite of substantial effort by SCS to color maps by hand. The total count of errors for the first 66 sheets is shown on the map appended. All such errors were removed in the editing process, often with recourse to the manuscript or the advance field sheets. A further, partial check of logical consistency (attribute accuracy ?) occurs along sheet borders when matched. In most cases, the classifications are identical and the sheet border can vanish. However, some classifications differ and the sheet border has to be retained. Some of these differences are simply a matter of slope category or could be a difference related to scale effects (small polygons on the sheet border are not shown whereas they might have appeared as a continuation of an adjacent polygon if the sheet boundary had been elsewhere). There is usually one problem per sheet match, on average. This could be indicative of attribute errors elsewhere on the sheet, or it could be edge specific. Without further tests, the situation cannot be clarified.

## Completeness

The soil maps exhaustively partition the county, all area is assigned to one and only one soil mapping unit. This relation is ensured by the method used to check logical consistency and to match sheet boundaries.

The soil classification has limitations due to mapping rules related to the scale of 1:15840 used for compilation. The line width was approximately 26 feet on the ground, and features were not allowed to become much narrower than 50-80 feet. This rule was not fixed and was not enforced rigidly. Also, the rules tended to generalize areas smaller than an acre or so. Whatever rules were in use are specified in SCS procedures.

The soil attributes were checked against a master list of permitted codes and all unknown codes were corrected.

# 5.0 TESTING THE INTERIM PROPOSED STANDARD FOR CARTOGRAPHIC FEATURES

Edited by
Robert Rugg and Warren Schmidt

## 5.1 BACKGROUND

The Working Group III - Cartographic Features (WGP III) of the National Committee for Digital Cartographic Data Standards (NCDCDS) began in 1982. Its original charge was to investigate the issues, recommend alternatives, and prepare an interim standard. These tasks were completed in the Spring of 1985. Since then the WGP has continued to work on feature definitions, sought to create a mechanism for maintenance, responded to comments on the Interim Proposed Standard (IPS), and tested that IPS. This report will summarize the comments received on the IPS, detail the testing methods and results, and give the revised IPS. It should be noted that work is continuing on the IPS definitions and those shown are not the final version.

Before going to the comments, I would like to list the members and observers of the WGP whose dedication has made this all possible.

Members:

Mary Clawson, Naval Oceanographic Research & Development Activity
Beth Driver, Technology Service Corporation
Erich Frey, National Ocean Service
Benny Klock, Defense Mapping Agency
Mark Monmonier, Syracuse University
Joel Morrison, U.S. Geological Survey
Robert Rugg, Vice Chairman, Virginia Commonwealth University
Warren Schmidt, Chairman, Digital Mapping Unlimited
Fred Tamm-Daniels, Tennessee Valley Authority
Walt Winn, National Ocean Service

Observers:

Meredith Burrill, DMA Retired
David Douglas, University of Ottawa
William Hess, Central Intelligence Agency
Roger Payne, U.S. Geological Survey

Special Assistance:

Billy Love, Defense Mapping Agency

## 5.2 SUMMARY OF COMMENTS ON THE INTERIM PROPOSED STANDARD

The eight comments received on the Cartographic Features portion of the Interim Proposed Standard represented a wide sprectrum of cartographic data users. In general, they were favorable and all were constructive. A summary of the responses follows:

- The majority favored the proposed approach.
- Two commented on the codes: one saying they needed more exploration and the other cautioning on adopting any system that would restrict exchange.
- Two letters agreed with the need for a national body to rule on additions and changes.
- One respondent could find no terms related to mining and minerals processing features. These are being added.
- One person thought too few features were defined and the remainder were referred to as included terms.
- Another felt that one more comprehensive features list was unneeded.
- Suggestions were offered clarifying the attribute value and feature class definitions in one response. The same wording had appeared in earlier versions but was eliminated later.
- One comment proposed that features be tied with 0, 1, and 2-dimensional objects and that each feature have a unique identifier. This was not adopted because our features are scale-independent and not tied to any single application.

## 5.3 TEST OF THE INTERIM PROPOSED STANDARD

### 5.3.1 Background

The test of the Interim Proposed Standard for feature definitions sought to determine the general validity of the model developed by Working Group III and the specific application of the model to topographic map and nautical chart features. Three broad questions were posed by the Working Group as the basis for the test. How complete is the set of definitions? Are the definitions understandable and specific enough to assure consistency of interpretation in a variety of operational settings? How easy or difficult to use is the proposed scheme? These questions were addressed in a test of the September 1985 version of the proposed definitions (see Appendix II). The test was administered in four Federal agencies and four external organizations during the period November 1985 through February 1986.

To meet the objectives of the test, three sections were devised. Section 1, the "consistency test," involved the identification and coding of 51 selected features on the Port Royal, Virginia quadrangle of the USGS 7.5 minute series topographic map. Section 2, the "completeness test," involved identification and coding of selected features shown in the legends for nautical charts and topographic maps. The sources used for the completeness test were Section G -- Ports and Harbors -- of NOAA/DMA Chart No. 1, Nautical Chart Symbols and Abbreviations, November 1984 edition, and page 11 -- Blue Plate -- of USGS Standards for 1:24,000 and 1:25,000 - Scale Quadrangle Maps, part 6, December 1981 edition. Section 3 on "ease of use" consisted of a series of open-ended questions. The test instructions appear as Appendix 1.

Each participating organization was asked to select three testers. All organizations participated. The number of tests returned by each organization is shown in Table 1.

Table 1
Tests Returned by Organization

| Organization | Tests Completed: Consistency Test | Tests Completed: Completeness Test |
|---|---|---|
| External | | |
| Bell South | 3 | 3 |
| Perkin-Elmer | 3 | 3 |
| Synectics | 1 | 1 |
| U. of Minnesota Geog. Dept. | 3 | 3 |
| Federal | | |
| Defense Mapping Agency | 3 | 3 |
| Federal Emergency Mgt. Agency | 1 | 1 |
| National Ocean Service | 4 | 0 |
| Tennessee Valley Authority | 3 | 3 |
| All organizations | 21 | 17 |

### 5.3.2 Consistency

The results of the consistency test were measured in terms of the percentage of testers who coded the same map features the same way. For the 51 features identified on the Port Royal Quadrangle, an average "consistency score" of 85% was achieved. This result did not vary significantly between names features (such as Rappahannock River) versus unnamed features (such as fence rows or marshes). There were significant differences in consistency scores among the specific features themselves, however. (See Table 2.) The first feature, for example, was named "Skinker's Neck." The Interim Proposed Standard definition refers "neck" to a coastal feature "isthmus," whereas the feature shown on the map is the land area within a meander of the river. While 45% of the testers coded Skinker's

Table 2

FEATURES CONSISTENCY TEST

Consistency Scores by Test Item

| test item | number giving code | most frequent code given | consistency score (%) |
|---|---|---|---|
| 1 | 20 | IST | 45.000 |
| 2 | 21 | WAT | 42.857 |
| 3 | 19 | PLC | 94.737 |
| 4 | 21 | MIN | 90.476 |
| 5 | 21 | BUI | 95.238 |
| 6 | 21 | BUI | 100.000 |
| 7 | 21 | ROA | 100.000 |
| 8 | 20 | BOU | 50.000 |
| 9 | 21 | BUI | 100.000 |
| 10 | 20 | LAK | 90.000 |
| 11 | 21 | MIN | 90.476 |
| 12 | 21 | WET | 95.238 |
| 13 | 21 | WAT | 52.381 |
| 14 | 17 | CON | 70.588 |
| 15 | 20 | BOU | 50.000 |
| 16 | 20 | BOU | 55.000 |
| 17 | 21 | ROA | 100.000 |
| 18 | 21 | ROA | 100.000 |
| 19 | 20 | BUI | 100.000 |
| 20 | 20 | STR | 95.000 |
| 21 | 20 | PLC | 95.000 |
| 22 | 20 | BUI | 90.000 |
| 23 | 20 | BOU | 95.000 |
| 24 | 17 | PLC | 94.118 |
| 25 | 20 | LAK | 100.000 |
| 26 | 19 | CON | 94.737 |
| 27 | 20 | WET | 100.000 |
| 28 | 20 | BOU | 95.000 |
| 29 | 20 | ROA | 100.000 |
| 30 | 20 | MIL | 70.000 |
| 31 | 20 | STR | 95.000 |
| 32 | 18 | PLC | 88.889 |
| 33 | 20 | RUN | 90.000 |
| 34 | 20 | LAK | 95.000 |
| 35 | 20 | PAR | 100.000 |
| 36 | 20 | ROA | 100.000 |
| 37 | 20 | ROA | 100.000 |
| 38 | 20 | FLA | 85.000 |
| 39 | 19 | SHL | 42.105 |
| 40 | 18 | INL | 94.444 |
| 41 | 18 | BEA | 100.000 |
| 42 | 18 | BOU | 44.444 |
| 43 | 19 | CEM | 89.474 |
| 44 | 18 | CON | 100.000 |
| 45 | 19 | STR | 78.947 |
| 46 | 18 | PLC | 100.000 |
| 47 | 19 | MIN | 89.474 |
| 48 | 18 | CEM | 94.444 |
| 49 | 19 | MIN | 89.474 |
| 50 | 19 | WET | 36.842 |
| 51 | 19 | WET | 36.474 |

Overall Results

| | mean score | standard error |
|---|---|---|
| named | 84.5% (n=34) | 3.27% |
| unnamed | 87.1% (n=17) | 5.01% |
| all items | 85.4% (n=51) | 2.72% |

Neck as an "isthmus," the remainder sought definitions that fit the feature itself rather than the name "neck." Although many such ambiguous terms had been identified in the Interim Proposed Standard, in this instance an extension of the proposed standard would be necessary to resolve the problem. Other problems occurred simply because of name placement on the map. The second feature, "Buckner's Reach," was a stream segment but the name was placed on a bluff next to the River. While 43% of the testers coded it as a watercourse and 10% as a stream, the remainder sought definitions corresponding to the land feature where the name was placed. Some problems occurred because of analytical distinctions made by the Working Group that may be unfamiliar to some testers: the distinction between a watercourse as a stream bed and the stream itself, or between a wetland that has vegetation and a tidal flat without vegetation, for example. Nevertheless, the results of the consistency test were suprisingly good, with over three-fifths of the test features consistently coded by 90% or more of the testers.

### 5.3.3 Completeness

In the "completeness test," testers were simply asked to give a standard feature code for each item appearing on the legends. Completeness was measured in terms of whether or not a standard code could be found for each item attempted. About 90% of the items were successfully coded to the standard. There was a difference between the results for Chart No. 1 and for the USGS legend as shown in Table 3.

Table 3
Completeness Test Results

| Source | Coded | | Uncoded | |
|---|---|---|---|---|
| | number | % | number | % |
| NOS/HTC Chart No. 1 | 898 | 85.04 | 158 | 14.96 |
| USGS Legend | 575 | 97.62 | 14 | 2.38 |
| Both Sources | 1,473 | 89.54 | 172 | 10.46 |

To some extent, the difference in coding success can be attributed to the familiarity of testers with the source material. For example, testers from Bell South originally asked to be excused from coding Chart No. 1 since their work entirely concerns topographic features. They participated fully in the test, however, and their results were 100% complete for the USGS legend while only 74% complete for Chart No. 1.

### 5.3.4 Ease of Use

Responses to the open-ended questions were mixed. Many testers found the testing process cumbersome. (See Table 4.) It took between 4 and 40 hours to complete the test. In large part, this problem may be explained by the form of test materials. In addition to the test instructions, map, and

Table 4
Responses to Selected Open-Ended Questions

Q. 3. In both Part 1 and Part 2, were you able to separate different features adequately with the attributes provided? Please describe any problems in this respect.

| | |
|---|---|
| yes | 5 |
| no | 10 |
| inadequate or incomplete attribute list | 7 |
| too many features grouped together | 2 |
| lack of values | 2 |
| no response | 1 |

Q. 4. Overall, would you say that the proposed standard and attribute scheme was easy to use, or difficult to use? Please comment.

| | |
|---|---|
| easy | 4 |
| somewhat easy | 4 |
| difficult | 8 |
| time consuming | 3 |
| confusing | 1 |
| flipping around too much | 6 |
| inadequate attribute list | 2 |

Q. 5. Are you satisfied that the results of such a coding scheme could provide a sound basis for exchanging digital cartographic data?

| | |
|---|---|
| yes | 6 |
| no | 4 |
| mixed | 4 |
| attribute coding difficult | 1 |
| no response | 2 |

Q. 7. Please indicate your professional training or background in the area of cartography and computer mapping.

| | |
|---|---|
| cartography | 12 |
| geography | 5 |
| undergraduate | 3 |
| graduate | 6 |
| professional training | 2 |
| 1-3 years experience | 3 |
| 3+ years experience | 7 |
| no experience | 1 |
| no response | 4 |

copies of Chart No. 1 and the USGS Legend, the test materials included four print-outs. One print-out contained definitions for 145 standard feature terms and over 1,100 "included terms." A second print-out contained definitions for 197 attributes. The third and fourth print-outs consisted of 3-character alphanumeric codes for each standard feature and attribute. To complete parts 1 and 2 of the test required leafing through the definitions print-outs, finding a suitable definition and appropriate attributes for each feature to be coded, then scanning the separate code print-outs in order to enter the proper code on the test form. This amount of effort would be greatly reduced in a production environment by providing an on-line system to speed up the search process, and eventually would be minimized as coders begin to memorize the standard definitions.

### 5.3.5 Conclusions

The quantitative results of the test were positive, leading Working Group III to adopt the following resolution on March 16, 1986:

> "Working Group III accepts the test results as sufficient evidence of the viability of the proposed model."

While the results affirm the viability of the proposed model, they also indicate problems remaining to be addressed for the proposed standard. Among these are a need to refine current feature definitions to eliminate remaining ambiguities, a need to extend the basic set of definitions to include not just most, but all hydrographic and topographic features and their attributes, and a need to simplify the presentational form of the standard to promote greater ease of use.

## 5.4 REVISED INTERIM PROPOSED STANDARD

The purpose of feature classification is to describe entities as they occur in the world and not as they appear on a graphic representation. The lists of Features, Attributes and Attribute Values are not limited to any map series or scales.

### 5.4.1 Cartographic Feature Descriptive Model

Cartographic features shall be described by the following three categories: Feature, Attribute, and Attribute Value. These are defined as follows:

- Feature - a defined entity of interest that is not further subdivided.
- Attribute - a defined characteristic of a feature. The only mandatory attribute shall be location.
- Attribute Value - a specific quality or quantity assigned to an attribute.

Two additional categories, Feature Class and Attribute Class are provided as user options. These are defined as follows:

- Feature Class - a specified group of features (e.g., hydrographic, land use, transportation)

- Attribute Class - a specified group of attributes (e.g., those describing measure, serviceability, composition, or structure)

### 5.4.2 Cartographic Feature Definitions

A comprehensive list of feature and attribute definitions is being prepared. Appendix II describes and lists a sample of the feature definitions and attributes. Maintenance of the standard list of features and attributes will be provided by a national body which will rule on all additions and changes to the standard.

### 5.4.3 Cartographic Feature Codes

The assignment of codes for the features and attributes will be made upon completion and review of the definitions. These codes shall not impose a structure upon the features, but are intended only for retrieval and maintenance.

APPENDIX I

# INSTRUCTIONS FOR TESTING STANDARD FEATURES AND ATTRIBUTES *

Working Group III - Cartographic Features
National Committee for Digital Cartographic Data Standards

October 1, 1985

## Introduction

The test consists of three parts. Part 1 is a "consistency test." In this test, each participant will be given the same U.S.G.S. quadrangle (Port Royal, Virginia, 7.5 minute series), with 51 features to be coded. The results will show whether different coders arrive at the same codes for the same features. Part 2 is a "completeness test." In the completeness test, each participant will attempt to find standard codes for features contained in selected portions of the legends used for U.S.G.S. quadrangles and nautical charts. Part 3 is a participant evaluation. After completing the tests for consistency and completeness, each participant will record comments on various aspects of the proposed standard scheme. When the test has completed, please send the instructions, results and comments to:

Mr. Shih-Lung Shaw
Numerical Cartography Lab
158 Derby Hall
154 North Oval Mall
Columbus, OH 43210

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* Instructions prepared by Oona Przygocki and Robert Rugg

Instructions

## PART 1 - CONSISTENCY TEST

Looking at your materials you will find:

a. one Test Map
b. one Interim Proposed Standard Feature Definitions list
c. one Interim Proposed Standard Attribute Definitions list
d. one list of feature abbreviations
e. one list of attribute abbreviations
f. four sheets marked Form A.

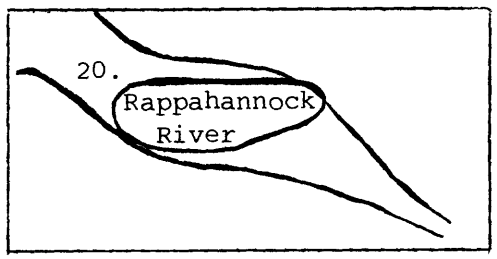
On the test map, each feature to be considered has been circled and given a number ranging from 1-51. This is the "item number." Each standard feature term has been given a 3 character abbreviation. This is the "feature code." Each standard attribute term has been given a 3 character abbreviation. This is called the "attribute code." The item number is located on the map. The features abbreviation list corresponds with the Interim Proposed Standard Feature Definitions list. The attribute abbreviation list corresponds with the Interim Proposed Standard Attribute Definitions list. The values for the attributes will be based on what you think is appropriate for the attribute chosen and specific to the feature on the test map. These values have no codes yet and thus will be listed in English.

The following instructions are written using Item Number 20 from the test map as an example.

1. Look at the map and identify the feature assigned item number 20. Write that item number on Form A under Item number.

Example:

| Item Number | Test Map |
|---|---|
| 20 | |



2. Look on the Proposed Standard Features and Definitions list for the feature identified on the map. If that term appears on that list it will be either a standard term or an included term. If it is an included term it will refer you to the standard term.

Example: River
See Stream

If the feature is referred to more than one standard term, read the definitions for both standard terms referred to. Choose the standard term that best describes what is seen on the map.

3. Using the standard feature term chosen, look on the Features Abbreviations list for that term. Beside the Standard Term on the abbreviations list there will be a three character code which has been assigned to it.

Example: STR Stream

Write this code on Form A, under Feature Code, and beside the Item Number it refers to.

Example:

| Item Number | Feature Code | Attribute Code | Value |
|---|---|---|---|
| 20 | STR | | |

4. In the Proposed Standard Feature Definitions list is a list of suggested attributes which may potentially apply to each feature. Look over this list to find one or more attributes that can be identified from the information shown on the test map. Please note that the list of suggested attributes is for your guidance only. Make a note of any attributes you wish to code that are not mentioned below the Standard Feature Definition. After selecting the attributes you wish to use, look at the Proposed Standard Attribute Definitions list. If a chosen attribute does not appear on the list, enter the attribute without a code on FORM A. If the attribute is listed, but refers you to another attribute, go to the attribute to which you are referred to find the standard attribute term.

Example: Natural
See: Artificially Improved/Manmade/Natural

Instructions

The standard attribute term is:
Artificially Improved/Manmade/Natural

Using this standard attribute term look on the Attributes Abbreviations list. The Standard Attribute term will appear with a 3 character code beside it. This is the Attribute Code.
Example: MAN Artificially Improved/Manmade/Natural

Enter this 3 character code on Form A, under Attribute Code, beside the corresponding feature code. Enter the first attribute listed for a feature on the same line beside the feature it is describing.

| Example: Item Number | Feature Code | Attribute Code | Values |
|---|---|---|---|
| 20 | STR | MAN | |

If there is more than one Standard Attribute that is relevant, follow the same procedure to find the Attribute Codes and list these codes in the column under Attribute Code. The next Item Number will be listed on the line after the last attribute code for the previous feature.

| Example: Item Number | Feature Code | Attribute Code | Value |
|---|---|---|---|
| 20 | STR | MAN | |
| | | NAM | |
| | | SAL | |
| 21 | | | |

5. Think of values for each attribute chosen that further describe the specific feature on the map. List these in English beside the corresponding attribute.

Example:

| Item Number | Feature Code | Attribute Code | Values |
|---|---|---|---|
| 20 | STR | MAN | Natural |
| | | NAM | Rappahannock River |
| | | SAL | Brackish |
| 21 | | | |

Continue this process in order for each item circled on the test map.

Instructions

## PART 2 - COMPLETENESS TEST

Portions of nautical chart and topographic map legend specifications have been chosen for the test of "completeness." Section G - Ports and Harbors - of Chart #1, 8th edition, November 1984, and page 11 of the Standards for 1:24,000 and 1:25,000 Scale Quadrangle Maps, December 1981, are the test legend sheets. Using the same procedure as in Part 1, complete FORM A for each numbered legend item on the test sheets.

## PART 3 - COMMENTS

Please respond to the questions on the following pages. Your comments will provide valuable information and assist greatly in making the changes necessary for the improvement of the standard.

1. In Part 1, which numbered features caused the greatest difficulties for coding? Were there any features on the map that could not be coded from the standard list?

2. In Part 2, which legend items caused the greatest difficulties for coding? Were there items that could not be coded from the standard list?

3. In both Part 1 and Part 2, were you able to separate different features adequately with the attributes provided? Please describe any problems in this respect.

4. Overall, would you say that the proposed standard and attribute scheme was easy to use, or difficult to use? Please comment.

5. Are you satisfied that the results of such a coding scheme could provide a sound basis for exchanging digital cartographic data?

6. Please record any additional comments you have on the testing procedure and the proposed scheme.

7. Please indicate your professional training or background in the area of cartography or computer mapping.

FORM A TEST OF STANDARD FEATURES AND ATTRIBUTES

| ITEM NUMBER | FEATURE CODE | ATTRIBUTE CODE | VALUE |
|---|---|---|---|
| | | | |
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# APPENDIX II

## INTERIM PROPOSED STANDARD FEATURE DEFINITIONS

## INTERIM PROPOSED STANDARD ATTRIBUTE DEFINITIONS

FEATURES

ACCESSWAY (INCLUDED TERM 1)
  SEE: ROAD

AERIAL_CABLEWAY (INCLUDED TERM 2)
  SEE: CABLEWAY

AERIAL_CABLEWAY_LINES (INCLUDED TERM 3)
  SEE: CABLEWAY
  DEFN: (NEW)STRONG, LARGE DIAMETER, HEAVY STEEL OR FIBER ROPES STRUNG BETWEEN ELEVATED SUPPORTS AS PART OF A CONVEYOR SYSTEM ON WHICH CARS, BUCKETS, OR OTHER CARRIER UNITS ARE SUSPENDED.

AERODROME (INCLUDED TERM 4)
  SEE: AIRPORT

AERODROME_BEACON (INCLUDED TERM 5)
  SEE: BEACON

AERODROME_CONTROL_TOWER (INCLUDED TERM 6)
  SEE: TOWER

AERONAUTICAL_RADIOBEACON (INCLUDED TERM 7)
  SEE: BEACON

AERONAUTICAL_BEACON (INCLUDED TERM 8)
  SEE: BEACON

AERONAUTICAL_LIGHT (INCLUDED TERM 9)
  SEE: BEACON

AERONAUTICAL_NAVIGATIONAL_RADIO_STATION (INCLUDED TERM 10)
  SEE: STATION/BUILDING

AIR_BEACON (INCLUDED TERM 11)
  SEE: BEACON

AIRDROME (INCLUDED TERM 12)
  SEE: AIRPORT

AIRFIELD (INCLUDED TERM 13)
  SEE: RUNWAY

STANDARD FEATURE TERM 1: AIRPORT
  ATTRIB: LOCATION NAME RUNWAYS_NUMBER_OF RUNWAY_LENGTH RUNWAY_WIDTH RUNWAY_SURFACE_MATERIAL SIZE_OF_AIRCRAFT_SERVED FACILITIES_AVAILABLE AIR_TRAFFIC_CONTROL_SERVICE AREA CIVILIAN MILITARY CARGO_TRANSPORTATION PASSENGER_TRANSPORTATION EXISTING/PROPOSED LIGHTED RESTRICTIONS SERVICES_PROVIDED USER_TYPE USE_TYPE
  INCLUD: AERODROME AIRDROME ALTERNATE_AERODROME AUXILIARY_AERODROME CONTROLLED_AERODROME LANDING_AREA SUPPLEMENTARY_AERODROME

AIRPORT_BEACON (INCLUDED TERM 14)
  SEE: BEACON

AIRPORT_TRAFFIC_AREA (INCLUDED TERM 15)

SEE: APPROACHWAY

AIRPORT_TRAFFIC_CONTROL_TOWER (INCLUDED TERM 16)
SEE: TOWER

AIRSTRIP (INCLUDED TERM 17)
SEE: RUNWAY

ALLEY (INCLUDED TERM 18)
SEE: RDAD

ALLUVIAL_FAN (INCLUDED TERM 19)
SEE: DELTA

STANDARD FEATURE TERM 2: ALLUVIUM
DEFN: ALL UNCONSOLIDATED FRAGMENTAL MATERIAL LAID DOWN BY A STREAM
SDURCE: MODIFIED FROM MONKHOUSE, A DICTIONARY DF GEDGRAPHY
ATTRIB: LOCATION COMPOSITION SHAPE VOLUME

ALTERNATE_AERODROME (INCLUDED TERM 20)
SEE: AIRPORT

ALTERNATING_LIGHT (INCLUDED TERM 21)
SEE: BEACON

ALTITUDE_TINT (INCLUDED TERM 22)
SEE: RELIEF

AMMUNITION_DUMP (INCLUDED TERM 23)
SEE: MILITARY_INSTALLATION

AMPHITHEATER (INCLUDED TERM 24)
SEE: OUTDOR_THEATER

AMUSEMENT_PARK (INCLUDED TERM 25)
SEE: PARK

ANABRANCH (INCLUDED TERM 26)
SEE: STREAM
DEFN: AN OLD TERM, NOT MUCH USED, FOR A BRANCH OF A STREAM WHICH LEAVES A RIVER AND RE-ENTERS IT LOWER DOWN.
SDURCE: A DICTIONARY OF GEOGRAPHY, STAMP

ANCHOR_BUOY (INCLUDED TERM 27)
SEE: BUOY

ANCHOR_LIGHT (INCLUDED TERM 28)
SEE: BEACON

ANCHORAGE (INCLUDED TERM 29)
SEE: HARBOR

ANCHORAGE_BUOY (INCLUDED TERM 30)
SEE: BUDY

FEATURES

ANSE (INCLUDED TERM 31)
  SEE: INLET

STANDARD FEATURE TERM 3: ANTENNA
  DEFN: A METALLIC APPARATUS FOR SENDING AND RECEIVING ELECTRO-MAGNETIC WAVES.
  SOURCE: AMERICAN HERITAGE DICTIONARY
  ATTRIB: LOCATION TYPE_OF_SIGNAL HEIGHT NAME CONNECTED_FEATURE COMPOSITION MICROWAVE_TRANSMISSION MOUNTED MOVABLE STATIONARY RADIO_TRANSMISSION TELEVISION_TRANSMISSION USE_TYPE
  INCLUD: DIRECTIONAL_ANTENNA ANTENNA_ARRAY LOOP_ANTENNA

ANTENNA_ARRAY (INCLUDED TERM 32)
  SEE: ANTENNA

APARTMENT (INCLUDED TERM 33)
  SEE: BUILDING

APPROACH_AREA (INCLUDED TERM 34)
  SEE: APPROACHWAY

APPROACH_LIGHTS (INCLUDED TERM 35)
  SEE: BEACON

APPROACH_PATH (INCLUDED TERM 36)
  SEE: APPRDACHWAY

APPROACH_TO_HIGHWAY (INCLUDED TERM 37)
  SEE: ROAD

STANDARD FEATURE TERM 4: APPROACHWAY
  DEFN: THE AIRSPACE THROUGH WHICH AIRCRAFT APPROACH OR LEAVE A LANDING AREA.
  SOURCE: NAVIGATION DICTIONARY
  ATTRIB: LOCATION AREA HEIGHT RESTRICTIONS NAME USER_TYPE RESTRICTIONS
  INCLUD: AIRPORT_TRAFFIC_AREA APPRDACH_PATH APPROACH_AREA

APPROXIMATE_CONTDUR (INCLUDED TERM 38)
  SEE: CONTOUR_LINE

APRON (INCLUDED TERM 39)
  SEE: PLAIN/REVETMENT

AQUEDUCT (INCLUDED TERM 40)
  SEE: WATERCDURSE/BRIDGE

ARCH (INCLUDED TERM 41)
  SEE: GAP

ARCHED_ICEBERG (INCLUDED TERM 42)
  SEE: ICEBERG

ARCHIPELAGO (INCLUDED TERM 43)
  SEE: SEA/ISLAND_CLUSTER

ARCHIPELAGO_APRDN (INCLUDED TERM 44)

SEE: PLAIN

ARCTIC_PACK (INCLUDED TERM 45)
SEE: ICE_FIELD

ARENA (INCLUDED TERM 46)
SEE: BUILDING

ARETE (INCLUDED TERM 47)
SEE: RIDGE

ARM (INCLUDED TERM 48)
SEE: INLET

ARMORY (INCLUDED TERM 49)
SEE: MILITARY_INSTALLATION/BUILDING

ARMY_CAMP (INCLUDED TERM 50)
SEE: MILITARY_INSTALLATION/CAMPGROUND

ARROYO (INCLUDED TERM 51)
SEE: WATERCOURSE
DEFN: THE COURSE OF AN INTERMITTENT STREAM, STEEP-CUT IN LOOSE EARTH; A COULEE; A STEEP-WALLED TRENCHLIKE VALLEY. SEE WASH.
SOURCE: NATIONAL OCEAN SERVICE GLOSSARY, 1985

ART_GALLERY (INCLUDED TERM 52)
SEE: BUILDING

ARTIFICIAL_HARBOR (INCLUDED TERM 53)
SEE: HARBOR

ATHLETIC_CLUB (INCLUDED TERM 54)
SEE: BUILDING

ATOLL (INCLUDED TERM 55)
SEE: REEF/ISLAND

ATOLL_REEF (INCLUDED TERM 56)
SEE: REEF

AUDITORIUM (INCLUDED TERM 57)
SEE: BUILDING

AUTOMOBILE_PLANT (INCLUDED TERM 58)
SEE: BUILDING

AUXILIARY_AERODROME (INCLUDED TERM 59)
SEE: AIRPORT

AUXILIARY_CONTOUR (INCLUDED TERM 60)
SEE: CONTOUR_LINE

AVENUE (INCLUDED TERM 61)

SEE: ROAD

AWASH_ROCK (INCLUDED TERM 62)
SEE: ROCK

AWAWA (INCLUDED TERM 63)
SEE: STREAM

BACK_MARSH (INCLUDED TERM 64)
SEE: WETLAND

BACKSWAMP (INCLUDED TERM 65)
SEE: WETLAND

STANDARD FEATURE TERM 5: BACKWATER
DEFN: AN AREA OF CALM WATER UNAFFECTED BY THE CURRENT OF A STREAM
SOURCE: ADAPTED FROM STAMP AND MONKHOUSE
ATTRIB: LOCATION WIDTH DEPTH FORCE_OF_FLOW

BALD (INCLUDED TERM 66)
SEE: CLEARING/MOUNT

BALL (INCLUDED TERM 67)
SEE: BAR

BALL_PARK (INCLUDED TERM 68)
SEE: PARK/SPORTS_FIELD

BANDSTAND (INCLUDED TERM 69)
SEE: OUTDOOR_THEATER

BANK (INCLUDED TERM 70)
SEE: MOUNT/SHORE

BANK_REEF (INCLUDED TERM 71)
SEE: REEF

STANDARD FEATURE TERM 6: BAR
DEFN: A SUBMERGED OR EMERGED MOUND OR RIDGE OF SAND, GRAVEL, OR MUD BUILT ON THE SEA FLOOR IN SHALLOW WATER BY WAVES AND CURRENTS.
SOURCE: MODIFIED FROM GLOSSARY OF OCEANOGRAPHIC TERMS
ATTRIB: COMPOSITION LOCATION LENGTH SHAPE AREA WIDTH HEIGHT SHORE_ORIENTATION ARTIFICIALLY_IMPROVED/MANMADE/NATURAL
INCLUD: BALL SANDBAR MARSH_BAR LONGSHORE_BAR SHOAL BAYMOUTH_BAR BARRIER_BEACH TRANSVERSE_BAR SAND_BANK BAY_BAR OFFSHORE_BAR LONGSHORE_BAR BARRIER_ISLAND BAY_BARRIER SHOAL_PATCHES BAY_HEAD_BAR CUSPATE_BAR TONGUE POINT HOOK SAND_HORN SAND_LOBE SPIT HOOKED_SPIT RECURVED_SPIT SAND_SPIT TOMBOLO CUSPATE_SPIT

BAR_BUOY (INCLUDED TERM 72)
SEE: BUOY

BAR_PORT (INCLUDED TERM 73)
SEE: PORT

BARE_ROCK (INCLUDED TERM 74)

SEE: ROCK

BARN (INCLUDED TERM 75)
SEE: BUILDING

BARRACKS (INCLUDED TERM 76)
SEE: MILITARY_INSTALLATION/BUILDING

BARRAGE (INCLUDED TERM 77)
SEE: DAM

BARRANCA (INCLUDED TERM 78)
SEE: WATERCOURSE

STANDARD FEATURE TERM 7: BARRIER
DEFN: A FENCE, WALL, OR OTHER STRUCTURE BUILT TO BAR PASSAGE, TO ENCLOSE AN AREA, OR TO MARK A BOUNDARY.
SOURCE: MODIFIED FROM AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION LENGTH HEIGHT CONSTRUCTION_MATERIAL ARTIFICIALLY_IMPROVED/MANMADE/NATURAL
INCLUD: FENCE GUARD_RAIL GUIDE_RAIL HEDGE HEDGEROW WALL WINDBREAK SOUND_BARRIER

BARRIER_BASIN (INCLUDED TERM 79)
SEE: BASIN

BARRIER_BEACH (INCLUDED TERM 80)
SEE: BAR

BARRIER_FLAT (INCLUDED TERM 81)
SEE: WETLAND/FLAT

BARRIER_ICEBERG (INCLUDED TERM 82)
SEE: ICEBERG

BARRIER_ISLAND (INCLUDED TERM 83)
SEE: BAR/ISLAND

BARRIER_LAGOON (INCLUDED TERM 84)
SEE: LAGOON

BARRIER_REEF (INCLUDED TERM 85)
SEE: REEF

BASCULE_BRIDGE (INCLUDED TERM 86)
SEE: BRIDGE

BASE_LINE (INCLUDED TERM 87)
SEE: BEARING_LINE/BOUNDARY

STANDARD FEATURE TERM 8: BASIN
DEFN: ANY BOWL-SHAPED DEPRESSIDN IN THE SURFACE OF THE LAND OR OCEAN FLOOR.
SOURCE: MDDIFIED FROM AMERICAN HERITAGE DICTIONARY
ATTRIB: CIRCUMFERENCE LOCATION SHAPE DEPTH SLOPE_OF_SIDES NAME SIZE NATURAL/ARTIFICIALLY_IMPROVED/MANMADE NAME AREA AIR/LAND/WATER
INCLUD: BARRIER_BASIN SINK SINK KETTLE DEPRESSION CALDRON NON_TIDAL_BASIN TIDAL_BASIN WAVE_BASIN

FEATURES

BATTERY (INCLUDED TERM 88)
SEE: MILITARY_INSTALLATION

BAY (INCLUDED TERM 89)
SEE: INLET

BAY-HEAD_BAR (INCLUDED TERM 90)
SEE: BAR

BAY_BAR (INCLUDED TERM 91)
SEE: BAR

BAY_BARRIER (INCLUDED TERM 92)
SEE: BAR

BAY_DELTA (INCLUDED TERM 93)
SEE: DELTA

BAY_ICE (INCLUDED TERM 94)
SEE: ICE_FIELD

BAYMOUTH_BAR (INCLUDED TERM 95)
SEE: BAR

BAYOU (INCLUDED TERM 96)
SEE: STREAM/LAKE

STANDARD FEATURE TERM 9: BEACH
DEFN: THE AREA EXTENDING FROM THE SHORELINE INLAND TO A MARKED CHANGE IN PHYSIDGRAPHIC FORM OR MATERIAL,OR TO THE LINE OF PERMANENT VEGETATION. THE GENTLY SLOPING SHORE WHICH IS WASHED BY WAVES OR TIDES, ESPECIALLY THE PARTS COVERED BY SAND OR PEBBLES.
SOURCE: NAVIGATION DICTIONARY, U.S. NAVAL OCEANOGRAPHIC OFFICE
INCLUD: LAGOON_BEACH FORESHORE_FLATS RIVAGE BEACH_BERM

BEACH_BERM (INCLUDED TERM 97)
SEE: BEACH

BEACH_CUSPS (INCLUDED TERM 98)
SEE: RIDGE

BEACH_FACE (INCLUDED TERM 99)
SEE: SHORE

BEACH_RIDGE (INCLUDED TERM 100)
SEE: RIDGE

BEACH_SCARP (INCLUDED TERM 101)
SEE: CLIFF

STANDARD FEATURE TERM 10: BEACON
DEFN: A FIXED SIGNAL, MARK OR LIGHT ERECTED FOR THE GUIDANCE OF MARINERS OR AIRPLANE PILOTS.
SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION SIGNAL_TYPE FIXED/FLASHING INTENSITY NAME WATCHED HEIGHT WIDTH SIGNAL_DIRECTION COLOR LIGHT_DISPLAY SIGNAL_INTENSITY

FEATURES

INCLUD: AERODROME_BEACON AERONAUTICAL_RADIOBEACON AERONAUTICAL_BEACON AIR_BEACON AIRPORT_BEACON CIRCULAR_BEACON CALIBRATION_RADIOBEACON CODE_BEACON CONTINUOUS_RADIOBEACON DAYBEACON DIRECTIONAL_BEACON FAN_MARKER_BEACON HOMING_BEACON IDENTIFICATION_BEACON LANDING_BEACON LANDMARK_BEACON LIGHTHOUSE LIGHTED_BEACON MARKER_RADIOBEACON MARKER_BEACON MARINE_RADIOBEACON OBSTRUCTION_BEACON OMNIDIRECTIONAL_BEACON PILE_LIGHTHOUSE POST PERCH PILE_BEACON RACON RADAR_ BEACON RADAR_RESPONDER_BEACON RADIOBEACON RESPONDER_BEACON ROTATING_BEACON ROTATING_LOOP_RADIOBEACON SEA_BEACON TRANSPONDER_BEACON WARNING_BEACON WARNING_RADIOBEACON OBSTRUCTION_MARKER WINTER_MARKER TIDE_SIGNAL RANGING_MARKER AERONAUTICAL_LIGHT ALTERNATING_LIGHT ANCHOR_LIGHT CHANNEL_LIGHT COLORED_LIGHT FIXED_LIGHT FIXED_AND_FLASHING_LIGHT INTERMITTENT_LIGHT FIXED_AND_GROUP_FLASHING_LIGHT FLASHING_LIGHT HORIZON_LIGHTS LEADING_LIGHT INTERMITTANT_LIGHT LONG_FLASHING_LIGHT MAJOR_LIGHT MARINE_LIGHT MINOR_LIGHT NAVIGATION_LIGHT OBSTRUCTION_LIGHT OCCASIONAL_LIGHT OCCULTING_LIGHT PILE_DOLPHIN OCCULTING_QUICK_FLASHING_LIGHT QUICK_FLASHING_LIGHT RANGING_LIGHT REAR_LIGHT RED_SECTOR RUNWAY_LIGHTS ROTATING_LIGHT SECTORED_LIGHT SHORT_FLASHING_LIGHT SHORT_LONG_FLASHING_LIGHT TAXI_CHANNEL_LIGHT TAXIWAY_LIGHTS THRESHOLD_LIGHT TIDAL_LIGHT UNATTENDED_LIGHT UNDULATING_LIGH UNWATCHED_LIGHT WARNING_LIGHT WATCHED_LIGHT WEAK_LIGHT WINTER_LIGHT RED_SECTOR_LIGHT APPROACH_LIGHTS FOG_SIGNAL MAJOR_FOG_SIGNAL MINOR_FOG_SIGNAL OCCASIONAL_FOG_SIGNAL BOUNDARY_LIGHTS LIGHT

STANDARD FEATURE TERM 11: BEARING LINE

DEFN: A LINE EXTENDING IN THE DIRECTION OF A BEARING. THE MOST COMMON APPLICATION OF THE EXPRESSION IS TO A LINE OF POSITION CONSTITUTING THE LOCUS OF ALL POINTS HAVING A COMMON BEARING OF A GIVEN REFERENCE MARK.
SOURCE: NAVIGATION DICTIONARY.
ATTRIB: LOCATION NAME
INCLUO: CENTER_LINE OMNIBEARING_LINE COURSE_LINE COMPASS_DIRECTION COMPASS_DEVIATION COMPASS_VARIATION COMPASS_MAGNETIC_VARIATION LEADING_LINE CLEARING_LINE CLEARING_BEARING GRID_BEARING GRID_COURSE GRID_TRACK TRUE_BEARING BEARING COMPASS_BEARING RHUMB_LINE LOXODROME RHUMB_LINE_COURSE LOXODROMIC_CURVE GRID_LINE GRID_RHUMB_LINE GRID_PARALLEL GRID_MERIDIAN TRANSVERSE_RHUMB_LINE MERIDIAN BASE_LINE PARALLEL_OF_LATITUDE

BEAVER_DAM (INCLUDED TERM 102)
SEE: DAM

BECK (INCLUDED TERM 103)
SEE: STREAM

BELL_BUOY (INCLUDED TERM 104)
SEE: BUOY

BENCH (INCLUDED TERM 105)
SEE: TERRACE

BENCH_MARK (INCLUDED TERM 106)
SEE: CONTROL_POINT

BEND (INCLUDED TERM 107)
SEE: WATERCOURSE
DEFN: A CURVE IN THE COURSE OF A STREAM AND (OR) THE LAND WITHIN THE CURVE; A CURVE IN A LINEAR BODY OF WATER (BOTTOM, LOOP, MEANDER)

BERY (INCLUDED TERM 108)
SEE: MOUNT/ICEBERG

BICYCLE_PATH (INCLUDED TERM 109)
SEE: ROAD

BICYCLE_TRAIL (INCLUDED TERM 110)
SEE: ROAD

BIFURCATION_BUOY (INCLUDED TERM 111)
SEE: BUOY

BIGHT (INCLUDED TERM 112)
SEE: INLET

BILLBOARD (INCLUDED TERM 113)
SEE: SIGN

BIRD_SANCTUARY (INCLUDED TERM 114)
SEE: PARK

BLANKET_BOG (INCLUDED TERM 115)
SEE: WETLAND

BLUFF (INCLUDED TERM 116)
SEE: CLIFF/WOODLAND

BOARDWALK (INCLUDED TERM 117)
SEE: ROAD

BOAT_BASIN (INCLUDED TERM 118)
SEE: HARBOR

BOAT_HARBOR (INCLUDED TERM 119)
SEE: HARBOR

BOAT_LANDING (INCLUDED TERM 120)
SEE: WHARF/PIER

BOATHOUSE (INCLUDED TERM 121)
SEE: BUILDING

BOG (INCLUDED TERM 122)
SEE: WETLAND

BOLLARD (INCLUDED TERM 123)
SEE: MOORING

BOOM (INCLUDED TERM 124)
SEE: BREAKWATER

BOROUGH (INCLUDED TERM 125)
SEE: PLACE

BORROW_PIT (INCLUDED TERM 126)
SEE: MINE/HOLE

BOTANICAL_GARDEN (INCLUDED TERM 127)
SEE: PARK

BOULEVARD (INCLUDED TERM 128)
SEE: ROAD

STANDARD FEATURE TERM 12: BOUNDARY
DEFN: A LINE INDICATING THE LIMIT OR EXTENT OF AN AREA OR TERRITORY.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING.
ATTRIB: LOCATION LENGTH PHYSICAL NAME
INCLUD: TREE_LINE TIMBER_LINE HARBOR_LINE BOUNDARY_LINE BOUNDARY_LIGHTS TIDE_LIMIT TOWN/CITY_LIMITS INTERNATIONAL_BOUNDARY INTERPROVINCIAL_BOUNDARY CADASTRAL_BOUNDARY LIMITS COAST_GUARD_LINES HEDGE HEDGEROW FENCE

BOUNDARY_LINE (INCLUDED TERM 129)
SEE: BOUNDARY

BOUNDARY_LIGHTS (INCLUDED TERM 130)
SEE: BOUNDARY/BEACON

BOUNDARY_MONUMENT (INCLUDED TERM 131)
SEE: CONTROL_POINT

BOUNDARY_SIGN (INCLUDED TERM 132)
SEE: SIGN

BRAIDED_RIVER (INCLUDED TERM 133)
SEE: STREAM
DEFN: A RIVER HAVING DIVISIONS WHICH ARE NUMEROUS AND INTERCONNECTED.
SOURCE: MODIFIED FROM THE CANADIAN COUNCIL ON SURVEYING AND MAPPING DRAFT REPORT, VOL 1, STANDARDS FOR THE CLASSIFICATION OF TOPOGRAPHIC FEATURES

BRAIDED_STREAM (INCLUDED TERM 134)
SEE: STREAM
DEFN: A STREAM CHOKED WITH SAND BARS THAT DIVIDE IT INTO AN INTRICATE NETWORK OF INTERLACING CHANNELS.
SOURCE: "GLOSSARY OF TERMS"

BRAKE (INCLUDED TERM 135)
SEE: WOODLAND

BRANCH (INCLUDED TERM 136)
SEE: STREAM
DEFN: A CREEK OR BROOK, AS USED LOCALLY IN SOUTHERN STATES. ALSO USED TO DESIGNATE ONE OF THE BIFURCATIONS OF A STREAM, AS A FORK.
SOURCE: THE AMERICAN HERITAGE DICTIONARY

STANDARD FEATURE TERM 13: BREAKER
DEFN: A WAVE BREAKING INTO FOAM AS IT ADVANCES TOWARD THE SHORE.
SOURCE: A DICTIONARY OF GEOGRAPHY, MOORE

STANDARD FEATURE TERM 14: BREAKWATER
DEFN: A STRUCTURE BUILT TO BREAK THE FORCE OF WAVES SO AS TO PROTECT A BEACH, HARBOR, OR OTHER WATERFRONT FACILITY.
SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION ORIENTATION_TO_SHORE LENGTH CONSTRUCTION_MATERIAL WIDTH PROTRUDING/SUBMERGED PERMEABLE NAME
INCLUD: GROIN/GROYNE JETTY MOLE SEAWALL BOOM FLOATING_BREAKWATER WAVE_TRAP TRAINING_WALL BULKHEAD WEIR_JETTY WAVE_BASIN SEA_GATE

STANDARD FEATURE TERM 15: BRIDGE
DEFN: A STRUCTURE ERECTED OVER A DEPRESSION OR OBSTACLE TO CARRY TRAFFIC OR SOME FACILIY SUCH AS A PIPELINE.
SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION NAME SPAN_LENGTH CONSTRUCTION_MATERIAL WIDTH BEARING_CAPACITY MODE_TRANSPORTED FEATURE_SPANNED SUPPORT_TYPE SPAN_MOVEMENT ELEVATION COVERED/UNCOVERED CONNECTED_FEATURE MATERIAL_TRANSPORTED CLEARANCE LIGHTED CONDITION_OF_SURFACE_MATERIAL TOLL SPAN_MOVEMENT

FEATURES

INCLUD: AQUEDUCT COVERED_BRIDGE BASCULE_BRIDGE DRAW_BRIDGE FOOTBRIOGE LIFT_BRIDGE OVERPASS PEDESTRIAN-BICYCLE_OVERPASS PONTOON_BRIDGE SUSPENSION_BRIDGE SWING_BRIDGE TRESTLE VIADUCT

BRIGALOW (INCLUDED TERM 137)
SEE: WOOOLAND

BRINE_WELL (INCLUDED TERM 138)
SEE: WELL

BROOK (INCLUDED TERM 139)
SEE: STREAM
DEFN: A SMALL STREAM OR RIVULET, COMMONLY SWIFTLY FLOWING IN RUGGED TERRAIN, OF LESS LENGTH AND VOLUME THAN A CREEK. ONE OF THE SMALLEST BRANCHES OF A DRAINAGE SYSTEM.
SOURCE: OHIO STATE PRELIMINARY LIST (GNIS, CANADIAN COUNCIL, AND THE AMERICAN HERITAGE DICTIONARY)

BRUSH (INCLUDED TERM 140)
SEE: WOODLANO

STANDARD FEATURE TERM 16: BUILDING
DEFN: ANY PERMANENT WALLED AND ROOFED CONSTRUCTION SUCH AS A HOUSE, FACTORY, ETC.
SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: NAME LOCATION AGE HEIGHT SIZE MICROWAVE_TRANSMISSION OWNER_TYPE RADIO_TRANSMISSION STORAGE TELEVISION_TRANSMISSION USE_TYPE USE_TYPE USER_TYPE
INCLUD: APARTMENT ARENA ART_GALLERY ATHLETIC_CLUB AUDITORIUM BARN BOATHOUSE TOURIST_CABIN CANNERY CATHEDRAL CEMENT_PLANT CHEMICAL_PLANT CHURCH CITY_HALL CLINIC COLLEGE CONVENT COURTHOUSE CREMATORIUM DEPOT DWELLING FACTORY FARM FIRE_LOOKOUT_BUILDING FUNERAL_HOME GARAGE GREENHOUSE HANGAR HOSPITAL HOSTEL HOTEL MOTEL HOUSE JAIL LIBRARY TOURIST_LODGE MARINA MILL MONASTERY MOSQUE MUSEUM OFFICE PENITENTIARY PLANETARIUM PLANT POST_OFFICE PRISON RAILROAD_STORAGE/REPAIR_BUILDING RESEARCH_CENTER ROADHOUSE SANITARIUM SCHOOL SCIENCE_CENTER SHOPPING_CENTER STABLE STATION STORE SYNAGOGUE TEMPLE TERMINAL THEATER TOWN_HALL UNIVERSIY WAREHOUSE MONUMENT SHRINE ARMORY BARRACKS DRILL_HALL FILTRATION_PLANT REFINERY SEWAGE_TREATMENT_PLANT WINDMILL GRAIN_ELEVATOR GRANARY PUMPING_STATION COAST_GUARD_STATION FIRE_STATION FILLING_STATION POLICE_STATION RADAR_STATION RANGER_STATION SIGNAL_STATION AUTOMOBILE_PLANT TELEVISION_STATION
TIDE_STATION PRIMARY_TIDE_STATION SECONDARY_TIDE_STATION LIFE_SAVING_STATION ROCKET_STATION
MARINE_AUTOMATIC_METEROLOGICAL_STATION LIGHT_STATION OFFSHORE_LIGHT_STATION OCEAN_STATION RADIO_STATION RADIOBEACON_MONI
TRANSMITTER_STATION RADIO_DIRECTION_FINDER_STATION AERONAUTICAL_NAVIGATIONAL_RADIO_STATION
ELECTRIC_POWER_GENERATING_STATION ELECTRIC_SUBSTATION TRANSFORMER_STATION

BULKHEAD (INCLUDED TERM 141)
SEE: BREAKWATER/REVETMENT EMBANKMENT

STANDARD FEATURE TERM 17: BUOY
DEFN: A FLOAT MOORED OR ANCHORED IN WATER AS AN AID TO NAVIGATION.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY
ATTRIB: LOCATION SHAPE COLOR SOUND_CHARACTERISTIC LIGHT_CHARACTERISTIC RADIO_SIGNAL_CHARACTERISTIC COLOR_PATTERN NAME HEIGHT WIDTH LIGHTED SIGNAL_INTENSITY SIGNAL_TYPE LIGHT_DISPLAY
INCLUD: BAR_BUOY BELL_BUOY CABLE_BUOY CAN_BUOY CASK_BUOY ANCHORAGE_BUOY BIFURCATION_BUOY ANCHOR_BUOY CHANNEL_MARKER CHECKERED_BUOY CHANNEL_BUOY COMBINATION_BUOY CONICAL_BUOY DAN_BUOY DANGER_BUOY DREDGING_BUOY FAIRWAY_BUOY FISH_NET_BUOY HORN_BUOY ICE_BUOY JUNCTION_BUOY KEG_BUOY LIGHTED_BUOY LIGHTED_SOUND_BUOY LIGHT_FLOAT LIGHTSHIP LIGHT_VESSEL MID_CHANNEL_BUOY MOORING_BUOY NUN_BUOY OBSTRUCTION_BUOY PARTI-COLORED_BUOY PILLAR_BUOY PILOT_LIGHTSHIP QUARANTINE_BUOY RADAR_BUOY RADIOBEACON_BUOY SEA_BUOY RIVER_BUOY SONOBUOY SOUND_BUOY SPAR_BUOY SPECIAL_PURPOSE_BUOY SPOIL_GROUND_BUOY STATION_BUOY SUPER_BUOY SWINGING_BUDY TELEGRAPH_BUOY THERMOBUOY TOPMARK_BUOY TRANSOBUOY TRUMPET_BUOY TRUNK_BUOY TURNING_BUOY WARPING_BUOY WHISTLE_BUOY WINTER_BUOY WRECK_BUOY FLAME_FLOAT MISSISSIPPI_RIVER-TYPE_BUOY BEACON_BUOY

BURN (INCLUDED TERM 142)
SEE: CLEARING

BURNT_OVER_AREA (INCLUDED TERM 143)
SEE: CLEARING

BUSH (INCLUDED TERM 144)
SEE: WOODLAND

BUTTE (INCLUDED TERM 145)
SEE: PLATEAU

CAATINGA (INCLUDED TERM 146)
SEE: WOODLAND

CABLE_BUOY (INCLUDED TERM 147)
SEE: BUOY

STANDARD FEATURE TERM 18: CABLEWAY
DEFN: A CONVEYOR SYSTEM IN WHICH CARRIER UNITS RUN ON WIRE CABLES STRUNG BETWEEN SUPPORTS.
SOURCE: MODIFIED FROM AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION HEIGHT LENGTH OPERATING_SEASON MODE_TRANSPORTED NAME COMPOSITION COVERED PASSENGER_TRANSPORTATION
INCLUD: AERIAL_CABLEWAY' SKI_LIFT AERIAL_CABLEWAY_LINES

CADASTRAL_BOUNDARY (INCLUDED TERM 148)
SEE: BOUNDARY

CADASTRAL_MONUMENT (INCLUDED TERM 149)
SEE: CONTROL_POINT

CAIRN (INCLUDED TERM 150)
SEE: CONTROL_POINT

CAISSON (INCLUDED TERM 151)
SEE: GATE

CALDERA (INCLUDED TERM 152)
SEE: CRATER

CALDRON (INCLUDED TERM 153)
SEE: BASIN

CALIBRATION_RADIOBEACON (INCLUDED TERM 154)
SEE: BEACON

CAMBER (INCLUDED TERM 155)
SEE: HARBOR/BASIN

STANDARD FEATURE TERM 19: CAMPGROUND
DEFN: THE GROUND OR AREA ON WHICH TENTS, HUTS, ETC. ARE ERECTED FOR TEMPORARY SHELTER.
SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: NAME LOCATION
INCLUD: LUMBER_CAMP ARMY_CAMP

CAN_BUOY (INCLUDED TERM 156)
  SEE: BUOY

CANAL (INCLUDED TERM 157)
  SEE: WATERCOURSE
  DEFN: A MANMADE OR ARTIFICIALLY IMPROVED WATERCOURSE CUT THRDUGH A LAND AREA FOR SUCH USES AS NAVIGATION AND IRRIGATION.
  SOURCE: MODIFIED FROM NATIONAL OCEAN SERVICE GLOSSARY, 1985

CANAL_PORT (INCLUDED TERM 158)
  SEE: PORT

CANNERY (INCLUDED TERM 159)
  SEE: BUILDING

CANYON (INCLUDED TERM 160)
  SEE: VALLEY

CANYON_DELTA (INCLUDED TERM 161)
  SEE: DELTA

STANDARD FEATURE TERM 20: CAPE
  DEFN: A RELATIVELY EXTENSIVE LAND AREA JUTTING INTO A WATERBODY, WHICH PROMINENTLY MARKS A CHANGE IN OR INTERRUPTS NOTABLY THE COASTAL TREND OF THAT WATERBODY.
  SOURCE: MODIFIED FROM NAVIGATION DICTIONARY
  ATTRIB: NAME LOCATION SHAPE WIDTH LENGTH
  INCLUD: FORELAND PROMONTORY WINGED_HEADLAND HEADLAND HEAD TONGUE POINT HOOK PEAK NECK PENINSULA

CARLINE (INCLUDED TERM 162)
  SEE: RAILWAY

CART_TRACK (INCLUDED TERM 163)
  SEE: ROAD

CASCADE (INCLUDED TERM 164)
  SEE: WATERFALL

CASK_BUOY (INCLUDED TERM 165)
  SEE: BUOY

CATARACT (INCLUDED TERM 166)
  SEE: RAPIDS

STANDARD FEATURE TERM 21: CATCH BASIN
  DEFN: A TANK OR RESERVOIR DESIGNED TO RECEIVE RAINWATER; IT IS NOT TO BE CONFUSED WITH CATCHMENT
  SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING, DRAFT STANDARDS
  ATTRIB: LOCATION COMPOSITION WIDTH DEPTH COVERED

STANDARD FEATURE TERM 22: CATCHMENT
  DEFN: AN AREA DRAINED BY A SINGLE RIVER; A NATURAL DRAINAGE AREA WHICH MAY COINCIDE WITH A RIVER BASIN, IN WHICH THE DIVIDES DIRECT THE WATER FROM THE RAINFALL AND PERCOLATION INTO A RIVER. HOWEVER WHERE UNDERGROUND FLOW IS INVOLVED THE C. MAY BE LARGER OR SMALLER THAN THAT THAT MAY BE APPARENT FROM THE SURFACE RELIEF.
  SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE
  ATTRIB: LOCATION AREA FLOOD_CONTROL

CATHEDRAL (INCLUDED TERM 167)
SEE: BUILDING

CATTLE_GATE (INCLUDED TERM 168)
SEE: GATE

CATTLE_UNDERPASS (INCLUDED TERM 169)
SEE: TUNNEL

CAUSEWAY (INCLUDED TERM 170)
SEE: ROAD

STANDARD FEATURE TERM 23: CAVE
DEFN: NATURALLY FORMED, SUBTERRANEAN OPEN AREA OR CHAMBER.
SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: AREA DEPTH WIDTH CHAMBERS_NUMBER_OF NAME LOCATION AIR/LAND/WATER
INCLUD: CAVERN GROTTO NOTCH

CAVERN (INCLUDED TERM 171)
SEE: CAVE

CAY/KEY (INCLUDED TERM 172)
SEE: ISLAND

CEJA (INCLUDED TERM 173)
SEE: CLIFF

CEMENT_PLANT (INCLUDED TERM 174)
SEE: BUILDING

STANDARD FEATURE TERM 24: CEMETERY
DEFN: A PLACE FOR BURYING THE DEAD
SOURCE: AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION NAME
INCLUD: GRAVEYARD

CENTER_LINE (INCLUDED TERM 175)
SEE: BEARING_LINE

CERRITO (INCLUDED TERM 176)
SEE: MOUNT

CERRO (INCLUDED TERM 177)
SEE: MOUNT/RIDGE

CHANARAL (INCLUDED TERM 178)
SEE: WOODLAND

CHANNEL (INCLUDED TERM 179)
SEE: WATERCOURSE/LANE
SOURCE: GNIS DOCUMENTATION, APPENDIX B

CHANNEL_BUOY (INCLUDED TERM 180)

SEE: BUOY

CHANNEL_LIGHT (INCLUDED TERM 181)
SEE: BEACON

CHANNEL_MARKER (INCLUDED TERM 182)
SEE: BUOY

CHAPARRAL (INCLUDED TERM 183)
SEE: WOODLAND

CHAPEIRAO (INCLUDED TERM 184)
SEE: PINNACLE

CHART_DATUM (INCLUDED TERM 185)
SEE: SOUNDING

CHARTED_DEPTH (INCLUDED TERM 186)
SEE: SOUNDING

CHASM (INCLUDED TERM 187)
SEE: VALLEY

CHECKERED_BUOY (INCLUDED TERM 188)
SEE: BUOY

CHEMICAL_PLANT (INCLUDED TERM 189)
SEE: BUILDING

CHIMNEY (INCLUDED TERM 190)
SEE: TOWER

CHURCH (INCLUDED TERM 191)
SEE: BUILDING

CINDER_CONE (INCLUDED TERM 192)
SEE: MOUNT

CIRCULAR_BEACON (INCLUDED TERM 193)
SEE: BEACON

STANDARD FEATURE TERM 25: CIRQUE
DEFN: (MODIFIED)A DEEP HOLLOW IN A MOUNTAIN SIDE WHICH HAS BEEN ERODED AND SHAPED BY THE MOVEMENT OF SNOW AND ICE. THE WALLS ARE STEEP ALL ROUND.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING

CITY (INCLUDED TERM 194)
SEE: PLACE

CITY_HALL (INCLUDED TERM 195)
SEE: BUILDING

CLEARED_AREA (INCLUDED TERM 196)

SEE: CLEARING

STANDARD FEATURE TERM 26: CLEARING
DEFN: AN OPEN AREA IN A FOREST.
SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION ELEVATION AGE AREA NATURAL/ARTIFICIALLY_IMPROVED/MANMADE SPECIES_REMOVED PREDOMINANT_SPECIES NAME FIRE_LINE SPECIES WIDTH
INCLUD: CLEARED_AREA BALD GLADE BURN BURNT_OVER_AREA FIREBREAK FIRE_LINE LOGGED_AREA CUT_LINE

CLEARING_BEARING (INCLUDED TERM 197)
SEE: BEARING_LINE

CLEARING_LINE (INCLUDED TERM 198)
SEE: BEARING_LINE

STANDARD FEATURE TERM 27: CLIFF
DEFN: A HIGH, STEEP, OR OVERHANGING FACE OF ROCK.
SOURCE: AMERICAN HERITAGE DICTIONARY
ATTRIB: ELEVATION SLOPE COMPOSITION LOCATION NAME HEIGHT LENGTH
INCLUD: BLUFF CEJA CRAG ICE_CLIFF ESCARPMENT BEACH_SCARP PRECIPICE SCAW PALISADE SCARP SCAR MARINE_CLIFF

CLINIC (INCLUDED TERM 199)
SEE: BUILDING

CLOSED_BAY (INCLUDED TERM 200)
SEE: INLET

CLOSED_SEA (INCLUDED TERM 201)
SEE: SEA

CLOVER_LEAF_INTERCHANGE (INCLUDED TERM 202)
SEE: INTERSECTION

CO-RANGE_LINE (INCLUDED TERM 203)
SEE: CONTOUR_LINE

STANDARD FEATURE TERM 28: COAST
DEFN: THE GENERAL REGION OF INDEFINITE WIDTH THAT EXTENDS FROM THE SEA INLAND TO THE FIRST MAJOR CHANGE IN TERRAIN FEATURES.
SOURCE: U.S. NAVAL OCEANOGRAPHIC OFFICE GLOSSARY OF OCEANOGRAPHIC TERMS
ATTRIB: NAME LOCATION
INCLUD: COASTAL_AREA SEA_COAST RIVAGE COASTAL_PLAIN

COAST_GUARD_STATION (INCLUDED TERM 204)
SEE: STATION/BUILDING

COAST_GUARD_LINES (INCLUDED TERM 205)
SEE: BOUNDARY

COASTAL_AREA (INCLUDED TERM 206)
SEE: COAST

COASTAL_PLAIN (INCLUDED TERM 207)
SEE: PLAIN/COAST

COASTLINE (INCLUDED TERM 208)
SEE: SHORELINE

CODE_BEACON (INCLUDED TERM 209)
SEE: BEACON

COL (INCLUDED TERM 210)
SEE: GAP

COLLEGE (INCLUDED TERM 211)
SEE: BUILDING

COLOR_GRADIENT (INCLUDED TERM 212)
SEE: RELIEF

COLORED_LIGHT (INCLUDED TERM 213)
SEE: BEACON

COMBINATION_BUOY (INCLUDED TERM 214)
SEE: BUOY

COMMUNITY (INCLUDED TERM 215)
SEE: PLACE

COMPASS_BEARING (INCLUDED TERM 216)
SEE: BEARING_LINE

COMPASS_DEVIATION (INCLUDED TERM 217)
SEE: BEARING_LINE

COMPASS_DIRECTION (INCLUDED TERM 218)
SEE: BEARING_LINE

COMPASS_MAGNETIC_VARIATION (INCLUDED TERM 219)
SEE: BEARING_LINE

COMPASS_VARIATION (INCLUDED TERM 220)
SEE: BEARING_LINE

CONICAL_BUOY (INCLUDED TERM 221)
SEE: BUOY

CONIFEROUS_FOREST (INCLUDED TERM 222)
SEE: WOODLAND

CONSERVATION_AREA (INCLUDED TERM 223)
SEE: PARK

CONTINENTAL_GLACIER (INCLUDED TERM 224)
SEE: ICE_FIELD

CONTINENTAL_ICE (INCLUDED TERM 225)
SEE: ICE_FIELD

CONTINUOUS_RADIOBEACON (INCLUDED TERM 226)
SEE: BEACON

CONTOUR (INCLUDED TERM 227)
SEE: CONTOUR_LINE

CONTOUR_INTERVAL (INCLUDED TERM 228)
SEE: RELIEF

STANDARD FEATURE TERM 29: CONTOUR LINE
DEFN: A LINE CONNECTING POINTS OF EQUAL ELEVATION OR EQUAL DEPTH.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY.
ATTRIB: NAME ABOVE/BELOW_SEA_LEVEL UNIT_OF_MEASUREMENT APPROXIMATE/EXACT_MEASUREMENT ELEVATION/DEPRESSION
INCLUD: DEPTH_CONTOUR FATHOM_CURVE FORM_LINE CONTOUR APPROXIMATE_CONTOUR AUXILIARY_CONTOUR DEPRESSION_CONTOUR
FORM_LINE_CONTOUR_(LAND) FORM_LINE_CONTOUR_(GLACIER,_ICEFIELD,_SNOWFIELD) INDEX_CONTOUR INTERMEDIATE_CONTOUR
DEPTH_CURVE ISOBATH CO-RANGE_LINE ISOHYPSE

STANDARD FEATURE TERM 30: CONTROL POINT
DEFN: A SURVEYED POINT OF KNOWN ALTITUDE AND/OR LATITUDE AND LONGITUDE.
SOURCE: NEW DEFINITION
ATTRIB: LOCATION PHYSICAL CONSTRUCTION_MATERIAL ALTITUDE HORIZONTAL/VERTICLE ELEVATION
INCLUD: VERTICAL_CONTROL_POINT BENCH_MARK VERTICAL_CONTROL_MONUMENT HORIZONTAL_CONTROL_POINT HORIZONTAL_CONTRDL_MONUMENT
PHOTOGRAMMETRIC_HORIZONTAL_CONTROL_POINT CONTROL_SURVEY_MONUMENT CADASTRAL_MONUMENT BOUNDARY_MONUMENT
SURVEY_MONUMENT MONUMENTED_CONTROL_POINT WAY_POINT STONE_MOUND_MONUMENT CAIRN

CONTROL_SURVEY_MONUMENT (INCLUDED TERM 229)
SEE: CONTROL_POINT

CONTROL_TOWER (INCLUDED TERM 230)
SEE: TOWER

CONTROLLED_ACCESS_ROAD (INCLUDED TERM 231)
SEE: ROAD

CONTROLLED_AERODROME (INCLUDED TERM 232)
SEE: AIRPORT

CONTROLLING_DEPTH (INCLUDED TERM 233)
SEE: SOUNDING

CONVENT (INCLUDED TERM 234)
SEE: BUILDING

COPSE (INCLUDED TERM 235)
SEE: WOODLAND

CORAL_HEAD (INCLUDED TERM 236)
SEE: PINNACLE

CORAL_REEF (INCLUDED TERM 237)
SEE: REEF

CORDUROY_ROAD (INCLUDED TERM 238)

SEE: ROAD

COULEE (INCLUDED TERM 239)
SEE: VALLEY/WATERCOURSE

COURSE_LINE (INCLUDED TERM 240)
SEE: BEARING_LINE

COURTHOUSE (INCLUDED TERM 241)
SEE: BUILDING

COVE (INCLUDED TERM 242)
SEE: INLET

COVERED_BRIDGE (INCLUDED TERM 243)
SEE: BRIDGE

CRAG (INCLUDED TERM 244)
SEE: CLIFF/PINNACLE

STANDARD FEATURE TERM 31: CRATER
SEE: BASIN
DEFN: CIRCULAR-SHAPED DEPRESSION AT THE SUMMIT OF A VOLCANIC CONE OR ON THE SURFACE OF THE LAND CAUSED BY THE IMPACT OF A METEORITE; A MANMADE DEPRESSION CAUSED BY AN EXPLOSION.
SOURCE: GNIS DOCUMENTATION, APPENDIX B, FEATURE CLASS DEFINITIONS
INCLUD: CALDERA

CREEK (INCLUDED TERM 245)
SEE: STREAM
DEFN: A STREAM OF LESS VOLUME THAN A RIVER BUT LARGER THAN A BROOK. A SMALL TIDAL CHANNEL THROUGH A COASTAL MARSH.
SOURCE: NAVIGATION DICTIONARY, U.S. OCEANOGRAPHIC OFFICE

CREMATORIUM (INCLUDED TERM 246)
SEE: BUILDING

CREST (INCLUDED TERM 247)
SEE: RIDGE

CREVASSE (INCLUDED TERM 248)
SEE: VALLEY

CRIB (INCLUDED TERM 249)
SEE: MOORING

STANDARD FEATURE TERM 32: CROP LAND
DEFN: LAND THAT HAS BEEN PLOWED OR OTHERWISE CULTIVATED.
SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION CROP_GROWN GROWING_PATTERNS AREA GROWING_SEASON IRRIGATED NAME ACIDITY COMMERCIAL ELEVATION ENCLOSED FALLOW GRAZING LATITUDINAL_ZONE MINERAL_CONTENT PREDOMINANT_SPECIES TREE_COVER
INCLUD: FIELD CULTIVATED_FIELD CULTIVATED_AREA ORCHARD VINEYARD GARDEN MARKET_GARDEN TRUCK_FARM TRUCK_GARDEN PADDY_FIELD

CROSS_LINES (INCLUDED TERM 250)
SEE: SOUNDING

CROSSING (INCLUDED TERM 251)
SEE: INTERSECTION

CROSSING_GATE (INCLUDED TERM 252)
SEE: GATE

CUESTA (INCLUDED TERM 253)
SEE: RIDGE/MOUNT

CUL_DE_SAC (INCLUDED TERM 254)
SEE: ROAD/LEAD

CULTIVATED_FIELD (INCLUDED TERM 255)
SEE: CROP_LAND
DEFN: (NEW)AN EXPANSE OF LAND THAT HAS BEEN PLOWED OR PREPARED FOR RAISING CROPS.

CULTIVATED_AREA (INCLUDED TERM 256)
SEE: CROP_LAND

CUSPATE_BAR (INCLUDED TERM 257)
SEE: BAR

CUSPATE_SPIT (INCLUDED TERM 258)
SEE: BAR

CUT (INCLUDED TERM 259)
SEE: GAP/WATERCOURSE

CUT_LINE (INCLUDED TERM 260)
SEE: CLEARING

CUT_OFF (INCLUDED TERM 261)
SEE: WATERCOURSE
DEFN: A NEW AND RELATIVELY SHORT CHANNEL FORMED WHEN A STREAM CUTS THROUGH THE NECK OF AN OXBOW OR HORSESHOE BEND; AN ARTIFICIAL STRAIGHTENING OR SHORTCUT IN A CHANNEL.
SOURCE: NATIONAL OCEAN SERVICE GLOSSARY, 1985

DALE (INCLUDED TERM 262)
SEE: VALLEY

STANDARD FEATURE TERM 33: DAM
DEFN: A BARRIER CONSTRUCTED ACROSS A WATERCOURSE TO CONTROL THE FLOW OR RAISE THE LEVEL OF WATER.
SOURCE: AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION NAME CONSTRUCTION MATERIAL DISCHARGE FLOOD_CONTROL HYDROELECTRIC_POWER IRRIGATION LIGHTED
INCLUD: BARRAGE WEIR BEAVER_DAM

DAN_BUOY (INCLUDED TERM 263)
SEE: BUOY

STANDARD FEATURE TERM 34: DANGER AREA
DEFN: A SPECIFIED AREA ABOVE, BELOW, OR WITHIN WHICH THERE MAY EXIST POTENTIAL DANGER.
SOURCE: NATIONAL OCEAN SERVICE DRAFT GLOSSARY
ATTRIB: LOCATION AREA AIR LAND WATER AREA NAME

INCLUD: PROHIBITED_AREA PROHIBITED_FLYING_AREA RESTRICTED_AREA RESTRICTED_WATERS

DANGER_BUOY (INCLUDED TERM 264)
SEE: BUOY

DANGER_SOUNDINGS (INCLUDED TERM 265)
SEE: SOUNDING

DANGEROUS_WRECK (INCLUDED TERM 266)
SEE: WRECK

DANGEROUS_ROCK (INCLUDED TERM 267)
SEE: ROCK

DAYBEACON (INCLUDED TERM 268)
SEE: BEACON

DEAD_END_STREET (INCLUDED TERM 269)
SEE: ROAD

DECIDUOUS_FOREST (INCLUDED TERM 270)
SEE: WOODLAND

DEEP (INCLUDED TERM 271)
SEE: TROUGH

DEFILE (INCLUDED TERM 272)
SEE: GAP/VALLEY

DELL (INCLUDED TERM 273)
SEE: VALLEY

STANDARD FEATURE TERM 35: DELTA
DEFN: A TRACT OF ALLUVIUM FORMED AT THE MOUTH OF A RIVER WHERE THE DEPOSITION OF SOME OF ITS LOAD EXCEEDS ITS RATE OF REMOVAL, CROSSED BY THE DIVERGENT CHANNELS (DISTRIBUTATIES) OF THE RIVER. ....
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE
ATTRIB: LOCATION WIDTH DISCHARGE NAVIGABLE
INCLUD: BAY_DELTA CANYON_DELTA FAN_DELTA FAN OUTWASH_PLAIN

DELTA_MORAINE (INCLUDED TERM 274)
SEE: MORAINE

DEPOT (INCLUDED TERM 275)
SEE: BUILDING

DEPRESSION (INCLUDED TERM 276)
SEE: BASIN/VALLEY/HOLE

DEPRESSION_CONTOUR (INCLUDED TERM 277)
SEE: CONTOUR_LINE

DEPTH (INCLUDED TERM 278)
SEE: SOUNDING

DEPTH_CONTOUR (INCLUDED TERM 279)
SEE: CONTOUR_LINE

DEPTH_CURVE (INCLUDED TERM 280)
SEE: CONTOUR_LINE

STANDARD FEATURE TERM 36: DESERT
DEFN: A REGION RENDERED BARREN OR PARTIALLY BARREN BY ENVIRONMENTAL EXTREMES, ESPECIALLY BY LOW RAINFALL.
SOURCE: AMERICAN HERITAGE DICTIONARY
ATTRIB: NAME LOCATION LATITUDINAL_ZONE AREA

DIAMOND_INTERSECTION (INCLUDED TERM 281)
SEE: INTERSECTION

DIRECTIONAL_BEACON (INCLUDED TERM 282)
SEE: BEACON

DIRECTIONAL_ANTENNA (INCLUDED TERM 283)
SEE: ANTENNA

DISMAL (INCLUDED TERM 284)
SEE: WETLAND

DISPLAY_SIGN (INCLUDED TERM 285)
SEE: SIGN

DISPOSAL_AREA (INCLUDED TERM 286)
SEE: DUMPING_GROUND

DISPOSAL_BED (INCLUDED TERM 287)
SEE: DUMPING_GROUND

DISTRIBUTARY (INCLUDED TERM 288)
SEE: WATERCOURSE
DEFN: A WATERCOURSE BRANCHING FROM ANOTHER IN THE DIRECTION OF THE WATERFLOW, PARTICULARLY IF IT DOES NOT REJOIN FARTHER DOWN.
SOURCE: MODIFIED FROM COASTAL LANDFORMS AND SURFACE FEATURES, SNEAD

DITCH (INCLUDED TERM 289)
SEE: WATERCOURSE
DEFN: A TRENCH DUG IN THE EARTH, AS FOR DRAINAGE OR IRRIGATION.
SOURCE: OHIO STATE PRELIMINARY LIST (INCLUDES B, F, AND H)

DIVIDED_HIGHWAY (INCLUDED TERM 290)
SEE: ROAD

STANDARD FEATURE TERM 37: DOCK
DEFN: THE SLIP OR WATERWAY BETWEEN TWO PIERS, OR CUT INTO THE LAND FOR THE BERTHING OF SHIPS. ALSO CALLED SLIP.
SOURCE: NAVIGATION DICTIONARY, U.S. NAVAL OCEANOGRAPHIC OFFICE
INCLUD: SLIP FERRY_SITE_SLIP WETDOCK DRYDOCK DRY_DOCK GRAVING_DOCK FLOATING_DOCK

DOCKYARD (INCLUDED TERM 291)
SEE: SHIPYARD

DOLPHIN (INCLUDED TERM 292)
SEE: MOORING

DOME (INCLUDED TERM 293)
SEE: MOUNT

DOMINION_LAND_SURVEY (INCLUDED TERM 294)
SEE: GRID

DOUBLE_TRACK_RAILWAY (INCLUDED TERM 295)
SEE: RAILWAY

DOWN (INCLUDED TERM 296)
SEE: GRASSLAND

DOWNLAND (INCLUDED TERM 297)
SEE: GRASSLAND

DOWNS (INCLUDED TERM 298)
SEE: GRASSLAND

DRAIN (INCLUDED TERM 299)
SEE: WATERCOURSE
DEFN: AN ARTIFICIAL WATERCOURSE FOR CARRYING OFF EXCESS WATER FROM LOW-LYING AREAS.
SOURCE: MODIFIED FROM OHIO STATE PRELIMINARY (INCLUDES GNIS, CANADIAN COUNCIL, AND AMERICAN HERITAGE DICTIONARY)

DRAW (INCLUDED TERM 300)
SEE: WATERCOURSE
DEFN: A SMALL, NATURAL WATERCOURSE OR GULLY, GENERALLY SHALLOW OR MORE OPEN THAN A RAVINE; A TROUGHLIKE DEPRESSION LEADING UP FROM A VALLEY TO A GAP BETWEEN TWO HILLS.
SOURCE: CANADIAN COUNCIL ON SURVEYING AD MAPPING DRAFT REPORT, VOL. 1,STANDARDS FOR THE CLASSIFICATION OF TOPOGRAPHIC FEATURES

DRAW_BRIDGE (INCLUDED TERM 301)
SEE: BRIDGE

DREDGING_BUOY (INCLUDED TERM 302)
SEE: BUOY

DRIFT (INCLUDED TERM 303)
SEE: MORAINE

DRILL_HALL (INCLUDED TERM 304)
SEE: MILITARY_INSTALLATION/BUILDING

DRIVE-IN_THEATER (INCLUDED TERM 305)
SEE: OUTDOOR_THEATER

DRIVEWAY (INCLUDED TERM 306)
SEE: ROAD

DROWNED_VALLEY (INCLUDED TERM 307)
SEE: VALLEY

DRUMLIN (INCLUDED TERM 308)
SEE: MOUNT/RIDGE

DRY_DOCK (INCLUDED TERM 309)
SEE: DOCK

DRY_HARBOR (INCLUDED TERM 310)
SEE: HARBOR

DRYDOCK (INCLUDED TERM 311)
SEE: DOCK

DUAL_HIGHWAY (INCLUDED TERM 312)
SEE: ROAD

DUMP (INCLUDED TERM 313)
SEE: DUMPING_GROUND

DUMP_SITE (INCLUDED TERM 314)
SEE: DUMPING_GROUND

STANDARD FEATURE TERM 38: DUMPING_GROUND
DEFN: AREA DESIGNATED FOR DUMPING VARIOUS TYPES OF MATERIALS.
SOURCE: MODIFIED FROM NAUTICAL CHART MANUAL
ATTRIB: LOCATION AREA WASTE_MATERIAL WATER_DEPTH SALINITY NAME AIR/LAND/WATER MINERAL_CONTENT
INCLUD: SPOIL_GROUND SPOIL_AREA DISPOSAL_AREA DUMP_SITE SPOIL_BANKS DISPOSAL_BED DUMP LIQUID_WASTE_DISPOSAL_AREA TAILING_PILE TAILING_POND TAILING_DUMP SLAG_HEAP

DWELLING (INCLUDED TERM 315)
SEE: BUILDING

DYKE/DIKE (INCLUDED TERM 316)
SEE: EMBANKMENT

ECOLOGICAL_AREA (INCLUDED TERM 317)
SEE: PARK

EDDY (INCLUDED TERM 318)
SEE: CURRENT

ELECTRIC_POWER_GENERATING_STATION (INCLUDED TERM 319)
SEE: STATION/BUILDING
DEFN: AN INDUSTRIAL BUILDING USED TO PRODUCE ELECTRIC POWER.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING

ELECTRICAL_TOWER (INCLUDED TERM 320)
SEE: TOWER

ELECTRICAL_SUBSTATION (INCLUDED TERM 321)

ELEVATED_HIGHWAY (INCLUDED TERM 322)
SEE: ROAD

STANDARD FEATURE TERM 39: EMBANKMENT
DEFN: A RAISED STRUCTURE OF EARTH, GROUND, ETC. USED TO HOLD BACK WATER OR OTHER FLUIDS.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION LENGTH HEIGHT CONSTRUCTION_MATERIAL WIDTH NATURAL ARTIFICIALLY_IMPROVED NAME
INCLUD: DYKE/DIKE LEVEE SEA_WALL BULKHEAD

END_MORAINE (INCLUDED TERM 323)
SEE: RIDGE

ENTRANCE_LOCK (INCLUDED TERM 324)
SEE: LOCK

ENTREPOT (INCLUDED TERM 325)
SEE: PORT

EQUATORIAL_FOREST (INCLUDED TERM 326)
SEE: WOODLAND

EQUATORIAL_RAIN_FOREST (INCLUDED TERM 327)
SEE: WOODLAND

ESCARPMENT (INCLUDED TERM 328)
SEE: CLIFF

ESKER (INCLUDED TERM 329)
SEE: RIDGE

ESTUARY (INCLUDED TERM 330)
SEE: INLET/MOUTH

EVERGLADE (INCLUDED TERM 331)
SEE: WETLAND

EXCAVATION (INCLUDED TERM 332)
SEE: MINE/HOLE

STANDARD FEATURE TERM 40: EXHIBITION GROUND
DEFN: A PUBLIC AREA CONTAINING BUILDINGS, PADDOCKS ETC. FOR THE DISPLAY OF LIVESTOCK, AGRICULTURAL PRODUCE, MACHINERY, ETC.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION NAME
INCLUD: FAIRGROUND

EXPRESSWAY (INCLUDED TERM 333)
SEE: ROAD

FACTORY (INCLUDED TERM 334)
SEE: BUILDING

FAIRGROUND (INCLUDED TERM 335)
SEE: EXHIBITION_GROUND

FAIRWAY (INCLUDED TERM 336)
SEE: WATERCOURSE/LANE

DEFN: THE MAIN TRAVELED PART OF A WATERWAY; A MARINE THOROUGHFARE.
SOURCE: NAVIGATION DICTIONARY

FAIRWAY_BUOY (INCLUDED TERM 337)
SEE: BUOY

FALLS (INCLUDED TERM 338)
SEE: WATERFALL

FAN (INCLUDED TERM 339)
SEE: DELTA

FAN_DELTA (INCLUDED TERM 340)
SEE: DELTA

FAN_MARKER_BEACON (INCLUDED TERM 341)
SEE: BEACON

STANDARD FEATURE TERM 41: FARM
DEFN: (MODIFIED) A TRACT OF CROP LAND, AS WELL AS THE GROUP OF BUILDINGS WITH AND OFTEN SURROUNDING A FARMHOUSE, INCLUDING BARNS, SHEDS, AND OTHER OUTBUILDINGS.
SOURCE: AMERICAN HERITAGE DICTIONARY

FARM_LANE (INCLUDED TERM 342)
SEE: ROAD

FATHOM_CURVE (INCLUDED TERM 343)
SEE: CONTOUR_LINE

FEN (INCLUDED TERM 344)
SEE: WETLAND

FENCE (INCLUDED TERM 345)
SEE: BARRIER/BOUNDARY

FERRY (INCLUDED TERM 346)
SEE: WHARF/PIER

FERRY/HOVERCRAFT/HYDROFOIL_TERMINAL/STATION (INCLUDED TERM 347)
SEE: DOCK

FERRY_CROSSING (INCLUDED TERM 348)
SEE: LANE

FERRY_SITE/SLIP (INCLUDED TERM 349)
SEE: DOCK

FERRY_TERMINAL (INCLUDED TERM 350)
SEE: PORT/DOCK

FIELD (INCLUDED TERM 351)
SEE: CROP_LAND/GRASSLAND

FILLING_STATION (INCLUDED TERM 352)
SEE: BUILDING/STATION

FILTRATION_PLANT (INCLUDED TERM 353)
SEE: BUILDING

FIRE_LINE (INCLUDED TERM 354)
SEE: CLEARING

FIRE_LOOKOUT_TOWER (INCLUDED TERM 355)
SEE: TOWER

FIRE_LOOKOUT-BUILDING (INCLUDED TERM 356)
SEE: BUILDING

FIRE_ROAD (INCLUDED TERM 357)
SEE: ROAD

FIRE_STATION (INCLUDED TERM 358)
SEE: BUILDING/STATION

FIRE_TOWER (INCLUDED TERM 359)
SEE: TOWER

FIREBREAK (INCLUDED TERM 360)
SEE: CLEARING

FIRTH (INCLUDED TERM 361)
SEE: INLET
DEFN: A LONG NARROW INLET OF THE SEA. FJORD, (FIORD)
SOURCE: THE AMERICAN HERITAGE DICTIONARY

STANDARD FEATURE TERM 42: FISH HATCHERY
DEFN: A FACILITY USED FOR THE SPAWNING OF FISH WHICH ARE SUBSEQUENTLY USED TO STOCK LAKES AND STREAMS.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION NAME SPECIES CAPACITY
INCLUD: FISHERY

FISH_HAVEN (INCLUDED TERM 362)
SEE: FISHING_GROUND

STANDARD FEATURE TERM 43: FISH LADDER
DEFN: A FACILITY CONSISTING OF A SERIES OF SMALL POOLS EACH ONE SLIGHTLY HIGHER THAN THE PRECEEDING, BUILD AROUND A DAM TO ENABLE FISH TO MAKE THEIR WAY UPSTREAM.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION LENGTH SPECIES_SERVED SEASON_USED WIDTH NAME

FISH_NET_BUOY (INCLUDED TERM 363)
SEE: BUOY

FISH_POUND (INCLUDED TERM 364)
SEE: FISH_TRAP

STANDARD FEATURE TERM 44: FISH TRAP
DEFN: A DEVICE USED TO CATCH FISH.
SOURCE: NEW DEFINITIDN
ATTRIB: LOCATIDN NAME SEASON_USED PREDOMINANT_SPECIES_TRAPPED SALINITY LENGTH WIDTH
INCLUD: FISH_POUND FISHING_STAKES WEIR TUNNY_NETS STAKE_NET

FISH_TRAP_AREA (INCLUDED TERM 365)
SEE: FISHING_GROUND

FISHERY (INCLUDED TERM 366)
SEE: FISHING_GROUND/FISH_HATCHERY

STANDARD FEATURE TERM 45: FISHING GROUND
DEFN: A WATER AREA IN WHICH FISHING IS FREQUENTLY CARRIED ON.
SOURCE: MODIFIED FRDM NAVIGATION DICTIONARY
ATTRIB: LOCATION PREDOMINANT_SPECIES SEASONAL_LIMITS AREA SALINITY ARTIFICIALLY_IMPRDVED/MANMADE/NATURAL NAME
INCLUD: FISHERY FISH_TRAP_AREA DYSTER_BED FISH_HAVEN FISHING_ZDNE

FISHING_STAKES (INCLUDED TERM 367)
SEE: FISH_TRAP

FISHING_ZONE (INCLUDED TERM 368)
SEE: FISHING_GRDUND

FIXED_AND_FLASHING_LIGHT (INCLUDED TERM 369)
SEE: BEACDN

FIXED_AND_GROUP_FLASHING_LIGHT (INCLUDED TERM 370)
SEE: BEACDN

FIXED_LIGHT (INCLUDED TERM 371)
SEE: BEACON

FJORD (INCLUDED TERM 372)
SEE: INLET
DEFN: A LONG NARROW ARM OF THE SEA, RUNNING UP BETWEEN HIGH BANKS OR CLIFFS, AS ON THE COAST OF NORWAY. DFTEN HAS RELATIVELY SHALLOW SILL ACROSS ITS ENTRANCE.
SOURCE: NATIONAL OCEAN SERVICE GLOSSARY, 1985

FLAG_TDWER (INCLUDED TERM 373)
SEE: TDWER

FLAME_FLOAT (INCLUDED TERM 374)
SEE: BUOY

FLASHING_LIGHT (INCLUDED TERM 375)
SEE: BEACON

STANDARD FEATURE TERM 46: FLAT
DEFN: A LEVEL TRACT LYING AT A SMALL DEPTH BELDW THE SURFACE OF WATER, OR ALTERNATELY COVERED AND LEFT BARE BY THE TIDE.
SDURCE: NAUTICAL CHART MANUAL, U.S. DEPT. DF CDMMERCE, NATIDNAL DCEAN SURVEY
INCLUD: TIDAL_FLAT BARRIER_FLAT

FLDATING_BREAKWATER (INCLUDED TERM 376)
SEE: BREAKWATER

FLOATING_DOCK (INCLUDED TERM 377)
SEE: DOCK

FLOATING_MARSH (INCLUDED TERM 378)
SEE: WETLAND

FLOEBERG (INCLUDED TERM 379)
SEE: ICEBERG

STANDARD FEATURE TERM 47: FLOOD PLAIN
DEFN: (MODIFIED)AN AREA ADJACENT TO A STREAM CHANNEL WHICH IS SUBJECT TO PERIODIC FLOODING.
SOURCE: A DICTIONARY OF BASIC GEOGRAPHY, SCHMIEDER, GRIFFIN, CHATHAM, NATOLI

FLOODGATE (INCLUDED TERM 380)
SEE: GATE

FLUME (INCLUDED TERM 381)
SEE: WATERCOURSE
DEFN: AN ARTIFICIAL STREAM CHANNEL CONSTRUCTED FOR INDUSTRIAL PURPOSES; TO PROVIDE POWER FOR WATER, TO FLOAT LOGS AND FOR WATER SUPPLY. USED IN PARTS OF U.S.A. FOR A NARROW RAVINE OR GORGE.
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE

FOG_SIGNAL (INCLUDED TERM 382)
SEE: BEACON

FOOTBRIDGE (INCLUDED TERM 383)
SEE: BRIDGE

FOOTHILL (INCLUDED TERM 384)
SEE: MOUNT

FOOTPATH (INCLUDED TERM 385)
SEE: ROAD

FORCES_BASE (INCLUDED TERM 386)
SEE: MILITARY_INSTALLATION

FORD (INCLUDED TERM 387)
SEE: WATERCOURSE
DEFN: THE SHALLOW PART OF A RIVER WHICH CAN BE EASILY CROSSED
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE

FOREDEEP (INCLUDED TERM 388)
SEE: TROUGH

FORELAND (INCLUDED TERM 389)
SEE: CAPE

FORESHORE (INCLUDED TERM 390)
SEE: SHORE

FORESHORE_FLATS (INCLUDED TERM 391)
SEE: BEACH

FOREST (INCLUDED TERM 392)
SEE: WOODLAND

FOREST_RESERVE (INCLUDED TERM 393)
SEE: PARK

FORK (INCLUDED TERM 394)
SEE: STREAM
DEFN: ONE OF THE MAJOR BIFURCATIONS OF A STREAM. ALSO CALLED A BRANCH.
SOURCE: NAVIGATION DICTIONARY, U.S. NAVAL OCEANOGRAPHIC OFFICE

FORM_LINE (INCLUDED TERM 395)
SEE: CONTOUR_LINE

FORM_LINE_CONTOUR(LAND) (INCLUDED TERM 396)
SEE: CONTOUR_LINE

FORM_LINE_CONTOUR(GLACIER, ICEFIELD, SNOWFIELD) (INCLUDED TERM 397)
SEE: CONTOUR_LINE

FORT (INCLUDED TERM 398)
SEE: MILITARY_INSTALLATION

FREEWAY (INCLUDED TERM 399)
SEE: ROAD

FRINGING_REEF (INCLUDED TERM 400)
SEE: REEF

STANDARD FEATURE TERM 48: FUMAROLE
DEFN: A HOLE IN THE EARTH'S CRUST FROM WHICH STEAM AND GASES ARE EMITTED UNDER PRESSURE
SOURCE: ADAPTED FROM MOORE, A DICTIONARY OF GEOGRAPHY
ATTRIB: LOCATION GAS_EMITTED_TYPE

FUNERAL_HOME (INCLUDED TERM 401)
SEE: BUILDING

STANDARD FEATURE TERM 49: GAP
DEFN: LOW POINT OR OPENING BETWEEN HILLS OR MOUNTAINS OR IN A RIDGE OR MOUNTAIN RANGE.
SOURCE: GNIS DOCUMENTATION, APPENDIX B
ATTRIB: LOCATION ELEVATION SHAPE SLOPE WIDTH AREA
INCLUD: ARCH DEFILE NOTCH PASS SADDLE COL SILL CUT

GARAGE (INCLUDED TERM 402)
SEE: BUILDING/VEHICLE_STORAGE

GARDEN (INCLUDED TERM 403)
SEE: CROP_LAND

GARIGUE (INCLUDED TERM 404)

SEE: WOODLAND

GAS_FIELD (INCLUDED TERM 405)
SEE: OIL_FIELD

GASOMETER (INCLUDED TERM 406)
SEE: TANK

STANDARD FEATURE TERM 50: GATE
DEFN: A STRUCTURE THAT MAY BE SWUNG, DRAWN, OR LOWERED TO BLOCK AN ENTRANCE OR PASSAGEWAY.
SOURCE: AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION RELATED_FEATURE NAME WIDTH LENGTH TOLL HEIGHT CONSTRUCTION_MATERIAL TIDAL CONNECTED_FEATURES
INCLUD: CROSSING_GATE CATTLE_GATE TOLL_GATE CAISSON TIDE_GATE FLOODGATE SLUICE SLUICE_GATE SEA_GATE

GEOISOTHERM (INCLUDED TERM 407)
SEE: ISOGRAM

STANDARD FEATURE TERM 51: GEYSER
DEFN: AN INTERMITTENT FOUNTAIN OF HOT WATER EJECTED WITH FORCE FROM A HOLE IN THE EARTH'S CRUST
SOURCE: ADAPTED FROM MONKHOUSE

GLACIAL_DRIFT (INCLUDED TERM 408)
SEE: MORAINE

GLACIAL_GORGE (INCLUDED TERM 409)
SEE: VALLEY

GLACIAL_STREAM (INCLUDED TERM 410)
SEE: STREAM

GLACIAL_TROUGH (INCLUDED TERM 411)
SEE: VALLEY

GLACIER (INCLUDED TERM 412)
SEE: ICE_FIELD

GLACIER_BERG (INCLUDED TERM 413)
SEE: ICEBERG

GLACIER_ICEBERG (INCLUDED TERM 414)
SEE: ICEBERG

GLACIER_TONGUE (INCLUDED TERM 415)
SEE: ICE_FIELD

GLADE (INCLUDED TERM 416)
SEE: CLEARING/GRASSLAND

GLEN (INCLUDED TERM 417)
SEE: VALLEY

GOE (INCLUDED TERM 418)
SEE: VALLEY

STANDARD FEATURE TERM 52: GOLF COURSE
DEFN: AN AREA SET OUT FOR THE PLAYING OF GOLF.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION NAME
INCLUD: GOLF_DRIVING_RANGE

GOLF_DRIVING_RANGE (INCLUDED TERM 419)
SEE: GOLF_COURSE

GORGE (INCLUDED TERM 420)
SEE: VALLEY
ATTRIB: LOCATION DISCHARGE

GRABEN (INCLUDED TERM 421)
SEE: VALLEY

GRADE_CROSSING (INCLUDED TERM 422)
SEE: INTERSECTION

GRADE_INTERSECTION (INCLUDED TERM 423)
SEE: INTERSECTION

GRADIENT_TINT (INCLUDED TERM 424)
SEE: RELIEF

GRAIN_ELEVATOR (INCLUDED TERM 425)
SEE: BUILDING/TOWER

GRANARY (INCLUDED TERM 426)
SEE: BUILDING

STANDARD FEATURE TERM 53: GRASSLAND
DEFN: AN AREA OF GRASS OR GRASSLIKE VEGETATION.
SOURCE: MODIFIED FROM AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION ANNUAL_PRECIPITATION ACIDITY AREA PREDOMINANT_SPECIES NAME
INCLUD: MEADOW PLAIN RANGE SAVANNA FIELD PRAIRIE PASTURE PAMPAS HAY_MEADOW STEPPE VELD PUSZTA DOWNLAND DOWNS DOWN GLADE MOOR

GRATICULE (INCLUDED TERM 427)
SEE: GRID

GRATICULE_TICK (INCLUDED TERM 428)
SEE: GRID

GRAVEL_PIT (INCLUDED TERM 429)
SEE: MINE/HOLE

GRAVEYARD (INCLUDED TERM 430)
SEE: CEMETERY

GRAVING_DOCK (INCLUDED TERM 431)
SEE: DOCK

GREENHOUSE (INCLUDED TERM 432)
SEE: BUILDING

STANDARD FEATURE TERM 54: GRID
DEFN: TWO SETS OF PARALLEL LINES, INTERSECTING AT RIGHT ANGLES AND FORMING SQUARES, THAT ARE SUPERIMPOSED ON MAPS IN A CONSISTENT MANNER TO PERMIT IDENTIFICATION OF GROUND LOCATIONS AND THE COMPUTATION OF DIRECTION AND DISTANCE FROM ONE POINT TO ANOTHER.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION NAME DISTANCE_BETWEEN_LINES ORIENTATION_OF_LINES
INCLUD: GRATICULE GRATICULE_TICK RANGE DOMINION_LAND_SURVEY LAND_SURVEY_SYSTEM TOWNSHIP

GRID_BEARING (INCLUDED TERM 433)
SEE: BEARING_LINE

GRID_COURSE (INCLUDED TERM 434)
SEE: BEARING_LINE

GRID_LINE (INCLUDED TERM 435)
SEE: BEARING_LINE

GRID_MERIDIAN (INCLUDED TERM 436)
SEE: BEARING_LINE

GRID_PARALLEL (INCLUDED TERM 437)
SEE: BEARING_LINE

GRID_RHUMB_LINE (INCLUDED TERM 438)
SEE: BEARING_LINE

GRID_TRACK (INCLUDED TERM 439)
SEE: BEARING_LINE

GROIN/GROYNE (INCLUDED TERM 440)
SEE: BREAKWATER

GROTTO (INCLUDED TERM 441)
SEE: CAVE

GROVE (INCLUDED TERM 442)
SEE: WOODLAND

GUARD_RAIL (INCLUDED TERM 443)
SEE: BARRIER

GUIDE_RAIL (INCLUDED TERM 444)
SEE: BARRIER

GULCH (INCLUDED TERM 445)
SEE: VALLEY/WATERCOURSE

GULF (INCLUDED TERM 446)
SEE: INLET

GULLY (INCLUDED TERM 447)
SEE: VALLEY/WATERCOURSE
SOURCE: GNIS DOCUMENTATION, APPENDIX B, FEATURE CLASS DEFINITIONS
DEFN: A SMALL CHANNEL RECENTLY CUT BY RUNNING WATER; SMALLER THAN A GULCH OR RAVINE.
SOURCE: NAUTICAL CHART MANUAL, U.S. DEPARTMENT OF COMMERCE, NATIONAL OCEAN SURVEY

GUT (INCLUDED TERM 448)
SEE: WATERCOURSE
DEFN: A NARROW PASSAGE OR CONTRACTED STRAIT CONNECTING TWO BODIES OF WATER.
SOURCE: NAVIGATION DICTIONARY, U.S. NAVAL OCEANOGRAPHIC OFFICE

GUTTER (INCLUDED TERM 449)
SEE: WATERCOURSE

GUYOT (INCLUDED TERM 450)
SEE: PLATEAU

HACHURED_AREA (INCLUDED TERM 451)
SEE: RELIEF

HACHURES (INCLUDED TERM 452)
SEE: RELIEF

HALF-TIDE_BASIN (INCLUDED TERM 453)
SEE: LOCK

HAMLET (INCLUDED TERM 454)
SEE: PLACE

HANGAR (INCLUDED TERM 455)
SEE: BUILDING

STANDARD FEATURE TERM 55: HARBOR
DEFN: AN AREA OF WATER WHERE SHIPS, PLANES OR OTHER WATERCRAFT CAN ANCHOR OR DOCK. ALSO SPELLED HARBOUR.
SOURCE: MODIFIED FROM GEOGRAPHIC NAMES INFORMATION SYSTEM APPENDIX B
ATTRIB: LOCATION TIDAL ARTIFICIALLY_IMPROVED/MANMADE/NATURAL NAME VEHICLE_TYPE DEPTH_OF_WATER AREA SALINITY FACILITIES_AVAILABLE MOORING_FACILITIES PRESENCE_OF_BREAKWATERS CONTROL_OVER_WATER_LEVEL SHELTERED/EXPOSED RESTRICTIONS LIGHTED VEHICLE_SIZE_SERVED BUOYED CARGO_TRANSPORTATION CHARTED_DEPTH COMMERCIAL_SHIPPING NAVIGABLE RESTRICTIONS LIGHTED VEHICLE_SIZE_SERVED
INCLUD: DRY_HARBOR HARBOR_OF_REFUGE ARTIFICIAL_HARBOR BOAT_HARBOR INNER_HARBOR ISLAND_HARBOR NATURAL_HARBOR TIDAL_HARBOR HAVEN BOAT_BASIN DOCKYARD PORT CANAL_PORT SEAPORT ENTREPOT ANCHORAGE OPEN_BERTH PROHIBITED_ANCHORAGE TEMPORARY_ANCHORAGE QUARANTINE_ANCHORAGE OPEN_HARBOR OPEN_ROADSTEAD ROADSTEAD SEAPLANE_BASE STRANDING_HARBOR CAMBER

HARBOR_LINE (INCLUDED TERM 456)
SEE: BOUNDARY

HARBOR_OF_REFUGE (INCLUDED TERM 457)
SEE: HARBOR

HAVEN (INCLUDED TERM 458)
SEE: HARBOR

HAY_MEADOW (INCLUDED TERM 459)
SEE: GRASSLAND

HEAD (INCLUDED TERM 460)
SEE: CAPE

HEADLAND (INCLUDED TERM 461)
SEE: CAPE

STANDARD FEATURE TERM 56: HEADWATERS
DEFN: THE UPPER PART OF A RIVER SYSTEM USED MORE COMMONLY IN THE PL. DENOTING THE UPPER BASIN AND SOURCE STREAMS OF A RIVER.
SOURCE: A DICTIONARY OF GEDGRAPHY, MONKHOUSE

HEATH (INCLUDED TERM 462)
SEE: WOODLAND/WETLAND

HEDGE (INCLUDED TERM 463)
SEE: BARRIER/BDUNDARY

HEDGEROW (INCLUDED TERM 464)
SEE: BARRIER/BOUNDARY

HELIPAD (INCLUDED TERM 465)
SEE: RUNWAY

HELIPORT (INCLUDED TERM 466)
SEE: RUNWAY

HIGHWAY (INCLUDED TERM 467)
SEE: ROAD

HIGHWAY_ROUTE_NUMBER (INCLUDED TERM 468)
SEE: SIGN

HILL (INCLUDED TERM 469)
SEE: MOUNT

HILL-SHADING (INCLUDED TERM 470)
SEE: RELIEF

HILL_SHADED_AREA (INCLUDED TERM 471)
SEE: RELIEF

HILLOCK (INCLUDED TERM 472)
SEE: MOUNT

HOCKEY_RINK (INCLUDED TERM 473)
SEE: OUTDOOR_THEATER

STANDARD FEATURE TERM 57: HOLE
DEFN: AN ABRUPT HOLLOW IN THE GROUND OR OCEAN FLOOR.
SOURCE: NAVIGATION DICTIONARY, U.S. NAVAL OCEANOGRAPHIC OFFICE
ATTRIB: LOCATION DIAMETER DEPTH

INCLUD: PIT GRAVEL_PIT SAND_PIT BORROW_PIT EXCAVATION QUARRY

HOLLDW (INCLUDED TERM 474)
SEE: VALLEY

HOMING_BEACON (INCLUDED TERM 475)
SEE: BEACON

HOOK (INCLUDED TERM 476)
SEE: BAR/CAPE

HOOKED_SPIT (INCLUDED TERM 477)
SEE: BAR

HORIZON_LIGHTS (INCLUDED TERM 478)
SEE: BEACON

HORIZONTAL_CONTRDL_POINT (INCLUDED TERM 479)
SEE: CONTROL_POINT

HORIZONTAL_CONTROL_MONUMENT (INCLUDED TERM 480)
SEE: CONTROL_POINT
DEFN: (MODIFIED)A SURVEY MARKER FOR WHICH THE PRECISE LATITUDE AND LONGITUDE ARE KNOWN.

HORN_BUOY (INCLUDED TERM 481)
SEE: BUOY

HOSPITAL (INCLUDED TERM 482)
SEE: BUILDING

HOSTEL (INCLUDED TERM 483)
SEE: BUILDING

HOTEL (INCLUDED TERM 484)
SEE: BUILDING

HOTSPRING (INCLUDED TERM 485)
SEE: SPRING

HOUSE (INCLUDED TERM 486)
SEE: BUILDING

HULK (INCLUDED TERM 487)
SEE: WRECK

HUMMOCK (INCLUDED TERM 488)
SEE: MOUNT/ISLAND

HYDRO_TOWER (INCLUDED TERM 489)
SEE: TOWER

HYPSOMETRIC_TINT (INCLUDED TERM 490)
SEE: RELIEF

ICE_BUOY (INCLUDED TERM 491)
SEE: BUOY

ICE_CAP (INCLUDED TERM 492)
SEE: ICE_FIELD

ICE_CLIFF (INCLUDED TERM 493)
SEE: CLIFF

STANDARD FEATURE TERM 58: ICE FIELD
DEFN: LARGE AREA OF PERMANENT SEA OR LAND ICE.
SOURCE: MODIFIED FROM STAMP, DICTIONARY OF GEOGRAPHY
ATTRIB: NAME LOCATION
INCLUD: ICE_SHEET ICE_CAP GLACIER ROCK_GLACIER POLAR_ICE_PACK GLACIER_TONGUE ISLAND_ICE ARCTIC_PACK BAY_ICE CONTINENTAL_GLACIER CONTINENTAL_ICE

ICE_SHEET (INCLUDED TERM 494)
SEE: ICE_FIELD

STANDARD FEATURE TERM 59: ICEBERG
DEFN: A LARGE MASS OF DETACHED LAND ICE IN THE SEA OR STRANDED IN SHALLOW WATER.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY
ATTRIB: LOCATION NAME
INCLUD: ARCHED_ICEBERG FLOEBERG GLACIER_BERG BARRIER_ICEBERG BERY GLACIER_ICEBERG

IDENTIFICATION_BEACON (INCLUDED TERM 495)
SEE: BEACON

IMPROVED_CHANNEL (INCLUDED TERM 496)
SEE: WATERCOURSE/LANE

INDEX_CONTOUR (INCLUDED TERM 497)
SEE: CONTOUR_LINE

STANDARD FEATURE TERM 60: INDIAN RESERVATION
DEFN: AN AREA SET ASIDE FOR THE USE OF AN INDIAN BAND OR BANDS.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION NAME
ATTRIB: LOCATION NAME

INLAND_SEA (INCLUDED TERM 498)
SEE: LAKE

STANDARD FEATURE TERM 61: INLET
DEFN: AN OPENING OF THE SEA INTO THE LAND, OR OF A LAKE INTO ITS SHORES.
SOURCE: MODIFIED FROM A DICTIONARY OF GEOGRAPHY, MONKHOUSE
ATTRIB: NAME LOCATION SIZE SHAPE WIDTH DEPTH SALINITY BUOYED COMMERCIAL_SHIPPING NAVIGABLE
INCLUD: ANSE ARM BAY BIGHT COVE ESTUARY FIRTH GULF CLOSED_BAY RIA RINCON FJORD

INNER_HARBOR (INCLUDED TERM 499)
SEE: HARBOR

INNER_LEAD (INCLUDED TERM 500)

SEE: LEAD

INSHORE (INCLUDED TERM 501)
SEE: SHORE

INTERCHANGE (INCLUDED TERM 502)
SEE: INTERSECTION

INTERMEDIATE_CDNTOUR (INCLUDED TERM 503)
SEE: CDNTOUR_LINE

INTERMITTANT_LIGHT (INCLUDED TERM 504)
SEE: BEACON

INTERMITTENT_LIGHT (INCLUDED TERM 505)
SEE: BEACON

INTERMONTAINE_PLATEAU (INCLUDED TERM 506)
SEE: PLATEAU

INTERNATIONAL_BOUNDARY (INCLUDED TERM 507)
SEE: BOUNDARY

INTERPROVINCIAL_BOUNDARY (INCLUDED TERM 508)
SEE: BOUNDARY

STANDARD FEATURE TERM 62: INTERSECTION
DEFN: THE JUNCTION OF ROADS OR TRACKS.
SOURCE: NEW DEFINITION
ATTRIB: LOCATION SHAPE GRADE_SEPARATION CONNECTED_FEATURES AREA FEATURE_PRESENT PASSENGER_TRANSPORTATION LIGHTED
INCLUD: CLOVER_LEAF_INTERCHANGE CROSSING DIAMOND_INTERSECTION GRADE_INTERSECTION GRADE_CROSSING INTERCHANGE PEDESTRIAN_CROSSING TRAFFIC_CIRCLE RAILROAD_CROSSING

ISABNORMAL (INCLUDED TERM 509)
SEE: ISANOMAL

ISALLOBAR (INCLUDED TERM 510)
SEE: ISANOMAL

ISALLOTHERM (INCLUDED TERM 511)
SEE: ISANOMAL

STANDARD FEATURE TERM 63: ISANOMAL
DEFN: A LINE CONNECTING POINTS HAVING THE SAME ANOMALIES OF TEMPERATURE, PRESSURE, ETC.
SOURCE: NAVIGATION DICTIONARY
ATTRIB: LOCATION PHENOMENON_MEASURED VALUE_ATTACHED_TO_LINE
INCLUD: ISABNORMAL ISALLOBAR ISALLOTHERM

STANDARD FEATURE TERM 64: ISLAND
DEFN: AREA OF DRY OR RELATIVELY DRY LAND SURROUNDED BY WATER OR LOW WETLAND.
SOURCE: GNIS DOCUMENTATION, APPENDIX B
ATTRIB: LOCATION NAME AREA SHAPE COMPOSITION ELEVATION
INCLUD: CAY/KEY ISLET ATOLL STACK TOMBOLO HUMMOCK BARRIER_ISLAND

ISLAND_ARC (INCLUDED TERM 512)
SEE: ISLAND_CLUSTER

STANDARD FEATURE TERM 65: ISLAND CLUSTER
DEFN: A GROUP OF ISLANDS
SOURCE: NEW TERM NO EXISTING DEFINITION
INCLUD: ARCHIPELAGD ISLAND_ARC

ISLAND_HARBOR (INCLUDED TERM 513)
SEE: HARBOR

ISLAND_ICE (INCLUDED TERM 514)
SEE: ICE_FIELD

ISLET (INCLUDED TERM 515)
SEE: ISLAND

ISOBAR (INCLUDED TERM 516)
SEE: ISOGRAM

ISOBATH (INCLUDED TERM 517)
SEE: CONTOUR_LINE

ISOBATHYTHERM (INCLUDED TERM 518)
SEE: ISOGRAM

ISOBRONT (INCLUDED TERM 519)
SEE: ISOGRAM

ISOCHASM (INCLUDED TERM 520)
SEE: ISOGRAM

ISOCHEIM (INCLUDED TERM 521)
SEE: ISOGRAM

ISOCHRONE (INCLUDED TERM 522)
SEE: ISOGRAM

ISOCLINAL (INCLUDED TERM 523)
SEE: ISOGRAM

ISOCLINAL_LINE (INCLUDED TERM 524)
SEE: ISOGRAM

ISOCLINIC_LINE (INCLUDED TERM 525)
SEE: ISOGRAM

ISODEF (INCLUDED TERM 526)
SEE: ISOGRAM

ISODYNAMIC_LINE (INCLUDED TERM 527)
SEE: ISOGRAM

ISOGEOTHERM (INCLUDED TERM 528)
SEE: ISOGRAM

ISOGONIC (INCLUDED TERM 529)
SEE: ISOGRAM

ISOGONIC_LINE (INCLUDED TERM 530)
SEE: ISOGRAM

ISOGRADIENT (INCLUDED TERM 531)
SEE: ISOGRAM

STANDARD FEATURE TERM 66: ISOGRAM
DEFN: THAT LINE, ON A CHART OR DIAGRAM, CONNECTING POINTS OF EQUAL VALUE OF SOME PHENOMENON.
SOURCE: NAVIGATION DICTIONARY
ATTRIB: LOCATION PHENOMENON_MEASURED VALUE_ATTACHED_TO_LINE
INCLUD: ISOBAR ISOBATHYTHERM ISOBRONT ISOCHASM ISOCHEIM ISOCHRONE ISOCLINAL ISOCLINIC_LINE ISOCLINAL_LINE MAGNETIC_PARALLEL ISODEF ISODYNAMIC_LINE ISOGEOTHERM GEOISOTHERM ISOGONIC ISOGONIC_LINE ISOGRADIENT ISOGRIV ISOHALINE ISOHALSINE ISOHEL ISOHYET ISOMAGNETIC ISOMAGNETIC_LINE ISONEPH ISOPAG ISOPECTICISOPOR ISOPORIC_LINE ISOPYCNIC ISOSTEREISOTAC ISOTACH ISOTHERE ISOTHERM ISOTHERMOBATH

ISOGRIV (INCLUDED TERM 532)
SEE: ISOGRAM

ISOHALINE (INCLUDED TERM 533)
SEE: ISOGRAM

ISOHALSINE (INCLUDED TERM 534)
SEE: ISOGRAM

ISOHEL (INCLUDED TERM 535)
SEE: ISOGRAM

ISOHYET (INCLUDED TERM 536)
SEE: ISOGRAM

ISOHYPSE (INCLUDED TERM 537)
SEE: CONTOUR_LINE

ISOMAGNETIC (INCLUDED TERM 538)
SEE: ISOGRAM

ISOMAGNETIC_LINE (INCLUDED TERM 539)
SEE: ISOGRAM

ISONEPH (INCLUDED TERM 540)
SEE: ISOGRAM

ISOPAG (INCLUDED TERM 541)
SEE: ISOGRAM

ISOPECTIC (INCLUDED TERM 542)
SEE: ISOGRAM

ISOPOR (INCLUDED TERM 543)
SEE: ISOGRAM

ISOPORIC_LINE (INCLUDED TERM 544)
SEE: ISOGRAM

ISOPYCNIC (INCLUDED TERM 545)
SEE: ISOGRAM

ISOSTERE (INCLUDED TERM 546)
SEE: ISOGRAM

ISOTAC (INCLUDED TERM 547)
SEE: ISOGRAM

ISOTACH (INCLUDED TERM 548)
SEE: ISOGRAM

ISOTHERE (INCLUDED TERM 549)
SEE: ISOGRAM

ISOTHERM (INCLUDED TERM 550)
SEE: ISOGRAM

ISOTHERMOBATH (INCLUDED TERM 551)
SEE: ISOGRAM

STANDARD FEATURE TERM 67: ISTHMUS
DEFN: NARROW SECTION OF LAND IN A BODY OF WATER CONNECTING TWO LARGER LAND AREAS.
SOURCE: GNIS DOCUMENTATION, APPENDIX B
ATTRIB: LOCATION COMPOSITION AREA WIDTH LENGTH NAME
INCLUD: NECK SUBMARINE_ISTHMUS

JAIL (INCLUDED TERM 552)
SEE: BUILDING

JETTY (INCLUDED TERM 553)
SEE: BREAKWATER/PIER

JUNCTION_BUOY (INCLUDED TERM 554)
SEE: BUOY

JUNGLE (INCLUDED TERM 555)
SEE: WOODLAND

JUNK_YARD (INCLUDED TERM 556)
SEE: VEHICLE_STORAGE

KAME (INCLUDED TERM 557)
SEE: MOUNT/RIDGE

KAME_TERRACE (INCLUDED TERM 558)
SEE: TERRACE

KEG_BUOY (INCLUDED TERM 559)
SEE: BUOY

KETTLE (INCLUDED TERM 560)
SEE: BASIN

KILL (INCLUDED TERM 561)
SEE: STREAM
DEFN: A CHANNEL, CREEK OR STREAM, AS THE KILLS BETWEEN STATEN ISLAND AND BERGEN NECK.
SOURCE: NAUTICAL CHART MANUAL, U.S. DEPT. OF COMMERCE, NATIONAL OCEAN SURVEY

KNOB (INCLUDED TERM 562)
SEE: MOUNT

KNOLL (INCLUDED TERM 563)
SEE: MOUNT

STANDARD FEATURE TERM 68: LAGOON
DEFN: A SHEET OF SALT WATER SEPARATED FROM THE OPEN SEA BY SAND OR SHINGLE BANKS... THE SHEET OF WATER BETWEEN AN OFFSHORE REEF ESP. OF CORAL AND MAINLAND. THE SHEET OF WATER WITHIN A RING OR HORSESHOE SHAPED ATOLL.
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE
ATTRIB: LOCATION NAME AREA SALINITY BUOYED CHARTED_DEPTH DEPTH NAVIGABLE
INCLUD: BARRIER_LAGOON LAGUNA

LAGOON_BEACH (INCLUDED TERM 564)
SEE: BEACH

LAGUNA (INCLUDED TERM 565)
SEE: LAGOON

STANDARD FEATURE TERM 69: LAKE
DEFN: ANY STANDING BODY OF INLAND WATER.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY
ATTRIB: LOCATION NAME ACIDITY CHARTED_DEPTH ENCLOSED RECREATIONAL SALINITY STORAGE TEMPERATURE WATER_SUPPLY ICE_PRESENCE_OF
INCLUD: BAYOU PASTEUER_LAKE PROGLACIAL_LAKE SALT_LAKE MORTLAKE OXBOW OPEN_WATER POOL INLAND_SEA MILLPOND POOL RESERVOIR POND SALINA SOUND

LAND_SURVEY_SYSTEM (INCLUDED TERM 566)
SEE: GRID

LANDING (INCLUDED TERM 567)
SEE: WHARF/PIER

LANDING_AREA (INCLUDED TERM 568)
SEE: AIRPORT/RUNWAY

LANDING_BEACON (INCLUDED TERM 569)
SEE: BEACON

LANDING_FIELD (INCLUDED TERM 570)
SEE: RUNWAY

LANDING_LANE (INCLUDED TERM 571)

SEE: RUNWAY/LANE

LANDING_STRIP (INCLUDED TERM 572)
SEE: RUNWAY

LANDMARK_BEACON (INCLUDED TERM 573)
SEE: BEACON

STANDARD FEATURE TERM 70: LANE
DEFN: A PRESCRIBED COURSE FOR SHIPS OR AIRCRAFT, OR
A STRIP DELINEATED ON A STREET OR HIGHWAY TO ACCOMODATE A SINGLE LINE OF AUTOMOBILES.
SOURCE: AMERICAN HERITAGE DICTIONARY
ATTRIB: WIDTH LENGTH CHARTED_DEPTH FEATURE_PRESENT LANES_NUMBER_OF
INCLUD: CHANNEL SHIPPING_LANE FAIRWAY WAY PASS SERVICE_LANE LANDING_LANE WATER_LANE FERRY_CROSSING IMPROVED_CHANNEL WATERWAY LEAD SEAWAY

LATERAL_MORAINE (INCLUDED TERM 574)
SEE: RIDGE

STANDARD FEATURE TERM 71: LAUNCHING RAMP
DEFN: A TRANSPORTATION STRUCTURE USED FOR LAUNCHING BOATS.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION LENGTH WIDTH SIZE_BOAT_CAN_ACCOMMODATE CONSTRUCTION_MATERIAL NAME GRADIENT

LAVA_CONE (INCLUDED TERM 575)
SEE: MOUNT

LAWN_BOWLING_GREEN (INCLUDED TERM 576)
SEE: PARK

LAYER_TINTING (INCLUDED TERM 577)
SEE: RELIEF

LAYER_TINT (INCLUDED TERM 578)
SEE: RELIEF

STANDARD FEATURE TERM 72: LEAD
SEE: LANE
DEFN: A NAVIGABLE PASSAGE THROUGH ICE, BETWEEN ROCKS OR SHOALS, ETC. IT MAY BE COVERED BY THIN ICE. ONE NOT SO COVERED IS CALLED AN OPEN LEAD. ONE BETWEEN FLOATING ICE AND THE SHORE OR FAST ICE IS CALLED A SHORE LEAD OR SHORE CLEARING.
A LEAD WITH ONLY ONE OUTLET IS CALLED A BLIND LEAD, POCKET, OR CUL-DE-SAC. ALSO CALLED A CHANNEL, LANE.
SOURCE: NAVIGATION DICTIONARY
ATTRIB: SHORE BLIND/OPEN CARTED_DEPTH LEAD_TYPE
INCLUD: INNER_LEAD/CUL_DE_SAC

LEADING LIGHT (INCLUDED TERM 579)
SEE: BEACON

LEADING_LINE (INCLUDED TERM 580)
SEE: BEARING_LINE

LEDGE (INCLUDED TERM 581)
SEE: REEF

LEVEE (INCLUDED TERM 582)
SEE: EMBANKMENT

LIBRARY (INCLUDED TERM 583)
SEE: BUILDING

LIFE_SAVING_STATION (INCLUDED TERM 584)
INCLUD: STATION/BUILDING
DEFN: A PLACE WHERE EQUIPMENT FOR SAVING LIFE AT SEA IS MAINTAINED.
SOURCE: NAVIGATION DICTIONARY

LIFT_BRIDGE (INCLUDED TERM 585)
SEE: BRIDGE

LIGHT (INCLUDED TERM 586)
SEE: BEACON

LIGHT_FLOAT (INCLUDED TERM 587)
SEE: BUOY

LIGHT_VESSEL (INCLUDED TERM 588)
SEE: BUOY

LIGHTED_BEACON (INCLUDED TERM 589)
SEE: BEACON

LIGHTED_BUOY (INCLUDED TERM 590)
SEE: BUOY

LIGHTED_SOUND_BUOY (INCLUDED TERM 591)
SEE: BUOY

LIGHTHOUSE (INCLUDED TERM 592)
SEE: BEACON/TOWER

LIGHTSHIP (INCLUDED TERM 593)
SEE: BUOY

LIMITS (INCLUDED TERM 594)
SEE: BOUNDARY

LIQUID_WASTE_DISPOSAL_AREA (INCLUDED TERM 595)
SEE: DUMPING_GROUND

LOCALITY (INCLUDED TERM 596)
SEE: PLACE

STANDARD FEATURE TERM 73: LOCK
DEFN: AN ENCLOSURE IN A WATERBODY WITH GATES AT EACH END TO RAISE OR LOWER VESSELS AS THEY PASS FROM ONE LEVEL TO ANOTHER.
SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION TIDAL VEHICLE_SIZE_SERVED LENGTH WIDTH SALINITY NAME DISCHARGE FLOOD_CONTROL
INCLUD: HALF-TIDE_BASIN ENTRANCE_LOCK TIDE_LOCK

LODE (INCLUDED TERM 597)
SEE: WATERCOURSE

LOGGED_AREA (INCLUDED TERM 598)
SEE: CLEARING

LONG_FLASHING_LIGHT (INCLUDED TERM 599)
SEE: BEACON

LONGSHORE_BAR (INCLUDED TERM 600)
SEE: BAR

LOOKOUT_TOWER (INCLUDED TERM 601)
SEE: TOWER

LOOP_ANTENNA (INCLUDED TERM 602)
SEE: ANTENNA

LOXODROME (INCLUDED TERM 603)
SEE: BEARING_LINE

LOXODROMIC_CURVE (INCLUDED TERM 604)
SEE: BEARING_LINE

LUMBER_CAMP (INCLUDED TERM 605)
SEE: CAMPGROUND

MAGNETIC_BEARING (INCLUDED TERM 606)
SEE: BEARING_LINE

MAGNETIC_PARELLEL (INCLUDED TERM 607)
SEE: ISOGRAM

MAINTENANCE_ROAD (INCLUDED TERM 608)
SEE: ROAD

MAJOR_FOG_SIGNAL (INCLUDED TERM 609)
SEE: BEACON

MAJOR_LIGHT (INCLUDED TERM 610)
SEE: BEACON

MALLEE_SCRUB (INCLUDED TERM 611)
SEE: WOODLAND

MANGROVE_SWAMP (INCLUDED TERM 612)
SEE: WETLAND/WOODLAND

MAQUIS (INCLUDED TERM 613)
SEE: WOODLAND

MARGINAL_SEA (INCLUDED TERM 614)
SEE: SEA

MARINA (INCLUDED TERM 615)
SEE: BUILDING

MARINE_AUTOMATIC_METEROLOGICAL_STATION (INCLUDED TERM 616)
SEE: STATION
DEFN: A MOORED, BOAT-TYPE AUTOMATIC WEATHER STATION CONSTRUCTED OF NONMAGNETIC MATERIALS. IT IS MOORED IN DEEP WATER.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY
ATTRIB: LOCATION NAME

MARINE_BENCH (INCLUDED TERM 617)
SEE: TERRACE

MARINE_CLIFF (INCLUDED TERM 618)
SEE: CLIFF

MARINE_LIGHT (INCLUDED TERM 619)
SEE: BEACON

MARINE_RADIOBEACON (INCLUDED TERM 620)
SEE: BEACON

MARKER_BEACON (INCLUDED TERM 621)
SEE: BEACON

MARKER_RADIOBEACON (INCLUDED TERM 622)
SEE: BEACON

MARKET_GARDEN (INCLUDED TERM 623)
SEE: CROP_LAND

MARSH (INCLUDED TERM 624)
SEE: WETLAND

MARSH_BAR (INCLUDED TERM 625)
SEE: BAR

MATTRESS (INCLUDED TERM 626)
SEE: REVETMENT

MEADOW (INCLUDED TERM 627)
SEE: GRASSLAND

MEAN_SEA_LEVEL (INCLUDED TERM 628)
SEE: SHORELINE
DEFN: THE AVERAGE LEVEL OF THE SEA, AS CALCULATED FROM A LARGE NUMBER OF OBSERVATIONS TAKEN AT EQUAL INTERVALS OF TIME. IT IS THE STANDARD LEVEL FROM WHICH ALL HEIGHTS ARE CALCULATED.
SOURCE: MODIFIED FROM MOORE'S A DICTIONARY OF GEOGRAPHY
ATTRIB: LOCATION NAME
INCLUD: ORDNANCE_DATUM

MEANDER (INCLUDED TERM 629)
SEE: WATERCOURSE
DEFN: A CURVED LOOP-LIKE BEND OR SINUOSITY IN THE COURSE OF A SLUGGISH STREAM OR RIVER.

SOURCE: MODIFIED FROM A DICTIONARY OF GEOGRAPHY, MONKHOUSE

MEMORIAL_PARK (INCLUDED TERM 630)
SEE: PARK

MERIDIAN (INCLUDED TERM 631)
SEE: BEARING_LINE

MESA (INCLUDED TERM 632)
SEE: PLATEAU

MID_CHANNEL_BUOY (INCLUDED TERM 633)
SEE: BUOY

MILE_POST (INCLUDED TERM 634)
SEE: SIGN

MILEAGE/KILOMETER_POST (INCLUDED TERM 635)
SEE: SIGN

MILITARY_BASE (INCLUDED TERM 636)
SEE: MILITARY_INSTALLATION

MILITARY_BUNKER (INCLUDED TERM 637)
SEE: MILITARY_INSTALLATION

STANDARD FEATURE TERM 74: MILITARY INSTALLATION
DEFN: ALL FORMS OF BUILDINGS, EMPLACEMENTS OR INSTALLATIONS USED FOR THE TRAINING OF THE MILITARY.
SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: NAME LOCATION
INCLUD: AMMUNITION_DUMP ARMORY ARMY_CAMP BARRACKS MILITARY_BASE BATTERY MILITARY_BUNKER DRILL_HALL FORCES_BASE FORT MILITARY_RESERVE NAVAL_STATION POWDER_MAGAZINE

MILITARY_RESERVE (INCLUDED TERM 638)
SEE: MILITARY_INSTALLATION

MILL (INCLUDED TERM 639)
SEE: BUILDING

MILLPOND (INCLUDED TERM 640)
SEE: LAKE

STANDARD FEATURE TERM 75: MINE
DEFN: AN EXCAVATION IN THE EARTH FOR THE PURPOSE OF EXTRACTING FREE METALS, COAL, SALT, OR OTHER MINERALS.
SOURCE: AMERICAN HERITAGE DICTIONARY
ATTRIB: NAME LOCATION DEPTH WIDTH SHAPE SUBSTANCE_EXTRACTED AREA
INCLUD: STRIP_MINE PLACER_MINE OPEN_PIT_MINE GRAVEL_PIT PIT EXCAVATION QUARRY SAND_PIT BORROW_PIT

MINERAL_SPRING (INCLUDED TERM 641)
SEE: SPRING

MINOR_FOG_SIGNAL (INCLUDED TERM 642)
SEE: BEACON

MINOR_LIGHT (INCLUDED TERM 643)
SEE: BEACON

MIRCOWAVE_TOWER (INCLUDED TERM 644)
SEE: TOWER

MIRE (INCLUDED TERM 645)
SEE: WETLAND

MISSISSIPPI_RIVER-TYPE_BUOY (INCLUDED TERM 646)
SEE: BUOY

MOAT (INCLUDED TERM 647)
SEE: VALLEY

MOLE (INCLUDED TERM 648)
SEE: BREAKWATER

MONADNOCK (INCLUDED TERM 649)
SEE: MOUNT

MONASTERY (INCLUDED TERM 650)
SEE: BUILDING

MONORAIL (INCLUDED TERM 651)
SEE: RAILWAY

MONSOON_FOREST (INCLUDED TERM 652)
SEE: WOODLAND

MONUMENT (INCLUDED TERM 653)
SEE: BUILDING

MONUMENTED_CONTROL_POINT (INCLUDED TERM 654)
SEE: CONTROL_POINT

MOOR (INCLUDED TERM 655)
SEE: WOODLAND/WETLAND/GRASSLAND

STANDARD FEATURE TERM 76: MOORING
DEFN: THE PLACE WHERE A CRAFT MAY BE SECURED TO THE GROUND, WHARF, PIER OR QUAY.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY
ATTRIB: LOCATION LENGTH WIDTH CONSTRUCTION_MATERIAL VEHICLE_TYPE_SERVED SURFACE_FEATURE NAME
INCLUD: CRIB DOLPHIN PILE BOLLARD MOORING_MAST MOORING_BUOY TRUNK_BUOY

MOORING_BUOY (INCLUDED TERM 656)
SEE: BUOY/MOORING

MOORING_MAST (INCLUDED TERM 657)
SEE: MOORING

STANDARD FEATURE TERM 77: MORAINE
DEFN: AN ACCUMULATION OF BOULDERS, STONES, OR OTHER DEBRIS CARRIED AND DEPOSITED BY A GLACIER.

SOURCE: AMERICAN HERITAGE DICTIONARY
INCLUD: TILL GLACIAL_DRIFT DELTA_MORAINE DRIFT

MORASS (INCLUDED TERM 658)
SEE: WETLAND

MORTLAKE (INCLUDED TERM 659)
SEE: LAKE

MOSQUE (INCLUDED TERM 660)
SEE: BUILDING

MOTEL (INCLUDED TERM 661)
SEE: BUILDING

MOTTE (INCLUDED TERM 662)
SEE: WOODLAND

MOUND (INCLUDED TERM 663)
SEE: MOUNT

STANDARD FEATURE TERM 78: MOUNT
DEFN: A MOUNTAIN OR HILL.
SOURCE: MODIFIED FROM AMERICAN HERITAGE DICTIONARY
ATTRIB: NAME LOCATION
INCLUD: SUMMIT MOUNTAIN CINDER_CONE SAND_DUNE HUMMOCK KNOLL PINGO RANGE MOUNTAIN_RANGE VOLCANO BALD SEAMOUNT SEAPEAK SHIELD_VOLCANO KNOB MOUND PEAK LAVA_CONE MONADNOCK SEAKNOLL DOME HILL HILLOCK DRUMLIN SEAMOUNT_CHAIN SEAMOUNT_GROUP SEAMOUNT_RANGE KAME BERY CERRITO CERRO FOOTHILL CUESTA RISE BANK

MOUNTAIN (INCLUDED TERM 664)
SEE: MOUNT

MOUNTAIN_RANGE (INCLUDED TERM 665)
SEE: MOUNT/RIDGE

STANDARD FEATURE TERM 79: MOUTH
DEFN: THE EXIT OR POINT OF DISCHARGE OF A STREAM INTO ANOTHER STREAM, LAKE OR SEA.
SOURCE: U.S. NAVAL OCEANOGRAPHIC OFFICE, NAVIGATION DICTIONARY
INCLUD: ESTUARY/OUTLET

MULGA (INCLUDED TERM 666)
SEE: WOODLAND

MULGA_SCRUB (INCLUDED TERM 667)
SEE: WOODLAND

MULTIPLE_TRACK_RAILWAY (INCLUDED TERM 668)
SEE: RAILWAY

MUNICIPAL_PARK (INCLUDED TERM 669)
SEE: PARK

MUNICIPALITY (INCLUDED TERM 670)

SEE: PLACE

MUSEUM (INCLUDED TERM 671)
SEE: BUILDING

MUSKEG (INCLUDED TERM 672)
SEE: WETLAND

NARROWS (INCLUDED TERM 673)
SEE: WATERCOURSE
DEFN: A CONSTRICTED SECTION OF A RIVER, A STRAIT, VALLEY OR PASS. THE N. IS A COMMON PLACE NAME; ...
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE

NATIONAL_PARK (INCLUDED TERM 674)
SEE: PARK

NATURAL_HARBOR (INCLUDED TERM 675)
SEE: HARBOR

NAVAL_STATION (INCLUDED TERM 676)
SEE: MILITARY_INSTALLATION

NAVIGATION_LIGHT (INCLUDED TERM 677)
SEE: BEACON

NECK (INCLUDED TERM 678)
SEE: ISTHMUS/CAPE

NGVD_DATUM (INCLUDED TERM 679)
SEE: SHORELINE
DEFN: FIXED REFERENCE ADOPTED AS A STANDARD GEODETIC DATUM FOR HEIGHTS.
SOURCE: U.S.G.S. & N.O.S., COASTAL MAPPING HANDBOOK, 1978

NON_TIDAL_BASIN (INCLUDED TERM 680)
SEE: BASIN

NOTCH (INCLUDED TERM 681)
SEE: GAP/CAVE

NULLAH (INCLUDED TERM 682)
SEE: WATERCOURSE
DEFN: (INDIAN) THE BED OF A STREAM WHICH FLOWS ONLY OCCASIONALLY, FOLLOWING SPORADIC THOUGH INTENSIVE DOWNPOURS OF RAIN.
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE

NUN_BUOY (INCLUDED TERM 683)
SEE: BUOY

OBSEQUENT_STREAM (INCLUDED TERM 684)
SEE: STREAM

OBSERVATION_TOWER (INCLUDED TERM 685)
SEE: TOWER

OBSTRUCTION_BEACON (INCLUDED TERM 686)
SEE: BEACON

OBSTRUCTION_MARKER (INCLUDED TERM 687)
SEE: BEACON

OBSTRUCTION_LIGHT (INCLUDED TERM 688)
SEE: BEACON

OBSTRUCTION_BUOY (INCLUDED TERM 689)
SEE: BUOY

OCCASIONAL_LIGHT (INCLUDED TERM 690)
SEE: BEACON

OCCASIONAL_FOG_SIGNAL (INCLUDED TERM 691)
SEE: BEACON

OCCULTING_LIGHT (INCLUDED TERM 692)
SEE: BEACON

OCCULTING_QUICK_FLASHING_LIGHT (INCLUDED TERM 693)
SEE: BEACON

OCEAN (INCLUDED TERM 694)
SEE: SEA

OCEAN_STATION (INCLUDED TERM 695)
SEE: STATION
DEFN: THE ASSIGNED POSITION OF AN OCEAN STATION VESSEL IN A SPECIFICALLY LOCATED AREA OF OCEAN SURFACE, ROUGHLY SQUARE AND 200 NAUTICAL MILES ON A SIDE.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY

STANDARD FEATURE TERM 80: OFF-ROAD VEHICULAR AREA
DEFN: AN AREA USED FOR THE TESTING OF VEHICLES THAT ARE DESIGNED TO TRAVEL ACROSS THE TERRAIN.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION NAME

OFFICE (INCLUDED TERM 696)
SEE: BUILDING

OFFSHORE_BAR (INCLUDED TERM 697)
SEE: BAR

OFFSHORE_LIGHT_STATION (INCLUDED TERM 698)
SEE: STATION/BUILDING

OFFSHORE_TOWER (INCLUDED TERM 699)
SEE: STATION/BUILDING

STANDARD FEATURE TERM 81: OIL FIELD
DEFN: AN AREA WHERE PETROLEUM IS OR WAS REMOVED FROM THE EARTH.
SOURCE: GNIS DOCUMENTATION, APPENDIX B

ATTRIB: NAME LOCATION
INCLUD: GAS_FIELD

OIL_WELL (INCLUDED TERM 700)
SEE: WELL

OMNIBEARING_LINE (INCLUDED TERM 701)
SEE: BEARING_LINE

OMNIDIRECTIONAL_BEACON (INCLUDED TERM 702)
SEE: BEACON

OPEN-PIT_MINE (INCLUDED TERM 703)
SEE: MINE

OPEN_BERTH (INCLUDED TERM 704)
SEE: HARBOR

OPEN_HARBOR (INCLUDED TERM 705)
SEE: HARBOR

OPEN_ROADSTEAD (INCLUDED TERM 706)
SEE: HARBOR

OPEN_SEA (INCLUDED TERM 707)
SEE: SEA

OPEN_SOUND (INCLUDED TERM 708)
SEE: SEA

OPEN_WATER (INCLUDED TERM 709)
SEE: SEA/LAKE

ORCHARD (INCLUDED TERM 710)
SEE: CROP_LAND

ORDNANCE_DATUM (INCLUDED TERM 711)
SEE: SHORELINE

STANDARD FEATURE TERM 82: OUTDOOR THEATER
DEFN: AN OUTDOOR AREA CONSISTING OF A STAGE, AND AN AREA WHERE THE AUDIENCE CAN BE SEATED TO VIEW THE PERFORMANCE.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: NAME LOCATION
INCLUD: AMPHITHEATER BANDSTAND DRIVE-IN_THEATER HOCKEY_RINK STADIUM

OUTLET (INCLUDED TERM 712)
SEE: MOUTH

OUTPORT (INCLUDED TERM 713)
SEE: PORT

OUTWASH (INCLUDED TERM 714)
SEE: DELTA

OUTWASH_PLAIN (INCLUDED TERM 715)
  SEE: DELTA/PLAIN

OVERFLOW_CHANNEL (INCLUDED TERM 716)
  SEE: WATERCOURSE
  DEFN: A CHANNEL BY WHICH A LAKE HAS OVERFLOWED DURING A FORMER PERIOD OF HIGH WATER-LEVEL.
  SOURCE: MODIFIED FROM A DICTIONARY OF GEOGRAPHY, MONKHOUSE

OVERPASS (INCLUDED TERM 717)
  SEE: BRIDGE

OXBOW (INCLUDED TERM 718)
  SEE: LAKE

OYSTER_BED (INCLUDED TERM 719)
  SEE: FISHING_GROUND

PADDY_FIELD (INCLUDED TERM 720)
  SEE: CROP_LAND

PALISADE (INCLUDED TERM 721)
  SEE: CLIFF

PALSA_BOG (INCLUDED TERM 722)
  SEE: WETLAND

PAMPAS (INCLUDED TERM 723)
  SEE: GRASSLAND

PARALLEL_OF_LATITUDE (INCLUDED TERM 724)
  SEE: BEARING_LINE

PARISH (INCLUDED TERM 725)
  SEE: PLACE

STANDARD FEATURE TERM 83: PARK
  DEFN: A PLACE OR AREA SET ASIDE FOR RECREATION OR PRESERVATION OF A CULTURAL OR NATURAL RESOURCE.
  SOURCE: MODIFIED FROM GNIS DOCUMENTATION, APPENDIX B
  ATTRIB: NAME LOCATION
  INCLUD: AMUSEMENT_PARK BALL_PARK BIRD_SANCTUARY BOTANICAL_GARDEN CONSERVATION_AREA ECOLOGICAL_AREA FOREST_RESERVE
  LAWN_BOWLING_GREEN
  NATIONAL_PARK MEMORIAL_PARK MUNICIPAL_PARK REGIONAL_PARK PICNIC_SITE PLAYGROUND REST_AREA RESERVE RESERVATION SANCTUARY
  SQUARE TRAILER_PARK WAYSIDE_PARK ZOO

PARKING_AREA (INCLUDED TERM 726)
  SEE: VEHICLE_STORAGE

PARKING_GARAGE (INCLUDED TERM 727)
  SEE: VEHICLE_STORAGE

PARKING_LOT (INCLUDED TERM 728)
  SEE: VEHICLE_STORAGE

PARKWAY (INCLUDED TERM 729)
SEE: ROAD

PARTI-COLORED_BUOY (INCLUDED TERM 730)
SEE: BUOY

PASS (INCLUDED TERM 731)
SEE: GAP/WATERCOURSE/LANE

PASSAGE (INCLUDED TERM 732)
SEE: WATERCOURSE/LANE
DEFN: A NAVIGABLE CHANNEL, ESPECIALLY ONE THROUGH REEFS OR ISLANDS. SOMETIMES CALLED PASS.
SOURCE: NAVIGATION DICTIONARY, U.S. NAVAL OCEANOGRAPHIC OFFICE

PASTEUER_LAKE (INCLUDED TERM 733)
SEE: LAKE

PASTURE (INCLUDED TERM 734)
SEE: GRASSLAND

PATERNOSTER LAKE (INCLUDED TERM 735)
SEE: LAKE

PATH (INCLUDED TERM 736)
SEE: ROAD

PEAK (INCLUDED TERM 737)
SEE: MOUNT/CAPE

PEAT_BOG (INCLUDED TERM 738)
SEE: WETLAND

PEAT_CUTTING (INCLUDED TERM 739)
SEE: WETLAND

PEDESTRIAN_CROSSING (INCLUDED TERM 740)
SEE: INTERSECTION

PEDESTRIAN-BICYCLE_OVERPASS (INCLUDED TERM 741)
SEE: BRIDGE

PEDESTRIAN_UNDERPASS (INCLUDED TERM 742)
SEE: TUNNEL

STANDARD FEATURE TERM 84: PENINSULA
SEE: CAPE
DEFN: A BODY OF LAND JUTTING OUT INTO AND NEARLY SURROUNDED BY WATER.
SOURCE: MODIFIED FROM NAUTICAL CHART MANUAL
ATTRIB: NAME LOCATION

PENITENTIARY (INCLUDED TERM 743)
SEE: BUILDING

PENS (INCLUDED TERM 744)
SEE: WHARF

PERCH (INCLUDED TERM 745)
SEE: BEACON

PHOTOGRAMMETRIC_HORIZONTAL_CONTROL_POINT (INCLUDED TERM 746)
SEE: CONTROL_POINT

PICNIC_SITE (INCLUDED TERM 747)
SEE: PARK

STANDARD FEATURE TERM 85: PIER
DEFN: A STRUCTURE BUILT OUT INTO THE WATER, USUALLY WITH ITS GREATEST DIMENSION AT RIGHT ANGLES TO THE SHORE, FORMING A LANDING PLACE OR A PLACE ALONGSIDE WHICH VESSELS CAN LIE.
SOURCE: NAUTICAL CHART MANUAL
INCLUD: LANDING JETTY BOAT_LANDING JETTY

PILE (INCLUDED TERM 748)
SEE: MOORING

PILE_BEACON (INCLUDED TERM 749)
SEE: BEACON

PILE_DOLPHIN (INCLUDED TERM 750)
SEE: BEACON

PILE_LIGHTHOUSE (INCLUDED TERM 751)
SEE: BEACON

PILLAR (INCLUDED TERM 752)
SEE: PINNACLE

PILLAR_BUOY (INCLUDED TERM 753)
SEE: BUOY

PILOT_LIGHTSHIP (INCLUDED TERM 754)
SEE: BUOY

STANDARD FEATURE TERM 86: PILOT WATERS
DEFN: AREAS IN WHICH THE SERVICES OF A MARINE PILOT ARE ESSENTIAL.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY
ATTRIB: NAME LOCATION

PINGO (INCLUDED TERM 755)
SEE: MOUNT
SEE: MOUNT/RIDGE

STANDARD FEATURE TERM 87: PINNACLE
DEFN: A TALL, SLENDER, SPIRE-SHAPED ROCK PROJECTING FROM A LEVEL OR MORE GENTLY SLOPING SURFACE.
SOURCE: MODIFIED FROM NAUTICAL CHART MANUAL
ATTRIB: HEIGHT SHAPE CIRCUMFERENCE NAME LOCATION COMPOSITION
INCLUD: PILLAR SCAR CRAG CORAL_HEAD CHAPEIRAO PRECIPICE

PIPELINE (INCLUDED TERM 756)
SEE: UTILITY

PIT (INCLUDED TERM 757)
SEE: MINE/HOLE

STANDARD FEATURE TERM 88: PLACE
DEFN: AN AREA WITH DEFINITE OR INDEFINITE BOUNDARIES
SOURCE: THE AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION NAME POPULATION AREA INCORPORATED/UNINCORPORATED
INCLUD: POPULATED_PLACE CITY BOROUGH TOWN VILLAGE PARISH HAMLET LOCALITY MUNICIPALITY SETTLEMENT COMMUNITY URBAN_AREA SEAPORT

PLACER_MINE (INCLUDED TERM 758)
SEE: MINE

STANDARD FEATURE TERM 89: PLAIN
SEE: GRASSLAND
DEFN: A REGION OF GENERAL UNIFORM SLOPE, COMPARATIVELY LEVEL AND OF CONSIDERABLE EXTENT.
SOURCE: GNIS DOCUMENTATION, APPENDIX B
ATTRIB:
INCLUD: FLAT ARCHIPELAGO_APRON COASTAL_PLAIN APRON DELTA OUTWASH_PLAIN

PLANETARIUM (INCLUDED TERM 759)
SEE: BUILDING

PLANT (INCLUDED TERM 760)
SEE: BUILDING

STANDARD FEATURE TERM 90: PLATEAU
DEFN: AN ELEVATED AND COMPARATIVLEY LEVEL EXPANSE OF LAND.
SOURCE: AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION NAME
INCLUD: TABLELAND MESA BUTTE GUYOT TABLEMOUNT TABLEKNOLL INTERMONTAINE_PLATEAU

PLAYGROUND (INCLUDED TERM 761)
SEE: PARK

STANDARD FEATURE TERM 91: PLUNGE POOL
DEFN: A HOLLOW ERODED BY THE FORCE OF THE FALLING WATER AT THE BASE OF A WATERFALL, PARTICULARILY BY THE EDDYING EFFECT.
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE

POCOSIN (INCLUDED TERM 762)
SEE: WETLAND

POINT (INCLUDED TERM 763)
SEE: CAPE/BAR

POLAR_ICE_PACK (INCLUDED TERM 764)
SEE: ICE_FIELD

POLICE_STATION (INCLUDED TERM 765)
SEE: BUILDING/STATION

STANDARD FEATURE TERM 92: POLYNA
DEFN: A WATER AREA ENCLOSED BY ICE, GENERALLY FAST. THIS WATER AREA REMAINS CONSTANT AND USUALLY HAS AN OBLONG SHAPE, SOMETIMES LIMITED ON ONE SIDE BY THE COAST.
ANY ENCLOSED WATER AREA IN PACK ICE OTHER THAN A LEAD, NOT LARGE ENOUGH TO BE CALLED OPEN WATER. WHEN FROZEN OVER, A POLYNA BECOMES AN ICE SKYLIGHT FROM THE POINT OF VIEW OF THE SUBMARINER. ALSO CALLED BIG CLEARING , CLEARING,GLADE, ICE CLEARING, POOL, REGIONAL CLEARING.
SOURCE: NAVIGATION DICTIONARY

POND (INCLUDED TERM 766)
SEE: LAKE

PONTOON_BRIDGE (INCLUDED TERM 767)
SEE: BRIDGE
DEFN: (NEW)A FLOATING BRIDGE.

POOL (INCLUDED TERM 768)
SEE: LAKE

POPULATED_PLACE (INCLUDED TERM 769)
SEE: PLACE
DEFN: A PLACE OR AREA WITH CLUSTERED OR SCATTERED BUILDINGS AND A PERMANENT HUMAN POPULATION.
SOURCE: GNIS DOCUMENTATION, APPENDIX B

STANDARD FEATURE TERM 93: PORT
DEFN: A PLACE PROVIDED WITH TERMINAL AND TRANSFER FACILITIES FOR LOADING AND DISCHARGING CARGO OR PASSENGERS, USUALLY LOCATED IN A HARBOR.
SOURCE: NAVIGATION DICTIONARY, U.S. NAVAL OCEANOGRAPHIC OFFICE
ATTRIB: LOCATION NAME AREA BUOYED CHARTED_DEPTH COMMERCIAL_SHIPPING FACILITIES_AVAILABLE FEATURE_PRESENT VEHICLE_SIZE_SERVED
INCLUD: CANAL_PORT SEAPLANE_BASE OUTPORT SEAPORT

POST (INCLUDED TERM 770)
SEE: BEACON

POST_OFFFICE (INCLUDED TERM 771)
SEE: BUILDING

POWDER_MAGAZINE (INCLUDED TERM 772)
SEE: MILITARY_INSTALLATION

POWER_LINE (INCLUDED TERM 773)
SEE: UTILITY

PRAIRIE (INCLUDED TERM 774)
SEE: GRASSLAND

PRECIPICE (INCLUDED TERM 775)
SEE: CLIFF/PINNACLE

PRIMARY_TIDE_STATION (INCLUDED TERM 776)
SEE: STATION/BUILDING

PRISON (INCLUDED TERM 777)
SEE: BUILDING

PRIVATE_ROAD (INCLUDED TERM 778)
SEE: ROAD

PROGLACIAL LAKE (INCLUDED TERM 779)
SEE: LAKE

PROHIBITED_ANCHORAGE (INCLUDED TERM 780)
SEE: HARBOR

PROHIBITED_AREA (INCLUDED TERM 781)
SEE: DANGER_AREA

PROHIBITED_FLYING_AREA (INCLUDED TERM 782)
SEE: DANGER_AREA

PROMONTORY (INCLUDED TERM 783)
SEE: CAPE

PUMPING_STATION (INCLUDED TERM 784)
SEE: BUILDING/STATION

PUP (INCLUDED TERM 785)
SEE: STREAM

PUSZTA (INCLUDED TERM 786)
SEE: GRASSLAND

PYLON (INCLUDED TERM 787)
SEE: TOWER
DEFN: (NEW)A BRIDGE SUPPORT.

QUAGMIRE (INCLUDED TERM 788)
SEE: WETLAND

QUAKING_BOG (INCLUDED TERM 789)
SEE: WETLAND

QUARANTINE_ANCHORAGE (INCLUDED TERM 790)
SEE: HARBOR

QUARANTINE_BUOY (INCLUDED TERM 791)
SEE: BUOY

QUARRY (INCLUDED TERM 792)
SEE: MINE/HOLE

QUAY (INCLUDED TERM 793)
SEE: WHARF

QUICK_FLASHING_LIGHT (INCLUDED TERM 794)
SEE: BEACON

STANDARD FEATURE TERM 94: QUICKSAND

DEFN: A BED OF LOOSE SAND MIXED WITH WATER FORMING A SOFT, SHIFTING MASS THAT YIELDS EASILY TO PRESSURE AND TENDS TO SUCK DDWN ANY DBJECT RESTING ON ITS SURFACE.
SOURCE: AMERICAN HERITAGE DICTIDNARY
ATTRIB: NAME LOCATIDN

RACE (INCLUDED TERM 795)
SEE: WATERCOURSE/STREAM
DEFN: SWIFTLY FLOWING WATER IN A NARROW CHANNEL OR RIVER; ALSO THE CHANNEL ITSELF.
SOURCE: NATIONAL OCEAN SERVICE GLDSSARY, 1985

STANDARD FEATURE TERM 95: RACETRACK
DEFN: A COURSE LAID OUT FOR RACING.
SOURCE: AMERICAN HERITAGE DICTIONARY
ATTRIB: NAME LOCATION
INCLUD: SPORTS_TRACK

RACON (INCLUDED TERM 796)
SEE: BEACON

RADAR_BEACON (INCLUDED TERM 797)
SEE: BEACON

RADAR_BUOY (INCLUDED TERM 798)
SEE: BUOY

STANDARD FEATURE TERM 96: RADAR DDME
DEFN: A DOME SHAPED STRUCTURE USED TO PROTECT THE ANTENNA OF A RADAR INSTALLATION.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION NAME

STANDARD FEATURE TERM 97: RADAR REFLECTOR
DEFN: A DEVICE CAPABLE OF OR INTENDED FOR REFLECTING RADAR SIGNALS.
SOURCE: NAVIGATION DICTIDNARY
ATTRIB: LOCATION NAME

RADAR_RESPONDER_BEACON (INCLUDED TERM 799)
SEE: BEACON

RADAR_STATION (INCLUDED TERM 800)
SEE: BUILDING/STATION

RADIO_DIRECTION_FINDER_STATION (INCLUDED TERM 801)
SEE: STATION/BUILDING

RADIO_MAST (INCLUDED TERM 802)
SEE: TOWER

RADIO_STATION (INCLUDED TERM 803)
SEE: BUILDING/STATION
DEFN: A PLACE EQUIPPED WITH ONE OR MORE TRANSMITTERS OR RECEIVERS INCLUDING THE ACCESSORY EQUIPMENT NECESSARY FOR CARRYING ON A RADIOCOMMUNICATION SERVICE.
SOURCE: MODIFIED FROM NATIONAL OCEAN SERVICE GLOSSARY

RADIO_TOWER (INCLUDED TERM 804)
SEE: TOWER

RADIOBEACON (INCLUDED TERM 805)
SEE: BEACON

RADIOBEACON_BUOY (INCLUDED TERM 806)
SEE: BUOY
SEE: BUDY

RADIOBEACON_MONITOR_STATION (INCLUDED TERM 807)
SEE: STATION/BUILDING

RAILROAD (INCLUDED TERM 808)
SEE: RAILWAY

RAILROAD_CROSSING (INCLUDED TERM 809)
SEE: INTERSECTION

STANDARD FEATURE TERM 98: RAILROAD GANTRY
DEFN: A BRIDGELIKE SPANNING FRAME SUPPORTING A GROUP OF RAILWAY SIGNALS OVER SEVERAL TRACKS.
SOURCE: MODIFIED FROM AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION NAME

RAILROAD_PASSING (INCLUDED TERM 810)
SEE: RAILWAY
DEFN: (NEW)A SHORT SECTION OF RAILROAD TRACK CONNECTED BY SWITCHES WITH THE MAIN TRACK AND USED FOR THE PASSAGE OF TRAINS ON SINGLE LINE RAILROADS.

RAILROAD_STORAGE/REPAIR_BUILDING (INCLUDED TERM 811)
SEE: BUILDING
DEFN: (NEW)A BUILDING USED TO RESTORE, REPAIR, OR STORE RAILROAD EQUIPMENT.

STANDARD FEATURE TERM 99: RAILWAY
DEFN: A PERMANENT WAY HAVING ONE OR MORE RAILS WHICH PROVIDES A TRACK FOR CARS.
SOURCE: MODIFIED FORM CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION ACCESS NAME RAILS_NUMBER_OF ELEVATION GRADIENT TRACK_GAUGE LENGTH MOVABLE/STATIONARY MAIN_TRACK/CONNECTED_BY_SWITCHES CARGO_TRANSPORTATION PASSENGER_TRANSPORTATION COMPOSITION COVERED FEATURE_PRESENT SPAN_RAIL_DIRECTION_CHANGES RAIL_CONNECTOR_TYPE RAIL_GUAGE_ADAPTABILITY SLOPE TRAFFIC_LIGHTS_PRESENCE*OF TREE_LINED
INCLUD: CARLINE MONORAIL MULTIPLE_TRACK_RAILWAY RAILROAD_PASSING RAILRDAD_YARD RAILROAD SIDING SPECIAL_TRACK_RAILWAY SPUR STREETCAR_LINE SUBWAY TRAMWAY/INCLINE_RAILWAY SINGLE_TRACK_RAILWAY DOUBLE_TRACK_RAILWAY TRACK RAIL_DIRECTION_CHANGES

RAILWAY_TUNNEL (INCLUDED TERM 812)
SEE: TUNNEL

STANDARD FEATURE TERM 100: RAILWAY YARD
DEFN: AN AREA PROVIDED WITH A SYSTEM OF TRACKS WHERE RAILROAD TRAINS ARE MADE UP AND CARS ARE SWITCHED, STORED, OR SERVICED.
SOURCE: AMERICAN HERITAGE DICTIONARY

RAISED_BEACH (INCLUDED TERM 813)
SEE: TERRACE

RAISED_BOG (INCLUDED TERM 814)

SEE: WETLAND

RAMP (INCLUDED TERM 815)
SEE: ROAD

RANGE (INCLUDED TERM 816)
SEE: GRASSLAND/LANE/MOUNT/RIDGE

RANGER_STATION (INCLUDED TERM 817)
SEE: BUILDING/STATION

RANGING_LIGHT (INCLUDED TERM 818)
SEE: BEACON

RANGING_MARKER (INCLUDED TERM 819)
SEE: BEACON

STANDARD FEATURE TERM 101: RAPIDS
DEFN: AN AREA OF BROKEN, FAST FLOWING WATER IN A STREAM, WHERE THE SLOPE OF THE BED INCREASES (BUT WITHOUT A PROMINENT BREAK OF SLOPE WHICH MIGHT RESULT IN A WATERFALL), OR WHERE A GENTLY DIPPING BAR OF HARDER ROCK OUTCROPS;...
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE
ATTRIB: LOCATION WIDTH FEATURE_PRESENT DISCHARGE
INCLUD: CATARACT

RAVINE (INCLUDED TERM 820)
SEE: VALLEY/WATERCOURSE
DEFN: A DEEP NARROW CLEFT OR GORGE IN THE EARTH'S SURFACE, ESPECIALLY ONE WORN BY THE FLOW OF WATER.
SOURCE: ADAPTED FROM WEBSTER'S NEW COLLEGIATE DICTIONARY

RE-ENTRANT (INCLUDED TERM 821)
SEE: VALLEY

REACH (INCLUDED TERM 822)
SEE: WATERCOURSE/STREAM
DEFN: A SPECIFIC SECTION OF A RIVER. IN NAVIGATION, A STRAIGHT SECTION BETWEEN BENDS. IN A CANAL, A SECTION BETWEEN TWO LOCKS.
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE

REAR_LIGHT (INCLUDED TERM 823)
SEE: BEACON

RECURVED_SPIT (INCLUDED TERM 824)
SEE: BAR

RED_SECTOR (INCLUDED TERM 825)
SEE: BEACON

RED_SECTOR_LIGHT (INCLUDED TERM 826)
SEE: BEACON

STANDARD FEATURE TERM 102: REEF
DEFN: A RIDGE OF ROCKS, LYING NEAR THE SURFACE OF THE SEA, WHICH MAY BE VISABLE AT LOW TIDE, BUT IS USUALLY COVERED BY WATER.
SOURCE: MOORE, A DICTIONARY OF GEOGRAPHY

ATTRIB: LENGTH WIDTH HEIGHT LOCATION COMPOSITION SHAPE NAME NAVIGABLE
INCLUD: BARRIER_REEF CORAL_REEF REEF_FLAT BANK_REEF LEDGE SUBMERGED_REEF ATOLL ATOLL_REEF SHORE_REEF FRINGING_REEF

REEF_FLAT (INCLUDED TERM 827)
SEE: REEF

REFINERY (INCLUDED TERM 828)
SEE: BUILDING

REFORESTED_AREA (INCLUDED TERM 829)
SEE: WOODLAND

REGIONAL_PARK (INCLUDED TERM 830)
SEE: PARK

STANDARD FEATURE TERM 103: RELIEF
DEFN: INEQUALITIES IN THE ELEVATIONS OF THE TERRAIN OR THE OCEAN BED OR THEIR REPRESENTATION ON A CHART OR MAP.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY.
ATTRIB: LOCATION NAME UNIT_OF_MEASUREMENT ELEVATION/DEPRESSION
INCLUD: HILL_SHADED_AREA RELIEF_SHADED_AREA HACHURES LAYER_TINTING HACHURED_AREA SHADING GRADIENT_TINT HYPSOMETRIC_TINT
LAYER_TINT ALTITUDE_TINT COLOR_GRADIENT TINTS CONTOUR_INTERVAL HILL-SHADING

RELIEF_SHADED_AREA (INCLUDED TERM 831)
SEE: RELIEF

RESEARCH_CENTER (INCLUDED TERM 832)
SEE: BUILDING

RESERVATION (INCLUDED TERM 833)
SEE: PARK

RESERVE (INCLUDED TERM 834)
SEE: PARK

RESERVOIR (INCLUDED TERM 835)
SEE: LAKE

RESPONDER_BEACON (INCLUDED TERM 836)
SEE: BEACON

REST_AREA (INCLUDED TERM 837)
SEE: PARK
DEFN: (NEW)AN AREA SET ASIDE FOR THE PURPOSE OF RESTING OR CEASING ACTIVITIES SUCH AS TRAVELLING.

RESTRICTED_AREA (INCLUDED TERM 838)
SEE: DANGER_AREA

RESTRICTED_WATERS (INCLUDED TERM 839)
SEE: DANGER_AREA

RETAINING_WALL (INCLUDED TERM 840)
SEE: REVETMENT

STANDARD FEATURE TERM 104: REVETMENT
DEFN: A FACING OF STONE, CONCRETE, WOOD ETC., BUILT TO SUSTAIN AN EMBANKMENT.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION LENGTH CONSTRUCTION_MATERIAL HEIGHT WIDTH NAME
INCLUD: RIPRAP MATTRESS RETAINING_WALL APRON BULKHEAD RIPRAP_MOUNDS

RHUMB_LINE (INCLUDED TERM 841)
SEE: BEARING_LINE

RHUMB_LINE_COURSE (INCLUDED TERM 842)
SEE: BEARING_LINE

RIA (INCLUDED TERM 843)
SEE: INLET
DEFN: A LONG NARROW INLET WITH GRADUALLY DECREASING DEPTH INWARD.
SOURCE: NAVIGATION DICTIONARY, U.S. NAVAL OCEANOGRAPHIC OFFICE

STANDARD FEATURE TERM 105: RIDGE
DEFN: A LONG AND NARROW UPLAND WITH STEEP SIDES.
SOURCE: MODIFIED FROM NAUTICAL CHART MANUAL
ATTRIB: LOCATION HEIGHT ELEVATION SLOPE COMPOSITION LENGTH WIDTH
INCLUD: SPUR ARETE ESKER SILL SAND_DUNE CERRO LATERAL_MORAINE TERMINAL_MORAINE END_MDRAINE CUESTA BEACH_CUSPS BEACH_RIDGE CREST RANGE MOUNTAIN_RANGE DRUMLIN SEAMOUNT_RANGE KAME

RIFT_VALLEY (INCLUDED TERM 844)
SEE: VALLEY

RILL (INCLUDED TERM 845)
SEE: STREAM

RINCON (INCLUDED TERM 846)
SEE: INLET

RIO (INCLUDED TERM 847)
SEE: STREAM

RIPRAP (INCLUDED TERM 848)
SEE: REVETMENT

RIPRAP_MOUNDS (INCLUDED TERM 849)
SEE: REVETMENT

RISE (INCLUDED TERM 850)
SEE: MOUNT

RIVAGE (INCLUDED TERM 851)
SEE: SHORE/COAST/BEACH

RIVER (INCLUDED TERM 852)
SEE: STREAM
DEFN: A NATURAL STREAM OF WATER, OF GREATER VOLUME THAN A CREEK OR RIVULET, FLOWING IN A MORE OR LESS PERMANENT BED OR CHANNEL, BETWEEN DEFINED BANKS OR WALLS, WITH A CURRENT WHICH MAY EITHER BE CONTINUOUS IN ONE DIRECTION OR AFFECTED BY THE EBB AND FLOW OF THE TIDAL CURRENT.

SOURCE: NAVIGATION DICTIONARY, U.S. NAVAL OCEANOGRAPHIC OFFICE

RIVER_BED (INCLUDED TERM 853)
SEE: WATERCOURSE
DEFN: THE WATERCOURSE COVERED OR ONCE COVERED BY WATER, BETWEEN THE BANKS OF A RIVER.
SOURCE: MODIFIED FROM HERITAGE DICTIONARY

RIVER_BUOY (INCLUDED TERM 854)
SEE: BUOY

RIVULET (INCLUDED TERM 855)
SEE: STREAM
DEFN: A SMALL BROOK OR STREAM; STREAMLET
SOURCE: THE AMERICAN HERITAGE DICTIONARY

STANDARD FEATURE TERM 106: ROAD
DEFN: AN OPEN WAY FOR THE PASSAGE OF VEHICLES, PERSONS, OR ANIMALS ON LAND.
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION ACCESS NAME MODE_TRANSPORTED WIDTH LENGTH LANES_NUMBER_OF SURFACE_MATERIAL BEARING_CAPACITY ACCESS ELEVATION GRADIENT USE BLIND/OPEN RESTRICTIONS MEDIAN EXISTING/PROPOSED PUBLIC/PRIVATE CARGO_TRANSPORTATION COVERED LIGHTED PASSENGER_TRANSPORTATION MEDIAN_PRESENCE_OF CUL_DE_SAC FEATURE_PRESENT GROUND_LEVEL_RELATIONSHIP ONE_WAY/TWO_WAY SLOPE OWNER_TYPE USER_TYPE PEDESTRIAN_USE PHYSICAL_CONDITION_OF_SURFACE_MATERIAL ROAD_TYPE TOLL TRAFFIC_LIGHTS_PRESENCE_OF TREE_LINED
INCLUD: ACCESSWAY ALLEY APPROACH_TO_HIGHWAY AVENUE BICYCLE_PATH BICYCLE_TRAIL BOARDWALK BOULEVARD CART_TRACK CONTROLLED_ACCESS_ROAD CORDUROY_ROAD CAUSEWAY DEAD_END_STREET DIVIDED_HIGHWAY DRIVEWAY DUAL_HIGHWAY EXPRESSWAY ELEVATED_FARM_LANE FIRE_ROAD FOOTPATH FREEWAY HIGHWAY LANE MAINTENANCE_ROAD PARKWAY PRIVATE_ROAD RAMP RUNAWAY_PREVENTER SERVICE_LANE SERVICE_STREET SIDEWALK STREET TOLLROAD TRACK TRAIL TURNPIKE WALK WINTER_ROAD THRUWAY PATH PIER CUL_DE_SAC WAY THOROFARE THRDUGHFARE

ROADSTEAD (INCLUDED TERM 856)
SEE: HARBOR

STANDARD FEATURE TERM 107: ROCK
DEFN: AN ISOLATED ROCKY FORMATION OR A SINGLE LARGE STONE, USUALLY ONE CONSTITUTING A DANGER TO NAVIGATION. IT MAY BE ALWAYS SUBMERGED, ALWAYS UNCOVERED, OR ALTERNATELY COVERED AND UNCOVERED BY THE TIDE.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY
ATTRIB: NAME LOCATION
INCLUD: BARE_ROCK AWASH_ROCK SUNKEN_ROCK DANGEROUS_ROCK

ROCK_GLACIER (INCLUDED TERM 857)
SEE: ICE_FIELD

ROCK_TERRACE (INCLUDED TERM 858)
SEE: TERRACE

ROCKET_STATION (INCLUDED TERM 859)
SEE: BUILDING/STATION

ROTATING_BEACON (INCLUDED TERM 860)
SEE: BEACON

ROTATING_LOOP_RADIOBEACON (INCLUDED TERM 861)
SEE: BEACON

RDTATING_LIGHT (INCLUDED TERM 862)
SEE: BEACON

RDUNDHOUSE (INCLUDED TERM 863)
SEE: BUILDING

ROUTE_MARKER (INCLUDED TERM 864)
SEE: SIGN

RUN (INCLUDED TERM 865)
SEE: STREAM

RUNAWAY_PREVENTER (INCLUDED TERM 866)
SEE: ROAD

RUNNEL (INCLUDED TERM 867)
SEE: STREAM/TRDUGH
DEFN: SMALL BRODK DR CHANNEL. A TROUGH, GENERALLY ABOUT PARALLEL TO THE SHORE, SEPARATED BY LOW RIDGES (ORDINARILY ON SANDY BOTTDM), EXPOSED AS A RULE WHEN THE TIDE EBBS ACROSS A COMPARATIVELY FLAT BOTTOM, AS A RULE SEVERAL ORDERS OF MAGNITUDE LARGER THAN RIPPLE MARKS (WHICH CDMMONLY ARE PRESENT DN ITS SURFACE).
SOURCE: COASTAL LANDFORMS AND SURFACE FEATURES, SNEAD

STANDARD FEATURE TERM 108: RUNWAY
DEFN: A STRAIGHT PATH USED FOR LANDING AND TAKE-OFF DF AIRCRAFT.
SDURCE: MODIFIED FRDM NAVIGATIDN DICTIONARY
ATTRIB: LDCATION NAME LENGTH WIDTH SURFACE_MATERIAL SIZE_OF_AIRCRAFT_SERVED LIGHTED PHYSICAL_CONDITIDN_OF_SURFACE RESTRICTIONS PASSENGER_TRANSPORTATION
INCLUD: LANDING_LANE LANDING_STRIP TAXIWAY WATER_LANE TAXI_CHANNEL LANDING_AREA LANDING_FIELD AIRSTRIP AIRFIELD HELIPAD HELIPORT LANDING_AREA SEADROME

RUNWAY_LIGHTS (INCLUDED TERM 868)
SEE: BEACON

SADDLE (INCLUDED TERM 869)
SEE: GAP

SAGEBRUSH (INCLUDED TERM 870)
SEE: WDODLAND

SALINA (INCLUDED TERM 871)
SEE: WETLAND LAKE

SALT_MARSH (INCLUDED TERM 872)
SEE: WETLAND

SALTING (INCLUDED TERM 873)
SEE: WETLAND

SANCTUARY (INCLUDED TERM 874)
SEE: PARK

SAND_BANK (INCLUDED TERM 875)
SEE: BAR

SAND_DUNE (INCLUDED TERM 876)
SEE: MOUNT/RIDGE

SAND_HORN (INCLUDED TERM 877)
SEE: BAR

SAND_LOBE (INCLUDED TERM 878)
SEE: BAR

SAND_PIT (INCLUDED TERM 879)
SEE: HOLE/MINE

SAND_SPIT (INCLUDED TERM 880)
SEE: BAR

SANDBAR (INCLUDED TERM 881)
SEE: BAR

SANITARIUM (INCLUDED TERM 882)
SEE: BUILDING

SAVANNA (INCLUDED TERM 883)
SEE: GRASSLAND

SCAR (INCLUDED TERM 884)
SEE: CLIFF/PINNACLE

SCARP (INCLUDED TERM 885)
SEE: CLIFF

SCAW (INCLUDED TERM 886)
SEE: CLIFF

SCHOOL (INCLUDED TERM 887)
SEE: BUILDING

SCIENCE_CENTER (INCLUDED TERM 888)
SEE: BUILDING

SCRUB (INCLUDED TERM 889)
SEE: WOODLAND

STANDARD FEATURE TERM 109: SEA
DEFN: THE GREAT BODY OF SALT WATER OF THE OCEANS.
SOURCE: ADAPTED FROM STAMP
ATTRIB: LOCATION NAME ACIDITY SALINITY CHARTED_DEPTH COMMERCIAL_SHIPPING ICE_PRESENCE_OF MINERAL_CONTENT NAVIGABLE RECREATIONAL
INCLUD: ARCHIPELAGO MARGINAL_SEA CLOSED_SEA OPEN_SOUND OCEAN OPEN_SEA OPEN_WATER SOUND

SEA_BEACON (INCLUDED TERM 890)
SEE: BEACON

SEA_BUOY (INCLUDED TERM 891)
SEE: BUOY

SEA_COAST (INCLUDED TERM 892)
SEE: COAST

SEA_GATE (INCLUDED TERM 893)
SEE: BREAKWATER/GATE

SEA_WALL (INCLUDED TERM 894)
SEE: EMBANKMENT

SEACHANNEL (INCLUDED TERM 895)
SEE: VALLEY/WATERCOURSE

SEADROME (INCLUDED TERM 896)
SEE: RUNWAY

SEAKNOLL (INCLUDED TERM 897)
SEE: MOUNT

SEAMOUNT (INCLUDED TERM 898)
SEE: MOUNT

SEAMOUNT_CHAIN (INCLUDED TERM 899)
SEE: MOUNT

SEAMOUNT_GROUP (INCLUDED TERM 900)
SEE: MOUNT

SEAMOUNT_RANGE (INCLUDED TERM 901)
SEE: MOUNT/RIDGE

SEAPEAK (INCLUDED TERM 902)
SEE: MOUNT

SEAPLANE_BASE (INCLUDED TERM 903)
SEE: PORT

SEAPORT (INCLUDED TERM 904)
SEE: PORT/PLACE

SEASHORE (INCLUDED TERM 905)
SEE: SHORE

SEAWALL (INCLUDED TERM 906)
SEE: BREAKWATER

SEAWAY (INCLUDED TERM 907)
SEE: WATERCOURSE/LANE
DEFN: A SHIP CANAL; IN INLAND WATERWAY WHICH CAN TAKE SEA-GOING SHIPS; E,G. THE ST. LAWRENCE S.
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE

SECONDARY_TIDE_STATION (INCLUDED TERM 908)
SEE: STATION/BUILDING

SECTORED_LIGHT (INCLUDED TERM 909)
SEE: BEACON

SEEP (INCLUDED TERM 910)
SEE: SPRING

SERVICE_LANE (INCLUDED TERM 911)
SEE: ROAD/LANE

SERVICE_STREET (INCLUDED TERM 912)
SEE: ROAD

SETTLEMENT (INCLUDED TERM 913)
SEE: PLACE

SEWAGE_TREATMENT_PLANT (INCLUDED TERM 914)
SEE: BUILDING

SHADING (INCLUDED TERM 915)
SEE: RELIEF

SHIELD_VOLCANO (INCLUDED TERM 916)
SEE: MOUNT

STANDARD FEATURE TERM 110: SHINGLE
DEFN: A COLLECTION OF LOOSE PEBBLES ON THE SHORE OF THE SEA OR A LAKE
SOURCE: ADAPTED FROM MOORE, A DICTIONARY OF GEOGRAPHY

SHIP_CANAL (INCLUDED TERM 917)
SEE: WATERCOURSE
DEFN: AN ARTIFICIAL WATERWAY LARGE ENOUGH TO ACCOMODATE OCEAN-GOING VESSELS.
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE

SHIPPING_LANE (INCLUDED TERM 918)
SEE: LANE

STANDARD FEATURE TERM 111: SHIPYARD
DEFN: A YARD DR AREA WHERE SHIPS ARE BUILT OR REPAIRED.
SOURCE: AMERICAN HERITAGE DICTIONARY
INCLUD: DOCKYARD

SHOAL (INCLUDED TERM 919)
SEE: BAR

SHOAL_PATCHES (INCLUDED TERM 920)
SEE: BAR

SHOPPING_CENTER (INCLUDED TERM 921)
SEE: BUILDING

STANDARD FEATURE TERM 112: SHORE
DEFN: THAT PART OF THE LAND IN IMMEDIATE CONTACT WITH A BODY OF WATER INCLUDING THE AREA BETWEEN HIGH AND LOW WATER LINES.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY

ATTRIB: SLOPE LOCATION AREA COMPOSITION LENGTH WIDTH NAME
INCLUD: INSHORE STRAND FORESHORE BEACH_FACE RIVAGE SHOREFACE SEASHORE SHORELINE BANK

SHORE_REEF (INCLUDED TERM 922)
SEE: REEF

SHOREFACE (INCLUDED TERM 923)
SEE: SHORE

STANDARD FEATURE TERM 113: SHORELINE
DEFN: THE LINE OF CONTACT BETWEEN A BODY OF WATER AND THE LAND
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY
ATTRIB: MEAN_HIGH_WATER MEAN_SEA_LEVEL DATUM COASTLINE
INCLUD: SHORELINE MEAN_SEA_LEVEL ORDNANCE_DATUM COASTLINE NGVD_DATUM

SHORT_FLASHING_LIGHT (INCLUDED TERM 924)
SEE: BEACON

SHORT_LONG_FLASHING_LIGHT (INCLUDED TERM 925)
SEE: BEACON

SHRINE (INCLUDED TERM 926)
SEE: BUILDING

SIDEWALK (INCLUDED TERM 927)
SEE: ROAD

SIDING (INCLUDED TERM 928)
SEE: RAILWAY

STANDARD FEATURE TERM 114: SIGN
DEFN: A ROADWAY ASSOCIATED FEATURE WHICH PROVIDES INFORMATION TO PEOPLE PASSING.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION INFORMATION_DISPLAYED COMPOSITION LIGHTED
INCLUD: DISPLAY_SIGN HIGHWAY_ROUTE_NUMBER MILE_POST MILEAGE/KILOMETER_POST ROUTE_MARKER TRAFFIC_SIGN SIGN_POST BILLBOARD BOUNDARY_SIGN

SIGN_POST (INCLUDED TERM 929)
SEE: SIGN

SIGNAL_STATION (INCLUDED TERM 930)
SEE: BUILDING/STATION

SILL (INCLUDED TERM 931)
SEE: RIDGE/GAP

SILO (INCLUDED TERM 932)
SEE: TOWER

SILVA (INCLUDED TERM 933)
SEE: WOODLAND

SINGLE_TRACK_RAILWAY (INCLUDED TERM 934)

SEE: RAILWAY

SINK (INCLUDED TERM 935)
SEE: BASIN

SINKHOLE (INCLUDED TERM 936)
SEE: BASIN

STANDARD FEATURE TERM 115: SKI AREA
DEFN: AN AREA USED FOR SKIING.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION NAME

SKI_LIFT (INCLUDED TERM 937)
SEE: CABLEWAY

SLAG_HEAP (INCLUDED TERM 938)
SEE: DUMPING_GROUND

SLASH (INCLUDED TERM 939)
SEE: WETLAND

SLIP (INCLUDED TERM 940)
SEE: DOCK

SLOUGH (INCLUDED TERM 941)
SEE: WETLAND

SLUE (INCLUDED TERM 942)
SEE: WETLAND

SLUICE (INCLUDED TERM 943)
SEE: WATERCOURSE/GATE

SLUICE_GATE (INCLUDED TERM 944)
SEE: GATE

SMOKE_STACK (INCLUDED TERM 945)
SEE: TOWER

STANDARD FEATURE TERM 116: SNOWFIELD
DEFN: A REGION OF PERMANENT SNOW IN MOUNTAINOUS AREAS OR HIGH LATITUDES.
SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING

SONOBUOY (INCLUDED TERM 946)
SEE: BUOY

SOUND (INCLUDED TERM 947)
SEE: WATERCOURSE/LAKE/SOUND
DEFN: A RELATIVELY LONG ARM OF THE SEA OR OCEAN FORMING A CHANNEL BETWEEN AN ISLAND AND A MAINLAND OR CONNECTING TWO LARGER BODIES OF WATER, AS A SEA AND THE OCEAN, OR TWO PARTS OF THE SAME BODY BUT USUALLY WIDER AND MORE EXTENSIVE THAN A STRAIT. THE TERM HAS BEEN APPLIED TO MANY FEATURES WHICH DO NOT FIT THE ACCEPTED DEFINITION. MANY ARE VERY LARGE BODIES OF WATER, SUCH AS MISSISSIPPI SOUND AND PRINCE WILLIAM SOUND, OTHERS ARE MERE SALT WATER PONDS OR SMALL PASSAGES BETWEEN ISLANDS.

SOURCE: NAVIGATIDN DICTIONARY, U.S. NAVAL OCEANOGRAPHIC OFFICE

SOUND_BARRIER (INCLUDED TERM 948)
SEE: BARRIER

SOUND_BUOY (INCLUDED TERM 949)
SEE: BUOY

STANDARD FEATURE TERM 117: SDUNDING
DEFN: MEASURED DR CHARTED DEPTH DF WATER, OR THE MEASUREMENT DF SUCH DEPTH.
SDURCE: MODIFIED FROM NAVIGATIDN DICTIONARY
ATTRIB: LOCATIDN DEPTH NAME APPROXIMATE/EXACT_MEASUREMENT NO_MEASUREMENT_POSSIBLE
INCLUD: CRDSS_LINES DANGER_SOUNDINGS CHART_DATUM CHARTED_DEPTH DEPTH CDNTRDLLING_DEPTH NO-BDTTDM_SDUNDING DDUBTFUL_SDUNDINGS NO_BDTTOM_FOUND OUT_OF_POSITIDN LEAST_DEPTH_IN_NARROW_CHANNELS DREDGED_CHANNEL DREDGED_AREA SWEPT_CHANNEL DRYING_(OR_UNCOVERING)_HEIGHTS_ABOVE_CHART_SDUNDING_DATUM SWEPT_AREA ECHD_SDUNDINGS UNSDUNDED_AREA SDUNDINGS_AT_WHICH_BOTTOM_HAS_NOT_BEEN_REACHED SDUNDING_DATUM

SDUNDING_DATUM (INCLUDED TERM 950)
SEE: SOUNDING

SPAR_BUDY (INCLUDED TERM 951)
SEE: BUDY

SPECIAL_PURPOSE_BUOY (INCLUDED TERM 952)
SEE: BUOY

SPECIAL_TRACK_RAILWAY (INCLUDED TERM 953)
SEE: RAILWAY

SPILLWAY (INCLUDED TERM 954)
SEE: WATERCOURSE
DEFN: A PASSAGE FDR SURPLUS WATER TO RUN OVER OR AROUND A DAM.
SOURCE: WEBSTERS NEW CDLLEGIATE DICTIONARY

SPIT (INCLUDED TERM 955)
SEE: BAR

SPOIL_AREA (INCLUDED TERM 956)
SEE: DUMPING_GROUND

SPOIL_BANKS (INCLUDED TERM 957)
SEE: DUMPING_GROUND

SPOIL_GRDUND_BUDY (INCLUDED TERM 958)
SEE: BUDY

SPOIL_GRDUND (INCLUDED TERM 959)
SEE: DUMPING_GROUND

STANDARD FEATURE TERM 118: SPDRTS FIELD
DEFN: A FIELD ON WHICH SPORTING ACTIVITIES ARE CARRIED OUT.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION NAME

INCLUD: SPORTS_PLAYING_FIELD BALL_PARK

SPORTS_PLAYING_FIELD (INCLUDED TERM 960)
SEE: SPORTS_FIELD

SPORTS_TRACK (INCLUDED TERM 961)
SEE: RACETRACK

STANDARD FEATURE TERM 119: SPRING
DEFN: THE PLACE WHERE WATER ISSUES FROM THE GROUND NATURALLY.
SOURCE: MODIFIED FROM USGS
ATTRIB: LOCATION NAME FORCE OF FLOW INTERMITTENT/PERENNIAL TEMPERATURE RELATION_TO_WATER_SURFACE SALINITY
INCLUD: SEEP MINERAL_SPRING HOTSPRING WATERING_PLACE

SPUR (INCLUDED TERM 962)
SEE: RIDGE/RAILWAY/ROAD

SQUARE (INCLUDED TERM 963)
SEE: PARK

STABLE (INCLUDED TERM 964)
SEE: BUILDING

STACK (INCLUDED TERM 965)
SEE: ISLAND

STADIUM (INCLUDED TERM 966)
SEE: OUTDOOR_THEATER

STAKE_NET (INCLUDED TERM 967)
SEE: FISH_TRAP

STAND (INCLUDED TERM 968)
SEE: WOODLAND

STANDPIPE (INCLUDED TERM 969)
SEE: TOWER

STANDARD FEATURE TERM 120: STATION
SEE: BUILDING
DEFN: THE PLACE, BUILDING OR ESTABLISHMENT FROM WHICH A SERVICE IS PROVIDED OR OPERATIONS ARE DIRECTED.
SOURCE: AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION NAME FACILITIES_AVAILABLE LIGHTED USER_TYPE OWNER_TYPE RADIO_TRANSMISSION
INCLUD: PUMPING_STATION FIRE_STATION FILLING_STATION POLICE_STATION RADAR_STATION RANGER_STATION SIGNAL_STATION
TELEVISION_STATION TIDE_STATION PRIMARY_TIDE_STATION SECONDARY_TIDE_STATION LIFE_SAVING_STATION
COAST_GUARD_STATION ROCKET_STATION MARINE_AUTOMATIC_METEROLOGICAL_STATION LIGHT_STATION OFFSHORE_STATION
OFFSHORE_LIGHT_STATIONOCEAN_STATION RADIO_STATION RADIOBEACON_MONITOR_STATION TRANSMITTER_STATION
RADIO_DIRECTION_FINDER_STATION AERONAUTICAL_NAVIGATIONAL_RADIO_STATION ELECTRICAL_POWER_GENERATING_STATION
ELECTRICAL_SUBSTATION TRANSFORMER_STATION

STATION_BUOY (INCLUDED TERM 970)
SEE: BUOY

STEPPE (INCLUDED TERM 971)
SEE: GRASSLAND

STONE_MOUND_MONUMENT (INCLUDED TERM 972)
SEE: CONTROL_POINT

STORAGE_TANK (INCLUDED TERM 973)
SEE: TANK

STORE (INCLUDED TERM 974)
SEE: BUILDING

STRAIT (INCLUDED TERM 975)
SEE: WATERCOURSE
DEFN: A RELATIVELY NARROW WATERWAY, USUALLY NARROWER AND LESS EXTENSIVE THAN A SOUND, CONNECTING TWO LARGER BODIES OF WATER.
SOURCE: NATIONAL OCEAN SERVICE GLOSSARY DRAFT, 1985

STRAND (INCLUDED TERM 976)
SEE: SHORE

STRANDED_WRECK (INCLUDED TERM 977)
SEE: WRECK

STRANDING_HARBOR (INCLUDED TERM 978)
SEE: HARBOR

STRATH (INCLUDED TERM 979)
SEE: VALLEY

STANDARD FEATURE TERM 121: STREAM
DEFN: A LINEAR BODY OF WATER FLOWING ALONG A WATERCOURSE
SOURCE: MODIFIED FROM OHIO STATE PRELIMINARY LIST
ATTRIB: LOCATION,NAME, GROUND_LEVEL_RELATIONSHIP WIDTH DEPTH VOLUME LENGTH INTERMITTENT/PERENNIAL SALINITY DIRECTION_OF_FLOW BRANCH/PARENT FORCE_OF_FLOW TIDAL GLACIAL HYDRAULIC_RADIUS FORM_RATIO CROSS_SECTIONAL_AREA WETTED_PERIMETER ACIDITY BRAIDED BUOYED CHARTED_DEPTH COVERED DISCHARGE DRAINAGE ICE_PRESENCE_OF IRRIGATION MINERAL_CONTENT NAVIGABLE RECREATIONAL LIGHTED TEMPERATURE
INCLUD: ANABRANCH AWAWA BAYOU BECK BRAIDED_RIVER BRAIDED_STREAM BRANCH BROOK CREEK FORK GLACIAL_STREAM KILL OBSEQUENT_STREAM PUP RIO RIVER RUN SLOUGH TORRENT RIVULET RUNNEL RILL TRIBUTARY RACE SWALE REACH THOROFARE THROUGHFARE

STREAM_CHANNEL (INCLUDED TERM 980)
SEE: WATERCOURSE
DEFN: THE WATERCOURSE OF A STREAM.
SOURCE: MODIFIED FROM A DICTIONARY OF BASIC GEOGRAPHY, SCHMIEDER, GRIFFIN, CHATHAM, NATOLI

STREET (INCLUDED TERM 981)
SEE: ROAD

STREETCAR_LINE (INCLUDED TERM 982)
SEE: RAILWAY

STRING_BOG (INCLUDED TERM 983)
SEE: WETLAND

STRIP_MINE (INCLUDED TERM 984)
SEE: MINE

SUBMARINE_ISTHMUS (INCLUDED TERM 985)
SEE: ISTHMUS

SUBMARINE_CABLE (INCLUDED TERM 986)
SEE: UTILITY

SUBMERGED_REEF (INCLUDED TERM 987)
SEE: REEF

SUBWAY (INCLUDED TERM 988)
SEE: RAILWAY/TUNNEL

SUMMIT (INCLUDED TERM 989)
SEE: MOUNT

SUNKEN_ROCK (INCLUDED TERM 990)
SEE: ROCK

SUNKEN_WRECK (INCLUDED TERM 991)
SEE: WRECK

SUPER-BUOY (INCLUDED TERM 992)
SEE: BUOY

SUPPLEMENTARY_AERODROME (INCLUDED TERM 993)
SEE: AIRPORT

SURVEY_MONUMENT (INCLUDED TERM 994)
SEE: CONTROL_POINT

SUSPENSION_BRIDGE (INCLUDED TERM 995)
SEE: BRIDGE

SWALE (INCLUDED TERM 996)
SEE: TROUGH
DEFN: A LONG NARROW DEPRESSION ON A BEACH, BROADLY PARALLEL TO THE COASTLINE, SEPARATING TWO RIDGES OF SHINGLE;
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE

SWAMP (INCLUDED TERM 997)
SEE: WETLAND

SWAMP_FOREST (INCLUDED TERM 998)
SEE: WETLAND

STANDARD FEATURE TERM 122: SWASH
DEFN: THE MASS OF BROKEN FOAMING WATER WHICH RUSHES BODILY UP A BEACH AS A WAVE BREAKS. SYN. WITH SEND.
SOURCE: A DICTIONARY OF GEOGRAPHY, MONKHOUSE

SWING_BRIDGE (INCLUDED TERM 999)
SEE: BRIDGE

SWINGING_BUOY (INCLUDED TERM 1000)
SEE: BUOY

SYNAGOGUE (INCLUDED TERM 1001)
SEE: BUILDING

TABLEKNOLL (INCLUDED TERM 1002)
SEE: PLATEAU

TABLELAND (INCLUDED TERM 1003)
SEE: PLATEAU

TABLEMOUNT (INCLUDED TERM 1004)
SEE: PLATEAU

TAIGA (INCLUDED TERM 1005)
SEE: WOODLAND

TAILING_DUMP (INCLUDED TERM 1006)
SEE: DUMPING_GROUND

TAILING_PILE (INCLUDED TERM 1007)
SEE: DUMPING_GROUND

TAILING_POND (INCLUDED TERM 1008)
SEE: DUMPING_GRDUND

STANDARD FEATURE TERM 123: TALUS
DEFN: SLOPES OF BROKEN ROCK DEBRIS ON A MOUNTAINSIDE.
SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION NAME

STANDARD FEATURE TERM 124: TANK
DEFN: A STRUCTURE USED FOR THE STORAGE OF FLUIDS.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION NAME
INCLUD: GASOMETER STORAGE_TANK

TAXI-CHANNEL (INCLUDED TERM 1009)
SEE: RUNWAY

TAXI_CHANNEL_LIGHT (INCLUDED TERM 1010)
SEE: BEACON

TAXIWAY (INCLUDED TERM 1011)
SEE: RUNWAY

TAXIWAY_LIGHTS (INCLUDED TERM 1012)
SEE: BEACON

TELEGRAPH_BUOY (INCLUDED TERM 1013)
SEE: BUOY

TELEVISION_TOWER (INCLUDED TERM 1014)
SEE: TOWER

TELEVISION_STATION (INCLUDED TERM 1015)
SEE: BUILDING/STATION

TEMPLE (INCLUDED TERM 1016)
SEE: BUILDING

TEMPORARY_ANCHORAGE (INCLUDED TERM 1017)
SEE: HARBOR

STANDARD FEATURE TERM 125: TENNIS COURT
DEFN: A RECREATIONAL AREA USED FOR PLAYING TENNIS.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION NAME

TERMINAL (INCLUDED TERM 1018)
SEE: BUILDING

TERMINAL_MORAINE (INCLUDED TERM 1019)
SEE: RIDGE

STANDARD FEATURE TERM 126: TERRACE
DEFN: A STEPLIKE FEATURE BETWEEN HIGHER AND LOWER GROUND: A RELATIVELY FLAT OR GENTLY INCLINED SHELF OF EARTH, BACKED AND FRONTED BY STEEP SLOPES OR MAN-MADE RETAINING WALLS.
SOURCE: MODIFIED FROM CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: NAME LOCATION
INCLUD: BENCH MARINE_BENCH KAME_TERRACE ROCK_TERRACE RAISED_BEACH FLAT

TEXAS_TOWER (INCLUDED TERM 1020)
SEE: TOWER

THEATER (INCLUDED TERM 1021)
SEE: BUILDING

THERMOBUOY (INCLUDED TERM 1022)
SEE: BUOY

THICKET (INCLUDED TERM 1023)
SEE: WOODLAND

THORN_FOREST (INCLUDED TERM 1024)
SEE: WOODLAND

THOROFARE (INCLUDED TERM 1025)
SEE: WATERCOURSE/STREAM/ROAD

THRESHOLD_LIGHT (INCLUDED TERM 1026)
SEE: BEACON

THROUGHFARE (INCLUDED TERM 1027)
SEE: WATERCOURSE/STREAM/ROAD

THRUWAY (INCLUDED TERM 1028)
SEE: ROAD

TIDAL_BASIN (INCLUDED TERM 1029)
SEE: BASIN

TIDAL_FLAT (INCLUDED TERM 1030)
SEE: FLAT

TIDAL_HARBOR (INCLUDED TERM 1031)
SEE: HARBOR

TIDAL_LIGHT (INCLUDED TERM 1032)
SEE: BEACON

TIDAL_MARSH (INCLUDED TERM 1033)
SEE: WETLAND

TIDAL_QUAY (INCLUDED TERM 1034)
SEE: WHARF

TIDE_GATE (INCLUDED TERM 1035)
SEE: GATE

TIDE_LIMIT (INCLUDED TERM 1036)
SEE: BOUNDARY

TIDE_LOCK (INCLUDED TERM 1037)
SEE: LOCK

TIDE_SIGNAL (INCLUDED TERM 1038)
SEE: BEACON

TIDE_STATION (INCLUDED TERM 1039)
SEE: STATION/BUILDING
DEFN: A PLACE AT WHICH TIDE OBSERVATIONS ARE MADE.
SOURCE: NAVIGATION DICTIONARY

TIDE_STATIDN (INCLUDED TERM 1040)
DEFN: A GRDUP OF BUILDINGS INCLUDING A LIGHTHOUSE AND ADDITIONAL BUILDINGS HOUSING PERSONNEL, FOG SIGNAL, RADIOBEACON, AND ANY OTHER EQUIPMENT ASSOCIATED WITH THE LIGHTHOUSE.
SOURCE: NAVIGATIDN DICTIONARY

TIDEWAY (INCLUDED TERM 1041)
SEE: WATERCOURSE

TILL (INCLUDED TERM 1042)
SEE: MORAINE

TIMBER_LINE (INCLUDED TERM 1043)
SEE: BOUNDARY

TINTS (INCLUDED TERM 1044)

SEE: RELIEF
DEFN:

TOLL_GATE (INCLUDED TERM 1045)
SEE: GATE

TOLLROAD (INCLUDED TERM 1046)
SEE: ROAD

TOMBOLO (INCLUDED TERM 1047)
SEE: BAR/ISLAND

TONGUE (INCLUDED TERM 1048)
SEE: CAPE/BAR

TOPMARK_BUOY (INCLUDED TERM 1049)
SEE: BUOY

TORRENT (INCLUDED TERM 1050)
SEE: STREAM

TOURIST_CABIN (INCLUDED TERM 1051)
SEE: BUILDING

TOURIST_LODGE (INCLUDED TERM 1052)
SEE: BUILDING

STANDARD FEATURE TERM 127: TOWER
DEFN: A BUILDING OR STRUCTURE TYPICALLY MUCH HIGHER THAN ITS DIAMETER OR WIDTH.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: LOCATION HEIGHT DIAMETER NAME SURFACE_FEATURE CONNECTED_FEATURE CONTROL LIGHTED MOVABLE/STATIONARY RADIO_TRANSMISSION MICROWAVE_TRANSMISSION STORAGE SUPPORT_TYPE TELEVISION_TRANSMISSION USE_TYPE
INCLUD: CONTROL_TOWER AIRPORT_TRAFFIC_CONTROL_TOWER PYLON AERODROME_CONTROL_TOWER CHIMNEY FLAG_TOWER TEXAS_TOWER LOOKOUT_TOWER SMOKE_STACK OBSERVATION_TOWER RADIO_MAST RADIO_TOWER WATER_TOWER TELEVISIDN_TOWER MICROWAVE_TOWER TRANSMISSION_TOWER FIRE_LOOKOUT_TOWER FIRE_TOWER SILO ELECTRICAL_TOWER HYDRO_TOWER STANDPIPE GRAIN_ELEVATOR LIGHTHOUSE

TOWN (INCLUDED TERM 1053)
SEE: PLACE

TOWN/CITY_LIMITS (INCLUDED TERM 1054)
SEE: BOUNDARY

TOWN_HALL (INCLUDED TERM 1055)
SEE: BUILDING

TOWNSHIP (INCLUDED TERM 1056)
SEE: GRID

TRACK (INCLUDED TERM 1057)
SEE: RAILWAY/ROAD

TRAFFIC_CIRCLE (INCLUDED TERM 1058)

SEE: INTERSECTION

TRAFFIC_SIGN (INCLUDED TERM 1059)
SEE: SIGN

TRAIL (INCLUDED TERM 1060)
SEE: ROAD

TRAILER_PARK (INCLUDED TERM 1061)
SEE: PARK

TRAINING_WALL (INCLUDED TERM 1062)
SEE: BREAKWATER

TRAMWAY/INCLINE_RAILWAY (INCLUDED TERM 1063)
SEE: RAILWAY

TRANSFORMER_STATION (INCLUDED TERM 1064)

TRANSMISSION_TOWER (INCLUDED TERM 1065)
SEE: TOWER

TRANSMISSION_LINE (INCLUDED TERM 1066)
SEE: UTILITY

TRANSMITTER_STATION (INCLUDED TERM 1067)
SEE: STATION/BUILDING

TRANSOBUOY (INCLUDED TERM 1068)
SEE: BUOY

TRANSPONDER_BEACON (INCLUDED TERM 1069)
SEE: BEACON

TRANSVERSE_BAR (INCLUDED TERM 1070)
SEE: BAR

TRANSVERSE_RHUMB_LINE (INCLUDED TERM 1071)
SEE: BEARING_LINE

TREE_LINE (INCLUDED TERM 1072)
SEE: BOUNDARY

TRENCH (INCLUDED TERM 1073)
SEE: VALLEY/TROUGH

TRESTLE (INCLUDED TERM 1074)
SEE: BRIDGE

TRIBUTARY (INCLUDED TERM 1075)
SEE: STREAM

TROPICAL_RAIN_FOREST (INCLUDED TERM 1076)
SEE: WOODLAND

STANDARD FEATURE TERM 128: TROUGH
DEFN: A LONG DEPRESSION OF THE SEA FLOOR
SOURCE: ADAPTED FROM NAUTICAL CHART MANUAL
INCLUD: DEEP TRENCH FOREDEEP RUNNEL

TRUCK_FARM (INCLUDED TERM 1077)
SEE: CROP_LAND

TRUCK_GARDEN (INCLUDED TERM 1078)
SEE: CROP_LAND

TRUE_BEARING (INCLUDED TERM 1079)
SEE: BEARING_LINE

TRUMPET_BUOY (INCLUDED TERM 1080)
SEE: BUOY

TRUNK_BUOY (INCLUDED TERM 1081)
SEE: BUOY/MOORING

TULELANDS (INCLUDED TERM 1082)
SEE: WETLAND

STANDARD FEATURE TERM 129: TUNDRA
DEFN: A TREELESS AREA POLEWARD OR UPWARD OF THE TREE LINE OF ARCTIC OR ALPINE REGIONS, HAVING A PERMANENTLY FROZEN SUBSOIL AND SUPPORTING LOW-GROWING VEGETATION SUCH AS LICHENS, MOSSES, AND STUNTED SHRUBS.
SOURCE: NEW DEFINITION
ATTRIB: LOCATION AREA ELEVATION PREDOMINANT_SPECIES NAME

STANDARD FEATURE TERM 130: TUNNEL
DEFN: AN UNDERGROUND OR UNDERWATER PASSAGE.
SOURCE: AMERICAN_HERITAGE_DICTIONARY
ATTRIB: LOCATION NAME MODE_TRANSPORTED CLEARANCE LENGTH WIDTH RESTRICTIONS DISTANCE_BELOW_SURFACE FEATURE_PASSED_UNDER CONNECTED_FEATURE PASSENGER_TRANSPORTATION PHYSICAL_CONDITION_OF_SURFACE_MATERIAL TOLL
INCLUD: CATTLE_UNDERPASS PEDESTRIAN_UNDERPASS RAILWAY_TUNNEL SUBWAY UNDERPASS

TUNNY_NETS (INCLUDED TERM 1083)
SEE: FISH_TRAP

STANDARD FEATURE TERM 131: TURNING BASIN
DEFN: A WATER AREA USED FOR TURNING VESSELS.
SOURCE: NAVIGATION DICTIONARY
ATTRIB: LOCATION WIDTH LENGTH DEPTH_OF_WATER SALINITY

TURNING_BUOY (INCLUDED TERM 1084)
SEE: BUOY

TURNPIKE (INCLUDED TERM 1085)
SEE: ROAD

STANDARD FEATURE TERM 132: TURNTABLE
DEFN: A CIRCULAR HORIZONTAL ROTATING PLATFORM EQUIPPED WITH A RAILWAY TRACK, USED FOR TURNING LOCOMOTIVES, AS IN A ROUNDHOUSE.
SOURCE: AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION NAME DIAMETER TRACK_GAUGE

UNATTENDED_LIGHT (INCLUDED TERM 1086)
SEE: BEACON

UNDERPASS (INCLUDED TERM 1087)
SEE: TUNNEL

UNDULATING_LIGHT (INCLUDED TERM 1088)
SEE: BEACON

UNIVERSITY (INCLUDED TERM 1089)
SEE: BUILDING

UNWATCHED_LIGHT (INCLUDED TERM 1090)
SEE: BEACON

URBAN_AREA (INCLUDED TERM 1091)
SEE: PLACE

UTILIDOR (INCLUDED TERM 1092)
SEE: UTILITY

STANDARD FEATURE TERM 133: UTILITY
DEFN: A LINEAR DISTRIBUTION SYSTEM CONSISTING OF PIPELINES, HIGH TENSION WIRES, CABELS ETC., PROVIDING A PUBLIC SERVICE AND USUALLY SUBJECT TO GOVERNMENT REGULATIONS.
SOURCE: CANADIAN COUNCIL ON SURVEYING AND MAPPING
ATTRIB: NAME LOCATION
INCLUD: TRANSMISSION_LINE POWER_LINE SUBMARINE_CACLE UTILIDORE PIPELINE

STANDARD FEATURE TERM 134: VALLEY
DEFN: A LONG, NARROW DEPRESSION IN THE EARTH'S SURFACE, USUALLY WITH A FAIRLY REGULAR DOWNSLOPE.
SOURCE: MODIFIED FROM A DICTIONARY OF GEOGRAPHY, MOORE
ATTRIB: LENGTH DEPTH WIDTH SLOPE_OF_SIDES WATER NAME LOCATION AIR/LAND/WATER
INCLUD: TRENCH MOAT GLACIAL_ CANYON CHASM CREVASSE DALE DELL GLACIAL_GORGE GLEN COULEE RAVINE GORGE GRABEN HOLLOW RE-ENTRANT STRATH RIFT_VALLEY GULCH GULLY DROWNED_VALLEY FIORD RIA GOE DEPRESSION DEFILE SEACHANNEL

STANDARD FEATURE TERM 135: VEHICLE STORAGE
DEFN: AN AREA FOR PARKING OR STORING MOTOR VEHICLES.
SOURCE: MODIFIED FROM AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION AREA TYPE_OF_VEHICLES
INCLUD: PARKING_LOT PARKING_AREA PARKING_GARAGE JUNK_YARD GARAGE

VELD (INCLUDED TERM 1093)
SEE: GRASSLAND

VERTICAL_CONTROL_POINT (INCLUDED TERM 1094)
SEE: CONTROL_POINT

VERTICAL_CONTRDL_MONUMENT (INCLUDED TERM 1095)
SEE: CONTROL_POINT

VIADUCT (INCLUDED TERM 1096)
SEE: BRIDGE

VILLAGE (INCLUDED TERM 1097)
SEE: PLACE

VINEYARD (INCLUDED TERM 1098)
SEE: CROP_LAND

VOLCANO (INCLUDED TERM 1099)
SEE: MOUNT

WADI (INCLUDED TERM 1100)
SEE: WATERCOURSE
DEFN: ARID-CLIMATE (TYPICALLY DESERT) STREAM CHANNEL, ORDINARILY DRY BUT CAPABLE OF FLOWING, AT TIMES WITH CONSIDERABLE VELOCITY, WHEN CONCENTRATING LOCAL RUNOFF.
TERM ORIGINATED IN MEDITERRANEAN AFRICA BUT HAS COME INTO GENERAL USE. ALSO, ARROYD, WASH, BARRANCA, ETC.
SOURCE: OHIO STATE PRELIMINARY LIST (GNIS, CANADIAN COUNCIL, AND HERITAGE DICTIONARY)

WALK (INCLUDED TERM 1101)
SEE: ROAD

WALL (INCLUDED TERM 1102)
SEE: BARRIER

WAREHOUSE (INCLUDED TERM 1103)
SEE: BUILDING

WARNING_BEACON (INCLUDED TERM 1104)
SEE: BEACON

WARNING_LIGHT (INCLUDED TERM 1105)
SEE: BEACON

WARNING_RADIOBEACON (INCLUDED TERM 1106)
SEE: BEACON

WARPING_BUDY (INCLUDED TERM 1107)
SEE: BUOY

WASH (INCLUDED TERM 1108)
SEE: WATERCOURSE
DEFN: THE DRY CHANNEL OF AN INTERMITTENT STREAM.
SOURCE: NATIONAL OCEAN SERVICE GLOSSARY, 1985

WATCHED_LIGHT (INCLUDED TERM 1109)
SEE: BEACON

WATER_GAP (INCLUDED TERM 1110)
SEE: WATERCOURSE

DEFN: A NARROW GORGE CUT BY A STREAM THROUGH A RIDGE OF HARD ROCK.
SOURCE: A DICTIONARY OF GEOGRAPHY, MOORE

WATER_HOLE (INCLUDED TERM 1111)
SEE: WELL

WATER_LANE (INCLUDED TERM 1112)
SEE: RUNWAY/LANE

WATER_TOWER (INCLUDED TERM 1113)
SEE: TOWER

STANDARD FEATURE TERM 136: WATERCOURSE
DEFN: A WAY OR COURSE THROUGH WHICH WATER MAY OR DOES FLOW, NOT TO BE CONFUSED WITH THE WATER ITSELF.
SOURCE: NEW TERM NO EXISTING DEFINITION
ATTRIB: LOCATION NAME WIDTH DEPTH VOLUME LENGTH GROUND_LEVEL_RELATIONSHIP COMPOSITION CHARTED_DEPTH COVERED SLOPE SHAPE NAVIGABLE IRRIGATION DRAINAGE WATER_SUPPLY COMMERCIAL_SHIPPING PASSENGER_TRANSPORTATION WATER_BODY_CONNECTION ACCESS BUOYED LIGHTED WATERAGE RECREATIONAL FLOOD_CONTROL HYDROELECTRIC_POWER GRADIENT_OF_SLOPE_OF_SIDES ARTIFICIALLY_IMPROVED/MANMADE/NATURAL BLIND/OPEN CARGO_TRANSPORTATION DISCHARGE EMBANKED FEATURE_PRESENT LIGHTED TOLL
INCLUD: AQUEDUCT CANAL CHANNEL CULVERT DITCH DRAIN FAIRWAY FLUME LODE OVERFLOW_CHANNEL SEAWAY SHIP_CANAL VIADUCT RACE SLUICE SPILLWAY CUT
ARROYO BARRANCA BEND CUT_OFF DISTRIBUTARY DRAW GULCH GULLY GUT MEANDER NARROWS NULLAH PASS PASSAGE RAVINE
STREAM_CHANNEL WADI WASH THOROFARE THOROUGHFARE STRAIT WATER_GAP COULEE IMPROVED_CHANNEL
RIVER_BED GUTTER REACH FORD TIDEWAY SOUND SEACHANNEL

STANDARD FEATURE TERM 137: WATERFALL
DEFN: A SUDDEN DESCENT OF WATER OVER A STEP OR LEDGE IN THE BED OF A RIVER.
SOURCE: DICTIONARY OF GEOGRAPHY, STAMP
ATTRIB: LOCATION WIDTH DISCHARGE HYDROELECTRIC_POWER NAME LOCATION NAME
INCLUD: CASCADE FALLS

WATERING_PLACE (INCLUDED TERM 1114)
SEE: SPRING/WELL
DEFN: A PLACE WHERE WATER IS SUPPLIED FOR HUMAN OR ANIMAL CONSUMPTION
SOURCE: DEVISED AT VCU

WATERWAY (INCLUDED TERM 1115)
SEE: LANE

WAVE_BASIN (INCLUDED TERM 1116)
SEE: BREAKWATER/BASIN

WAVE_TRAP (INCLUDED TERM 1117)
SEE: BREAKWATER

WAY (INCLUDED TERM 1118)
SEE: LANE/ROAD

WAY_POINT (INCLUDED TERM 1119)
SEE: CONTROL_POINT

WAYSIDE_PARK (INCLUDED TERM 1120)
SEE: PARK

WEAK_LIGHT (INCLUDED TERM 1121)
SEE: BEACON

WEIR (INCLUDED TERM 1122)
SEE: FISH_TRAP/DAM

WEIR_JETTY (INCLUDED TERM 1123)
SEE: BREAKWATER

STANDARD FEATURE TERM 138: WELL
DEFN: AN UNDERGROUND SOURCE OF WATER OR OTHER FLUIDS WHICH HAS BEEN RENDERED ACCESSIBLE BY THE DRILLING OR DIGGING OF A HOLE FROM GROUND LEVEL TO THE WATER TABLE. THE TERM IS ALSO USED IN CONNECTION WITH OIL DEPOSITS.
SOURCE: A DICTIONARY OF GEOGRAPHY, MOORE
ATTRIB: SUBSTANCE_EXTRACTED SALINITY_OF_WATER COMPOSITION COVERED IRRIGATION
INCLUD: BRINE_WELL OIL_WELL WATERING_PLACE WATER_HOLE

WETDOCK (INCLUDED TERM 1124)
SEE: WHARF

STANDARD FEATURE TERM 139: WETLAND
DEFN: A VEGETATED AREA THAT IS INUNDATED OR SATURATED BY SURFACE OR GROUNDWATER.
SOURCE: NEW DEFINITION.
ATTRIB: LOCATION ELEVATION NAME AREA SALINITY PREDOMINANT_SPECIES TIDAL SEASONAL_DEPTH_OF_SURFACE_WATER ACIDITY NAVIGABLE
INCLUD: BOG PEAT_BOG STRING_BOG PALSA_BOG MARSH SLOUGH MUSKEG FEN SWAMP POCOSIN TIDAL_MARSH SALT_MARSH DISMAL MIRE MORASS QUAGMIRE SLASH SLUE TULELANDS EVERGLADE SWAMP-FOREST SALTING QUAKING_BOG MANGROVE_SWAMP SWAMPLAND RAISED_BOG BLANKET_BOG BACK_MARSH BACKSWAMP BARRIER_FLAT FLOATING_MARSH SALINA HEATH MOOR PEAT_CUTTING

STANDARD FEATURE TERM 140: WHARF
DEFN: A STRUCTURE EXTENDING PARALLEL TO THE SHORELINE SO THAT VESSELS MAY LIE CLOSE ALONGSIDE TO RECEIVE AND DISCHARGE CARGO.
SOURCE: NAUTICAL CHART MANUAL, US DEPT. OF COMMERCE, NATIONAL OCEAN SURVEY
ATTRIB: LOCATION LENGTH WIDTH ORIENTATION_TO_SHORE PILLAR/SOLID_CONSTRUCTION TIDAL CONTROL_OVER_WATER_LEVEL DEPTH_OF_WATER FACILITIES_AVAILABLE SIZE_VESSEL_CAN_ACCOMMODATE NUMBER_OF_SLIPS NAME
INCLUD: QUAY LANDING PENS FERRY/HOVERCRAFT/HYDROFOIL_TERMINAL/STATION TIDAL_QUAY JETTY FERRY FERRY_TERMINAL FERRY_SITE/SLIP CARGO_TRANSPORTATION COMPOSITION CONSTRUCTION_TYPE BOAT_LANDING

WHISTLE_BUOY (INCLUDED TERM 1125)
SEE: BUOY

WINDBREAK (INCLUDED TERM 1126)
SEE: WOODLAND/BARRIER

WINDMILL (INCLUDED TERM 1127)
SEE: BUILDING

WINGED_HEADLAND (INCLUDED TERM 1128)
SEE: CAPE

WINTER_BUOY (INCLUDED TERM 1129)
SEE: BUOY

WINTER_LIGHT (INCLUDED TERM 1130)
SEE: BEACON

FEATURES

WINTER_MARKER (INCLUDED TERM 1131)
SEE: BEACON

WINTER_ROAD (INCLUDED TERM 1132)
SEE: ROAD

WOOD (INCLUDED TERM 1133)
SEE: WOODLAND

WOODED_AREA (INCLUDED TERM 1134)
SEE: WOODLAND

STANDARD FEATURE TERM 141: WOODLAND
DEFN: LAND HAVING A COVER OF TREES, SHRUBS, OR BOTH.
SOURCE: MODIFIED FROM AMERICAN HERITAGE DICTIONARY
ATTRIB: LOCATION ELEVATION AREA PREDOMINATE_SPECIES AGE GROWTH LEAF_TYPE EVERGREEN/DECIDUOUS PERCENT_TREE_COVER COMMERCIAL/NON-COMMERCIAL NAME AMOUNT_OF_ANNUAL_PRECIPITATION AVERAGE_ANNUAL_TEMPERATURE_EXTREMES PREDOMINANT_HEIGHT ACIDITY ENCLOSED GROWING_PATTERN TREE_COVER UNDERGROWTH_PRESENCE_OF LUMBERING STUNTED_GROWTH
INCLUD: FOREST GROVE STAND WODDS TAIGA THICKET SILVA BRUSH JUNGLE COPSE WDDDED_AREA MOTTE BRAKE BLUFF REFORESTED_AREA WOOD CONIFEROUS_FOREST DECIDUOUS_FOREST EQUATORIAL_FOREST MONSOON_FOREST THORN_FOREST TROPICAL_RAIN_FOREST EQUATORIAL_RAIN_FOREST CAATINGA SCRUB BUSH CHANARAL CHAPARRAL GARIGUE MALLEE_SCRUB MAQUIS MULGA MULGA_SCRUB SAGEBRUSH WINDBREAK MOOR HEATH BRIGALOW MANGROVE_SWAMP

WOODS (INCLUDED TERM 1135)
SEE: WOODLAND

STANDARD FEATURE TERM 142: WRECK
DEFN: A WRECKED VESSEL, EITHER SUBMERGED OR VISIBLE, WHICH IS ATTACHED TO OR FOUL OF THE BOTTOM OR CAST UP ON THE SHORE.
SOURCE: MODIFIED FROM NAVIGATION DICTIONARY
ATTRIB: LOCATION NAME
INCLUD: STRANDED_WRECK SUNKEN_WRECK HULK DANGEROUS_WRECK

WRECK_BUOY (INCLUDED TERM 1136)
SEE: BUOY

ZOO (INCLUDED TERM 1137)
SEE: PARK

SOURCES USED:
ANO SOURCE
BGNIS DOCUMENTATION, APPENDIX B
COHIO STATE PRELIMINARY LIST, INCLUD. GNIS, CANADA, HERITAGE
DU.S. NAVAL OCEANOGRAPHIC OFFICE, NAVIGATION DICTIONARY
EU.S. NAVAL OCEANOGRAPHIC OFFICE, GLOSSARY OF OCEANOGRAPHIC TERMS
FCANADIAN COUNCIL ON SURVEYING AND MAPPING, DRAFT STANDARDS
GBRUDER (ED.), NAUTICAL CHART MANUAL
HTHE AMERICAN HERITAGE DICTIONARY OF THE ENGLISH LANGUAGE
ISNEAD, COASTAL LANDFORMS AND SURFACE FEATURES
JMOORE, A DICTIONARY OF GEOGRAPHY
KSTAMP, DICTIONARY OF GEOGRAPHY
LMONKHOUSE, A DICTIONARY OF GEOGRAPHY
MDEFENSE MAPPING AGENCY, PRODUCT SPECIFICATIONS FOR DLMS DATA BASE
NSCHMIEDER ET AL, A DICTIONARY OF BASIC GEOGRAPHY
OUNKNOWN
PNATIONAL OCEAN SERVICE, DRAFT GLOSSARY, 1985
QWEBSTER'S NEW COLLEGIATE DICTIONARY
RDEFENSE INTELLIGENCE AGENCY, INTELLIGENCE DATA ELEMENTS (IDEAS), 1983
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## ATTRIBUTES

ACCESS (ATTRIBUTE TERM 1)
FEATURE: ROAD RAILWAY WATERCOURSE
DEFN: THE TYPE OF CONNECTION AVAILABLE TO A GIVEN TRANSPORTATION FEATURE
SOURCE: DEVISED AT VCU
ALTERNATE DEFINITION(S) FROM: DEFENSE INTELLIGENCE AGENCY, INTELLIGENCE DATA ELEMENTS (IDEAS), 1983
THE TYPE OF TRANSPORTATION CONNECTION AVAILABLE AT A SPECIFIC LOCATION
VALUES: FREE/LIMITED

ACIDITY (ATTRIBUTE TERM 2)
FEATURE: STREAM LAKE SEA WOODLAND CROP_LAND WETLAND GRASSLAND
DEFN: THE DEGREE TO WHICH HYDROGEN IONS ARE HELD BY SOIL COLLOIDS OR WATER
SOURCE: STRAHLER, PHYSICAL GEOGRAPHY
INCLUD: ALKALINE
VALUES: ACID/ALKALINE
VALUES: PH

AGE (ATTRIBUTE TERM 3)
FEATURE: BUILDING CLEARING WOODLAND
DEFN: THE PERIOD DURING WHICH SOMETHING EXISTS SPECIFYING THE FIRST YEAR IN EXISTENCE WHERE APPLICABLE.
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
VALUES: YEAR_CONSTRUCTED
YEAR_CLEARING_OCCURRED
MATURE/SECOND_GROWTH

AIR/LAND/WATER (ATTRIBUTE TERM 4)
FEATURE: DANGER_AREA VALLEY CAVE DUMPING_GROUND
DEFN: EXISTING IN OR PART OF THE ATMOSPHERE, THE EARTH'S DRY SURFACE, OR A BODY OF WATER
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
INCLUD: LAND WATER

ALKALINE (ATTRIBUTE TERM 5)
SEE: ACIDITY

ALTITUDE (ATTRIBUTE TERM 6)
FEATURE: SATELLITE
DEFN: THE HEIGHT OF A THING ABOVE A REFERENCE LEVEL, ESPECIALLY ABOVE THE EARTH'S SURFACE. SEE ALSO HEIGHT, ELEVATION.
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

ANNUAL_PRECIPITATION (ATTRIBUTE TERM 7)
FEATURE: EARTH
DEFN: THE QUANTITY OF RAIN AND SNOW FALLING WITHIN THE PERIOD OF A YEAR
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

AREA (ATTRIBUTE TERM 8)
FEATURE: BAR SHORE ISLAND ISTHMUS CAVE GAP FISHING_GROUND HARBOR CROP_LAND WOODLAND CLEARING TUNDRA GRASSLAND WETLAND
INTERSECTION AIRPORT DANGER_AREA DUMPING_GROUND VEHICLE_STORAGE POPULATED_PLACE APPROACHWAY INLET BASIN
DEFN: THE MEASURE OF A PLANAR REGION OF THE EARTH'S SURFACE
SOURCE: THE AMERICAN HERITAGE DICTIONARY

ARTIFICIALLY_IMPROVED/MANMADE/NATURAL (ATTRIBUTE TERM 9)
FEATURE: WATERCOURSE LAKE TROUGH CLEFT LEAD MOUNTAIN SWASH SPRING TUNDDRA BACKWATER BREAKER CORAL_HEAD COULEE DANGER_AREA
FERRY_CROSSING FISH_HAVEN FISH_HATCHERY FISHING_GROUND FUMAROLE HEADWATERS ISTHMUS MOUTH POLYNA STREAM INLET BRIDGE
GAP SEA ISLAND_CLUSTER FLAT RIDGE HARBOR REEF ISLAND_CLUSTER FOUL_BOTTOM WETLAND CLEARING SHORE PORT DAM BASIN BAR
LAGOON DELTA LAKE BEACH WOODDLAND BREAKWATER DEPRESSION VALLEY WATERFALL VALLEY RAPIDS CAVE CLIFF COAST CAPE
GRASSLAND BARRIER SCHOOL ROAD CABLEWAY AIRPORT BEACON TOWER STATION APPROACHWAY ANTENNA CLEARING DAM WHARF SIGN MOORING
BREAKWATER POPULATED_PLACE WELL RAILWAY GATE TUNNEL CROP_LAND DUMPING_GROUND EMBANKMENT LOCK TERMINAL

ATTRIBUTES

DEFN: ARTIFICIALLY IMPROVED: NATURALLY EXISTING FEATURE WITH MAN MADE ALTERATIONS.
SOURCE: DEVISED AT VCU
DEFN: MANMADE: MADE BY MAN, RATHER THAN OCCURRING IN NATURE.
NATURAL: PRESENT OR PRODUCED BY NATURE.
SOURCE: THE AMERICAN HERITAGE DICTIONARY
INCLUD: MANMADE NATURAL

BEARING_CAPACITY (ATTRIBUTE TERM 10)
FEATURE: ROAD BRIDGE
DEFN: THE ABILITY OF A SURFACE OR A STRUCTURE TO BEAR WEIGHT
SOURCE: MODIFIED FROM IDEAS
INCLUD: WEIGHT_BEARING_CAPACITY

BLIND/OPEN (ATTRIBUTE TERM 11)
FEATURE: WATERCOURSE ROAD LEAD
DEFN: BLIND: NOT HAVING AN OUTLET
OPEN: ALLOWING CONTINUOUS PASSAGE
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
INCLUD: OPEN DEAD_END CUL_DE_SAC THROUGH_ROAD

BRAIDED (ATTRIBUTE TERM 12)
FEATURE: STREAM
DEFN: SPLIT INTO MANY PARTS OR CHOKED WITH SANDBARS THAT DIVIDE IT INTO AN INTRICATE NETWORK OF INTERLACING CHANNELS.
SOURCE: DEVISED AT VCU

BRANCH/PARENT (ATTRIBUTE TERM 13)
FEATURE: STREAM
DEFN: RELATIONSHIP BETWEEN A MAIN STREAM AND ONE OF ITS TRIBUTARIES
SOURCE: DEVISED AT VCU
INCLUD: PARENT

BUOYED (ATTRIBUTE TERM 14)
FEATURE: WATERCOURSE INLET STREAM PORT HARBOR LAGOON INLET
DEFN: MARKED WITH BUOYS USED AS NAVIGATION AIDS
SOURCE: DEVISED AT VCU

CARGO_TRANSPORTATION (ATTRIBUTE TERM 15)
FEATURE: WHARF HARBOR AIRPORT WATERCOURSE ROAD RAILWAY
DEFN: USED FOR THE MOVING OF FREIGHT FROM ONE PLACE TO ANOTHER
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

CHAMBERS_NUMBER_OF (ATTRIBUTE TERM 16)
FEATURE: CAVE
DEFN: THE NUMBER OF ENCLOSED SPACES OR COMPARTMENTS
SOURCE: THE AMERICAN HERITAGE DICTIONARY

CHARTED_DEPTH (ATTRIBUTE TERM 17)
FEATURE: WATERCOURSE STREAM PORT LAGOON HARBOR SEA LAKE LEAD LANE
DEFN: THE VERTICAL DISTANCE FROM THE TIDAL DATUM TO THE BOTTOM
SOURCE: GLOSSARY OF OCEANOGRAPHIC TERMS
INCLUD: SOUNDING

CIRCUMFERENCE (ATTRIBUTE TERM 18)

ATTRIBUTES

FEATURE: BASIN PINNACLE
DEFN: THE LENGTH OF THE BOUNDARY LINE OF ANY CLOSED CURVILINEAR FEATURE
SOURCE: THE AMERICAN HERITAGE DICTIONARY

CIVILIAN (ATTRIBUTE TERM 19)
SEE: OWNER_TYPE USER_TYPE

CLEARANCE (ATTRIBUTE TERM 20)
FEATURE: TUNNEL BRIDGE
DEFN: THE VERTICLE DISTANCE FROM A SURFACE TO THE NEAREST OVERHEAD OBSTRUCTION
SOURCE: MODIFIED FROM IDEAS

COASTLINE (ATTRIBUTE TERM 21)
FEATURE: SHORELINE
DEFN: THE SHORELINE OF THE SEA
SOURCE: DEVISED AT VCU

COLOR (ATTRIBUTE TERM 22)
FEATURE: BEACON BUOY
DEFN: THAT ASPECT OF THINGS THAT IS CAUSED BY DIFFERING WAVE LENGTHS OF LIGHT REFLECTED OR EMITTED BY THEM
SOURCE: THE AMERICAN HERITAGE DICTIONARY

COLOR_PATTERN (ATTRIBUTE TERM 23)
FEATURE: BUOY
DEFN: THE COLOR OR COMBINATION OF COLORS IN THE GEOMETRICAL DESIGN OR PATTERN
SOURCE: IDEAS

COMMERCIAL (ATTRIBUTE TERM 24)
FEATURE: CROP_LAND WOODLAND
DEFN: USED OR EXPLOITED FOR FINANCIAL GAIN
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

COMMERCIAL_SHIPPING (ATTRIBUTE TERM 25)
FEATURE: WATERCOURSE HARBOR PORT SEA INLET
DEFN: TRAVEL OR TRAFFIC BY WATER VESSELS CARRYING COMMERCIAL GOODS
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

COMPOSITION (ATTRIBUTE TERM 26)
FEATURE: WATERCOURSE ROAD RUNWAY CABLEWAY WELL RAILWAY CATCH_BASIN CATCHMENT BRIDGE ANTENA DAM SIGN WHARF BAR SHORE REEF ISLAND ISTHMUS CLIFF PINNACLE RIDGE BREAKWATER MOORING REVETMENT EMBANKMENT LAUNCHING_RAMP GATE BARRIER CONTROL_POINT
DEFN: THE SPECIFIED MIXTURE OR COMBINATION OF ONE OR MORE ELEMENTS OR INGREDIENTS
SOURCE: THE AMERICAN HERITAGE DICTIONARY
INCLUD: SURFACE_MATERIAL CONSTRUCTION_MATERIAL

CONNECTED_BY_SWITCHES/MAIN_TRACK (ATTRIBUTE TERM 27)
FEATURE: RAILWAY
DEFN: A RAILWAY SEGMENT SUCH AS A SIDING OR SPUR, REQUIRING PASSING THROUGH A SWITCH TO GAIN ACCESS TO THE MAIN TRACK
SOURCE: DEVISED AT VCU
INCLUD: MAIN_TRACK

CONNECTED_FEATURE (ATTRIBUTE TERM 28)
FEATURE: INTERSECTION BRIDGE TUNNEL GATE TOWER
DEFN: THE FEATURE(S) THAT IS(ARE) LINKED OR JOINED BY ANOTHER

SOURCE: DEVISED AT VCU

CONSTRUCTION_MATERIAL (ATTRIBUTE TERM 29)
SEE: COMPOSITION

CONSTRUCTION_TYPE (ATTRIBUTE TERM 30)
FEATURE: WHARF
DEFN: THE STRUCTURAL CONFIGURATION OF A FEATURE
SOURCE: MODIFIED FROM IDEAS
INCLUD: SOLID_CONSTRUCTION PILLAR_CONSTRUCTION

CONTROL (ATTRIBUTE TERM 31)
FEATURE: TOWER
DEFN: TO EXERCISE AUTHORITY OR DOMINATING INFLUENCE OVER; DIRECT; REGULATE/VERIFY
SOURCE: THE AMERICAN HERITAGE DICTIONARY

CONTROL_OVER_WATER_LEVEL (ATTRIBUTE TERM 32)
FEATURE: HARBOR WHARF
DEFN: HAVING SOME MEANS OF REGULATING THE HEIGHT OF A SPECIFIC BODY OF WATER
SOURCE: DEVISED AT VCU

COVERED (ATTRIBUTE TERM 33)
FEATURE: WATERCOURSE ROAD CABLEWAY STREAM WELL RAILWAY CATCH_BASIN CATCHMENT BRIDGE
DEFN: HAVING SOMETHING PLACED OVER OR ABOUT ANOTHER THING
SOURCE: THE AMERICAN HERITAGE DICTIONARY

CROP_GROWN (ATTRIBUTE TERM 34)
FEATURE: CROP_LAND
DEFN: TYPE OF AGRICULTURAL PRODUCE SUCH AS GRAIN, VEGETABLES, OR FRUIT
SOURCE: DEVISED AT VCU

CROSS_SECTIONAL_AREA (ATTRIBUTE TERM 35)
FEATURE: WATERCOURSE STREAM LAKE
DEFN: A SECTION FORMED BY A PLANE CUTTING THROUGH AN OBJECT AT RIGHT ANGLES TO AN AXIS.
SOURCE: THE AMERICAN HERITAGE DICTIONARY

CUL_DE_SAC (ATTRIBUTE TERM 36)
SEE: BLIND/OPEN

CULTIVATED (ATTRIBUTE TERM 37)
FEATURE: CROP_LAND
DEFN: IMPROVED AND PREPARED LAND; PLOWED OR FERTILIZED OR TENDED FOR GROWING CROPS
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

DATUM (ATTRIBUTE TERM 38)
FEATURE: SHORELINE CONTOUR_LINE CONTROL_POINT
DEFN: ANY NUMERICAL OR GEOMETRICAL QUANTITY OR SET OF QUANTITIES WHICH MAY SERVE AS A REFERENCE OR BASE FOR OTHER QUANTITIES.
SOURCE: USGS AND NOS, COASTAL MAPPING HANDBOOK
VALUES: MEAN_SEA_LEVEL MEAN_HIGH_WATER NATIONAL_GEODETIC_VERTICAL_DATUM
VAL.DEF: MEAN_SEA_LEVEL: A STANDARD DATUM FOR HEIGHTS, LAST ADJUSTED IN 1929
MEAN_HIGH_WATER: THE TIDAL DATUM THAT IS THE ARITHMETIC AVERAGE OF THE HIGH WATER HEIGHTS OBSERVED OVER A SPECIFIC 19-YEAR METONIC CYCLE
NATIONAL_GEODETIC_VERTICAL_DATUM (NGVD) OF 1929: THE GEODETIC DATUM IS FIXED AND DOES NOT TAKE INTO ACCOUNT THE CHANGING STANDS OF SEA LEVEL.

SOURCE: USGS AND NOS, COASTAL MAPPING HANDBOOK

DEAD_END (ATTRIBUTE TERM 39)
SEE: BLIND/OPEN

DECIDUOUS/EVERGREEN (ATTRIBUTE TERM 40)
FEATURE: WOODLAND
DEFN: DECIDUOUS: CHARACTERIZED BY SHEDDING FOILAGE AT THE END OF ITS GROWING SEASON
EVERGREEN: CHARACTERIZED BY HAVING FOILAGE THAT PERSISTS AND REMAINS GREEN THROUGHOUT THE YEAR.
SOURCE: THE AMERICAN HERITAGE DICTIONARY
INCLUD: EVERGREEN

DENSITY_OF_GROWTH (ATTRIBUTE TERM 41)
FEATURE: WOODLAND
DEFN: THE DEGREE OR MEASURED DEGREE TO WHICH THE AREA IS FILLED OR OCCUPIED BY PLANT LIFE
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

DEPRESSION (ATTRIBUTE TERM 42)
FEATURE: CONTOUR_LINE
DEFN: A CLOSED LINE INDICATING DEPTH BELOW ADJACENT CONTOURS, RATHER THAN HEIGHT ABOVE SAME.
SOURCE: DEVISED AT VCU

DEPTH (ATTRIBUTE TERM 43)
FEATURE: WATERCOURSE SEA STREAM LAKE HARBOR BASIN INLET WELL LEAD LAGOON
DEFN: THE VERTICAL MEASUREMENT DOWNWARD FROM THE SURFACE; FOR WATER FEATURES, THE VERTICAL DISTANCE FROM THE PLANE OF THE HYDROGRAPHIC DATUM TO THE BED OF THE SEA, LAKE, STREAM OR WATERCOURSE
SOURCE: MODIFIED FROM WEBSTER'S NEW COLLEGIATE DICTIONARY

DIAMETER (ATTRIBUTE TERM 44)
FEATURE:
DEFN: THE LENGTH OF A LINE SEGMENT PASSING THROUGH THE CENTER OF A FEATURE; LOOSELY THE THICKNESS OF A FEATURE
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

DIRECTION_OF_FLOW (ATTRIBUTE TERM 45)
FEATURE: STREAM
DEFN: THE LINE OR COURSE OF MOVEMENT OF WATER OR LAVA SHOWN BY THE POSITION OF ONE POINT RELATIVE TO ANOTHER WITHOUT REFERENCE TO THE DISTANCE BETWEEN THEM. THE DIRECTION IS USUALLY INDICATED IN TERMS OF ITS ANGULAR DISTANCE FROM A REFERENCE DIRECTION
SOURCE: MODIFIED FROM THE DEFENSE MAPPING AGENCY

DISCHARGE (ATTRIBUTE TERM 46)
FEATURE: WATERFALL STREAM DAM LOCK DELTA WATERCOURSE GEYSER RAPIDS
DEFN: CUBIC MEASURE OF WATER FLOWING PER UNIT OF TIME
SOURCE: DEVISED AT VCU

DRAINAGE (ATTRIBUTE TERM 47)
FEATURE: WATERCOURSE STREAM DELTA CATCHMENT
DEFN: THE ACT, PROCESS OR MODE OF DRAINING OR DRAWING OFF WATER FROM A LAND SURFACE
SOURCE: THE AMERICAN HERITAGE DICTIONARY

ELEVATION (ATTRIBUTE TERM 48)
FEATURE: CROP_LAND ISLAND GAP CLIFF RIDGE WOODLAND CLEARING TUNDRA WETLAND ROAD BRIDGE RAILWAY CONTROL_POINT
DEFN: THE HEIGHT TO WHICH SOMETHING IS ABOVE A REFERENCE DATUM, ESPECIALLY ABOVE SEA LEVEL.

SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
INCLUD: SEA_LEVEL_RELATIONSHIP
VALUES: ABOVE_SEA_LEVEL/BELOW_SEA_LEVEL

FMBANKED (ATTRIBUTE TERM 49)
FEATURE: WATERCOURSE
DEFN: CONFINED, SUPPORTED OR PROTECTED BY A PILED UP MASS
SOURCE: THE AMERICAN HERITAGE DICTIONARY

ENCLOSED (ATTRIBUTE TERM 50)
FEATURE: WOODLAND CROP_LAND LAKE
DEFN: SURROUNDED ON ALL SIDES BY FOR EXAMPLE A BARRIER
SOURCE: THE AMERICAN HERITAGE DICTIONARY

EVERGREEN (ATTRIBUTE TERM 51)
SEE: DECIDUOUS/EVERGREEN

EXISTING/PROPOSED (ATTRIBUTE TERM 52)
FEATURE: ROAD
DEFN: PREVIOUSLY CONSTRUCTED AND PRESENTLY EXISTING VS. IN THE PLANNING STAGE
SOURCE: DEVISED AT VCU
INCLUD: PROPOSED

EXPOSED/SHELTERED (ATTRIBUTE TERM 53)
FEATURE: HARBOR
DEFN: NOT PROTECTED OR COVERED VS. PROTECTED OR COVERED AS FROM THE WEATHER
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
INCLUD: SHELTERED

FACILITIES_AVAILABLE (ATTRIBUTE TERM 54)
FEATURE: HARBOR AIRPORT PORT MOORING ROAD AIRPORT
DEFN: THE STRUCTURES OR INSTALLATIONS AVAILABLE FOR THE ENHANCEMENT OF THE USE OF THE RELATED FEATURE
SOURCE: DEVISED AT VCU
VALUES: REPAIR_FACILITIES COMFORT_FACILITIES DRINKING_WATER PICNIC_TABLES

FALLOW (ATTRIBUTE TERM 55)
FEATURE: CROP_LAND
DEFN: CULTIVATED LAND THAT IS ALLOWED TO LIE IDLE DURING THE GROWING SEASON.
SOURCE: WEBSTER'S NEW COLLEGIATE DICTIONARY

FEATURE_PRESENT (ATTRIBUTE TERM 56)
FEATURE: WATERCOURSE HARBOR ROAD LANE RAILWAY
DEFN: PRESENCE OF ONE FEATURE WITHIN ANOTHER FEATURE, FOR EXAMPLE DAM IN WATERCOURSE, BREAKWATER IN HARBOR
SOURCE: DEVISED AT VCU

FIRE_LINE (ATTRIBUTE TERM 57)
FEATURE: CLEARED_AREA
DEFN: CLEARED OR PLOWED STRIP OF LAND TO STOP THE SPREAD OF FIRE
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

FLOOD_CONTROL (ATTRIBUTE TERM 58)
FEATURE: WATERCOURSE CATCHMENT DAM LOCK
DEFN: DESIGNED FOR THE CONTROL OR DRAINAGE OF A RISING AND OVERFLOWING BODY OF WATER

SOURCE: DEVISED AT VCU

FLOODED (ATTRIBUTE TERM 59)
FEATURE: EARTH
DEFN: INUNDATED WITH OR SUBMERGED UNDER AN EXCESS AMOUNT OF WATER
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

FORCE_OF_FLOW (ATTRIBUTE TERM 60)
FEATURE: STREAM SPRING
DEFN: THE STRENGTH OF ENERGY EXERTED BY THE MOVEMENT OF WATER OR LAVA.
SOURCE: MODIFIED FROM WEBSTER'S NEW COLLEGIATE DICTIONARY
VALUES: FREE_FLOWING/SLUGGISH/STAGNANT
VAL.DEF: SLUGGISH: DISPLAYING LITTLE MOVEMENT OR ACTIVITY; SLOW; INACTIVE
STAGNANT: NOT MOVING OR FLOWING WITHOUT A CURRENT; MOTIONLESS.
SOURCE: THE AMERICAN HERITAGE DICTIONARY

FORM_RATIO (ATTRIBUTE TERM 61)
FEATURE: STREAM
DEFN: THE RELATIONSHIP BETWEEN THE DEPTH AND WIDTH OF A STREAM, EXPRESSED AS A RATIO
SOURCE: MONKHOUSE, A DICTIONARY OF GEOGRAPHY

GAS_EMITTED_TYPE (ATTRIBUTE TERM 62)
FEATURE: FUMAROLE
DEFN: KIND OF GASEOUS SUBSTANCE RELEASED
SOURCE: DEVISED AT VCU

GLACIAL (ATTRIBUTE TERM 63)
FEATURE: STREAM
DEFN: OF, PERTAINING TO OR DERIVED FROM A GLACIER
SOURCE: THE AMERICAN HERITAGE DICTIONARY

GRADE_SEPARATION (ATTRIBUTE TERM 64)
FEATURE: INTERSECTION
DEFN: AN INTERSECTION USING AN OVERPASS OR UNDERPASS
SOURCE: WEBSTER'S NEW COLLEGIATE DICTIONARY

GRADIENT (ATTRIBUTE TERM 65)
SEE: SLOPE

GRADIENT_OF_SIDES (ATTRIBUTE TERM 66)
SEE: SLOPE_OF_SIDES

GRAZING (ATTRIBUTE TERM 67)
FEATURE: CROP_LAND
DEFN: LAND WHICH SUPPLIES HERBIAGE FOR GRAZING ANIMALS
SOURCE: MODIFIED FROM WEBSTER'S NEW COLLEGIATE DICTIONARY

GROUND_LEVEL_RELATIONSHIP (ATTRIBUTE TERM 68)
FEATURE: WATERCOURSE STREAM ROAD
DEFN: THE OCCUPATION OF SPACE IN RELATION TO THE EARTH'S SURFACE
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
VALUES: ABOVE_GROUND/AT_GROUND_LEVEL/BELOW_GROUND

ATTRIBUTES

GROWING_PATTERN (ATTRIBUTE TERM 69)
FEATURE: CROP_LAND WOODLAND
DEFN: THE LAYOUT OR ARRANGEMENT OF GROWING PLANT LIFE
SOURCE: DEVISED AT VCU

GROWING_SEASON (ATTRIBUTE TERM 70)
FEATURE: CROP_LAND
DEFN: THE PERIOD OF TIME DURING THE YEAR CHARACTERIZED BY ENVIRONMENTAL CONDITIONS SUITABLE FOR PLANTING AND GROWING CROPS
SOURCE: DEVISED AT VCU

HEIGHT (ATTRIBUTE TERM 71)
FEATURE: BUILDING CROPLAND WOODLAND REVETMENT EMBANKMENT BAR REEF CLIFF PINNACLE RIDGE BEACON BUOY APPROACHWAY CABLEWAY GATE BARRIER TOWER ANTENNA
DEFN: THE VERTICAL DISTANCE FROM THE BASE TO THE TOP
SOURCE: THE AMERICAN HERITAGE DICTIONARY
VALUES: NUMBER OF STOREYS
PREDOMINANT HEIGHT OF VEGETATION

HORIZONTAL/VERTICAL (ATTRIBUTE TERM 72)
FEATURE: CONTROL_POINT
DEFN: PARALLEL TO OR IN THE PLANE OF THE HORIZON VS. PERPENDICULAR TO THE PLANE OF THE HORIZON
SOURCE: THE AMERICAN HERITAGE DICTIONARY

HYDRAULIC_RADIUS (ATTRIBUTE TERM 73)
FEATURE: STREAM
DEFN: THE RATIO BETWEEN THE CROSS-SECTIONAL AREA OF A STREAM AND ITS WETTED PERIMETER
SOURCE: MONKHOUSE, A DICTIONARY OF GEOGRAPHY

HYDROELECTRIC_POWER (ATTRIBUTE TERM 74)
FEATURE: WATERCOURSE WATERFALL DAM
DEFN: USED FOR THE PRODUCTION OF ELECTRICITY BY WATER POWER
SOURCE: DEVISED AT VCU

ICE_PRESENCE_OF (ATTRIBUTE TERM 75)
FEATURE: STREAM LAKE SEA
DEFN: CONTAINING WATER WHICH IS EITHER PARTIALLY OR COMPLETELY FROZEN
SOURCE: DEVISED AT VCU

INCORPORATED/UNINCORPORATED (ATTRIBUTE TERM 76)
FEATURE: POPULATED_PLACE
DEFN: UNITED OR COMBINED INTO AN ORGANIZED BODY WHICH IS MAINTAINED THROUGH A SERIES OF LAWS OR RULES
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
INCLUD: UNINCORPORATED

INFORMATION_DISPLAYED (ATTRIBUTE TERM 77)
FEATURE: SIGN
DEFN: THE IDEA COMMUNICATED THROUGH EXHIBITION
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

INTERMITTENT/PERENNIAL (ATTRIBUTE TERM 78)
FEATURE: STREAM SPRING
DEFN: PRESENT AT ALL SEASONS OF THE YEAR VS. OCCURRING OR APPEARING IN INTERRUPTED SEQUENCE
SOURCE: MODIFIED FROM WEBSTER'S NEW COLLEGIATE DICTIONARY

INCLUD: PERENNIAL

IRRIGATED (ATTRIBUTE TERM 79)
FEATURE: CROP_LAND
DEFN: SUPPLIED WITH WATER BY MEANS OF PIPES, DITCHES OR STREAMS FOR AGRICULTURAL PURPOSES.
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

IRRIGATION (ATTRIBUTE TERM 80)
FEATURE: WATERCOURSE STREAM WELL LAKE DAM
DEFN: USED FOR THE SUPPLYING OF WATER BY ARTIFICIAL MEANS TO LAND FOR AGRICULTURAL PURPOSES.
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

LAND (ATTRIBUTE TERM 81)
SEE: AIR/LAND/WATER

LANES_NUMBER_OF (ATTRIBUTE TERM 82)
FEATURE: ROAD RAILWAY LANE
DEFN: THE NUMBER OF PATHS AVAILABLE SIDE BY SIDE FOR THE SIMULTANEOUS PASSAGE OF VEHICLES IN A ROAD, RAILWAY OR NAVIGATION ROUTE
SOURCE: DEVISED AT VCU

LATITUDINAL_ZONE (ATTRIBUTE TERM 83)
FEATURE: WOODLAND GRASSLAND CROP_LAND DESERT
DEFN: ONE OF THE LARGE REGIONS DELIMITED BY DISTANCE FROM THE EQUATOR, USED AS A BASIS FOR CLASSIFYING CLIMATES
SOURCE: DEVISED AT VCU
VALUES: TROPICAL SUBTROPICAL TEMPERATE SUBARCTIC ARCTIC

LEAD_TYPE (ATTRIBUTE TERM 84)
FEATURE: LEAD
DEFN: CHARACTERISTICS OR CATEGORY OF LEAD
SOURCE: DEVISED AT VCU
VALUES: SHORE_LEAD

LENGTH (ATTRIBUTE TERM 85)
FEATURE: WATERCOURSE STREAM ROAD FISH_LADDER FISH_TRAP LOCK TURNING_BASIN BREAKWATER WHARF MOORING REVETMENT EMBANKMENT BAR SHORE REEF VALLEY ISTHMUS CLIFF RIDGE LAUNCHING_RAMP RUNWAY RAILWAY TUNNEL CABLEWAY GATE BARRIER BOUNDARY
DEFN: THE LONGER OR LONGEST DIMENSION OF A FEATURE
SOURCE: WEBSTER'S NEW COLLEGIATE DICTIONARY

LIGHT_CHARACTERISTIC (ATTRIBUTE TERM 86)
FEATURE: BUOY
DEFN: THE DISTINCTIVE CHARACTER OR QUALITY TYPICAL OF A SPECIFIC LIGHT EMITTED
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

LIGHT_DISPLAY (ATTRIBUTE TERM 87)
FEATURE: BEACON BUOY
DEFN: THE SEQUENCE AND APPROXIMATE LENGTH OF LIGHT AND DARK PERIODS OF A SPECIFIC LIGHT
SOURCE: MODIFIED FROM IDEAS
VALUES: FIXED/FLASHING

LIGHTED (ATTRIBUTE TERM 88)
FEATURE: WATERCOUURSE STREAM BUOY BEACON HARBOR AIRPORT ROAD TOWER SIGN POPULATED_PLACE DAM BRIDGE TUNNEL INTERSECTION STATION RUNWAY

DEFN: MARKED WITH LIGHTS USED AS AIDS TO NAVIGATION, OR TO GENERAL NIGHT USE
SOURCE: DEVISED AT VCU

LOCATION (ATTRIBUTE TERM 89)
FEATURE: ALL
DEFN: THE PLACE, SITE OR SPACE OCCUPIED BY A SPECIFIED FEATURE
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

LUMBERING (ATTRIBUTE TERM 90)
FEATURE: WOODLAND
DEFN: THE CUTTING AND PREPARING OF TIMBER FOR MARKET
SOURCE: THE AMERICAN HERITAGE DICTIONARY

MAIN_TRACK (ATTRIBUTE TERM 91)
SEE: CONNECTED_BY_SWITCHES/MAIN_TRACK

MANMADE (ATTRIBUTE TERM 92)
SEE: ARTIFICIALLY_IMPROVED/MANMADE/NATURAL

MEAN_HIGH_WATER (ATTRIBUTE TERM 93)
FEATURE: SHORELINE
DEFN: THE TIDAL DATUM THAT IS THE ARITHMETIC AVERAGE OF THE HIGH WATER HEIGHTS OBSERVED OVER A SPECIFIC 19-YEAR METONIC CYCLE. SEE ALSO DATUM.
SOURCE: USGS AND NOS, COASTAL MAPPING HANDBOOK

MEAN_SEA_LEVEL (ATTRIBUTE TERM 94)
FEATURE: SHORELINE
DEFN: A STANDARD DATUM FOR HEIGHTS AND ELEVATION IN COASTAL AREAS. SEE ALSO DATUM.
SOURCE: USGS AND NOS, COASTAL MAPPING HANDBOOK

MEDIAN_PRESENCE_OF (ATTRIBUTE TERM 95)
FEATURE: ROAD
DEFN: PRESENCE OF A DIVIDING AREA OFTEN PAVED OR LANDSCAPED, BETWEEN OPPOSING TRAFFIC OR ROADS
SOURCE: THE AMERICAN HERITAGE DICTIONARY

MICROWAVE_TRANSMISSION (ATTRIBUTE TERM 96)
FEATURE: TOWER ANTENNA BUILDING
DEFN: THE ACT OR PROCESS OF SENDING A SIGNAL OF ELECTROMAGNETIC RADIATION HAVING A WAVELENGTH IN THE APPROXIMATE RANGE FROM ONE CENTIMETER TO ONE METER.
SOURCE: MODIFIED FROM WEBSTER'S NEW COLLEGIATE DICTIONARY

MILITARY (ATTRIBUTE TERM 97)
SEE: OWNER_TYPE USER_TYPE

MINERAL_CONTENT (ATTRIBUTE TERM 98)
FEATURE: STREAM LAKE SEA CROP_LAND DUMPING_GROUND MINE
DEFN: PRESENCE OF ANY NATURALLY OCCURRING, HOMOGENEOUS INORGANIC SUBSTANCES.
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

MODE_TRANSPORTED (ATTRIBUTE TERM 99)
FEATURE: ROAD BRIDGE TUNNEL CABLEWAY
DEFN: THE MEANS OF MOVING PEOPLE OR GOODS THAT ARE ACCOMODATED
SOURCE: DEVISED AT VCU

INCLUD: TRANSPORTATION_ACCOMODATED_TYPE

MOUNTED (ATTRIBUTE TERM 100)
FEATURE: ANTENNA
DEFN: FITTED INTO OR SET IN A BACKING OR SUPPORT
SOURCE: THE AMERICAN HERITAGE DICTIONARY

MOVABLE/STATIONARY (ATTRIBUTE TERM 101)
FEATURE: RAILWAY TOWER ANTENNA BRIDGE
DEFN: ABILITY TO CHANGE POSITION VS. FIXED IN POSITION UNABLE TO MOVE
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
INCLUD: STATIONARY

NAME (ATTRIBUTE TERM 102)
FEATURE: ALL
DEFN: A WORD OR PHRASE THAT CONSTITUTES THE DISTINCTIVE DESIGNATION OF AN OCCURRENCE OF A FEATURE
SOURCE: THE AMERICAN HERITAGE DICTIONARY

NATURAL (ATTRIBUTE TERM 103)
SEE: ARTIFICIALLY_IMPROVED/MANMADE/NATURAL

NAVIGABLE (ATTRIBUTE TERM 104)
FEATURE: WATERCOURSE STREAM INLET SEA LAKE HARBOR DELTA REEF LEAD LAGOON WETLAND
DEFN: HAVING WATER DEEP ENOUGH AND WIDE ENOUGH TO AFFORD PASSAGE TO SHIPS; CAPABLE OF BEING STEERED
SOURCE: THE AMERICAN HERITAGE DICTIONARY

ONE_WAY/TWO_WAY (ATTRIBUTE TERM 105)
FEATURE: ROAD
DEFN: ACCOMODATING A LANE OR LANES OF TRAFFIC MOVING IN ONE DIRECTION ONLY VS. TRAFFIC MOVING IN OPPOSING DIRECTIONS WITH SOME SORT OF DIVISION BETWEEN LANES OF OPPOSING TRAFFIC
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
INCLUD: TWO_WAY

OPEN (ATTRIBUTE TERM 106)
SEE: BLIND/OPEN

OWNER_TYPE (ATTRIBUTE TERM 107)
FEATURE: AIRPORT ROAD BUILDING
DEFN: CHARACTERISTICS OR CATEGORY OF OWNERS OF THE FEATURE
SOURCE: DEVISED AT VCU
INCLUD: CIVILIAN MILITARY PRIVATE PUBLIC
VALUES: CIVILIAN MILITARY PRIVATE PUBLIC

PARENT (ATTRIBUTE TERM 108)
SEE: BRANCH/PARENT

PASSED_UNDER_FEATURE (ATTRIBUTE TERM 109)
FEATURE: TUNNEL
DEFN: THE FEATURE THAT ANOTHER FEATURE CROSSES BELOW WITHOUT JOINING
SOURCE: MODIFIED FROM IDEAS

PASSENGER_TRANSPORTATION (ATTRIBUTE TERM 110)
FEATURE: WATERCOURSE ROAD AIRPORT RUNWAY CABLEWAY RAILWAY TUNNEL INTERSECTION

DEFN: USED FOR THE CONVEYANCE OF HUMAN PASSENGERS
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

PEDESTRIAN_USE (ATTRIBUTE TERM 111)
FEATURE: ROAD
DEFN: USED BY PEOPLE TRAVELING ON FOOT
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

PERENNIAL (ATTRIBUTE TERM 112)
SEE: INTERMITTENT/PERENNIAL

PERMEABILITY (ATTRIBUTE TERM 113)
FEATURE: BREAKWATER
DEFN: THE ABILITY OF SUBSTANCES TO PASS THROUGH THE OPENINGS OR INTERSTICES
SOURCE: THE AMERICAN HERITAGE DICTIONARY
VALUES: IMPERMEABLE/PERMEABLE

PHYSICAL (ATTRIBUTE TERM 114)
FEATURE: BOUNDARY CONTROL_POINT
DEFN: OF OR PERTAINING TO MATERIAL THINGS
SOURCE: THE AMERICAN HERITAGE DICTIONARY
VALUES: PHYSICAL/NOT_PHYSICAL

PHYSICAL_CONDITION_OF_SURFACE_MATERIAL (ATTRIBUTE TERM 115)
FEATURE: ROAD RUNWAY BRIDGE TUNNEL
DEFN: THE PHYSICAL CONDITION OF A SPECIFIED TRANSPORTATION SURFACE WHICH ALLOWS FOR USE RANGING FROM SUSTAINED USE BY HEAVIEST VEHICLES TO NON-USE DUE TO DISREPAIR OR DETERIORATION
SOURCE: IDEAS

PILLAR_CONSTRUCTION (ATTRIBUTE TERM 116)
SEE: CONSTRUCTION_TYPE

POPULATION (ATTRIBUTE TERM 117)
FEATURE: POPULATED_PLACE
DEFN: THE NUMBER OF PEOPLE INHABITING A SPECIFIED AREA
SOURCE: THE AMERICAN HERITAGE DICTIONARY

PREDOMINANT_SPECIES (ATTRIBUTE TERM 118)
FEATURE: CROP_LAND FISHING_GROUND CLEARING TUNDRA GRASSLAND WETLAND FISH_TRAP WOODLAND
DEFN: THE MOST COMMON, CONSPICUOUS, OR PREVALENT ANIMAL OR PLANT LIFE BELONGING TO A DISTINCT BIOLOGICAL SPECIES
SOURCE: THE AMERICAN HERITAGE DICTIONARY

PRIVATE (ATTRIBUTE TERM 119)
SEE: OWNER_TYPE USER_TYPE

PROPOSED (ATTRIBUTE TERM 120)
SEE: EXISTING/PROPOSED

PUBLIC (ATTRIBUTE TERM 121)
SEE: OWNER_TYPE USER_TYPE

RADIO_SIGNAL_CHARACTERISTIC (ATTRIBUTE TERM 122)
FEATURE: BUOY

DEFN: THE DISTINCTIVE CHARACTER OR QUALITY TYPICAL OF A SPECIFIC RADIO SIGNAL EMITTED
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

RADIO_TRANSMISSION (ATTRIBUTE TERM 123)
FEATURE: TOWER ANTENNA STATION BUILDING
DEFN: USED FOR OR CONTAINING THE EQUIPMENT USED TO TRANSMIT RADIO SIGNALS, ELECTROMAGNETIC WAVES IN APPROXIMATE FREQUENCY RANGE FROM 10 KILOCYCLES/SECOND TO 300,000 MEGACYCLES/SECOND. TO TRANSMIT OR TO RECEIVE ELECTRIC SIGNALS WITHOUT WIRES CONNECTING THE POINTS OF TRANSMISSION AND RECEPTION.
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

RAIL_CONNECTOR_TYPE (ATTRIBUTE TERM 124)
FEATURE: RAILWAY
DEFN: THE METHOD USED TO JOIN OR CONNECT CONSECUTIVE RAILS OF A SPECIFIC RAIL LINE OR SEGMENT
SOURCE: IDEAS

RAIL_DIRECTION_CHANGES (ATTRIBUTE TERM 125)
FEATURE: RAILWAY
DEFN: TYPE OF FACILITY AVAILABLE AT A SPECIFIC LOCATION TO ACCOMPLISH CHANGING THE DIRECTION OF A LOCOMOTIVE
SOURCE: IDEAS

RAIL_GAUGE_ADAPTABILITY (ATTRIBUTE TERM 126)
FEATURE: RAILWAY
DEFN: METHOD USED TO CHANGE THE GAUGE ON A SPECIFIC PIECE OR CATEGORY OF RAILWAY EQUIPMENT
SOURCE: IDEAS

RAILS_NUMBER_OF (ATTRIBUTE TERM 127)
FEATURE: RAILWAY
DEFN: HAVING PARALLEL BARS FOR CONVEYANCE VS. A SINGLE BAR SYSTEM
SOURCE: DEVISED AT VCU
VALUES: MONORAIL SINGLE_TRACK DOUBLE_TRACK
VAL.DEF: SINGLE_TRACK: TWO PARALLEL RAILS MAKING A SINGLE RAIL LINE

RECREATIONAL (ATTRIBUTE TERM 128)
FEATURE: WATERCOURSE LAKE STREAM SEA
DEFN: USED FOR THE REFRESHMENT OF ONE'S MIND OR BODY AFTER LABOR THROUGH DIVERTING ACTIVITY; PLAY
SOURCE: MODIFIED FROM WEBSTER'S NEW COLLEGIATE DICTIONARY

REGULATED (ATTRIBUTE TERM 129)
SEE: RESTRICTIONS

RELATED_FEATURE (ATTRIBUTE TERM 130)
FEATURE: GATE
DEFN: THE LOGICAL OR NATURAL ASSOCIATION BETWEEN TWO OR MORE FEATURES; RELEVANCE OF ONE TO ANOTHER; CONNECTION
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

RELIEF (ATTRIBUTE TERM 131)
FEATURE: EARTH
DEFN: THE DIFFERENCE BETWEEN HIGH AND LOW PLACES IN A LOCALITY
SOURCE: DEVISED AT VCU

RESTRICTIONS (ATTRIBUTE TERM 132)
FEATURE: HARBOR ROAD APPROACHWAY TUNNEL BRIDGE RUNWAY
DEFN: LIMITATIONS ON THE USE FOR LEGAL, SAFETY, SECURITY OR OTHER REASONS.

SOURCE: DEVISED AT VCU
INCLUD: USE_RESTRICTIONS REGULATED SEASONAL_LIMITS SPECIAL_USE

ROAD_TYPE (ATTRIBUTE TERM 133)
FEATURE: ROAD
DEFN: CHARACTERISTICS OR CATEGORY OF ROAD
SOURCE: DEVISED AT VCU
VALUES: INTERSTATE/STATE_HIGHWAY/COUNTY_ROAD/LOCAL_ROAD

RUNWAYS_NUMBER_OF (ATTRIBUTE TERM 134)
FEATURE: AIRPORT
DEFN: THE NUMBER OF PREPARED SURFACES AVAILABLE TO ACCOMODATE THE LANDING AND TAKE-OFF OF AIRCRAFT
SOURCE: DEVISED AT VCU

SALINITY (ATTRIBUTE TERM 135)
FEATURE: STREAM LAKE SPRING INLET FISHING_GROUND FISH_TRAP LOCK HARBOR TURNING_BASIN WETLAND DUMPING_GROUND WELL
DEFN: THE PROPORTION OF DISSOLVED SALTS IN PURE WATER, STATED IN PARTS PER THOUSAND BY MASS
SOURCE: MONKHOUSE, A DICTIONARY OF GEOGRAPHY
VALUES: SALTY/BRACKISH/FRESH
VAL.DEF: BRACKISH IS SLIGHTLY SALTY, BETWEEN 15 AND 30 PARTS PER THOUSAND
VALUES: PARTS OF SALT PER THOUSAND PARTS OF WATER

SEA_LEVEL_RELATIONSHIP (ATTRIBUTE TERM 136)
SEE: ELEVATION

SEASON_USED (ATTRIBUTE TERM 137)
FEATURE: FISH_TRAP FISH_LADDER CABLEWAY
DEFN: THE SPECIFIED SEASON OR TIME OF YEAR THAT SOMETHING CAN BE USED, ESPECIALLY IN REFERENCE TO SOMETHING THAT IS DEPENDENT ON OR CONTROLLED BY SEASONAL CHANGES
SOURCE: DEVISED AT VCU
INCLUD: SEASONAL_LIMITS

SEASONAL_DEPTH (ATTRIBUTE TERM 138)
FEATURE: WETLAND
DEFN: THE MEASUREMENT FROM THE WATER SURFACE TO THE BOTTOM OF THAT WATER BODY AT DIFFERENT SEASONS; USED IN RELATION TO WATER BODIES WHICH HAVE MARKED CHANGES DUE TO SEASON CHANGE
SOURCE: DEVISED AT VCU

SEASONAL_LIMITS (ATTRIBUTE TERM 139)
SEE: RESTRICTIONS SEASON_USED

SERVICES_PROVIDED (ATTRIBUTE TERM 140)
FEATURE: AIRPORT STATION
DEFN: KINDS OF SERVICES PROVIDED AT A GIVEN FACILITY. SEE ALSO FACILITIES_AVAILABLE.
SOURCE: DEVISED AT VCU
VALUES: AIR_TRAFFIC_CONTROL_SERVICE BAGGAGE_SERVICE

SHAPE (ATTRIBUTE TERM 141)
FEATURE: ALL
DEFN: SPATIAL FORM
SOURCE: THE AMERICAN HERITAGE DICTIONARY

SHELTERED (ATTRIBUTE TERM 142)

SEE: EXPOSED/SHELTERED

SHORE_ORIENTATION (ATTRIBUTE TERM 143)
FEATURE: BREAKWATER WHARF BAR
DEFN: THE POSITION OF SOMETHING RELATIVE TO THE SHORE: FOR EXAMPLE, PARALLEL
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

SIGNAL_DIRECTION (ATTRIBUTE TERM 144)
FEATURE: BEACON
DEFN: THE LINE OR COURSE ALONG WHICH THE SOUND, IMAGE, OR OTHER TRANSMITTED MESSAGE TRAVELS
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

SIGNAL_INTENSITY (ATTRIBUTE TERM 145)
FEATURE: BEACON BUOY
DEFN: THE CONCENTRATION OF POWER OR FORCE OF THE SIGNAL EMITTED
SOURCE: THE AMERICAN HERITAGE DICTIONARY

SIGNAL_TYPE (ATTRIBUTE TERM 146)
FEATURE: BEACON BUOY ANTENNA
DEFN: THE SPECIFIC SOUND, IMAGE, OR OTHER TRANSMITTED MESSAGE
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

SIZE (ATTRIBUTE TERM 147)
FEATURE: BUILDING
DEFN: THE PHYSICAL DIMENSIONS, PROPORTIONS, MAGNITUDE, OR EXTENT OF SOMETHING
SOURCE: THE AMERICAN HERITAGE DICTIONARY
VALUES: LARGE SMALL

SLIPS_NUMBER_OF (ATTRIBUTE TERM 148)
FEATURE: WHARF
DEFN: THE NUMBER OF SPACES BETWEEN WHARFS OR PIERS DESIGNED TO ACCOMODATE WATER VESSELS
SOURCE: DEVISED AT VCU

SLOPE (ATTRIBUTE TERM 149)
FEATURE: WATERCOURSE SHORE GAP CLIFF RIDGE ROAD LAUNCHING_RAMP RAILWAY
DEFN: UNIT INCREASE (DECREASE) IN HEIGHT PER UNIT OF HORIZONTAL DISTANCE. EXPRESSED AS A PERCENTAGE.
SOURCE: DEVISED AT VCU
INCLUD: GRADIENT

SLOPE_OF_SIDES (ATTRIBUTE TERM 150)
FEATURE: BASIN VALLEY WATERCOURSE
DEFN: SAME AS FOR "SLOPE," BUT MEASURED BETWEEN THE UPPER AND LOWER SURFACES OF THE FEATURE, ALONG ITS SIDES.
SOURCE: DEVISED AT VCU
INCLUD: GRADIENT_OF_SIDES

SMOKE_EMISSION (ATTRIBUTE TERM 151)
FEATURE: TOWER
DEFN: THE VENTING OF VAPOR MADE UP OF SMALL PARTICLES OF CARBONACEOUS MATTER IN THE AIR, RESULTING MAINLY FROM INCOMPLETE COMBUSTION OF ORGANIC MATERIAL, SUCH AS WOOD OR COAL. (A SUSPENSION OF PARTICLES IN A GASEOUS MEDIUM.)
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

SOLID_CONSTRUCTION (ATTRIBUTE TERM 152)
SEE: CONSTRUCTION_TYPE

SOUND_CHARACTERISTIC (ATTRIBUTE TERM 153)
FEATURE: BUOY
DEFN: THE DISTINCTIVE CHARACTER OR QUALITY TYPICAL OF A SPECIFIC SOUND EMITTED
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

SOUNDING (ATTRIBUTE TERM 154)
SEE: CHARTED_DEPTH

SPAN_LENGTH (ATTRIBUTE TERM 155)
FEATURE: BRIDGE
DEFN: THE LENGTH OF THE SECTION BETWEEN INTERMEDIATE SUPPORTS OF A BRIDGE
SOURCE: THE AMERICAN HERITAGE DICTIONARY

SPAN_MOVEMENT (ATTRIBUTE TERM 156)
FEATURE: BRIDGE
DEFN: THE ABILITY OF THE SECTION BETWEEN TWO INTERMEDIATE SUPORTS OF A BRIDGE TO MOVE
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

SPANNED_FEATURE (ATTRIBUTE TERM 157)
FEATURE: BRIDGE
DEFN: THE FEATURE THAT A BRIDGE OR OTHER SPECIFIC FEATURE CROSSES ABOVE WITHOUT JOINING
SOURCE: MODIFIED FROM IDEAS

SPECIAL_USE (ATTRIBUTE TERM 158)
SEE: RESTRICTIONS.

SPECIES (ATTRIBUTE TERM 159)
FEATURE: CLEARING FISH_HATCHERY FISH_LADDER
DEFN: A FUNDAMENTAL CATEGORY OF TAXONOMIC CLASSIFICATION, RANKING AFTER A GENUS, AND CONSISTING OF ORGANISMS CAPABLE INTERBREEDING
SOURCE: THE AMERICAN HERITAGE DICTIONARY
VALUES: SPECIES_REMOVED
SPECIES_SERVED

STATIONARY (ATTRIBUTE TERM 160)
SEE: MOVABLE/STATIONARY

STORAGE (ATTRIBUTE TERM 161)
FEATURE: LAKE TOWER BUILDING
DEFN: USED FOR MAINTAINING A STOCK OR SUPPLY FOR FUTURE USE
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

STUNTED_GROWTH (ATTRIBUTE TERM 162)
FEATURE: WOODLAND
DEFN: CHARACTERIZED BY HINDERANCE OF NORMAL GROWTH
SOURCE: MODIFIED FROM WEBSTER'S NEW COLLEGIATE DICTIONARY

SUBSTANCE_EXTRACTED (ATTRIBUTE TERM 163)
FEATURE: MINE WELL
DEFN: THE MATTER (LIQUID OR SOLID) BEING DRAWN FORTH BY MECHANICAL OR CHEMICAL PROCESSES
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

SUPPORT_TYPE (ATTRIBUTE TERM 164)

FEATURE: TOWER BRIDGE
DEFN: "SUPPORT:" TO BEAR THE WEIGHT OF ESPECIALLY FROM BELOW. TO HOLD IN POSITION; PREVENT FROM FALLING, SINKING OR SLIPPING.
SOURCE: THE AMERICAN HERITAGE DICTIONARY

SURFACE_MATERIAL (ATTRIBUTE TERM 165)
SEE: COMPOSITION

TELEVISION_TRANSMISSION (ATTRIBUTE TERM 166)
FEATURE: TOWER BUILDING ANTENNA
DEFN: THE TRANSMISSION OF VISUAL IMAGES OF MOVING AND STATIONARY OBJECTS, GENERALLY WITH ACCOMPANYING SOUND, AS ELECTROMAGNETIC WAVES, AND THE RECONVERSION OF RECEIVED WAVES INTO VISUAL IMAGES
SOURCE: THE AMERICAN HERITAGE DICTIONARY

TEMPERATURE (ATTRIBUTE TERM 167)
FEATURE: SPRING STREAM GEYSER GLACIER SEA LAKE
DEFN: A SPECIFIC DEGREE OF HOTNESS OR COLDNESS AS INDICATED ON OR REFERED TO A STANDARD SCALE
SOURCE: THE AMERICAN HERITAGE DICTIONARY
VALUES: AVERAGE_ANNUAL
MINIMUM_RECORDED, MAXIMUM_RECORDED

THROUGH_ROAD (ATTRIBUTE TERM 168)
SEE: BLIND/OPEN

TIDAL (ATTRIBUTE TERM 169)
FEATURE: STREAM LAKE SEA
DEFN: SUBJECT TO THE ALTERNATING RISE AND FALL OF WATER LEVEL CAUSED BY THE ASTRONOMIC TIDE-PRODUCING FORCES
SOURCE: THE AMERICAN HERITAGE DICTIONARY

TOLL (ATTRIBUTE TERM 170)
FEATURE: ROAD BRIDGE WATERCOURSE TUNNEL
DEFN: A FIXED CHARGE OR TAX FOR ACCESS, ESPECIALLY FOR PASSAGE ACROSS A BRIDGE OR ALONG A ROAD.
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

TRACK_GAUGE (ATTRIBUTE TERM 171)
FEATURE: RAILWAY TURNTABLE
DEFN: THE DISTANCE BETWEEN THE RAILS OF A RAILWAY
SOURCE: THE AMERICAN HERITAGE DICTIONARY

TRAFFIC_LIGHTS_PRESENCE_OF (ATTRIBUTE TERM 172)
FEATURE: ROAD RAILWAY
DEFN: PRESENCE OF ROAD SIGNALS THAT BEAM A RED OR GREEN LIGHT OR AN AMBER WARNING LIGHT TO DIRECT TRAFFIC TO STOP OR PROCCEED
SOURCE: THE AMERICAN HERITAGE DICTIONARY

TRANSPORTATION_ACCOMODATED_TYPE (ATTRIBUTE TERM 173)
SEE: MODE_TRANSPORTED

TREE_COVER (ATTRIBUTE TERM 174)
FEATURE: WOODLAND CROP_LAND
DEFN: THE AMOUNT, OR DENSITY OF TALL WOODY PLANTS OCCUPYING THE SURFACE OF A SPECIFIED AREA
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
VALUES: PERCENT OF AREA COVERED BY TREES

TREE_LINED (ATTRIBUTE TERM 175)

FEATURE: ROAD RAILWAY
DEFN: HAVING A BORDER OF TREES ALONG ITS SIDES
SOURCE: THE AMERICAN HERITAGE DICTIONARY

TWO_WAY (ATTRIBUTE TERM 176)
SEE: ONE_WAY/TWO_WAY

UNDERGROWTH_PRESENCE_OF (ATTRIBUTE TERM 177)
FEATURE: WOODLAND
DEFN: PRESENCE OF LOW GROWING PLANTS, SAPLINGS, AND SHRUBS BENEATH THE TREES IN A FOREST.
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

UNINCORPORATED (ATTRIBUTE TERM 178)
SEE: INCORPORATED/UNINCORPORATED

USE_RESTRICTIONS (ATTRIBUTE TERM 179)
SEE: RESTRICTIONS

USE_TYPE (ATTRIBUTE TERM 180)
FEATURE: BUILDING TOWER
DEFN: THE DISTINGUISHED EMPLOYMENT OF SOMETHING FOR A PURPOSE
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
VALUES: RESIDENTIAL COMMERCIAL INDUSTRIAL PUBLIC_AND_INSTITUTIONAL
VAL.DEF: RESIDENTIAL: HAVING A BUILDING OR BUILDINGS USED TO HOUSE PEOPLE; PRESENCE OF HOMES
COMMERCIAL: OF, PERTAINING TO OR ENGAGED IN THE BUYING AND SELLING OF GOODS OR SERVICES.
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
VALUES: RELIGIOUS

USER_TYPE (ATTRIBUTE TERM 181)
FEATURE: AIRPORT ROAD BUILDING
DEFN: CHARACTERISTICS OR CATEGORY OF USERS OF THE FEATURE
SOURCE: DEVISED AT VCU
VALUES: CIVILIAN MILITARY PRIVATE PUBLIC

VEHICLE_SIZE_SERVED (ATTRIBUTE TERM 182)
FEATURE: AIRPORT RUNWAY LAUNCHING_RAMP LOCK WHARF PORT HARBOR MOORING
DEFN: THE PHYSICAL DIMENSION, PROPORTION, MAGNITUDE, OR EXTENT OF ANY DEVICE FOR CARYING PASSENGERS, GOODS, OR EQUIPMENT THAT THE SPECIFIED FEATURE HAS SPACE FOR STORAGE OR SERVICE FOR
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

VEHICLE_TYPE (ATTRIBUTE TERM 183)
FEATURE: VEHICLE_STORAGE MOORING HARBOR
DEFN: THE DISTINGUISHED DEVICES FOR CARRYING PASSENGERS, GOODS, OR EQUIPMENT THAT ARE ACCOMODATED
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
INCLUD: VESSEL_TYPE

VERTICAL (ATTRIBUTE TERM 184)
SEE: HORIZONTAL/VERTICAL

VESSEL_TYPE (ATTRIBUTE TERM 185)
SEE: VEHICLE_TYPE

VOLUME (ATTRIBUTE TERM 186)

FEATURE: STREAM WATERCOURSE LAKE
DEFN: SPACE OCCUPIED OR CUBIC CAPACITY AS MEASURED IN CUBIC UNITS
SOURCE: WEBSTER'S NEW COLLEGIATE DICTIONARY

WASTE_MATERIAL (ATTRIBUTE TERM 187)
FEATURE: DUMPING_GROUND
DEFN: THE USELESS OR WORTHLESS BYPRODUCTS OF A PROCESS OR THE LIKE; REFUSE OR EXCESS MATERIAL
SOURCE: THE AMERICAN HERITAGE DICTIONARY

WATCHED (ATTRIBUTE TERM 188)
FEATURE: BEACON
DEFN: OBSERVED ATTENTIVELY OR CAREFULLY
SOURCE: THE AMERICAN HERITAGE DICTIONARY
VALUES: WATCHED/UNWATCHED

WATER (ATTRIBUTE TERM 189)
SEE: AIR/LAND/WATER

WATER_BODY_CONNECTION (ATTRIBUTE TERM 190)
FEATURE: WATERCOURSE
DEFN: ACTING AS A LINK BETWEEN TWO LARGER BODIES OF WATER
SOURCE: DEVISED AT VCU

WATER_LEVEL_RELATIONSHIP (ATTRIBUTE TERM 191)
FEATURE: BREAKWATER SPRING
DEFN: THE POSITION OF SOMETHING IN REFERENCE TO THE SURFACE OF THE SURROUNDING OR CLOSEST WATER BODY
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY
VALUES: PROTRUDING/SUBMERGED

WATER_SUPPLY (ATTRIBUTE TERM 192)
FEATURE: WATERCOURSE LAKE
DEFN: EQUIPPED OR USED TO FURNISH WATER
SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

WATERAGE (ATTRIBUTE TERM 193)
FEATURE: WATERCOURSE
DEFN: THE MOVEMENT OF GOODS OR MERCHANDISE (SUCH AS LOGS) BY WATER
SOURCE: THE AMERICAN HERITAGE DICTIONARY

WEIGHT_BEARING_CAPACITY (ATTRIBUTE TERM 194)
DEFN: THE ABILITY OF SURFACE MATERIAL OR A STRUCTURE TO WITHSTAND THE WEIGHT OF SUCH THINGS AS TRANSPORTATION VEHICLES
SOURCE: MODIFIED FROM DIA IDEAS
SEE: BEARING_CAPACITY

WETTED_PERIMETER (ATTRIBUTE TERM 195)
FEATURE: STREAM
DEFN: LENGTH OF THE LINE OF CROSS-SECTIONAL CONTACT BETWEEN THE WATER IN A STREAM AND ITS WATERCOURSE
SOURCE: ADAPTED FROM MONKHOUSE, A DICTIONARY OF GEOGRAPHY

WIDTH (ATTRIBUTE TERM 196)
FEATURE: WATERCOURSE STREAM INLET FISH_LADDER FISH_TRAP LOCK TURNING_BASIN BREAKWATER WHARF MOORING REVETMENT EMBANKMENT BAR SHORE REEF VALLEY ISTHMUS CAVE GAP RIDGE BEACON BUOY ROAD LAUNCHING_RAMP BRIDGE RUNWAY TUNNEL GATE
DEFN: THE MEASUREMENT TAKEN AT RIGHT ANGLES TO THE LENGTH; BREADTH; THE MEASUREMENT OF THE EXTENT OF SOMETHING FROM SIDE TO SIDE

SOURCE: MODIFIED FROM THE AMERICAN HERITAGE DICTIONARY

WINDBREAK (ATTRIBUTE TERM 197)
FEATURE: BARRIER
DEFN: A HEDGE, ROW OF TREES, OR FENCE SERVING TO LESSEN OR BREAK THE FORCE OF THE WIND
SOURCE: THE AMERICAN HERITAGE DICTIONARY

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General Comments on the Work of the National Committee for Digital Cartographic Data Standards, Report No. 7.

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