



DGIWG – 203



NATO Geospatial Feature Concept Dictionary (NGFCD)

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Abstract:	This standard provides information on the purpose and structure of data within the NATO Geospatial Feature Concept Dictionary (NGFCD) part of the NATO Geospatial Information Framework (NGIF).
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i. Submitting organizations

Nation	Organisation
Sweden	Swedish Armed Forces Geo SE
Germany	Bundeswehr Geoinformation Centre (BGIC)
France	Institut Géographique National (IGN)
The Netherlands	Royal Netherlands Army Geographic Agency
United Kingdom	Joint Forces Intelligence Group - Defence Geographic Centre (JFIG-DGC)
United States	National Geospatial-Intelligence Agency (NGA)

ii. Document contributor contact points

All questions regarding this document shall be directed to the editor (secretariat@dgiwg.org) or the contributor organisations:

iii. Revision history

Date	Release	Editors	Primary clauses modified	Description
2013-10-18	1.0	SWE, DEU	All	Final editing for publication.

iv. Future work

As the NGIF programme of work continues and business and technical process mature it is expected that the NGFCD will evolve and this specification reviewed and updated accordingly.



Introduction

This Standard has been developed as part of the NATO Geospatial Information Framework (NGIF) suite of standards.

The NATO Geospatial Feature Concept Dictionary (NGFCD) provides all Concepts required by the NATO Geospatial Information Model (NGIM) and is the authoritative source for the model.

The NATO Geospatial Real World Object Index (NGRWI) provides a Real World Index for the NGIM.

The NGIM is an NGIF-wide logical model for geospatial data that is technology neutral. This *Platform Independent Model* determines the syntactic structure. The NATO Geospatial Entity Catalogue (NGEC) is a simplified view on the content using a catalogue structure.

The NGFCD provides Feature Concepts, Attributes Concepts, Datatypes, Unit of Measures and Concepts for Enumeration Values. The NGFCD itself is a profile of the DGIWG Feature Data Dictionary (DFDD).



1 Scope

The NATO Geospatial Feature Concept Dictionary (NGFCD) specifies an NATO-wide data element dictionary for geospatial data. This dictionary includes feature concepts, attribute concepts with their domain types, and accompanying metadata.

The NGFCD conforms to a subset of ISO 19126:2009, *Geographic information – Feature concept dictionaries and registers*, and its information schema. The NGFCD draws upon multiple community dictionaries (e.g., Digital Geospatial Information Working Group Feature Data Dictionary (DFDD), Aeronautical Information Exchange Model (AIXM), IHO S-57, NATO Additional Military Layers (AML), and others) to specify an integrated feature data dictionary tailored to the requirements of NATO.

ISO 19101, *Geographic information – Reference model*, defines a feature as an abstraction of real world phenomena. Such abstractions may be represented in information systems using a variety of spatial modelling methods, including representations such as vectors, grids and images. The NGFCD supports this breadth of geometric representations for “feature data” in NATO. The NGFCD also supports modelling entities that may represent other geospatially-located information that does not correspond to “real world phenomena”. Unless otherwise specifically stated, the terms feature and (modelling) entity are used interchangeably in this standard.

The NATO Geospatial Real World Object Index (NGRWI) provides a Real World Index for the NATO Geospatial Information Model (NGIM).

Information traceability is established from concepts in the NGFCD to appropriate authoritative concept sources, where possible, to maximize semantic integrity when geospatial data is exchanged between NATO-based and other systems.

NGFCD draws upon recognized content standards, specifications and profiles from both the military (e.g., DGIWG, NATO/MGID) and civilian sectors (e.g., IHO, ICAO/EUROCONTROL, WMO).

2 Conformance

This specification establishes a data dictionary with a structure as defined in ISO 19126. The content of the NGFCD is derived from the DGIWG Feature Data Dictionary. Additional NATO-specific content is published in the NATO Extension Feature Data Dictionary.



3 Normative references

The documents listed in Table 1 are indispensable to understanding and using this standard. For dated references, only the cited edition or version applies. For undated references, the latest edition or version of the referenced document (including any amendments) applies.

Table 1: Normative References

Standard or Specification
DGIWG STD-13-021-ed1.0.0 – <i>NATO Geospatial Feature Concept Dictionary (NGFCD) 1.0 – Normative Content</i> https://portal.dgiwg.org/files/?artifact_id=8629
ISO/TS 19103:2005, <i>Geographic information – Conceptual schema language</i>
ISO 19126:2009, <i>Geographic information – Feature concept dictionaries and registers</i>
HBK-DP-10-001- Implementation Guide to the DFDD 2.2.8 https://portal.dgiwg.org/files/?artifact_id=7148

4 Terms, definitions, and abbreviations

4.1 Definitions

The terms and definitions specific to this standard are given in Table 2.

Table 2: Definitions Applicable to this Standard

Term	Definition
Attribute	A characteristic of a feature.
Datatype	Specifies how the value of an Attribute shall be abstractly represented and consists of one or more fields, each capturing an aspect of information required to completely specify a value in the domain of the datatype. A simple datatype consists of a single field containing a primitive data value (e.g., a real number); a complex datatype consists of multiple fields, at least one of which contains a data value and others may contain metadata about the data value(s).
Datatype Element	An element (a field) of a complex datatype.
Datatype Listed Values	Values that are members of the domain of a specific enumerated datatype. These listed values are often referred to simply as "enumerants".
Feature	An abstraction of real world phenomena.
NATO Geospatial Feature Concept Dictionary	A structured collection of feature information (features, attributes, and ancillary data) whose schema conforms to the conceptual model of a feature concept dictionary as specified in ISO 19126:2009.
Physical Quantities	A set of physical quantities that characterize the properties of a phenomenon, body, or substance, where the property has a magnitude that can be expressed as a number (physical value) and a reference quantity - referred to as a "unit of measure".
Units of Measure	A set of units of measure, organized by physical quantity, where a unit of measure is a predefined amount of the concerned physical quantity (for example: a metre "of length" or kilogram "of mass").



4.2 Abbreviations

The acronyms that are used in this standard are specified in the following list.

- **AIXM** Aeronautical Information Exchange Model
- **AML** Additional Military Layers
- **DFDD** DGIWG Feature Data Dictionary
- **DGIWG** Defence Geospatial Information Working Group
- **FDD** Feature Data Dictionary
- **ICAO** International Civil Aviation Organization
- **IHO** International Hydrographic Organization
- **ISO** International Organization for Standardization
- **JGSWG** Joint Geospatial Standards Working Group
- **METOC** Meteorology and Oceanographic
- **MGID** Military Geographic Information & Documentation
- **NATO** North Atlantic Treaty Organization
- **NGEC** NATO Geospatial Entity Catalogue
- **NGFCD** NATO Geospatial Feature Concept Dictionary
- **NGIF** NATO Geospatial Information Framework
- **NGIM** NATO Geospatial Information Model
- **NGRWI** NATO Geospatial Real World Object Index
- **SI** International System of Units
- **TS** Technical Specification
- **UML** Unified Modeling Language
- **URI** Uniform Resource Identifier

5 Logical Structure

5.1 Conceptual Metamodel

The NATO Geospatial Feature Concept Dictionary (NGFCD) specifies an NATO-wide data element dictionary for geospatial data. This dictionary includes feature concepts, attribute concepts with their domain types, physical quantities with their units of measure, unit multiples and accompanying metadata.

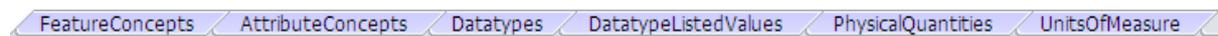
The NGFCD is maintained as a collection of feature concept information whose conceptual metamodel conforms to the conceptual model of a feature concept dictionary as specified in ISO 19126:2009, *Geographic information – Feature concept dictionaries and registers*. As necessary, the metamodel specified in ISO 19126 has been extended based on the object modelling component of *OMG Unified Modeling Language (OMG UML), Superstructure, Version 2.2, September 2009*, and ISO 19103:2005, *Geographic information – Conceptual schema language*.

The ISO 19126:2009 metamodel has also been simplified in some regards where the functionality is not applicable to the NGFCD.



5.2 Logical Metamodel

The NGFCD logical metamodel is organized as follows. There are seven basic categories of concepts: *Features*, *Attributes*, *Datatypes*, *Datatype Elements*, *Listed Values*, *Physical Quantities* and *Units of Measure*. Every concept category has its own table, except for *Datatype Elements* that are included in the *Datatypes* table. The following tabs are available in the Normative Content:



In each table it is possible to specify the following information for the concepts:

- **AlphaCode:** A unique alphanumeric value that may be used to designate this concept for the purposes of data interchange within the NATO. When this NGIF alphanumeric code is used in an information system or dataset then the intended semantic of the information system or dataset concept shall correspond 1:1 with the identified NGFCD concept. Whereas an information system may use other codes to denote the concept within its boundaries, data sets used in information exchange shall only use either the NGFCD-specified or (in technology-specific limited circumstances) either the 531-conformant alphanumeric code or integer-based code.
- **Name:** A compact and human-readable designator that is used to denote the concept. Aliases may be defined for use within the scope of an information system, but data sets used in information exchange shall only use the NGFCD -specified name.
- **Definition:** A precise statement of the nature, properties, scope, or essential qualities of the concept. Information systems and data sets shall preserve this meaning, neither narrowing, broadening, nor otherwise altering the specified semantic.
- **Description:** An optional statement of the nature, properties, scope, or non-essential qualities of the concept that are not specified by the definition. Information systems and data sets should consider this information in their design, implementation, and operations, but explicitly honouring this additional information is optional.
- **NGFCD Identifier:** This integer value identifies the concept uniquely within the scope of the NGFCD. When this NGFCD concept item identifier is used in an information system then the intended semantic of the information system concept shall correspond 1:1 with the identified NGFCD concept.
- **5-3-1 Code:** A unique alphanumeric value that conforms to the DGIWG-developed FDD and may be used to designate this concept in technology-specific limited circumstances for the purposes of data interchange in conformance with DGIWG standards. When this DFDD-conformant alphanumeric code is used in an information system or dataset then the intended semantic of the information system or dataset concept shall correspond 1:1 with the identified NGFCD concept.
- **Source:** Indicates whether the concept is profiled from the DFDD proper, or an Extension.



Depending on the type of concept, additional information may be specified. This additional information is specified in the following subsections of this standard.

For Feature, Attribute, Listed Values, Physical Quantities and Unit of Measure concepts, one or more aliases may be specified.

Additionally, there is information documenting the NGFCD as a whole.

5.3 Content Rules

Spelling conventions in the NGFCD are generally those internationally agreed and adopted by the Defence Geospatial Information Working Group (DGIWG) in their DGIWG Feature Data Dictionary (DFDD). The DFDD uses the *Oxford English Dictionary*, 6th Edition, Version 3.0, as the basis for all spelling. The preferred units of measure are in accordance with ISO 31 *Quantities and units* (multiple parts). The presentation of numbers follow U.S. convention in which the period (‘.’) is used as the radix marker (the decimal point”), and the comma (‘,’) is used to delimit groups of three digits to the left of the radix marker.

Additional rules apply to specific types of information for each concept. These are specified in Section 5.4.

5.4 Content Information and Examples

5.4.1 Feature Concepts

5.4.2 Attribute Concepts

Additional information includes:

- **Multiplicity:** Specifies the number of discrete domain values that may be assigned to the Attribute Concept. The default value is 1. Typed as "Multiplicity" from ISO/TS 19103, Section 6.5.2.14.
- **Collection:** Specifies the Unified Modelling Language (UML) stereotype in the case of a «Collection» datatype; one of {‘Set’, ‘Bag’, or ‘Sequence’} from ISO/TS 19103.
- **Datatype Link:** A textual value that is used to denote the datatype of the attribute concept.
- **Physical Quantity:** A character string specifying a reference physical quantity for allowed values that may be assigned to the attribute concept if its datatype is based on a numeric representation.
- **Recommended Unit of Measure:** A character string specifying a recommended unit of measure for the reference physical quantity for allowed values that may be assigned to the attribute concept if its datatype is based on a numeric representation.
- **Non-comparable Unit of Measure:** A character string specifying a non-comparable unit of measure that is related to the reference physical quantity for allowed values that may be assigned to the attribute concept if its datatype is based on a numeric representation. A non-comparable unit of measure is one that is not a strict member



of the specified physical quantity, but is related to that physical quantity through a complex context-sensitive computation.

- **Listed values Link:** A hyperlink to the set of allowed domain values in the DatatypeListedValues tab/sheet if the attribute concept datatype is an Enumeration.
- **Complete:** A Boolean that identifies, if the attribute concept datatype is an Enumeration, that the set of specified domain values is complete.

5.4.3 Datatypes

Additional information includes:

- **Datatype Element AlphaCode:** A textual value that is used to denote the Datatype Element.
- **Datatype Element Name:** A compact and human-readable designator that is used to denote the datatype field concept.
- **Note:** Additional information, if any, about the datatype.
- **Datatype Multiplicity:** A textual value specifying the number of discrete domain values that may be assigned to the datatype field.
- **Datatype Collection:** A textual value indicating the type of collection that is used if this datatype field stores collections of the specified datatype.
- **Datatype Element Datatype:** Identifies the Datatype of the Datatype Element.
- **Datatype and Type Specification:** A compact and human-readable designator that, if the field is not directly encodable using a data primitive, is used to denote the datatype concept and is intended for information processing.
- **Complete?:** A Boolean value indicating in the case of an Enumeration Datatype whether the list of enumerants is complete or not, with FALSE = "not complete" and TRUE = "complete". The default is FALSE.
- **Length:** A positive integer (i.e., greater than zero) that specify symbols the maximum length of character string values that may be assigned to the Datatype if it is based on the Text, Key, or Structured Text representations.
- **Lexical?:** A Boolean value indicating the range of character values that may be used in character string values that may be assigned to the Datatype if it is based on the Text or Structured Text representations.
- **Structure Specification:** A character string that specifies a scheme of one or more constraints on the structure of the text values that may be assigned to the Datatype if it is based on the Structured Text representation.
- **Range Minimum:** A value that specifies the minimum end of the range of allowed values that may be assigned to the Datatype if it is based on the Count, Integer or Real representations.
- **Range Maximum:** A value that specifies the maximum end of the range of allowed values that may be assigned to the Datatype if it is based on the Count, Integer or Real representations.



5.4.4 Datatype Listed Values

Additional information includes:

- **Datatype Link:** The textual code value assigned to the Datatype of which this enumerant concept is a domain member.
- **Datatype Name:** A compact and human-readable designator that is used to denote the datatype concept, identifies the Datatype of which this is a Listed Value.

5.4.5 Physical Quantities

Additional information includes:

- **Members Link:** A hyperlink to the set of included units of measure in the UnitsOfMeasure table.

5.4.6 Units of Measure

Additional information includes:

- **Physical Quantity Link:** The textual code value assigned to the Physical Quantity of which this Unit of Measure concept is a member.
- **Physical Quantity Name:** The textual name assigned to the Physical Quantity of which this Unit of Measure concept is a member, identifies the physical quantity for which this Unit of Measure applies.

5.4.7 Unit Terms

Each Unit Term is associated to one Unit of Measure concept whose **UoM Type** = '*derived*' using the following information:

1. **UoM Identifier:** Identifies the '*derived*' Unit of Measure to which the Unit Term applies.

Each Unit Term has the following information specified:

1. **Sequence Number:** Identifies the order in which the Unit Term participates in the derivation expression (composed from one or more Unit Terms) for the Unit of Measure.
2. **Derivation UoM:** Identifies the unit of measure for the Unit Term.
3. **Exponent:** A signed numeric value that specifies the base 10 exponent for the unit of measure.

5.4.8 Unit Multiples

Additional information includes:

1. **Symbol:** A character string that specifies the standard symbol used for the Unit Multiple in mathematical formulas.
2. **Exponent:** A signed numeric value that specifies the base 10 exponent designated by the Unit Multiple.



5.4.9 Aliases

Each Alias has the following information specified:

1. **Name:** A functionally equivalent synonym (an alias) for a concept.
2. **Note:** Additional information regarding the functionally equivalent synonym, *e.g.*, domain/community of use.

Each Alias is associated to one Feature, Attribute, Listed Value, Physical Quantity or Unit of Measure concept using the following information:

2. **NGFCD Identifier:** Identifies a Feature Concept, Attribute Concept, Listed Value, Physical Quantity or Unit of Measure.
3. **Alias Identifier:** Identifies an applicable Alias.

5.4.10 Feature Dictionary Metadata

The Feature Dictionary has the following information specified:

1. **Name:** A compact and human-readable designator that is used to denote the Feature Dictionary.
2. **Content Summary:** A general statement of the purpose for which items in the Entity Dictionary are made available to potential users.
3. **Version Number:** Specifies a unique state in the life of the Entity Dictionary.
4. **Version Date:** Specifies a unique state in the life of the Entity Dictionary, using a date
5. **Date of Last Change:** The (full precision) date of the most recent change to the status of an item in the Entity Dictionary was made.



6 Compliance Criteria

The NGFCD specifies an NATO-wide data element dictionary for geospatial data. Conformance to this dictionary requires that when a concept from the NGFCD is employed within an information system or data set that the meaning of the concept be preserved and that information regarding the concept that is specified in the NGFCD be honoured.

Section 5.2 identifies seven basic categories of NGFCD concepts: Feature Concepts, Attribute Concepts, Datatypes, Datatype Elements, Datatype Listed Values, Physical Quantities and Units of Measure. The concepts can be found in six tables, and each such table has at least seven types of information specified.¹

The following three types of information are (together with a date (of baseline)) alternative means to denote the concept (Conformance to each of these may be determined from the definitions in 5.2):

- **NGFCD Identifier**
- **AlphaCode**
- **5-3-1 Code**

The remaining four types of information are primary means of specifying the concept (see 5.2). Conformance to each of these can only be determined by inspection and subjective judgment.

- **Name**
- **Definition**
- **Description**
- **Source**

Depending on the type of concept the NGFCD may specify additional information. This additional information is presented in Section 5.4 and each item of additional information for a concept shall be honoured.

¹ In a few cases not all of the alternative types of codes are specified.