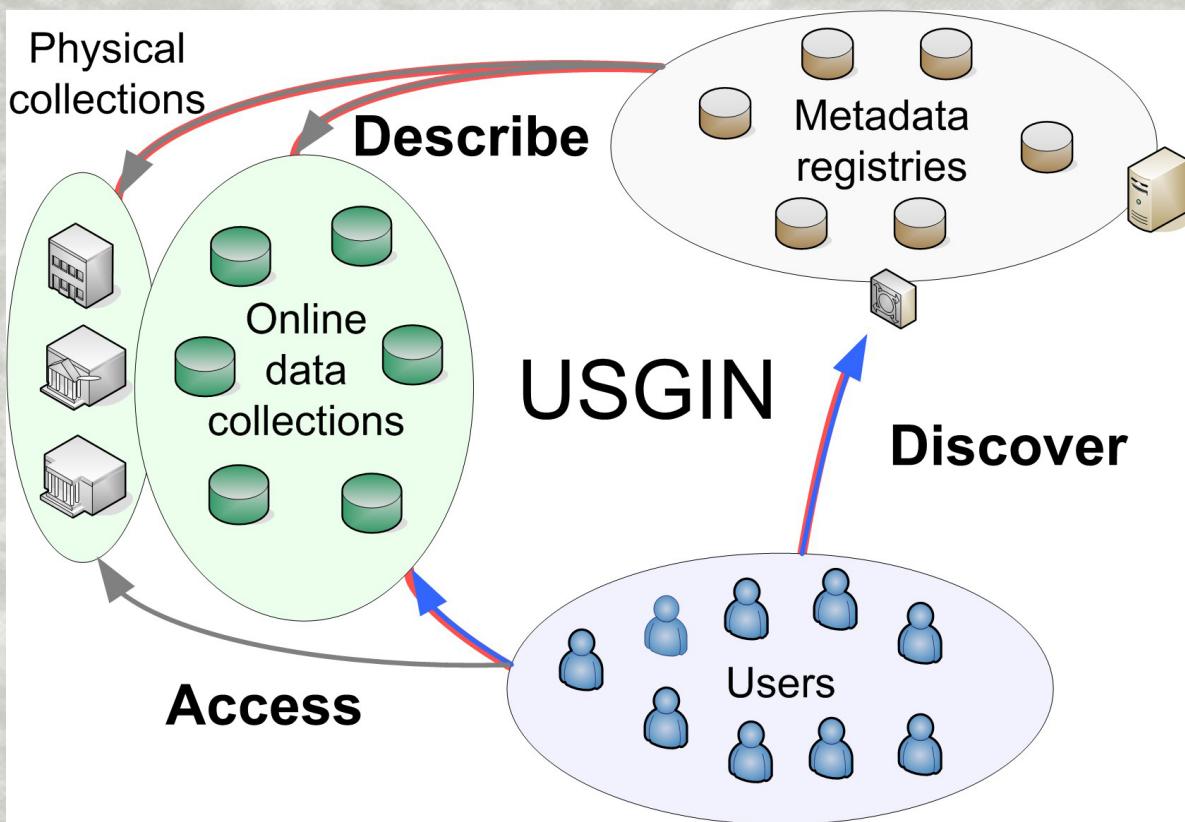


## OPEN-FILE REPORT OFR-10-02

Arizona Geological Survey

[www.azgs.az.gov](http://www.azgs.az.gov)



### USE OF ISO 19139 XML SCHEMA TO DESCRIBE GEOSCIENCE INFORMATION RESOURCES v 1.1

Steven M. Richard and Wolfgang Grunberg (Eds.)

March 2010

ARIZONA GEOLOGICAL SURVEY

# Foreword

The Association of American State Geologists (AASG) and the U.S. Geological Survey (USGS) formally agreed in 2007 to develop a national geoscience information framework that is distributed, interoperable, uses open source standards and common protocols, respects and acknowledges data ownership, fosters communities of practice to grow, and develops new web services and clients. The AASG and USGS have formed an interagency Steering Committee to pursue design and implementation of the U.S. Geoscience Information Network (USGIN).

This document is a profile for using ISO19139 xml schema ISO 19115 and ISO 19119 metadata to generate interoperable metadata for USGIN. The profile provides guidance for the population of ISO19139 dataset document metadata and geospatial data service metadata to enable interoperability between clients and servers conforming to this profile.





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# USGIN

## U.S. Geoscience

## Information Network

---

## Use of ISO 19139 xml schema to describe geoscience information resources.

### Profile Version 1.1

**Title:**

Use of ISO 19139 xml schema to describe geoscience information dataset, dataset series, and services resources

**Latest released version:**

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USGIN Standards and Protocols Drafting Team

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**Description:**

This document is a profile for using ISO19139 xml schema for of ISO 19115 and ISO 19119 metadata. The profile provides guidance for the population of ISO19139 dataset and dataset series documents to enable interoperability of catalog service clients with multiple servers conforming to this profile.

**Contributor:**

See acknowledgements

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# Revision History

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0.2	2009-10-16	Revisions, addition of material, re-title, focus on use of ISO 19139	Stephen Richard
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---

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# 1 Introduction

2 A key component of a distributed information network is a catalog system, a collection of resources that allow  
3 data and service providers to register resources, and data consumers to locate and use those resources. Cur-  
4 rently, many online catalogs are web pages with collections of URLs for services, or services are discovered  
5 accidentally or by word of mouth. The vision is to enable a web client (portal) to search across one or more me-  
6 tadata registries without having to configure the client individually for each of the registries that will be  
7 searched. Thus, metadata providers can focus on data development, without having to also develop web  
8 clients to enable search of that metadata.

9 The Open Geospatial Consortium (OGC) Catalog Service for the Web (CSW) specification defines a collection  
10 of basic operations for searching catalogs of metadata via the web. Engineering the desired interoperability  
11 requires adding additional constraints on CSW operation; one of the major constraints is selection of the xml  
12 schema that will be used to encode metadata for the service. The core CSW specification requires use of a  
13 basic xml schema that includes content defined by the Dublin Core Metadata specification [Dublin Core, 2008-  
14 01-14]. This document concerns use of the ISO19115 and ISO19119 content models implemented using the  
15 ISO19139 xml schema for encoding of metadata content. Some more specific constraints on use of this im-  
16 plementation may be included in a separate document (planned) describing metadata constraints for different  
17 kinds of resources.

18 A set of other USGIN resource registry and discovery service profile documents discuss the other constraints  
19 and best practices to enable catalog interoperability. These include a profile for use of the CSW specification,  
20 providing details on how requests and search criteria should be encoded. A profile that describes metadata  
21 content required for different resources adds additional detail for specific resources. Finally vocabularies for  
22 categorizing resources and specifying other metadata properties are documented in a separate document;  
23 these vocabularies will need to be published in a web accessible registry to make them accessible.

## 24 1.1 Normative References

25 The following referenced documents are indispensable for the application of this document. For dated refer-  
26 ences, only the edition cited applies. For undated references, the latest edition of the referenced document  
27 (including any amendments) applies.

28 **ISO 19115** designates these two normative references:

- 29 • ISO 19115:2005, *Geographic information - Metadata*
- 30 • ISO 19115/Cor.1:2006, *Geographic information – Metadata, Technical Corrigendum*

31 **ISO 19119** designates these normative references:

- 32 • ISO 19119:2005, *Geographic information - Services*
- 33 • ISO 19119:2005/Amd 1:2008, *Extensions of the service metadata model*
- 34 • ISO 19108:2005, *Geographic information – Temporal Schema*

35 **ISO 639-2**, Codes for the representation of names of languages - Part 2: Alpha-3 code control ISO 8601, Data  
36 elements and interchange formats - Information interchange - Representation of dates and times

38 **ISO/TS 19139:2007**, Geographic information - Metadata – XML Schema Implementation

39 **OGC 07-006r1**, OpenGIS Catalog Services Specification version 2.0.2, Corrigendum 2 release, 2007

40 **OGC 07-045**, OpenGIS Catalogue Services Specification 2.0.2 - ISO Metadata Application Profile, Version  
41 1.0.0, 2007

42 **INCITS 453-2009**, North American Profile of ISO 19115:2003 – Geographic Information – Metadata (NAP-  
43 Metadata), 2009, American National Standards Institute, Inc.

44 **ISO 10646-1**, Information technology — Universal Multiple-Octet Coded Character Set (UCS) — Part 1: Archi-  
45 tecture and Basic Multilingual Plane

46      **RFC 2119**, Key words for use in RFCs to Indicate Requirement Levels, Network Working Group, 1997.

## 47      **1.2 Purpose**

48      The USGIN development team is proposing to use ISO 19115/19119 metadata as the content model, and the  
49      ISO 19139 xml schema for encoding this content in xml documents that will be provided by USGIN CSW ser-  
50      vices. This profile conforms to most of the provisions of the North American Profile of ISO metadata (INCITS  
51      453-2009, referred to as NAP), except it allows multiple distributor-format-transferOptions bindings for re-  
52      source distribution, and recommends use of ISO19115 codelist values unless a required codelist value is one  
53      of those added by NAP. This USGIN profile document is meant to provide guidance on the use of the  
54      ISO19139 XML schema to encode metadata for geoscience resources, with sufficient guidance that develop-  
55      ers of client or server applications using this service can produce interoperable implementations of the OGC  
56      Catalog Service for the Web (CSW). The focus of the profile is to enable interoperable catalog services for  
57      discovery, evaluation, and access to information resource of interest to geoscientists.

## 58      **1.3 Terminology**

59      The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT",  
60      "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in Internet  
61      RFC 2119.

62

63      **Application profile:** a schema that consists of data elements drawn from one or more namespaces, com-  
64      bined together by implementers, and optimized for a particular local application. (Rachel Heery and Manjula  
65      Patel, 2000, <http://www.ariadne.ac.uk/issue25/app-profiles/>)

66      **Catalog application:** Software that implements a searchable metadata registry. The application must support  
67      the ability to register information resources, to search the registered metadata, to support the discovery and  
68      binding to registered information resources within an information community.

69      **Codelist (also as Code list):** a controlled vocabulary that is used to populate values for an xml element.

70      **Data product specification:** a definition of the data schema and value domains for a dataset. The data  
71      schema specifies entities (features), properties associated with each entity, the data type used to specify  
72      property values, cardinality for property values, and if applicable, other logical constraints that determine data  
73      validity. Value domains are specified for simple data types—strings or numbers, and may include controlled  
74      vocabularies for terminology required to specify some properties.

75      **Dataset series:** collection of datasets sharing the same product specification (ISO 19115). ISO 19115 does  
76      not define product specification. For the purposes of USGIN, a product specification defines a data schema,  
77      any required controlled vocabularies, and recommended practices for use of schema (see Data product speci-  
78      fication).

79      **Dataset:** an identifiable collection of data (ISO19115). USGIN refines this concept to represent a collection of  
80      data items in which individual data items are identified and accessible. USGIN extends the concept of data  
81      items to include physical artifacts like books, printed maps and diagrams, photographs, and material samples--  
82      any identifiable resource of interest. DCMI definition is "Data encoded in a defined structure" with additional  
83      comment "Examples include lists, tables, and databases. A dataset may be useful for direct machine  
84      processing." Metadata for the collection is a different type than metadata for individual items in the collection  
85      (dataset vs. features). Criteria for what unifies the collection are variable (topic, area, author...). Data items  
86      may represent intellectual content -- information content and organization (data schema) -- or may represent  
87      particular manifestations (formats) of an intellectual artifact.

88      **Interoperability:** "The capability to communicate, execute programs, or transfer data among various functional  
89      units in a manner that requires the user to have little or no knowledge of the unique characteristics of those  
90      units." ISO/IEC 2382-01 (SC36 Secretariat, 2003)

91      **Metadata element:** a discrete unit of metadata (ISO 19115), an attribute of a metadata entity. A metadata  
92      element contains some content specifying the value of the element; this content may be simple—a number or  
93      string, or may be another metadata entity.

94   **Metadata entity**: a named set of metadata elements describing some aspect of a resource.  
95   **Metadata register**: an information store that contains a collection of registered metadata records, maintained  
96 by a metadata registry. (ISO 11179)  
97   **Metadata registry**: an information system for assignment of unambiguous identifiers to administered metada-  
98 ta records. (ISO 11179)  
99   **Metadata section**: Part of a metadata document consisting of a collection of related metadata entities and  
100 metadata elements (ISO 191115).  
101   **Metadata**: data about a resource in some context. Generalize from ISO 11179 definition of metadata, which  
102 constrains the scope to data about data. For USGIN purposes, metadata may describe any resource—  
103 including electronic, intellectual, and physical artifacts. Metadata represent resource characteristics that can  
104 be queried and presented for evaluation and further processing by both humans and software.  
105   **Profile**: set of one or more base standards and - where applicable - the identification of chosen clauses,  
106 classes, subsets, options and parameters of those base standards that are necessary for accomplishing a par-  
107 ticular function [ISO 19101, ISO 19106]  
108   **Resource**: An identifiable thing that fulfills a requirement. Usage here is closer to definition used in RDF  
109 ([www.w3.org/TR/REC-rdf-syntax](http://www.w3.org/TR/REC-rdf-syntax)), generalized from ISO19115, which defines resource as an 'asset or means  
110 that fulfills a requirement' without defining asset or means. "An object or artifact that is described by a record in  
111 the information model of a catalogue" (OGC 07-006r1)  
112   **Service metadata**: metadata describing the operations and information available from a server.  
113   **Source Specification**: The specification or standard that is being profiled.  
114   **User Community**: A group of users, e.g. within a supply-chain industry, the members of which decide to make  
115 a similar usage of the source specification in order to be able to interoperate.  
116  
117 Note that throughout this document, the names of xml elements are shown in this typecase. Long X-paths  
118 have been broken with non-breaking hyphen characters. Note that hyphens are not used in any xml attribute  
119 or element name, so if they appear in the text, they are strictly for better text wrapping. In Xpath expressions  
120 /.../ indicates that some elements have been omitted from the path.

## 121   1.4 ISO Schemas Location

122 ISO I9139 xml schemas are in an online repository at <http://schemas.opengis.net/iso/19139>. Two versions are  
123 posted: 20060504 and 20070417. Unfortunately, these two directories both contain schema with the same tar-  
124 get namespace, so there is no clear way to distinguish applications that are based on one or the other. The  
125 metadataEntity.xsd in the two directories is identical; other schema have not been compared (but see discus-  
126 sion paper gin2009-005 at <http://lab.usgin.org/node/269> ). The 20070417 directory contains schema imple-  
127 menting ISO Technical Specification 19139:2007 (dated 2007 Apr 17), which appear to include the changes  
128 from ISO 19115:2003 Cor 1;2006(E), but this is not declared in any included documentation (need metadata  
129 on the metadata schema!).  
130 The 20070417 version of the ISO 19139 schemas references GML 3.2.1. However, there is no mention of the  
131 SRV namespace (<http://www.isotc211.org/2005/srv>) anywhere in this ISO 19139 version. The SRV names-  
132 pace is where, in our metadata documents using the 2006 version, we specified all our information about dy-  
133 namic, online services such as WFS and WMS, so the 20070417 version is not useful for metadata catalogs  
134 that register services.  
135 In order to create metadata for both static datasets and dynamic, online services and for use with CSW, the  
136 OGC created an xml schema that merges the schema for ISO19115 (dataset metadata) and ISO19119 (ser-  
137 vice metadata) (see section D.1.5, page 105 in OGC 07-045). The way that was accomplished was by creating  
138 a schema located at <http://schemas.opengis.net/csw/2.0.2/profiles/apiso/1.0.0/apiso.xsd>. This schema simply  
139 imports .. iso/19139/20060504/gmd/gmd.xsd and .. iso/19139/20060504/srv/srv.xsd. Thus for CSW 2.0.2 im-  
140 plementations, the 20060504 versions of the ISO19139 schema must be used.

---

## 141 2 Overview of the Profile

### 143 2.1 General Objectives

144 The Profile defines:

- 145 • mandatory and conditional metadata sections, metadata entities, and metadata elements
- 146 • the minimum set of metadata elements for any resource in order to conform to the Profile
- 147 • the core metadata for geographic datasets
- 148 • optional metadata elements that allow for a more extensive standard description of resources
- 149 • some recommended practices to increase the utility and interoperability of metadata.

### 150 2.2 Requirements

151 **M** (mandatory). Metadata element must have a valid value.

152 **C** (conditional). Metadata element is mandatory based on values of other metadata elements in the metadata record.

154 **O** (optional). Metadata element may be null in a valid document.

155 **X** (not used). Metadata element is not used by a Profile. The element may be included where it is schema valid, but may be ignored by applications implementing the profile.

### 157 2.3 Use cases to be supported

158 This section includes a number of user scenarios that motivate development of a catalog application for the  
159 US Geoscience Information Network. At its heart, the problem is to find resources of interest via the internet,  
160 based on criteria of topic, place, or time, evaluate resources for an intended purpose, and learn how to access  
161 those resources. Detailed metadata describing a resource data schema or describing service or application  
162 operation are outside the scope of the ISO19139 schema, and depend on linked documents like OGC getCa-  
163 pabilities, WSDL, and ISO19110 feature catalogs.

164 Basic search — A user specifies a geographic bounding box and one or more text keywords to constrain the  
165 resources of interest, and searches a metadata catalog using these criteria. The user is presented with a web  
166 page containing a list of resources that meet the criteria, with links for each resource that provide additional  
167 detailed metadata, and direct access to the resource if an online version is accessible, e.g. as a web page,  
168 Adobe Acrobat document, or online application.

169 A portal application provides user with a map window that contains some simple base map information (political  
170 boundaries, major roads and rivers). User wishes to assemble a variety of other data layers for a particular  
171 area to view in the portal map view, e.g. slope steepness, geologic units, bedding orientation, and vegetation  
172 type for a hazard assessment. User centers map view on area of interest, then using an ‘add data’ tab, ac-  
173 cesses a catalog application that allows them to search for web map services that display the desired data-  
174 sets. After obtaining the results and reviewing the metadata for the located services, user selects one or more  
175 to add to the table of contents for the portal map viewer. Response from catalog has sufficient information to  
176 enable the portal application to load and display the resource (e.g. serviceType, OnlineResourceLinkage).

177 User searches for boreholes in an area. Returned metadata records have links to metadata for related infor-  
178 mation, like logs of different types, core, water quality data, etc. that the user can follow to browse related re-  
179 sources.

180 Complex search examples:

- 181 • Search based on related resources, for example a search for boreholes that have core for which pho-  
182 tographs are available online.

- 183     • Boreholes that penetrate the Escabrosa formation.
  - 184     • Sample locations for samples with uranium-lead geochronologic data.
  - 185     • Find links to pdfs of publications by Harold Drewes on southeast Arizona.
  - 186     • Find geologic maps at scale < 100,000 in the Iron Mountains.
  - 187     • Who has a physical copy of USGS I-427?
- 188   A catalog operator wishes to import and cache catalog records from a collaborating catalog that have been in-
- 189   serted or updated during the last month (harvest).

## 2.4 Resources of interest

191 Table 1 summarizes the geoscience information resources of interest to the community that can be registered and discovered using this metadata pro-  
 192 file. Note that this collection of resource types includes several kinds of resources that are not typically associated with ISO19115/ISO19119, which  
 193 were created specifically for geospatial resources.

194 *Table 1. Summary of resource types described by metadata for US Geoscience Information Network catalogs. Resource type **names in bold** have*  
 195 *been prioritized for implementation in version one catalogs. The Resource type names include the type hierarchy encoded with the broader (parent)*  
 196 *resource type indicated in the Broader Resource Type column.*

Resource Type hierarchy	Broader Resource Type	Source	Definition
Collection		DCMI resource Types <a href="http://dublincore.org/documents/dcmi-type-vocabulary/">http://dublincore.org/documents/dcmi-type-vocabulary/</a>	An aggregation of resources. A collection is described as a group; its parts may also be separately described. (from <a href="http://www.ukoln.ac.uk/metadata/dcmi/collection-application-profile/">http://www.ukoln.ac.uk/metadata/dcmi/collection-application-profile/</a> ): The term "collection" can be applied to any aggregation of physical or digital items. Those items may be of any type, so examples might include aggregations of natural objects, created objects, "born-digital" items, digital surrogates of physical items, and the catalogs of such collections (as aggregations of metadata records). The criteria for aggregation may vary: e.g. by location, by type or form of the items, by provenance of the items, by source or ownership, and so on. Collections may contain any number of items and may have varying levels of permanence. A "collection-level description" provides a description of the collection as a unit: the resource described by a collection-level description is the collection, rather than the individual items within that collection. Collection-level descriptions are referred to in Michael Heaney's <i>An Analytical Model of Collections and their Catalogues</i> as "unitary finding-aids".
Dataset	Collection	DCMI resource Types <a href="http://dublincore.org/documents/dcmi-type-vocabulary/">http://dublincore.org/documents/dcmi-type-vocabulary/</a>	A collection of data items in which individual data items are identified and accessible. DCMI definition is "Data encoded in a defined structure." with additional comment "Examples include lists, tables, and databases. A dataset may be useful for direct machine processing." The container may be a stand-alone digital file (mdb, spreadsheet, table in a Word document), a web service, or an enterprise database. Metadata for the collection is a different type than metadata for individual items in the collection. Criteria for what unifies the collection are variable (topic, area, author...). Synonym: structured data collection. This resource type represents the intellectual artifact -- the information content and organization; the dataset may have more than one manifestation (format) -- as a list, a table, databases, using different software implementations.

<b>Catalog</b>	Dataset	USGIN	A collection of data items that index resources, as in metadata records; a metadata registry. The resource represents the information content and organization. Catalogs are accessed using other resources, like an interactiveResource or Service, and may have different formats.
<b>Physical artifact collection</b>	Collection	USGIN	A collection of identifiable physical objects, unified based on some criteria. Criteria for defining a collection may be who collected, where curated, why collected, kind of material...
Document		USGIN	A packaged body of intellectual work; has an author, title, some status with respect to Review/authority/quality. USGS peer reviewed would be a 'status property'. Have to account for gray literature, unpublished documents, etc. A document may have a variety of physical manifestations (pdf file, hard-bound book, tiff scan, Word processor document...), and versions may exist as the document is traced through some publication process. May be map, vector graphics, text. Sound, moving images are included as document types.
Image	Document	DCMI resource Types <a href="http://dublincore.org/documents/dcmi-type-vocabulary/">http://dublincore.org/documents/dcmi-type-vocabulary/</a>	A visual representation other than text. Comment: Examples include images and photographs of physical objects, paintings, prints, drawings, other images and graphics, animations and moving pictures, film, diagrams, maps, musical notation. Note that Image may include both electronic and physical representations.
StillImage	Image	DCMI resource Types <a href="http://dublincore.org/documents/dcmi-type-vocabulary/">http://dublincore.org/documents/dcmi-type-vocabulary/</a>	A static visual representation. Comment: Examples include paintings, drawings, graphic designs, plans and maps. Recommended best practice is to assign the type Text to images of textual materials if the intent of the image is to capture the textual content as opposed to the appearance of the medium containing the text. Instances of the type Still Image must also be describable as instances of the broader type Image. Subtype of Image.
Human-generated image	StillImage	USGIN	Image produced by human drawing or painting, using any media. May be entirely product of human imagination, human perception of the world, or a human-modified photographic image.
<b>Photograph</b>	StillImage	USGIN	Image produced by optical device with chemical or electronic image capture; represents things in the field of view directly as captured by the device. Photographs may be modified by human processing; there is a continuum between photographs and human-generated image. Distinction between the two is largely based on intention
<b>Remote sensing Earth image</b>	StillImage	USGIN	Image of earth surface acquired by an air born or earth-orbiting sensor. May be georeferenced such that location in the image directly corresponds to location on the earth.
<b>Map</b>	StillImage	USGIN	Human-generated depiction of some part of the earth using a mathematical system of correspondence between geometry in the image and location on the earth.

MovingImage	Document	DCMI resource Types <a href="http://dublincore.org/documents/dcmi-type-vocabulary/">http://dublincore.org/documents/dcmi-type-vocabulary/</a>	A series of visual representations imparting an impression of motion when shown in succession. Comment: Examples include animations, movies, television programs, videos, zoetropes, or visual output from a simulation. Instances of the type Moving Image must also be describable as instances of the broader type Image. Subtype of Image. Commonly include sound
Sound	Document	DCMI resource Types <a href="http://dublincore.org/documents/dcmi-type-vocabulary/">http://dublincore.org/documents/dcmi-type-vocabulary/</a>	A resource primarily intended to be heard. Comment: Examples include a music playback file format, an audio compact disc, and recorded speech or sounds.
<b>Text</b>	Document	DCMI resource Types <a href="http://dublincore.org/documents/dcmi-type-vocabulary/">http://dublincore.org/documents/dcmi-type-vocabulary/</a>	A resource consisting primarily of words for reading. Comment: Examples include books, letters, dissertations, poems, newspapers, articles, archives of mailing lists. Note that facsimiles or images of texts are still of the genre Text.
<b>Hypertext document collection</b>	Text	USGIN	A collection of files that contains http hyperlinks between them. Links to documents or other resources outside of the collection are possible. The criteria for determining membership in the collection are somewhat arbitrary, but in general the 'site' should contain related documents authored and managed by the same agent.
Event		DCMI resource Types <a href="http://dublincore.org/documents/dcmi-type-vocabulary/">http://dublincore.org/documents/dcmi-type-vocabulary/</a>	A non-persistent, time-based occurrence. Metadata for an event provides descriptive information that is the basis for discovery of the purpose, location, duration, and responsible agents associated with an event. Examples include an exhibition, webcast, conference, workshop, open day, performance, battle, trial, wedding, tea party, and conflagration.
Project	Event	USGIN	Project represents a funded activity that has some purpose; projects have associated extents, which represent the area of interest for the project. This extent serves as a mechanism to filter descriptions and concepts in the information system for those that may be related to the project based on spatial relationships. Projects in a large organization will likely have hierarchical (part-whole) relationships.
Model		USGIN	Algorithm, workflow; an abstract representation of a collection of related processes, objects and relationships. A model resource may be related to various kinds of document that portray the model, or to software that implements the model, or with datasets as input or output. Not clear that there is a compelling use case for cataloging models separately from the software or documents that are manifestations of the model.
<b>Physical artifact</b>		DCMI resource Types <a href="http://dublincore.org/documents/dcmi-type-vocabulary/">http://dublincore.org/documents/dcmi-type-vocabulary/</a>	General category for physical resources that are indexed by metadata records; also root of an artifact type hierarchy. An identifiable physical object. Identification is always a function of some human intention, thus differentiating an artifact from other 'natural' things. Note that digital representations of, or surrogates for, these objects should use Image, Text or one of the other types.

<b>Service</b>		DCMI resource Types <a href="http://dublincore.org/documents/dcmi-type-vocabulary/">http://dublincore.org/documents/dcmi-type-vocabulary/</a>	A system that provides one or more functions via a network interface designed for machine interaction. An implementation of an interface to some sort of digital resource, using either a 'pull' model in which client requests some content from the service, and receives that content in a single 'response' package, or a 'push' model in which client establishes connection and monitors for change events (update, new data...) from service. Difficult to draw line on when a service provides 'files' and when it provides 'data', because responses are always in a form that could be considered a file. Also includes interfaces to digital resources that provide a continuous (with some sampling interval?) feed of some sort of data.
Software		USGIN	A computer program in source or compiled form. Comment: Examples include a C source file, MS-Windows .exe executable, or Perl script.
Stand-Alone-Application	Software	DCMI resource Types <a href="http://dublincore.org/documents/dcmi-type-vocabulary/">http://dublincore.org/documents/dcmi-type-vocabulary/</a>	Identifiable stand alone software application. Identity of resource is based on function performed, input and output requirements, and authorship. The same application may be packaged in different file formats to run in different software environments; thus an application will have one or more associated digital files. For the purposes of this catalog scheme, stand alone applications are software that can be packaged in a single file that can be transferred between machines, unpackaged and compiled or installed on a computer meeting specified hardware and software environment conditions, to execute the described function on that computer, independent of any network connection.
Interactive-Resource	Software	DCMI resource Types <a href="http://dublincore.org/documents/dcmi-type-vocabulary/">http://dublincore.org/documents/dcmi-type-vocabulary/</a>	A resource requiring interaction from the user to be understood, executed, or experienced. Comment: Examples include forms on Web pages, applets, multimedia learning objects, chat services, or virtual reality environments. Interactive resources are software driven. From the point of view of the catalog, they are accessed by a URL to a web site that is the interface for operating the application. The application operates by interaction with one or more human participants. The application requires network connection to operate, is accessible via the internet, and requires human interaction.
Structured digital data item		USGIN	An individually identifiable item in a structured digital data collection. Characterized by a schema, and some particular values. In ISO11179 terms, this is an instance of a data element. Tagging, commenting, reviewing, rating community interaction with catalog will probably require metadata records about particular data items in cataloged datasets (including metadata items in catalogs.)
<b>Sampling point, site, station</b>	Structured digital data item	From ScienceBase item types, SMR redux	A resource that is a location-based container/base for observation data. Should this be generalized to OGC O&M samplingFrame to include other sampling geometry (borehole, image footprint)... Analogous in function to a keyword, but carries metadata on who located, when, why, how...

## 3 USGIN Usage of Metadata Elements

### 3.1 Core spatial dataset, dataset series, and service elements

Table 2 is a listing of ISO19115 metadata elements used to describe any resource. Tables 3 and 4 provide specifics for describing datasets and services. Note that in the USGIN context, dataset is construed quite broadly to include any kind of georeferenced information resource, including physical samples and hard copy documents. The service metadata elements are defined by ISO19119. The root element of ISO xml-encoded metadata is MD\_Metadata. Elements are discussed in this table in the order that they appear in the metadata document. Not all elements are discussed in detail. In a number of places where USGIN makes no specific provisions, we defer to recommendations in the North American Profile for ISO metadata (IN-CITS 453, referred to as NAP). Note that throughout this and the subsequent tables, the names of xml elements are shown in this typecase. Long X-paths have been broken with non-breaking hyphen characters. Hyphens are not used in any xml attribute or element name, so if they appear in the text, they are strictly for text wrapping.

*Table 2. Description best practices for ISO19139 metadata elements in USGIN profile. This table includes base elements.*

ISO 19115 (M/C/O) xPath from MD_Metadata	NAP-USGIN M/C/O	Comments
Metadata file identifier (O) <code>fileIdentifier</code>	M-M	<p>This identifies this metadata record, as opposed to <code>DatasetURI</code>, which identifies the described resource. A unique metadata record identifier must be included to allow CSW operations such as <code>GetRecordByld</code> or harvest transactions. This identifier should be copied during harvest operations. Ideally there is one metadata record describing each resource, such that there should be a one-to-one mapping between metadata fileIdentifiers and DatasetURIs. However, not all described resources will have a <code>DatasetURI</code>, and the metadata record is a different resource from the resource it describes, and thus should not have the same identifier. The protocol used to generate the identifier does not matter, as long as it generates globally unique identifier strings. Services that rely on natural keys (e.g. <code>serviceURL</code> and <code>layerID</code>) are expected to put the key values in this field. Although there is technically no limit on the length of the identifier string, suggested best practice is to keep the string length less than 255 so the string will fit in legacy database string value fields.</p> <p>USGIN, ANZLIC, and the OGC CSW profiles for ISO metadata (OGC 07-045) recommend the use of the UUID (Universally Unique Identifier) for the <code>fileIdentifier</code>. The <code>fileIdentifier</code> is used to identify duplicate copies of metadata records, to reference one metadata record from another (via <code>MD_DataIdentification/aggregationInfo</code>), or to reference metadata from a described resource (e.g. <code>DS_Dataset/has/MD_Metadata</code>). If there is a difference between the two metadata records then one can determine the appropriate version by the content of other elements in the metadata record. The authoritative metadata record should be the only one made publicly available in metadata search systems such as a catalog service.</p> <p>The OpenGIS® Catalogue Services Specification 2.0.2 - ISO Metadata Application Profile (OGC 07-045) mandates that "To simplify catalogue mining each <code>MD_DataIdentification</code> instance being part of</p>

<b>ISO 19115 (M/C/O) xPath from MD_Metadata</b>	<b>NAP-USGIN M/C/O</b>	<b>Comments</b>
		a MD_Metadata instance must have an identifier having a code value that is equal to the fileIdentifier of the owning MD_Metadata instance." USGIN is attempting to make the semantics of identifiers clear, with the provision (see Unique resource identifier in Table 3, below) that the identifier in MD_DataIdentification/citation/CI_Citation/identifier/MD_Identifier identifies the cited resource. This may be identical with the resource described by the metadata, in which case its value is MD_Metadata/dataSetURI, or it may be a publication that is the intellectual source of the described resource, in which case it is a different identifier. This USGIN provision, the OGC 07-045 recommendation is rejected because it obfuscates what the citation identifier refers to.
Metadata language (M)  language	M-M	NAP specifies that language string is composed of a language code (ISO639-2/T) and an alpha3 country code (ISO3166-1). The syntax is "<ISO639-2/T three letter language code><;><blank space><ISO3166-1 three letter country code>" Language code is given in lowercase. Country code is given in uppercase, e.g. fra; CAN  Currently, it appears that most CSW client and server applications only support the three letter language code; if testing reveals that this provision causes too much difficulty it will be changed. In the mean time, filtering for metadata in a particular language without a country localization may be done using a wildcard search for the three letter language code.
Metadata character set (C)  characterSet	M-M	NAP specifies default name is "utf8", with codeListValue = "RI_458", codeList = "http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_95". However, due to interoperability problems, USGIN recommends use of ISO codelists: codeListValue="utf8" codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources-/Codelist/ML_gmxCodelists.xml#CI_CharacterSetCode. See 4.17.3 Codelists for discussion of codelist usage.  USGIN requires that a character set code is defined to facilitate CSW servers (deegree, GeoNetwork, etc.).
Parent metadata record (O)  parentIdentifier	O-X	Not used in USGIN profile. Used in ISO19115 to inherit metadata properties from parent to child records; USGIN CSW service implementations do not require clients to be able to navigate parent links to obtain inherited metadata properties, or to process filters using parent links, so this element is not used. To represent relationships between described resources use MD_Identification/aggregationInfo.

ISO 19115 (M/C/O) xPath from MD_Metadata	NAP-USGIN M/C/O	Comments
Resource type (C) <code>hierarchyLevel</code>	M-M	<p>Cardinality is 1...*. NAP and ISO codelists are equivalent. See 4.17.3 <i>Codelists</i> for discussion of encoding of codelist values. Due to interoperability problems, USGIN mandates use of ISO codelists. At least one MD_ScopeCode codelist value is required. Codelist is {attribute, attributeType, collectionHardware, collectionSession, dataset, series, nonGeographicDataset, dimensionGroup, feature, featureType, propertyType, fieldSession, software, service, model, tile}. The European INSPIRE Implementing Rules (MD_IR_and_ISO_20090218) proscribes the code list for the first hierarchyLevel xml element in an MD_Metadata document to be one of {dataset, service, series}, or the metadata set will be considered out of scope for the directive (see section 4.6 Resource Type).</p> <p>This property essentially categorizes the indexed resource with types that determine the metadata content and the required behavior to access the indexed resource. ISO Example – dataset metadata:</p> <pre>&lt;gmd:hierarchyLevel&gt;   &lt;gmd:MD_ScopeCode&gt;     codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/Codelist/gmxCodelists.xml#MD_ScopeCode"     codeListValue="dataset"&gt;dataset&lt;/gmd:MD_ScopeCode&gt; &lt;/gmd:hierarchyLevel&gt;</pre>
Resource hierarchy level name (C) <code>hierarchyLevelName</code>	O-M	<p>ISO 19115 assumes that the metadata hierarchy level name defaults to "dataset" if it is not documented. NAP does not use it, recognizing that it is redundant.</p> <p>USGIN makes this property mandatory to identify the USGIN resource type from Table 1 (above). Default USGIN hierarchyLevelName.CharacterString is "Dataset". Encode hierarchy by including hierarchyLevelName elements for all broader resource categories. E.g. default should also include a hierarchyLevelName="Collection" element. For services USGIN hierarchyLevelName.CharacterString is "Service". As use cases develop that provide rationale for definition of sub-categories of service, the resource category list will be expanded.</p> <p>Example – dataset metadata:</p> <pre>&lt;gmd:hierarchyLevelName&gt;   &lt;gco:CharacterString&gt;Dataset&lt;/gco:CharacterString&gt; &lt;/gmd:hierarchyLevelName&gt; &lt;gmd:hierarchyLevelName&gt;   &lt;gco:CharacterString&gt;Collection&lt;/gco:CharacterString&gt; &lt;/gmd:hierarchyLevelName&gt;</pre>

<b>ISO 19115 (M/C/O) xPath from MD_Metadata</b>	<b>NAP-USGIN M/C/O</b>	<b>Comments</b>
Metadata point of contact (M) <code>Contact/CI_ResponsibleParty</code>	M-M	<p>Cardinality on contact is 1..*. USGIN requires at least one <code>CI_ResponsibleParty</code> with <code>role.CI_RoleCode@codeListValue = "originator"</code> (<code>CI_RoleCode</code> element value = "originator") that identifies the original source of the metadata record. If the point of contact for users to report errors, updates to metadata, etc. is different than the originator, an additional <code>contact/CI_ResponsibleParty</code> element may be included with <code>role.CI_RoleCode@codeListValue = "pointOfContact"</code> (<code>CI_RoleCode</code> element value="pointOfContact"). See 4.17.3 <i>Codelists</i> for discussion of encoding of codelist values. ISO Role codes applicable in this context include: {custodian, owner, distributor, originator, pointOfContact}. NAP adds {editor}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists.</p> <p>The point of contact information (either originator or pointOfContact) must include a contact e-mail address (<code>electronicMailAddress</code>). This is in addition to the NAP rule that count of (individual-Name + organisationName + positionName) &gt; 0 for any <code>CI_ResponsibleParty</code> element. The <code>contactInfo/CI_Contact/onlineResource/CI_OnlineResource</code> element for the <code>CI_ResponsibleParty</code> with <code>role.CI_RoleCode@codeListValue = "originator"</code> has <code>CI_OnlineResource/name = "icon"</code>, the <code>CI_OnlineResource/linkage/URL</code> will be assumed to points to an icon image file (e.g. tif, png, jpg) for the metadata originator. This Icon will be displayed in search results to credit the metadata originator. Metadata harvesters must harvest and maintain all metadata originator information so that the origin of metadata records can be credited, and should harvest the point of contact information if it is different.</p> <p>If the service providing the metadata records wishes to identify itself in result records, this information should be included in an additional <code>MD_Metadata/contact/CI_ResponsibleParty</code> element, with <code>role.CI_RoleCode@codeListValue = "distributor"</code>. Other responsible party roles applying to the metadata record (not the described resource) may also be specified here.</p>
Metadata date stamp (M) <code>dateStamp</code>	M-M	USGIN profile requires use of <code>dateStamp/gco:DateTime</code> (Note this contrasts with INSPIRE mandate to use <code>dateStamp/gco:Date</code> ). This is the date and time when the metadata record was created or updated (following NAP). The <code>dateStamp</code> is assumed to be updated to reflect any change in the metadata record that the metadata publisher wishes to propagate through the USGIN catalog system. This is the time stamp that will be used by harvesters to determine if a metadata needs to be updated in a harvesting catalog.
Metadata standard name (O) <code>metadataStandardName</code>	M-M	NAP specifies "NAP - Metadata". USGIN profile conformant metadata is indicated by using " ISO-USGIN" Use is mandatory to indicate that the metadata record conforms to this profile.
Metadata standard version (O) <code>metadataStandardVersion</code>	O-M	For this version of the USGIN profile, use "1.0" Use is mandatory to specify the version of the profile used

ISO 19115 (M/C/O) xPath from MD_Metadata	NAP-USGIN M/C/O	Comments
DataSet Identifier (O) <code>dataSetURI</code>	O-C	<p>For USGIN, this is a string that uniquely identifies the described resource. If the resource has an identifier, it should be included here; if the resource will be referenced from other metadata, it must have an identifier here. Any kind of resource (not only datasets) may have an identifier. The protocol for the identifier is not specified, but some sort of documented scheme to assure uniqueness should be used (UUID, URN...). Some implementations place a URL for online access in the <code>dataSetURI</code>; for USGIN profile, the <code>MD_Distribution/transferOptions/MD_DigitalTransferOptions/online/CI_OnlineResource</code> is used to specify URLs for access to the resource. The <code>dataSetURI</code> should be considered an opaque identifier. This will avoid ambiguity about where to find URLs for online access to a described resource.</p> <p>If the dataset is coupled to a service, the value of the <code>MD_Metadata/dataSetURI</code> attribute is the unique resource identifier used by <code>srv:coupledResource</code> to link the service with the dataset.</p> <p>The <i>OpenGIS® Catalogue Services Specification 2.0.2 - ISO Metadata Application Profile</i> (OGC 07-045) Annex F recommends that <code>MD_DataIdentification/citation/CI_Citation/identifier/-MD_Identifier/code</code> match the identifiers specified by <code>SV_ServiceIdentification/operatesOn</code> and <code>SV_ServiceIdentification/coupledResource</code> for linking a described service to datasets that the service operates on. As discussed for <code>fileIdentifier</code> (above), this requires that a <code>MD_DataIdentification/citation/CI_Citation/identifier</code> explicitly for the dataset is included in the metadata record, in which case its value is the same as <code>MD_Metadata/dataSetURI</code>.</p>
Other languages (C) <code>locale</code>	C-C	<p>Other languages used in metadata free text description.</p> <p>If description in more than one language is provided, this property should indicate what those languages are. The primary language used for metadata description is identified with <code>MD_Metadata/language</code> and <code>characterSet</code> and any additional languages are identified by <code>MD_Metadata/locale/PT_locale</code> elements, in which the language is provided according to ISO 639-2/T three-letter terminology codes in lowercase, and an optional country is provided according to ISO 3166-1 three-letter codes in uppercase, and mandatory characterEncoding. See 4.17.3 <i>Codelists</i> for discussion of encoding of codelist values. NAP has a <code>LanguageNameCodes</code> codelist in their registry (<a href="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_116">http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_116</a>), but this only points to ISO639-2. The a listing of codes in this codelist is available at <a href="http://www.loc.gov/standards/iso639-2/php/code_list.php">http://www.loc.gov/standards/iso639-2/php/code_list.php</a>. However, due to interoperability problems, USGIN prefers ISO over NAP codelists.</p> <p>The ISO code list catalog at <a href="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/Codelist/ML_gmxCodelists.xml">http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/Codelist/ML_gmxCodelists.xml</a> includes a <code>LanguageCode</code> codelist that includes the ISO 639-2 codes, in which the three letter codes are identifiers, and a <code>gml:name</code>, which is the English language name of the language is included. Unfortunately, only eng and fra are included in this codelist catalog. Go figure. Alternate names in other languages are also included in this catalogue. This catalogue should be referenced as the <code>codeList</code> for USGIN language elements as follows:</p> <p>NAP Example – dataset metadata:</p>

ISO 19115 (M/C/O) xPath from MD_Metadata	NAP-USGIN M/C/O	Comments
		<pre>&lt;gmd:locale&gt;   &lt;gmd:PT_Locale id="FR"&gt;     &lt;gmd:languageCode&gt;       &lt;gmd:LanguageCode         codeList="http://www.loc.gov/standards/iso639-2/php/code_list.php"         codeListValue="fra"&gt;French&lt;/gmd:LanguageCode&gt;     &lt;/gmd:languageCode&gt;     &lt;gmd:characterEncoding&gt;       &lt;gmd:MD_CharacterSetCode         codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_95"         codeListValue="RI_458"&gt;utf8&lt;/gmd:MD_CharacterSetCode&gt;     &lt;/gmd:characterEncoding&gt;   &lt;/gmd:PT_Locale&gt; &lt;/gmd:locale&gt;</pre> <p>ISO Example – dataset metadata:</p> <pre>&lt;gmd:locale&gt;   &lt;gmd:PT_Locale id="FR"&gt;     &lt;gmd:languageCode&gt;       &lt;gmd:LanguageCode         codeList="http://www.loc.gov/standards/iso639-2/php/code_list.php"         codeListValue="fra"&gt;French&lt;/gmd:LanguageCode&gt;     &lt;/gmd:languageCode&gt;     &lt;gmd:characterEncoding&gt;       &lt;gmd:MD_CharacterSetCode         codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ ISO_19139_Schemas/resources/Codelist/gmxCodelists.xml#MD_CharacterSetCode"         codeListValue="utf8"&gt;UTF-8&lt;/gmd:MD_CharacterSetCode&gt;     &lt;/gmd:characterEncoding&gt;   &lt;/gmd:PT_Locale&gt; &lt;/gmd:locale&gt;</pre> <p>The INSPIRE 19115/19 2009-02-18 guidelines use this codeList for language codes, but use the three letter abbreviation as the element value, not the gml:name from the codelist catalog. NAP examples (INCITES 453, 2009) reference the NAP codelist (IC_116), use the three letter code as the codeListValue, and the languageCode element value is the name of the language apparently using that language, e.g. codeListValue = 'fra', element value Français. Given these variations, it is recommended that search for a particular languageCode use the codeListValue as the criteria, with the three letter codes as the search value.</p>

ISO 19115 (M/C/O) xPath from MD_Metadata	NAP-USGIN M/C/O	Comments
[role] Resource spatial representation (O) <code>spatialRepresentationInfo</code>	O-O	Best practice is to include metadata for spatial representation if the described resource is a georeferenced dataset. Metadata for Spatial data representation are derived from ISO 19107. Metadata is instantiated as one or more of <code>MD_GridSpatialRepresentation</code> , <code>MD_VectorSpatialRepresentation</code> , <code>MD_Georectified</code> , or <code>MD_Georeferenceable</code> classes. USGIN profile follows NAP for spatial representation metadata. Vector Spatial Representation is required if point or vector objects exist in the dataset. If <code>MD_VectorSpatialRepresentation</code> is used, either <code>spatialRepresentationInfo/MD_VectorSpatialRepresentation/topologyLevel</code> or <code>spatialRepresentationInfo/MD_VectorSpatialRepresentation/geometricObjects</code> shall be provided, or both." (NAP) <code>MD_GridSpatialRepresentation</code> or one of its subtypes ( <code>MD_Georectified</code> , or <code>MD_Georeferenceable</code> ) is required if dataset objects are gridded. <code>MD_Georectified</code> should be used if the grid (image) is georeferenced, and <code>MD_Georeferenceable</code> is used if the grid (image) can be georeferenced. Follow NAP optionality if these elements are used.
Resource spatial representation vector topology (O) <code>spatialRepresentationInfo/-MD_VectorSpatialRepresentation/topologyLevel</code>	C-C	Code that specifies the degree of complexity of spatial relationships between features in a dataset. Value is from ISO codelist <code>MD_TopoLevelCode</code> . (Code names in this list include {geometryOnly, topology1D, planarGraph, fullPlanarGraph, surfaceGraph, fullSurfaceGraph, topology3D, fullTopology3D, abstract}). Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN mandates use of ISO codelists. See 4.17.3 <i>Codelists</i> for discussion of encoding of codelist values. It is unclear precisely what these values mean in terms of the topology encoding. To be useful, assertion that topology is present should indicate that topological relationships that may be implicit in the encoded vector geometry are explicitly represented (e.g. by correlation tables—left poly, right poly for a polyline) in the data.
Resource spatial representation vector geometric objects (O) <code>spatialRepresentationInfo/-MD_VectorSpatialRepresentation/geometricObjects</code>	C-C	"Identification of the objects used to represent features in the dataset." (NAP) Provides a geometry type and count for the number of objects of each type. Use the ISO <code>MD_GeometricObjectTypeCode</code> codelist. Code names in this list are: {complex, composite, curve, point, solid, surface}. The ISO and NAP codelists are equivalent. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN mandates use of ISO codelists. See 4.17.3 <i>Codelists</i> for discussion of encoding of codelist values.
[role] Resource's spatial reference system (O) <code>referenceSystemInfo</code>	O-O?	Description of the spatial and/or temporal reference systems used in the dataset. NAP specifies { ( <code>identificationInfo/spatialRepresentationType/MD_SpatialRepresentationTypeCode = "vector"</code> ) or ( <code>../MD_SpatialRepresentationTypeCode = "grid"</code> ) or ( <code>../MD_SpatialRepresentationTypeCode = "tin"</code> ) implies count <code>referenceSystemInfo &gt;= 1</code> }. See 4.17.3 <i>Codelists</i> for discussion of encoding of codelist values. NAP and ISO codelists are equivalent; USGIN mandates use of ISO codelist.

ISO 19115 (M/C/O) xPath from MD_Metadata	NAP-USGIN M/C/O	Comments
Reference System identifier code (O)  referenceSystemInfo/- MD_ReferenceSystem/- referenceSystemIdentifier/- RS_Identifier/code	C-C	If referenceSystemInfo is included, then the RS_Identifier element must include at least a code value. For USGIN the code should be a value from the EPSG Geodetic Parameter Dataset register ( <a href="http://www.epsg-registry.org/">http://www.epsg-registry.org/</a> ) in the form "EPSG:nnnn" where nnnn is the EPSG code number for the CRS. If the CRS is not defined in the EPSG registry, then the procedure specified in the NAP profile should be followed, e.g. the CRS shall be described according to ISO 19111 and ISO/TS 19127, assigned an identifier, and registered with an authority such that it may be referenced here. The RS_Identifier/codespace in this case should identify the registry authority where the CRS definition is registered, such that the definition can be located. Best Practice for USGIN purposes is to provide georeferenced data using one of the EPSG defined coordinate reference systems if this is possible.
Metadata extension information (O)  metadataExtensionInfo	X-X	Not used in this profile.
Resource identification information (M)  identificationInfo	M-M	Cardinality 1..*. The content of this element identifies the described resource. For resources that are not services, use MD_DataIdentification (see Table 3), otherwise SV_ServiceIdentification is required (see Table 4).
[role] Content information (O)  contentInfo	O-O	Characteristics describing the feature catalog, coverage, or image data. MD_ContentInformation is an abstract class. One or more of MD_FeatureCatalogueDescription or MD_CoverageDescription or MD_ImageDescription elements may be used to specify this content. MD_FeatureCatalogueDescription describes content in a feature service or dataset like an ESRI geodatabase that may have more than one feature, e.g. geologic unit outcrop polygons, fault line features, and point observation locations for strike and dip data. The MD_FeatureCatalogueDescription only provides a CI_Citation link to the full feature catalog, which may use ISO19110 or ISO11179. MD_CoverageDescription is for datasets that are one of the types listed in napMD_CoverageContentTypeCode: image, thematicClassification, physicalMeasurement. A coverage is a data structure that acts as a function to return values from its range for any direct position within its spatiotemporal domain (OGC 07-067r5). Image coverages return values for light intensity in a given wavelength range, thematicClassification coverages return codes corresponding to some domain concept, and physicalMeasurement coverages return values representing some physical quantity like magnetic susceptibility, density, resistivity. USGIN currently makes no recommendation for use of contentInfo; follow NAP recommendations (see INCITS 453).

ISO 19115 (M/C/O) xPath from MD_Metadata	NAP-USGIN M/C/O	Comments
[role] Resource distribution information (O) <code>distributionInfo</code>	O-O	This element provides information to inform users how to obtain or access the described resource. Cardinality is 0..1. US GIN profile specifies that if distribution information is included ( <code>MD_Distribution</code> is not null), then at least one <code>MD_Distribution/distributionFormat</code> and one <code>MD_Distribution/transferOptions</code> element is required, and the specified format is available via the specified transfer options. See section 4.13 'Use of <code>MD_Distribution</code> and <code>MD_Distributor</code> ' for instructions for more complicated combinations of distributor, format, transfer options, and ordering instructions.
Resource distribution format (O) <code>distributionInfo/-MD_Distribution/-distributionFormat</code>	O-O	Information on the format or physical manifestation of the resource. If the resource is a physical resource, like a book, rock sample, paper document, the <code>distributionFormat/MD_Format/name</code> is mandatory, and must be from the USGIN distribution format codelist. For digital resources, the format specifies the file type, either using a MIME type, or formatted string. Pattern for digital resources: [vendor:applicationName]/fileExtension. The vendor and application names may not be applicable, and could be omitted, but the '/' and file extension should always be present. If the format consists of a single file, the file extension is a three letter file-type abbreviation assigned by the vendor. For services, list the output formats offered by the service in <code>distributioninfo</code> as a collection of <code>distributionFormat/MD_Format</code> elements if all formats are applicable to all service requests, or if the mapping between requests and formats is obvious. Encoding of the format name should use whatever convention is used by the service to specify that output format in requests made to the service. (see 4.14 Distribution Format).
Resource distributor information (O) <code>distributionInfo/-MD_Distribution/distributor/-MD_Distributor/</code>	O-C	<i>USGIN differs from NAP</i> in this case (but not with ISO19115) by allowing multiple distributors, and binding between distributors, transfer options, and formats. For USGIN profile, each distributor/ <code>MD_Distributor</code> is a binding between one or more transfer options and the distributor formats that are available through that/those transfer options ( <code>MD_DigitalTransferOptions/onLine/CI_OnlineResource</code> in particular). If different formats are available from the same distributor, or have different transfer options, these should be represented as different distributor/ <code>MD_Distributor</code> instances. See section 4.13 'Use of <code>MD_Distribution</code> and <code>MD_Distributor</code> ' for instructions on use of these elements.
Resource distributor responsible party (O) <code>distributionInfo/-MD_Distribution/-distributor/MD_Distributor/-distributorContact/-CI_ResponsibleParty</code>	C-C	If <code>distributionInfo</code> is not null, <code>MD_Distributor</code> is required, which requires one <code>CI_ResponsibleParty</code> . For responsible party, count of ( <code>individualName + organisationName + positionName</code> ) > 0, and <code>CI_RoleCode</code> is required. ISO Role codes applicable in this context include: {resourceProvider, custodian, owner, distributor, pointOfContact, publisher, author}. NAP adds some potentially useful values. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 'Codelists' for details on codelist encoding.

ISO 19115 (M/C/O) xPath from MD_Metadata	NAP-USGIN M/C/O	Comments
Resource distributor order process (O)  <pre>distributionInfo/- MD_Distribution/distributor/- MD_Distributor/- distributionOrderProcess/- MD_StandardOrderProcess</pre>	O-O	Information on the availability of the service which includes at least one of fees, available date and time, ordering instructions, or turnaround.
Resource distributor format (O)  <pre>distributionInfo/- MD_Distribution/distributor/- MD_Distributor/- distributorFormat/MD_Format</pre>	(O-C)	See section 4.14Distribution Format ' for instructions on use of these elements.
Resource distributor online distribution linkage (O)  <pre>distributionInfo/- MD_Distribution/distributor/- MD_Distributor/- distributorTransferOptions/- MD_DigitalTransferOptions/- online/- CI_OnlineResource/linkage</pre>	M-M	Digital transfer options are "Technical means and media by which a dataset is obtained from the distributor." NAP requires CI_OnlineResource/linkage and CI_OnlineResource/protocol in CI_OnlineResource. The CI_OnlineResource/linkage element should contain the complete URL to access the resource directly (see section 4.13). CI_OnlineResource requires a Linkage element that is a gmd:URL.
Resource distributor online distribution linkage (O)  <pre>distributionInfo/- MD_Distribution/- distributor/MD_Distributor/- distributorTransferOptions/- MD_DigitalTransferOptions/- online/- CI_OnlineResource/protocol</pre>	M-M	The CI_OnlineResource/protocol element defines a valid internet protocol used to access the resource. USGIN mandates use of protocol mnemonics from the Official Internet Protocol Standards registry published on the Web at <a href="http://www.rfc-editor.org/rfcxx00.html">http://www.rfc-editor.org/rfcxx00.html</a> . 'ftp' or 'http' are common values. If no mnemonic has been assigned, use the rfc number.

ISO 19115 (M/C/O) xPath from MD_Metadata	NAP-USGIN M/C/O	Comments
Resource distributor online distribution linkage (O)  <code>distributionInfo/- MD_Distribution/distributor/- MD_Distributor/- distributorTransferOptions/- MD_DigitalTransfer- Options/online/- CI_OnlineResource/name</code>	O-O	The <code>CI_OnlineResource/name</code> element may duplicate the file name if the URL is a link to a file, but it is recommended to provide a user-friendly label for the file that could be presented in a user interface.
Resource distributor online distribution application profile (O)  <code>distributionInfo/- MD_Distribution/distributor/- MD_Distributor/- distributorTransferOptions/- MD_DigitalTransferOptions/- online/CI_OnlineResource/- applicationProfile</code>	C-C	<code>applicationProfile</code> is required if the <code>CI_OnlineResource/linkage</code> does not connect to a web page, and another software application is needed to use the indicated file resource. The <code>applicationProfile</code> character string should specify the software using the following recommended syntax: "vendor:application name/application version", e.g. "Microsoft:Word/2007", or "ESRI:ArcGIS/9.3"
Resource distributor online distribution function (O)  <code>distributionInfo/- MD_Distribution/distributor/- MD_Distributor/- distributorTransferOptions/- MD_DigitalTransferOptions/- online/CI_OnlineResource/- function</code>	O-C	<code>CI_OnlineResource/function</code> is required by USGIN to indicate how linkage is to be used. Valid values for <code>CI_OnlineFunctionCode</code> in this role are summarized in Table 7. If the resource is accessible as a web service, the metadata for the service should be separate metadata record with the dataset(s) exposed through the service identified in the service metadata record as <code>coupledResources</code> . The NAP function code vocabulary extends the ISO codelist, and this list will likely need to be customized further.
Resource distribution transfer options (O)  <code>distributionInfo/- MD_Distribution/- transferOptions/- MD_DigitalTransferOptions</code>	C-C	<code>MD_DigitalTransferOptions</code> provides information on digital distribution of resource. See section 4.13 ' <i>Use of MD_Distribution and MD_Distributor</i> ' for instructions on use of this element. Details on encoding for <code>MD_DigitalTransferOptions</code> are above in the <code>distributorTransferOptions</code> elements description.

<b>ISO 19115 (M/C/O) xPath from MD_Metadata</b>	<b>NAP-USGIN M/C/O</b>	<b>Comments</b>
[role] Data quality information (O) <code>dataQualityInfo</code>	C-C	Either <code>dataQualityInfo/DQ_DataQuality/report</code> or <code>dataQualityInfo/DQ_DataQuality/lineage</code> is mandatory if a <code>dataQualityInfo</code> element is present. <code>dataQualityInfo/DQ_DataQuality/scope</code> is required, with value from <code>MD_ScopeCode: {attribute, attributeType, collectionHardware, collectionSession, dataset, series, nonGeographicDataset, dimensionGroup, feature, featureType, propertyType, fieldSession, software, service, model, tile}</code> . The ISO and NAP codelists are identical, so USGIN mandates use of ISO codelists. See 4.17.3 <i>Codelists</i> for discussion of encoding of codelist values. <code>dataQualityInfo</code> has cardinality 0..*. See section 4.19 <i>Data quality for individual parts of a resource</i> for discussion of data quality with resource parts.
Data quality scope (O) <code>dataQualityInfo/DQ_DataQuality/scope</code>	C-C	Mandatory if <code>DQ_DataQuality</code> is not null. Specifies the extent of characteristics for which data quality information is reported. Value is from <code>MD_ScopeCode: {attribute, attributeType, collectionHardware, collectionSession, dataset, series, nonGeographicDataset, dimensionGroup, feature, featureType, propertyType, fieldSession, software, service, model, tile}</code> . The ISO and NAP codelists are identical, so USGIN mandates use of ISO codelists. See 4.17.3 <i>Codelists</i> for discussion of encoding of codelist values.
Data quality scope level description (O) <code>dataQualityInfo/-DQ_DataQuality/-scope/levelDescription</code>	C-C	<code>DQ_DataQuality/scope/levelDescription</code> is mandatory if <code>../scope/DQ_Scope/level/MD_ScopeCode = "attributeType" or "featureType"</code> . <code>levelDescription</code> specifies the aspect of the larger resource described by the containing <code>dataQualityInfo/DQ_DataQuality</code> element. The data type for the <code>levelDescription</code> child elements are reference only; the documentation in ISO19115 (2003, section B.4.4, p. 91) indicates that these are references to ISO19109 (Application Schema) elements describing attributes or features in the application scheme. For USGIN these will be <code>xlink:href</code> or <code>uuidref</code> URIs. Only the <code>features</code> and <code>attributes</code> child elements are used by the USGIN profile. See section 4.19 <i>Data quality for individual parts of a resource</i> for more discussion of <code>levelDescription</code> .
Data quality report (O) <code>dataQualityInfo/-DQ_DataQuality/report</code>	C-C	If a <code>DQ_DataQuality/report</code> element is included, at least one of the 15 possible data quality elements must be present, and multiple report elements are allowed within each <code>DQ_DataQuality</code> element. Each of these <code>AbstractDQ_element</code> subtypes has optional <code>nameOfMeasure</code> , <code>measureIdentification</code> , <code>measureDescription</code> , <code>evaluationMethodType</code> , <code>evaluationMethodDescription</code> , <code>evaluationProcedure</code> , and <code>dateTime</code> elements, and one or two required <code>result</code> elements. The <code>AbstractDQ_element /result</code> is either a <code>DQ_ConformanceResult</code> or a <code>DQ_QuantitativeResult</code> , each of which has required and optional sub-elements. Inclusion of this report metadata should follow recommendations in NAP.
Data quality lineage (O) <code>dataQualityInfo/-DQ_DataQuality/lineage</code>	C-C	USGIN follows NAP rule that $\text{count}(\text{lineage/LI_Lineage/source} + \text{lineage/LI_Lineage/sourceStep} + \text{lineage/LI_Lineage/statement}) > 0$ for spatial dataset and spatial dataset series. Not applicable to services. USGIN recommended practice is described in section 4.19.

ISO 19115 (M/C/O) xPath from MD_Metadata	NAP-USGIN M/C/O	Comments
Data quality lineage statement (O)  dataQualityInfo/- DQ_DataQuality/lineage/- LI_Lineage/statement	C-C	INSPIRE makes general lineage/LI_Lineage/statement mandatory. "General explanation of the data producer's knowledge of the dataset lineage" NAP. USGIN recommended practice is described in section 4.19.
Data quality lineage source (O)  dataQualityInfo/- DQ_DataQuality/lineage/- LI_Lineage/source	C-C	Each source/LI_Source element describes a source data resource that is input into a processStep. NAP provision is that LI_Source/description is mandatory if LI_Source/sourceCitation and LI_Source/sourceExtent are not provided. If used, the LI_Source/description includes the source medium name from the CodeList napMD_MediumNameCode, followed by <;><blank space> and a free text description, e.g. "dvd; source satellite image." If the source is part of a processing chain, the LI_Source/processStep/LI_ProcessStep provides "Information about an event related to the creation process for the source data." (INCITS 453). This is interpreted to mean that the link from a source to a process step is to a process step for which the described source is an output. USGIN recommended practice is described in section 4.19.
Data quality lineage process step (O)  dataQualityInfo/- DQ_DataQuality/lineage/- LI_Lineage/processStep	C-C	An event in the development of the dataset. Each step requires a free text description, and may have a free text rationale, dateTime stamp when process was complete, 0 to many CI_ResponsibleParty elements identifying parties involved in the process, and finally 0 to many source/LI_Source associations to identify data that is input into the process step. Best practice recommended for USGIN is that source association from a process step is to inputs to a process, and processStep associations from a source element link an output resource to a process step that produced it. See USGIN recommended practice is described in section 4.19.
[role] Portrayal catalog information (O)  portrayalCatalogueInfo	O-O	portrayalCatalogueInfo/MD_PortrayalCatalogReference/portrayalCatalogueCitation/CI_Citation element identifying a catalogue that contains symbols and rules to depict a resource. A portrayal catalog is a collection of defined symbols used to depict, to humans, features on a map. No documentation in ISO19115 about how this is supposed to work. ISO 19117 defines the structure of a Portrayal Catalogue. No USGIN recommended practices here yet.

ISO 19115 (M/C/O) xPath from MD_Metadata	NAP-USGIN M/C/O	Comments
[role] Metadata constraint information (O) <code>metadataConstraints</code>	O-O	<p>This element specifies use constraints for access to the metadata record. Use constraints for accessing the describe resource are in <code>resourceConstraint/MD_Constraint</code> in <code>MD_DatasetIdentification</code> or <code>MD_ServiceIdentification</code>. Follow NAP for specification of access constraints.</p> <p>NAP provision is that <code>metadataConstraints/MD_Constraints/useLimitation</code> is mandatory when <code>MD_Constraints</code> is used to specify <code>metadataConstraints</code>. When one of the subtypes <code>MD_LegalConstraints</code> or <code>MD_SecurityConstraints</code> is used, <code>useLimitation</code> is optional.</p> <p><code>MD_LegalConstraints</code> are specified by <code>MD_RestrictionCode</code>. ISO codelist values are {copyright, patent, patentPending, trademark, license, intellectualPropertyRights, restricted, otherRestrictions}. NAP codelist adds {licenseUnrestricted, licenseEndUser, licenseDistributor, privacy, statutory, confidential, sensitivity}. See 4.17.3 <i>Codelists</i> for discussion of encoding of codelist values. <code>otherConstraints</code> is a free text element required by NAP if <code>accessConstraints</code> or <code>useConstraints</code> is set to "otherRestrictions." For an example: "Data only to be used for the purposes for which they were collected."</p> <p><code>MD_SecurityConstraints</code> has various optional free text values, and a required <code>MD_SecurityConstraints/classification</code> from ISO <code>MD_ClassificationCode</code>: {unclassified, restricted, confidential, secret, topSecret}. NAP adds {sensitive, forOfficialUseOnly}. See 4.17.3 <i>Codelists</i> for discussion of encoding of codelist values.</p>
[role] Application schema information (O) <code>applicationSchemaInfo</code>	O-O	<p>Information about the information schema of the resource <code>applicationSchemaInfo/MD_ApplicationSchemaInformation</code> element has mandatory <code>name/CI_Citation</code>, <code>schemaLanguage</code> free text, and <code>constraintLanguage</code> free text. The <code>MD_ApplicationSchemaInformation</code> element also allows inclusion of an actual schema document as ASCII, or a binary <code>graphicsFile</code> or <code>softwareDevelopmentFile</code>. Multiple <code>applicationSchemaInfo</code> elements may be used for different presentations of a single schema, or for different kinds of schema (e.g. physical, logical, conceptual).</p>
[role] Metadata maintenance information (O) <code>metadataMaintenance</code>	O-O	<p>This element provides information about the maintenance schedule or history of the metadata record. Only one <code>MD_MaintenanceInformation</code> element may be included, with a required <code>MD_MaintenanceFrequencyCode</code>. The ISO codelist is {continual, daily, weekly, fortnightly, monthly, quarterly, biannually, annually, asNeeded, irregular, notPlanned, unknown}. NAP adds {semimonthly}. See 4.17.3 <i>Codelists</i> for discussion of encoding of codelist values.</p>
[role] Series information (O) <code>series</code>	X-X	<p>The <code>MD_Metadata/series</code> element that appears in the ISO19139 schema appears to implement the metadata application model in ISO19115:2003 Figure 3, which is a UML class diagram defining the classes of geographic information to which metadata applies. The series role appears to allow modeling aggregation of datasets into various kinds of aggregation classes like <code>DS_Series</code>, <code>DS_StereoMate</code>, <code>DS_Initiative</code> ... NAP does not mention it. Use case appears for bundling collections of related metadata records to allow simpler cross referencing and resolution of inherited property values. ... Not Used by USGIN.</p>

<b>ISO 19115 (M/C/O) xPath from MD_Metadata</b>	<b>NAP-USGIN M/C/O</b>	<b>Comments</b>
[role] Described resource (O) <code>describes</code>	X-X	The <code>MD_Metadata/describes</code> element that appears in the ISO19139 schema appears to implement the metadata application model in ISO19115:2003 Figure 3, which is a UML class diagram defining the classes of geographic information to which metadata applies. The <code>describes</code> association models the link from a metadata record to the described resource. ... Not used by USGIN.
[role] Property type description (O) <code>propertyType</code>	X-X	The <code>MD_Metadata/propertyType</code> element that appears in the ISO19139 schema appears to implement the metadata application model in ISO19115:2003 Figure 3, which is a UML class diagram defining the classes of geographic information to which metadata applies. The <code>propertyType</code> association apparently models the fact that a metadata record might be attribute-level metadata—that is describing an individual property value assignment. ... Not used by USGIN.
[role] Feature type description (O) <code>featureType</code>	X-X	Although an <code>MD_Metadata/featureType</code> element that appears in the ISO19139 schema appears to implement the metadata application model in ISO19115:2003 Figure 3, which is a UML class diagram defining the classes of geographic information to which metadata applies. The <code>featureType</code> association apparently models the fact that a metadata record might describe an individual feature. ... Not used by USGIN.
[role] Feature attributes (O) <code>featureAttribute</code>	X-X	Although an <code>MD_Metadata/featureAttribute</code> element that appears in the ISO19139 schema appears to implement the metadata application model in ISO19115:2003 Figure 3, which is a UML class diagram defining the classes of geographic information to which metadata applies. The <code>featureAttribute</code> association apparently models the fact that a metadata record might be attribute-level metadata—that is describing an individual property value assignment; distinction between <code>propertyType</code> and <code>featureAttribute</code> is not explained. ... Not used by USGIN.

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### 3.2 Dataset Identification properties (MD\_DataIdentification)

213 The difference between metadata for services, and metadata for other resources is in the `identificationInfo` part of the ISO19139 xml schema. Ser-  
 214 vice metadata utilizes the `SV_ServiceIdentification` element to provide a description and identification of a service (see 3.3 Service identification  
 215 elements (`SV_ServicelIdentification`)). This section documents use of `MD_DataIdentification` for metadata describing other resources of interest in the  
 216 geoscience information network.

*Table 3. Dataset Identification properties (MD\_DataIdentification)*

ISO 19115 (M/C/O) xPath from MD_Metadata	NAP-USGIN M/C/O	Comments on MD_DataIdentification
Resource citation (M) <code>identificationInfo[1]/-</code> <code>MD_DataIdentification/-</code> <code>citation/CI_Citation</code>	M-M	The citation attribute provides information for citing the described resource. Citation is defined by Webster as "an act of quoting". The precise semantics of what an identification/citation is supposed to be are not very well articulated in ISO19115. For USGIN purposes, this should be viewed as information to identify the intellectual origin of the content in the described resource, along the lines of a citation in a scientific journal. Required content for a <code>CI_Citation</code> element are <code>title</code> , <code>date</code> , and <code>responsibleParty</code> .
Resource title (M) <code>identificationInfo[1]/-</code> <code>MD_DataIdentification/-</code> <code>citation/CI_Citation/title</code>	M-M	USGIN recommends using titles that inform the human reader about the dataset's content as well as its context.
Resource reference date (M) <code>identificationInfo/-</code> <code>MD_DataIdentification/-</code> <code>citation/CI_Citation/date/-</code> <code>CI_Date/date/-</code>	M-M	Best practice is to include at least the date of publication or creation of the resource. The date of the resource reported in the citation corresponds to the resource's last update version according to its update frequency. <code>CI_Date</code> content includes a <code>date</code> and <code>dateType</code> . Date for USGIN profile uses xs:date data type, defined thus "date uses the date/timeSevenPropertyModel, with hour, minute, and second required to be <b>absent</b> . timezoneOffset- remains optional" ( <a href="http://www.w3.org/TR/xmlschema11-2">http://www.w3.org/TR/xmlschema11-2</a> ). Example date encoding: 2000-12-12+13:00, 2006-10-01. If the month or day is not known, encode as '00', for example '2006-00-00'. <code>DateType</code> is from napCI_DateTypeCode which identifies the event used for the temporal aspect of the resource. This date is distinct from the <code>dateStamp</code> for the metadata record, or the <code>EX_Extent/temporalElement</code> that specifies the time period to which the resource content is applicable.

<b>ISO 19115 (M/C/O) xPath from MD_Metadata</b>	<b>NAP-USGIN M/C/O</b>	<b>Comments on MD_DataIdentification</b>
Unique resource identifier (O) <code>identificationInfo/-MD_DataIdentification/-citation/CI_Citation/-identifier/MD_Identifier</code>	C-C	<p>NAP makes <code>MD_Identifier</code> mandatory for dataset and dataset series. For USGIN, if the Citation has an identifier that is different from the identifier for the described resource (<code>MD_Metadata/dataSetURI</code>), it must be included here.</p> <p>For USGIN purposes, this element content value should be only considered an identifier for the citation, without any assumption that it will use http protocol. The identifier may be resolvable to a URL, if a protocol prefix specifies an identifier scheme that is resolvable (e.g. http, urn...), but this is not necessary for a valid document, and should not be assumed when processing metadata documents.</p> <p>The USGIN profile requires the use of <code>MD_Identifier</code> element to identify resources. <code>RS_Identifier</code> may substitute for <code>MD_Identifier</code> in the ISO19139 schema, but the USGIN profile requires use of <code>MD_Identifier</code>. If additional codespace and version content is associated with the identifier, it should be encoded as <code>MD_Identifier/authority/CI_Citation/alternateTitle</code> and <code>MD_Identifier/authority/-CI_Citation/edition</code></p>
Resource responsible party (O) <code>identificationInfo/-MD_DataIdentification/-citation/CI_Citation/-citedResponsibleParty</code>	M-M	<p><code>CI_Citation</code> cardinality exactly one required. USGIN requires at least one <code>CI_ResponsibleParty</code> following the NAP rule that count of (<code>individualName + organisationName + positionName</code>) &gt; 0. The <code>CI_ResponsibleParty/role/CI_RoleCode@codeListValue</code> is from <code>CI_RoleCode</code>. See 4.17.3 <i>Codelists</i> for discussion of encoding of codelist values. For most intellectual content, the responsible party is what would normally be considered the author of a work. Best practice is to include point of contact information for the resource in <code>MD_DataIdentification/pointOfContact/ CI_ResponsibleParty</code>. Guidance on use of role codes would be helpful for consistency, but has not been developed as yet.</p>
Resource presentation form (O) <code>identificationInfo/-MD_DataIdentification/-citation/CI_Citation/-presentationForm</code>	O-C	<p>The form in which the cited resource is available. Note that the citation is to the original source of intellectual content in the described resource, and its presentation may be different from the format for distribution described in the metadata. USGIN recommends that this element is required if there is a difference between the cited resource presentation format and the distribution format(s) listed in the <code>distributionInfo/MD_Distribution</code> section of the metadata record.</p> <p><code>presentationForm</code> uses <code>CodeList = CI_PresentationFormCode</code>, with ISO code names {<code>documentDigital, documentHardcopy, imageDigital, imageHardcopy, mapDigital, mapHardcopy, modelDigital, modelHardcopy, profileDigital, profileHardcopy, tableDigital, tableHardcopy, videoDigital, videoHardcopy, audioDigital</code>}. NAP adds {<code>audioHardcopy, multimediaDigital, multimediaHardcopy, diagramDigital, diagramHardcopy</code>}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 <i>Codelists</i> for details on codelist encoding.</p>
Resource series (O) <code>identificationInfo/-MD_DataIdentification/-citation/CI_Citation/series</code>	O-O	<p>Information about the (publication) series or collection of which the resource is a part. NAP rule: <code>(name + issuanceIdentification) &gt; 0</code>.</p>

<b>ISO 19115 (M/C/O) xPath from MD_Metadata</b>	<b>NAP-USGIN M/C/O</b>	<b>Comments on MD_DataIdentification</b>
Resource other citation details (O)  <code>identificationInfo/- MD_DataIdentification/- citation/CI_Citation/- otherCitationDetails</code>	O-O	"Other information to complete a citation." NAP
Resource collective title (O)  <code>identificationInfo/- MD_DataIdentification/- citation/CI_Citation/- collectiveTitle</code>	O-C	Title of the combined resource that the cited resource is part of, for example the cited resource may be a paper in an anthology, in which case the anthology title would be the collective title. Required if the cited resource is part of such a collective work.
Resource abstract (M)  <code>identificationInfo/- MD_DataIdentification/abstract</code>	M-M	A free text summary of the content, significance, purpose, scope, etc. of the resource. Exactly one value.
Resource purpose (O)  <code>identificationInfo/- MD_DataIdentification/purpose</code>	O-O	"Summary of the intentions for which the dataset was developed. Purpose includes objectives for creating the dataset and what the dataset is to support." NAP
Resource status (O)  <code>identificationInfo/- MD_DataIdentification/status</code>	M-M	Value is from MD_ProgressCode codelist. ISO values are {completed, historicalArchive, obsolete, onGoing, planned, required, underdevelopment}. NAP adds {proposed}. Obsolete is synonymous with deprecated. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 <i>Codelists</i> for details on codelist usage.
Resource point of contact (O)  <code>identificationInfo/- MD_DataIdentification/- pointOfContact</code>	O-C	CI_ResponsibleParty element here would contain information for point of contact to access the resource. This information is mandatory for physical resources such as core, cuttings, samples, manuscripts. USGIN rule that count of (individualName + organisationName + positionName) > 0. The CI_ResponsibleParty/role/CI_RoleCode is from CI_RoleCode codelist. ISO role codes for physical resource point of contact are {custodian, owner, pointOfContact}; other point of contact role codes may apply for other resources. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 <i>Codelists</i> for details on codelist usage.

<b>ISO 19115 (M/C/O) xPath from MD_Metadata</b>	<b>NAP-USGIN M/C/O</b>	<b>Comments on MD_DataIdentification</b>
Resource maintenance (O) <code>identificationInfo/-MD_DataIdentification/-resourceMaintenance</code>	O-O	This element provides information about the maintenance schedule or history of the resource (or some subset/part of the resource specified by the scope and scope description) described by the metadata record. 0 to many <code>MD_MaintenanceInformation</code> elements may be included. Different <code>MD_MaintenanceInformation</code> elements are required to have different napMD_ScopeCode or <code>MD_ScopeDescription</code> . Usage of <code>MD_ScopeDescription</code> is poorly described, and no actual examples of usage could be found; it would appear to allow identification of a set of attribute or features (by name?), or feature instances or attribute instances (identified how?), or a dataset, to which the maintenance information applies. Use <code>MD_MaintenanceFrequencyCode</code> codelist. ISO values are {continual, daily, weekly, fortnightly, monthly, quarterly, biannually, annually, asNeeded, irregular, notPlanned, unknown}. NAP adds {semimonthly}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 <i>Codelists</i> for details on codelist usage.
Graphic overview of resource (O) <code>identificationInfo/-MD_DataIdentification/-graphicOverview</code>	O-O	Highly recommended to include a URL providing a web-accessible visual representation of the resource if it is applicable to the described resource, particularly for geographic datasets that may be represented by maps. If <code>MD_BrowseGraphic</code> is included, <code>MD_BrowseGraphic/filename</code> character string is mandatory. USGIN Recommended practice is to provide a complete URL as a gco:characterString value for the <code>filename</code> property. Use napMD_FileFormatCode code values ( <a href="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_115">http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_115</a> ) in <code>fileType/CharacterString</code> , but because of schema problems, encoding the <code>xsi&gt;Type</code> for the codelist extension is not recommended. See section 4.17.3 <i>Codelists</i> for details on codelist usage. Repeatable element; multiple values may present different resolutions, or different parts of resource. Names associated with overview should provide sufficient information for user to distinguish these.
Resource format (O) <code>identificationInfo/-MD_DataIdentification/-resourceFormat</code>	X-X	This element is not used by NAP or USGIN; this information is encoded in <code>MD_Metadata/distributionInfo/MD_Distribution/</code> in USGIN metadata (see 4.13 <i>Use of MD_Distribution and MD_Distributor</i> ).
Resource keywords (O) <code>identificationInfo/-MD_DataIdentification/-descriptiveKeywords/MD_Keyword</code>	O-O	Best Practice for USGIN profile metadata is to supply keywords to facilitate the discovery of metadata records relevant to the user. <b>USGIN Keywords:</b> USGIN keyword vocabularies are in development. Future versions of this profile may include required keyword vocabularies. <b>Other Keywords:</b> Keyword Type - allowed values from <code>MD_KeywordTypeCode</code> . ISO codelist includes {discipline, place, stratum, temporal, theme}. NAP adds {product, subTopicCategory}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 <i>Codelists</i> for details on codelist usage. USGIN requires that <code>MD_Keyword/keyword</code> contain a <code>CharacterString</code> (see section 4.16). USGIN best practice is to include keywords in English.

<b>ISO 19115 (M/C/O) xPath from MD_Metadata</b>	<b>NAP-USGIN M/C/O</b>	<b>Comments on MD_DataIdentification</b>
Condition applying to access and use of resource (O) <code>identificationInfo/-MD_DataIdentification/-resourceConstraints/</code>	O-O	Restrictions on the access and use of a resource or metadata. Follow NAP for specification of <code>resourceConstraints</code> . This attribute provides information for access control to the described resource itself. In some situations, the <code>metadataConstraints</code> may allow a user to learn of the existence of a resource that they may not actually be able to access without further clearance. Constraints may be represented by <code>MD_Constraint</code> , <code>MD_LegalConstraint</code> , or <code>MD_SecurityConstraint</code> .
Aggregation information (O) <code>identificationInfo/-MD_DataIdentification/-aggregationInfo/-MD_AggregateInformation</code>	O-O	This element includes either a citation for or identifier of an associated dataset, along with the type of association between the datasets, and optionally the activity that produced the dataset. <code>MD_AggregateInformation</code> requires either <code>aggregateDataSetName/CI_Citation</code> or <code>aggregateDataSetIdentifier/MD_Identifier</code> . <code>MD_AggregateInformation/associationType</code> is mandatory, from <code>DS_AssociationTypeCode</code> . ISO codelist includes {crossReference, largerWorkCitation, partOfSeamlessDatabase, source, stereoMate}. NAP adds {isComposedOf}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 <i>Codelists</i> for details on codelist usage. If the related resource has an associated metadata record, USGIN recommended practice is to include the identifier for that metadata record in <code>aggregateDataSetIdentifier/MD_Identifier</code> . For related resources that do not have a metadata record, <code>aggregateDataSetName/CI_Citation</code> may be used; this element is optional if <code>aggregateDataSetIdentifier</code> has a value. For USGIN profile, this property, rather than <code>MD_Metadata/parentIdentifier</code> , should be used to indicate relationships between described resources.
Spatial Representation Type (O) <code>MD_DataIdentification/spatialRepresentationType/</code>	O-O	value from <code>MD_SpatialRepresentationTypeCode</code> list. ISO codelist includes {vector, grid, textTable, tin, stereoModel, video}. ISO and NAP codelists have the same terms, USGIN mandates use of ISO codelists. See section 4.17.3 <i>Codelists</i> for details on codelist usage.
Resource spatial resolution (O) <code>MD_DataIdentification/-spatialResolution/-MD_resolution/equivalentScale/MD_RepresentativeFraction/-denominator</code>	C-C	USGIN requires use of <code>equivalentScale/.../denominator</code> to express spatial resolution, in order to be more easily interoperable. ISO19139 schema requires <code>MD_resolution</code> to be specified by an <code>equivalentScale/MD_RepresentativeFraction/denominator</code> or a <code>distance</code> (or both), so if a <code>distance</code> is available, that should be supplied as well. The resolution distance represents the smallest length between two resolvable points in the dataset. To calculate <code>equivalentScale</code> given a resolution distance, recommended practice is to divide the resolution distance in meters by 0.0005. This assumes that the smallest distance resolvable in a map display for human usage is 0.5 mm.

<b>ISO 19115 (M/C/O) xPath from MD_Metadata</b>	<b>NAP-USGIN M/C/O</b>	<b>Comments on MD_DataIdentification</b>
Resource language (O) <code>identificationInfo/-MD_DataIdentification/language</code>	M-M	<p>Language for content of described resource. The mandatory optionality is inherited from NAP, although it does not make sense for non-language based content like images or physical samples. Default value is 'eng'. If language is not applicable to the described resource use 'zxx'. Multiple instances of this element indicate that the linguistic content of the resource is available in multiple languages.</p> <p>Three-letter language code followed by an optional three-letter country code: {ISO 639-2/T three letter language code}{&lt;;&gt;&lt;blank space&gt;&lt;ISO 3166-1 three letter country code} Language code is given in lowercase. Country code is given in uppercase. ISO 639 codelists are available at <a href="http://www.loc.gov/standards/iso639-2/php/code_list.php">http://www.loc.gov/standards/iso639-2/php/code_list.php</a>. ISO 3166-1 codelists are at <a href="http://www.iso.org/iso/english_country_names_and_code_elements">http://www.iso.org/iso/english_country_names_and_code_elements</a>.</p>
Topic category <code>identificationInfo/-MD_DataIdentification/topicCategory</code>	C-C	<p>NAP specifies that topicCategory code shall be provided when hierarchyLevel is set to "dataset" or "dataset series". Codes are from MD_TopicCategoryCode, the ISO codelist includes {farming, biota, boundaries, climatologyMeterologyAtmosphere, economy, elevation, environment, geoscientificInformation, health, imageryBaseMapsEarthCover, intelligenceMilitary, inlandWater, location, oceans, planningCadastral, society, structure, transportation, utilitiesCommunication}. The NAP and ISO codelists are the same, USGIN mandates use of ISO codelists. See section 4.17.3 <i>Codelists</i> for details on codelist usage. Most USGIN resources will have MD_TopicCategoryCode = "geoscientificInformation", which is the default value for this profile. More specific topic categorization should be done using keywords.</p>
Resource content extent <code>identificationInfo/-MD_DataIdentification/extent/-EX_Extent</code>	C-C	<p>Defines the spatial (horizontal and vertical) and temporal region to which the content of the resource applies. For USGIN, the spatial extent is a rectangle that bounds the geographic extent to which resource content applies. NAP specifies required when hierarchyLevel is set to 'dataset'. Best Practice for USGIN is to include an extent for any resource with content related to some geographic or temporal location. For geoscience resources, the temporal extent may be expressed using time ordinal eras from a geologic time scale if the resource is related to some particular geologic time.</p> <p>USGIN specifies <code>count(description + geographicElement + temporalElement) &gt; 0</code></p>
Resource content extent description <code>identificationInfo/-MD_DataIdentification/extent/-EX_Extent/description</code>	C-C	<p>Free text that describes the spatial and temporal extent of the dataset. USGIN specifies that <code>description</code> is mandatory if a <code>geographicElement</code> or <code>temporalElement</code> is not provided. Note that if geographic place names are used to express the geographic extent, USGIN profile specifies that these should be encoded using keyword with keyword type code = 'place.' Geographic names may be duplicated in the <code>EX_Extent/description</code>.</p>

<b>ISO 19115 (M/C/O) xPath from MD_Metadata</b>	<b>NAP-USGIN M/C/O</b>	<b>Comments on MD_DataIdentification</b>
Resource content extent bounding box  identificationInfo/- MD_DataIdentification/extent/ - EX_Extent/geographicElement/- EX_GeographicBoundingBox	O-C	USGIN profile requires that if an EX_Extent/geographicElement is supplied, it include a geographic bounding box with bounding latitude and longitude expressed using World Geodesic System WGS 84 decimal degrees.  The corner coordinates for the geographic bounding box must not coincide in one point, because this may result in fatal errors with some CSW implementations. Point locations must thus be represented as tiny rectangles. USGIN recommended practice is to place the actual point location in the lower left corner of the rectangle.
Resource content extent geographic description  identificationInfo/- MD_DataIdentification/extent/ - EX_Extent/geographicElement/- EX_GeographicDescription	C-X	Not used by USGIN profile, use keyword with type code = 'place'. This ISO19115 element provides an MD_Identifier element that identifies a geographic location by name. MD_Identifier provides an authority/CI_Citation that specifies the authority for a location name, and a code, which is a text string identifying the location. For the purposes of USGIN metadata, this information should be encoded using keywords, for which the napMD_KeywordTypeCode = 'place'; the thesaurus/CI_Citation has the same content as EX_GeographicDescription/authority/CI_Citation, and the keyword is the same as the EX_GeographicDescription/code.
Resource content extent bounding polygon  identificationInfo/- MD_DataIdentification/extent/ - EX_Extent/geographicElement/- EX_BoundingPolygon	C-X	Not used by USGIN profile. To improve interoperability, USGIN mandates the use of Geographic Bounding Box instead of bounding polygon. "An element which describes inclusions or exclusions in a resource. The enclosed boundary of the dataset expressed in x-y coordinates."

ISO 19115 (M/C/O) xPath from MD_Metadata	NAP-USGIN M/C/O	Comments on MD_DataIdentification
Resource temporal extent (O) identificationInfo/- MD_DataIdentification/extent/- EX_Extent/temporalElement/- EX_TemporalExtent/extent/- TimePeriod	O-O	<p>Property contains information about temporal extent to which resource is applicable. For many geoscience resources, this would be the geologic time period(s) to which the resource applies. USGIN mandates use of TimePeriod for all temporal extents. The default time extent for beginPosition@frame and endPosition@frame attributes are #ISO-8601. For geologic time extents, USGIN requires the values for beginPosition@frame and endPosition@frame to be populated using numeric time coordinates in Ma, measured positive increasing older with an origin at 1950 CE (see Temporal extents). The default frame attribute value for geologic time coordinates is "urn:cgi:trs:CGI:StandardGeologicTimeMa"</p> <p>ISO 8601 Default Example:</p> <pre>&lt;gml:TimePeriod gml:id="IdModern"&gt;   &lt;gml:name&gt;Y2kX&lt;/gml:name&gt;   &lt;gml:beginPosition     frame="#ISO-8601"&gt;2010-01-00T00:00:00&lt;/gml:beginPosition&gt;   &lt;gml:endPosition     frame="#ISO-8601"&gt;2010-12-31T24:00:00&lt;/gml:endPosition&gt; &lt;/gml:TimePeriod&gt;</pre> <p>Geologic Time Example:</p> <pre>&lt;gml:TimePeriod gml:id="IdJurassic"&gt;   &lt;gml:name&gt;Jurassic&lt;/gml:name&gt;   &lt;gml:beginPosition     frame="urn:cgi:trs:CGI:StandardGeologicTimeMa"&gt;203&lt;/gml:beginPosition&gt;   &lt;gml:endPosition     frame="urn:cgi:trs:CGI:StandardGeologicTimeMa "&gt;135&lt;/gml:endPosition&gt; &lt;/gml:TimePeriod&gt;</pre>
Resource spatio-temporal extent (O) identificationInfo/- MD_DataIdentification/extent/- EX_Extent/temporalElement/- EX_SpatialTemporalExtent/	O-X	Not used. Although use of EX_SpatialTemporalExtent is allowed by ISO19139 and NAP, USGIN mandates encoding space time location with EX_TemporalExtent and EX_GeographicBoundingBox.

<b>ISO 19115 (M/C/O) xPath from MD_Metadata</b>	<b>NAP-USGIN M/C/O</b>	<b>Comments on MD_DataIdentification</b>
Resource vertical extent (O) <code>identificationInfo/- MD_DataIdentification/extent/ -EX_Extent/verticalElement/- EX_VerticalExtent</code>	O-O	<p>Vertical extent is used to provide elevation location for resources that have an explicit vertical location. Most common example will be samples related to vertical location in a borehole. The borehole trace is the vertical CRS within which the sample will be located, typically using coordinates measured in linear distance from the collar (or ground level, or Kelly bushing) of the borehole.</p> <p><code>EX_VerticalExtent</code> has <code>minimumValue</code>, <code>maximumValue</code> that are real numbers, and a <code>verticalCRS</code> <code>verticalCRS</code> has (minimally) an <code>xlink:href</code> attribute which references an EPSG registry code (<a href="http://www.epsg-registry.org/">http://www.epsg-registry.org/</a>). For interoperability, USGIN mandates use of a VerticalCRS with origin at World mean sea level (MSL), with elevations measured up positive in meters; the URI for this VerticalCRS is "urn:ogc:def:crs:EPSG::5714"</p>

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221 **3.3 Service identification elements (SV\_ServiceIdentification)***Table 4. Service Identification properties (SV\_ServiceIdentification)*

<b>ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata</b>	<b>NAP-USGIN M/C/O</b>	<b>Comments on SV_ServiceIdentification</b>
Resource service citation (M) <code>identificationInfo[1]/-</code> <code>SV_ServiceIdentification/-</code> <code>citation/CI_Citation</code>	M-M	The citation attribute provides information for citing the described service. Note that for scientific citation purposes, a citation for the intellectual content of the information presented by the service would be found in the <code>MD_DataIdentification/citation/CI_Citation</code> for datasets identified in the <code>operationsOn</code> section of <code>SV_ServiceIdentification</code> . Citation is defined by Webster as "an act of quoting". For USGIN purposes, this should be viewed as information to identify the intellectual origin or authority for the content in the described resource, along the lines of a citation in a scientific journal. The purpose of the citation for the service is to identify a particular service instance as a unique entity. Required content for a <code>CI_Citation</code> element are <code>title</code> , <code>date</code> , and <code>responsibleParty</code> .
Resource title (M) <code>identificationInfo[1]/-</code> <code>SV_ServiceIdentification/-</code> <code>citation/CI_Citation/title</code>	M-M	USGIN recommends that the title in a service identification citation should uniquely identify the particular service instance, and inform the human reader about the service content, function, and context.
Resource reference date (M) <code>identificationInfo/-</code> <code>SV_ServiceIdentification/-</code> <code>citation/CI_Citation/date/-</code> <code>CI_Date/date/-</code>	M-M	The citation date for a service may indicate the creation date, when the service first became operational, the publication date, when the service first became public, or the revision date, which specifies the date of most recent update. If the service is no longer online, a <code>notAvailable</code> or <code>superseded</code> date may be specified. These are differentiated by the <code>DateType</code> . <code>CI_Date</code> content includes a <code>date</code> and <code>dateTime</code> . Date for USGIN profile uses <code>xs:date</code> data type, defined thus " <code>date</code> uses the <code>date/timeSevenPropertyModel</code> , with <code>hour</code> , <code>minute</code> , and <code>second</code> required to be sent. <code>timezoneOffset</code> remains <code>optional</code> " ( <a href="http://www.w3.org/TR/xmlschema11-2">http://www.w3.org/TR/xmlschema11-2</a> ).  Example date encoding: 2000-12-12+13:00, 2006-10-01. If the month or day is not known, encode as '01', for example '2006-01-01'. <code>DateType</code> is from <code>napCI_DateTypeCode</code> which identifies the event used for the temporal aspect of the resource. This date is distinct from the <code>dateStamp</code> for the metadata record, or the <code>EX_Extent/temporalElement</code> that specifies the time period to which the resource content is applicable. ISO <code>CI_DateTypeCode</code> names that apply to services include {creation, publication, revision}. NAP adds {notAvailable, superseded}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 <i>Codelists</i> for details on codelist usage.

<b>ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata</b>	<b>NAP-USGIN M/C/O</b>	<b>Comments on SV_ServiceIdentification</b>
Unique resource identifier (O) <code>identificationInfo/- SV_ServiceIdentification/- citation/CI_Citation/- identifier/MD_Identifier</code>	C-O	<p>For USGIN, because the Citation is for the service, this identifier should be identical to <code>MD_Metadata/dataSetURI</code>, and is therefore optional.</p> <p>For USGIN purposes, this element content value is only an identifier for the citation; it is not a URL for accessing the service. The USGIN profile requires the use of <code>MD_Identifier</code> element to identify resources. <code>RS_Identifier</code> may substitute for <code>MD_Identifier</code> in the ISO19139 schema, but the USGIN profile requires use of <code>MD_Identifier</code>. If additional codespace and version content is associated with the identifier, it should be encoded as <code>MD_Identifier/authority/CI_Citation/alternateTitle</code> and <code>MD_Identifier/authority/CI_Citation/edition</code></p>
Resource responsible party (O) <code>identificationInfo/- SV_ServiceIdentification/- citation/CI_Citation/- citedResponsibleParty</code>	M-M	<p>USGIN requires at least one <code>CI_ResponsibleParty</code> following the NAP rule that count of (individual-Name + organisationName + positionName) &gt; 0. The <code>CI_ResponsibleParty/role/CI_RoleCode</code> is from <code>napCI_RoleCode</code>. For a service, the point of contact information for questions or reporting problems should be in <code>SV_ServiceIdentification/pointOfContact/CI_ResponsibleParty</code>. The service citation responsible party would logically identify the parties responsible for creating (implementing) and publishing the service. ISO Role code names applicable to a service citation include {originator, principalInvestigator, processor, author, publisher}, and NAP adds {collaborator}. Other codelist values ISO {resourceProvider, custodian, owner}, and NAP {rightsHolder, mediator} would logically be specified in the <code>SV_ServiceIdentification/pointOfContact</code> element. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 <i>Codelists</i> for details on codelist usage.</p>
Resource presentation form (O) <code>identificationInfo/- SV_ServiceIdentification/- citation/CI_Citation/- presentationForm</code>	O-O	<p>The form in which the service is available, which in the case of a service is only through the service implementation described by the metadata record, so the information here is not generally very useful. Note that the citation is to the original source of intellectual content in the described resource should be in <code>MD_DataIdentification/citation/CI_Citation</code> that describes the datasets operated on by the service.</p> <p><code>presentationForm</code> uses the <code>CI_PresentationFormCode</code> codelist; ISO code names that are applicable to a service citation include {documentDigital, imageDigital, mapDigital, modelDigital, profileDigital, tableDigital, videoDigital, audioDigital}. NAP adds {multimediaDigital, diagramDigital}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 <i>Codelists</i> for details on codelist usage.</p>

<b>ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata</b>	<b>NAP-USGIN M/C/O</b>	<b>Comments on SV_ServiceIdentification</b>
Resource series (O) <code>identificationInfo/- SV_ServiceIdentification/- citation/CI_Citation/series</code>	O-O	Information about the series or collection of which the cited service is a part. NAP rule: (name + is- sueldentification) > 0. At this point there is not much precedent for aggregating services into a formal series, so in general this element is probably not applicable to services.
Resource other citation details (O) <code>identificationInfo/- SV_ServiceIdentification/- citation/CI_Citation/- otherCitationDetails</code>	O-O	Free text information useful to identify and cite the described service instance, usage is not specified by this profile.
Resource collective title (O) <code>identificationInfo/- SV_ServiceIdentification/- citation/CI_Citation/- collectiveTitle</code>	O-O	Free text title of a "combined resource of which the service is a part." At this point there is not much precedent for aggregating services into a collections, so in general this element is probably not applic- able to services. Use aggregation info to link layer-specific service metadata records to a metadata record for the aggregate service that serves the layer.
Resource abstract (M) <code>identificationInfo/- SV_ServiceIdentification/- abstract</code>	M-M	A free text summary of the content, significance, purpose, scope, etc. of the service described by this metadata. Exactly one value.
Resource purpose (O) <code>identificationInfo/- SV_ServiceIdentification/- purpose</code>	O-O	Text summary of the intentions for which the service was developed, including objectives for creating the service and use cases it is designed to support. One value optional.
Resource status (O) <code>identificationInfo/- SV_ServiceIdentification/- status</code>	M-M	Value is from MD_ProgressCode codelist. ISO Code names applicable to services include {com- pleted, obsolete, onGoing, planned, required, underDevelopment}. NAP adds {proposed}. Obsolete is synonymous with deprecated. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 Codelists for details on codelist usage.

<b>ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata</b>	<b>NAP-USGIN M/C/O</b>	<b>Comments on SV_ServiceIdentification</b>
Resource point of contact (O) <code>identificationInfo/- SV_ServiceIdentification/- pointOfContact</code>	O-O	<p><code>pointOfContact/CI_ResponsibleParty</code> element for service metadata should contain information for a point of contact to report problems with the service. Element is optional but highly recommended! USGIN rule that count of (<code>individualName + organisationName + positionName</code>) &gt; 0. The <code>CI_ResponsibleParty/role/CI_RoleCode@codeListValue</code> is from <code>CI_RoleCode</code>; applicable name for the point of contact party are from the ISO codelist {resourceProvider, custodian, owner}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN mandates use of ISO codelists. See section 4.17.3 <i>Codelists</i> for details on codelist usage.</p>
Resource maintenance (O) <code>identificationInfo/- SV_ServiceIdentification/- resourceMaintenance</code>	O-O	<p>This element provides information about the maintenance schedule or history of the service described by the metadata record. For a service, only one <code>MD_MaintenanceInformation</code> elements may be included; for which the <code>MD_ScopeDescription</code> <code>MD_ScopeCode</code> will be 'service'. If <code>MD_MaintenanceInformation</code> is present, then <code>maintenanceAndUpdateFrequency</code> is mandatory, populated by a <code>MaintenanceFrequencyCode</code>; ISO names in this code list are {continual, daily, weekly, fortnightly, monthly, quarterly, biannually, annually, asNeeded, irregular, notPlanned, unknown}. NAP adds {semimonthly}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 <i>Codelists</i> for details on codelist usage. NAP specified best practice is that when <code>SV_ServiceIdentification/status</code> is set to "onGoing," either the attribute <code>MD_MaintenanceInformation/dateOfNextUpdate</code> or <code>MD_MaintenanceInformation/userDefined-MaintenanceFrequency</code> must be provided.</p> <p>Maintenance information for data the service presents should be included in the dataset metadata for coupleResources associated with the service.</p>
Graphic overview of resource (O) <code>identificationInfo/- SV_ServiceIdentification/- graphicOverview</code>	O-O	<p>Highly recommended to include a small image visual representation of the resource provided by a map or image service. For geographic feature or data services, a graphic overview might show the geographic distribution of available data. If <code>MD_BrowseGraphic</code> is included, <code>MD_BrowseGraphic/filename</code> character string is mandatory. USGIN Recommended practice is to provide a complete URL as a <code>gco:characterString</code> value for the <code>filename</code> property. Use <code>napMD_FileFormatCode</code> code values (<a href="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_115">http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_115</a>) in <code>fileType/CharacterString</code>. Although USGIN mandates use of <code>napMD_FileFormatCode</code> for specifying file type, the full encoding of the <code>xsi:type= "napm:napMD_FileFormatCode_PropertyType"</code> in the <code>CharacterString</code> element causes validation problems, and is not recommended. See section 4.17.3 <i>Codelists</i> for details on encoding of the file format code, which is special because this is a NAP extension to the ISO base specification.</p> <p>Repeatable element; multiple values may present different resolutions, or different parts of resource. Names associated with overview should provide sufficient information for user to distinguish these.</p>

<b>ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata</b>	<b>NAP-USGIN M/C/O</b>	<b>Comments on SV_ServiceIdentification</b>
Resource format (O) <code>identificationInfo/- SV_ServiceIdentification/- resourceFormat</code>	O-X	The format of service response documents varies at the operation level, and for a particular operation, different output formats may be requested. A listing of all possible options here without bindings to the operations that respond with that format is not useful. NAP does not include this role in the list of properties associated with <code>SV_ServiceIdentification</code>
Resource keywords (O) <code>identificationInfo/- SV_ServiceIdentification/- descriptiveKey- words/MD_Keyword</code>	O-O	<p>Best Practice for USGIN profile metadata is to supply keywords to facilitate the discovery of metadata records relevant to the user.</p> <p><b>USGIN Keywords:</b> USGIN keyword vocabularies are in development. Future versions of this profile may include required keyword vocabularies.</p> <p><b>Other Keywords:</b> Keyword Type - allowed ISO values from MD_KeywordTypeCode: {discipline, place, stratum, temporal, theme}. NAP adds {product, subTopicCategory}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 Codelists for details on codelist usage.</p> <p>USGIN requires that <code>MD_Keyword/keyword</code> contain a <code>CharacterString</code> (see section 4.16). USGIN best practice is to include keywords in English.</p>
Resource specific usage (O) <code>identificationInfo/- SV_ServiceIdentification/- resourceSpecificUsage/</code>	O-X	NAP excludes this property in INCITS 453, figure 64 p.175, but it is schema valid under <a href="http://schemas.opengis.net/iso/19139/20060504/serviceMetadata.xsd">http://schemas.opengis.net/iso/19139/20060504/serviceMetadata.xsd</a> , which is the service metadata schema imported by apiso.xsd for the OGC CSW profile for ISO19115/19 metadata. Property not used by USGIN.
Condition applying to access and use of resource (O) <code>identificationInfo/- SV_ServiceIdentification/- resourceConstraints/</code>	O-O	Restrictions on the access and use of a service. Follow NAP for specification of <code>resourceConstraints</code> . This attribute provides information for access control to the described service. In some situations, the <code>metadataConstraints</code> may allow a user to learn of the existence of a resource that they may not actually be able to access without further clearance. Follow NAP for specification of <code>resourceConstraints</code> . Constraints may be represented by <code>MD_Constraint</code> , <code>MD_LegalConstraint</code> , or <code>MD_SecurityConstraint</code> . The attribute <code>MD_Constraint/useLimitation</code> is mandatory unless <code>MD_LegalConstraint</code> or <code>MD_SecurityConstraint</code> is provided. Condition applying to access and use of resource - ISO19119 duplicates this property as <code>SV_ServiceIdentification/resourceConstraints</code> is to be used, and <code>SV_ServiceIdentification/restrictions</code> is not to be used; USGIN profile follows this provision.

<b>ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata</b>	<b>NAP-USGIN M/C/O</b>	<b>Comments on SV_ServiceIdentification</b>
Aggregation information (O) <code>identificationInfo/- SV_ServiceIdentification/- aggregationInfo/- MD_AggregateInformation</code>	O-O	<p>This element includes either a citation for or identifier of an associated service or dataset, along with the type of association, and optionally the activity that produced the dataset.</p> <p>MD_AggregateInformation requires either aggregateDataSetName/CI_Citation or aggregateDataSetIdentifier/MD_Identifier. associationType is mandatory, from DS_AssociationTypeCode. ISO code names in this list include {crossReference, largerWorkCitation, partOfSeamlessDatabase, source, stereoMate}. NAP adds {isComposedOf}. Due to interoperability problems with NAP identifiers different from ISO identifiers for the same codelist elements, USGIN recommends use of ISO codelists. See section 4.17.3 <i>Codelists</i> for details on codelist usage. The only currently recognized use for this aggregation would be to associate metadata for individual layers with metadata for a service that provides a collection of layers.</p> <p>If the related resource has an associated metadata record, USGIN recommended practice is to include the identifier for that metadata record in aggregateDataSetIdentifier/MD_Identifier. For related resources that do not have a metadata record, aggregateDataSetName/CI_Citation may be used; this element is optional if aggregateDataSetIdentifier has a value.</p> <p>For USGIN profile, this property, rather than MD_Metadata/parentIdentifier, should be used to indicate relationships between described resources.</p>
Resource service type (M) <code>identificationInfo/- SV_ServiceIdentification/- serviceType</code>	M-M	<p>Exactly one value required. USGIN mandates use of a LocalName value (<a href="http://schemas.opengis.net/iso/19139/20060504/srv/serviceMetadata.xsd">http://schemas.opengis.net/iso/19139/20060504/srv/serviceMetadata.xsd</a>) allows either localName or ScopedName). There is not as yet a standard registry of service types and identifiers that can serve as an authority for serviceTypes. An interim list of service types and identifiers is included in section 7.1 ServiceType (with the ad hoc codespace URI '<a href="http://resources.usgin.org/registry/serviceType201001">http://resources.usgin.org/registry/serviceType201001</a>'). Valid values for OGC services are {WMS, WFS, WCS, CSW, ...}</p> <p>Example:</p> <pre>&lt;srv:serviceType&gt;   &lt;gco:LocalName codeSpace=     "http://resources.usgin.org/registry/serviceType201001"&gt;WMS&lt;/gco:LocalName&gt; &lt;/srv:serviceType&gt;</pre>
Resource service type version (O) <code>identificationInfo/- SV_ServiceIdentification/- serviceTypeVersion</code>	O-C	Multiple serviceTypeVersion tags may not be implemented in some harvesting server applications - USGIN recommends a reverse chronological order for supported versions. Constraint: if various versions are available, it is mandatory to list versions that are supported. Default is oldest version of service.

<b>ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata</b>	<b>NAP-USGIN M/C/O</b>	<b>Comments on SV_ServiceIdentification</b>
Resource service access properties (O) <code>identificationInfo/- SV_ServiceIdentification/- accessProperties</code>	O-O	Optional MD_StandardOrderProcess element to provide information on the availability of the service which include: fees, available date and time, ordering instructions, turnaround. Ordering instructions and turnaround are not applicable to web services.
Resource service restrictions (O) <code>identificationInfo/- SV_ServiceIdentification/- restrictions</code>	O-X	Not used by USGIN; use <code>resourceConstraints</code> as per NAP.
Keywords (O) <code>identificationInfo/- SV_ServiceIdentification/- keywords</code>	O-X	Not used by USGIN; use <code>descriptiveKeywords</code> as per NAP
Resource service content extent (O) <code>identificationInfo/- SV_ServiceIdentification/- extent/EX_Extent</code>	C-C	Defines the spatial (horizontal and vertical) and temporal region to which the content of the resource applies. For USGIN, the spatial extent is a rectangle that bounds the geographic extent to which resource content applies. Best Practice for USGIN is to include an extent for any resource with content related to some geographic or temporal location. For geoscience resources, the temporal extent may be expressed using time ordinal eras from a geologic time scale if the resource is related to some particular geologic time.  USGIN specifies <code>count(description + geographicElement + temporalElement) &gt;0</code>
Resource service content extent description () <code>identificationInfo/- SV_ServiceIdentification/- extent/EX_Extent/description</code>	C-C	Free text that describes the spatial and temporal extent of the dataset. USGIN specifies that <code>description</code> is mandatory if a <code>geographicElement</code> or <code>temporalElement</code> is not provided. Note that if geographic place names are used to express the geographic extent, USGIN profile specifies that these should be encoded using keyword with keyword type code = 'place'. Geographic names may be duplicated in the <code>EX_Extent/description</code> .
Resource service content extent bounding box () <code>identificationInfo/- SV_ServiceIdentification/- extent/EX_Extent/- geographicElement/- EX_GeographicBoundingBox</code>	O-C	USGIN profile requires that if an <code>EX_Extent/geographicElement</code> is supplied, it include a geographic bounding box with bounding latitude and longitude expressed using WGS 84 decimal degrees.  The corner coordinates for the geographic bounding box must not coincide in one point, because this may result in fatal errors with some CSW implementations. Point locations must thus be represented as tiny rectangles. USGIN recommended practice is to place the actual point location in the lower left corner of the rectangle.

ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata	NAP-USGIN M/C/O	Comments on SV_ServiceIdentification
Resource service content extent geographic description ()  identificationInfo/- SV_ServiceIdentification/- extent/EX_Extent/geographic- Element/EX_Geographic- Description	C-X	Not used by USGIN profile, use keyword with type code = 'place'. This ISO19115 element provides an MD_Identifier element that identifies a geographic location by name. MD_Identifier provides an authority/CI_Citation that specifies the authority for a location name, and a code, which is a text string identifying the location. For the purposes of USGIN metadata, this information should be encoded using keywords, for which the MD_KeywordTypeCode = 'place'; the thesaurus/CI_Citation has the same content as EX_GeographicDescription/authority/CI_Citation, and the keyword is the same as the EX_GeographicDescription/code.
Resource service content extent bounding polygon ()  identificationInfo/- SV_ServiceIdentification/- extent/EX_Extent/- geographicElement/- EX_BoundingPolygon	C-X	To improve interoperability, USGIN mandates use of Geographic Bounding Box; bounding polygons may be present, but may be ignored by harvesters.
Resource service temporal extent (O)  identificationInfo/- SV_ServiceIdentification/- extent/EX_Extent/temporal- Element/EX_TemporalExtent/- extent/TimePeriod	O-O	Property contains information about temporal extent to which resource is applicable. For many geoscience resources, this would be the geologic time period(s) to which the resource applies. Although the ISO19139 xml schema allows temporal extents to be instants, intervals, or ordered eras, USGIN mandates use of only TimePeriod for temporal extent in order to make metadata interoperable. USGIN mandates that values for beginPosition@frame and endPosition@frame must be populated. The default frame property value is "#ISO-8601", for standard calendar date and time. For geologic time extents, USGIN requires the values for beginPosition@frame and endPosition@frame to be populated using numeric time coordinates in Ma, measured positive increasing older with an origin at 1950 CE (see <i>Temporal extents</i> ). The default frame attribute value for geologic time coordinates is "urn:cgi:trs:CGI:StandardGeologicTimeMa". See section 4.21, below.
Resource service spatio-temporal extent (O)  identificationInfo/- SV_ServiceIdentification/- extent/EX_Extent/- temporalElement/- EX_SpatialTemporalExtent/	O-X	Although use of EX_SpatialTemporalExtent is allowed by ISO19139 and NAP, USGIN best practice is to encode space time location with EX_TemporalExtent and EX_GeographicBoundingBox. Other optional extent elements may be included, but they may be ignored by client implementations processing the metadata document.

<b>ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata</b>	<b>NAP-USGIN M/C/O</b>	<b>Comments on SV_ServiceIdentification</b>
Resource service vertical extent (O)  <code>identificationInfo/- SV_ServiceIdentification/- extent/EX_Extent/- verticalElement/- EX_VerticalExtent</code>	O-O	Vertical extent is used to provide elevation location for resources that have an explicit vertical location. Most common example will be samples related to vertical location in a borehole. The borehole trace is the vertical CRS within which the sample will be located, typically using coordinates measured in linear distance from the collar (or ground level, or Kelly bushing) of the borehole.  <code>EX_VerticalExtent</code> has <code>minimumValue</code> , <code>maximumValue</code> that are real numbers, and a <code>verticalCRS</code> <code>verticalCRS</code> has (minimally) an <code>xlink:href</code> attribute which references an EPSG registry code ( <a href="http://www.epsg-registry.org/">http://www.epsg-registry.org/</a> ). The default VerticalCRS code is for the World mean sea level (MSL) in meters: "urn:ogc:def:crs:EPSG::5714"
Coupled Resource ()  <code>identificationInfo/- SV_ServiceIdentification/- coupledResource</code>	O-O	This element correlates operations (identified by <code>operationName</code> ) with datasets (identified by <code>identifier</code> ). For logical consistency, and <code>SV_coupledResource/identifier</code> values should be equal to <code>MD_DataIdentification/citation/CI_Citation/identifier/MD_Identifier/code</code> for a dataset that is the target of a <code>SV_ServiceIdentification/operatesOn</code> element (either in an inline <code>MD_DataIdentification/citation../code</code> element, or a <code>@uuidref</code> attribute). This element is necessary to implement the many-to-many relationship between data sources and operations in a single service.
Coupled Resource operation name (M)  <code>identificationInfo/- SV_ServiceIdentification/- coupledResource/- SV_CoupledResource/- operationName</code>	M-M	String, the name of the service operation: GetMap, GetFeature, etc. There is no internal check in the metadata record that the given operation name is valid.
Coupled Resource identifier (M)  <code>identificationInfo/- SV_ServiceIdentification/- coupledResource/- SV_CoupledResource/identifier</code>	M-M	Identifier of a given tightly coupled dataset. Equal to <code>MD_DataIdentification/citation/CI_Citation/identifier/MD_Identifier/code</code> for a dataset that is the target of a <code>SV_ServiceIdentification/-operatesOn</code> element (either in an inline <code>MD_DataIdentification/citation../code</code> element, or a <code>@uuidref</code> attribute).
Coupled Resource scoped name (X)  <code>identificationInfo/- SV_ServiceIdentification/- coupledResource/- SV_CoupledResource/ScopedName</code>	X-O	OGC 07-045 application profile for ISO metadata using CSW 2.0.2 extends <code>SV_CoupledResource</code> with a <code>ScopedName</code> , defined as a scoped identifier of the resource in the context of the given service instance (e.g. layer name or featureTypeName). This is necessary for users to generate service requests (like GetMap or GetFeature) based on ISO service metadata.

<b>ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata</b>	<b>NAP-USGIN M/C/O</b>	<b>Comments on SV_ServiceIdentification</b>
Service coupling type (M)  <code>identificationInfo/- SV_ServiceIdentification/- couplingType</code>	M-M	<p>Type of coupling between service and associated data (if exists) - "Qualitative information on the tightness with which the service and the associated data are coupled." NAP. NAP uses the napSV_CouplingType codelist.</p> <p>According to ISO:</p> <ul style="list-style-type: none"> <li>• loose - service instance is loosely coupled with a data instance, i.e. no MD_DataIdentification class has to be described (ISO 19119).</li> <li>• mixed - service instance is mixed coupled with a data instance, i.e. MD_DataIdentification describes the associated data instance and additionally the service instance might work with other external data instances (ISO 19119 / ISO 19115).</li> <li>• tight - service instance is tightly coupled with a data instance, i.e. MD_DataIdentification class MUST be described. (ISO 19119 / ISO 19115)</li> </ul> <p>According to OGC:</p> <ul style="list-style-type: none"> <li>• loose - A service instance that is not associated with a specific dataset or datasetcollection. Looselycoupled services may have an association with data types through the service type definition. Dataset metadata need not be provided in the service metadata.</li> <li>• mixed - A service that is associated with a specific dataset or datasetcollection. Service metadata shall describe both the service and the geographic dataset, the latter being defined in accordance with ISO 19115. But this service instance can also be used with external data (i.e. data that is not described by the operatesOn association).</li> <li>• tight - An information resource that is hosted on a specific set of hardware and accessible over a network.</li> </ul>
Service operations (M)  <code>identificationInfo/- SV_ServiceIdentification/- containsOperations</code>	M-M	<p>"This element is intended for use to describe the operations performed by the service". However, the ISO19119 model includes insufficient detail to completely describe all parameters necessary to automate connection to a service. Widely used xml formats exist to describe service function, including OGC getCapabilities.xml and W3C Web Service Description Language (WSDL). Following INSPIRE guidelines, USGIN does not use the srv:containsOperations. It is a required element in the ISO19139 (20060504) srv.xsd xml schema, so it should be populated with the attribute gco:nilReason='Missing'. Although this is xml schema valid, it may break some existing client implementations; we need to work with developers to correct these problems.</p> <p>For information describing function of the service see distributionInfo/..transferOptions/..online/..linkage where online/..name = 'serviceDescription'; this should provide a URL for getCapabilities or a WSDL document, depending on the service type.</p>

<b>ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata</b>	<b>NAP-USGIN M/C/O</b>	<b>Comments on SV_ServiceIdentification</b>
Service operation name (M) <code>identificationInfo/- SV_ServiceIdentification/- containsOperations/- SV_OperationMetadata/- operationName</code>	M-X	not used by this profile
Service operation distributed computing platforms (M) <code>identificationInfo/- SV_ServiceIdentification/- containsOperations/- SV_OperationMetadata/DCP</code>	M-X	not used by this profile
Service operation description (O) <code>identificationInfo/- SV_ServiceIdentification/- containsOperations/- SV_OperationMetadata/- operationDescription</code>	O-X	not used by this profile
Service operation invocation name (O) <code>identificationInfo/- SV_ServiceIdentification/- containsOperations/- SV_OperationMetadata/- invocationName</code>	O-X	not used by this profile
Service operation online resource (M) <code>identificationInfo/- SV_ServiceIdentification/- containsOperations/- SV_OperationMetadata/- connectpoint</code>	M-X	not used by this profile; see <code>distributionInfo/.../transferOptions/.../onLine</code>

ISO 19115 and 19119 (M/C/O) xPath from MD_Metadata	NAP-USGIN M/C/O	Comments on SV_ServiceIdentification
Service operates on (O)  identificationInfo/- SV_ServiceIdentification/- operatesOn	O-C	<p>"Provides information on the datasets that the service operates on." ISO 19119.</p> <p>With tightly coupled references, <code>operatesOn</code> must include a map or feature layer's valid <code>MD_DataIdentification</code> element inline or a <code>@uuidref</code> attribute value that explicitly links to an existing dataset metadata record that describes the same layer.</p> <p>Mandatory if metadata for datasets on which the service operates are available. The value of <code>SV_ServiceIdentification/operatesOn@uuidref</code> or <code>SV_ServiceIdentification/operatesOn/MD_DataIdentification/citation/CI_Citation/identifier/MD_Identifier/code</code> must correspond to one of the <code>SV_ServiceIdentification/coupledResource/MD_CoupledResource/identifier</code> values. If the metadata record for the coupled dataset is a separate gmd:MD_Metadata record, the service described in the service metadata record should be identified as a distribution for the dataset.</p> <p>Explicitly linked reference example:</p> <pre>&lt;srv:operatesOn   uuidref="13ce1e84-c887-4fd8-b888-8d021b1fa4c2"   xlink:href="http://resources.azgs.org/geonetwork/srv/en/metadata.show?id=8717"   xlink:title="azgs:azgeochron" /&gt;</pre>

224     **3.4 USGIN specification constraints and recommendations**

225     Summary of constraints to ISO19115, ISO119, ISO19139, and NAP (INCITS 453) introduced by USGIN  
226     profile.

- 227
  - Require fileIdentifier
  - Require hierarchyLevelName
  - Require metadataStandardName and metadataStandardVersion
  - Require DatasetURI if there is one
  - Allow multiple distributor-format-transfer option combinations for a single resource.
  - Representation of aggregated resources done using `identificationInfo/MD_DataIdentification/aggregationInfo/MD_AggregateInformation`, not `MD_Metadata/parentIdentifier`
  - Geographic extent must be represented by bounding box in WGS 84 decimal degrees
  - Vertical resource extent uses CRS referenced to mean sea level, meters, measured positive up.
  - Resolution is expressed using `equivalentScale/MD_RepresentativeFraction/denominator`
  - Language for resource must be specified
  - Introduces recommended distribution format codes (Table 6) for `distributionFormat/name` introduced for categorization of physical resources, like a book, rock sample, paper document. USGIN recommends use of MIME types if they are registered for the format, and provides a recommended syntax for file formats that do not have corresponding MIME types.
  - Introduces a ServiceType codelist recommended for use population the `srv:ServiceType` (Table 11)
  - Introduces recommended `CI_OnlineResource/name` strings (Table 12) to identify special online resources link icons for branding.

247     As a convention for using controlled vocabularies on characterString elements without the overhead of a  
248     new namespace and XML schema, USGIN proposes that use a controlled vocabulary be indicated by us-  
249     ing xsi:type on the gco:characterString element to make the type gml:CodeType, which then requires a  
250     codeSpace attribute (see 4.14.2-Non digital resources and 7.2-Linkage name conventions). This codeS-  
251     pace should be the URI for the vocabulary used, with the implication that the CharacterString element  
252     value will then be an identifier from that vocabulary. This essentially turns the CharacterString into a GML  
253     scoped name or gco:LocalName element.

254     **3.5 USGIN specification extensions**

255     Summary of extensions to ISO19115, ISO119, ISO19139, and NAP (INCITS 453) introduced by USGIN  
256     profile.

257     Allow use of `identificationInfo/SV_ServiceIdentification/coupledResource/-`  
258     `SV_CoupledResource/ScopedName` defined by OGC 07-045 ISO profile for CSW 2.0.2, use to provide WMS  
259     layer names or WFS feature names for service requests.

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## 260 4 Usage notes for Metadata Elements

261 This section presents additional information and discussion to supplement that in Table 1.

### 262 4.1 Metadata file identifier

263 `MD_Metadata/fileIdentifier` is unique identifier for the metadata file. Some metadata profiles suggest  
264 that the metadata field UUID should be the same as the UUID for the described resource. This seems  
265 problematic. In the USGIN scheme, the metadata record is considered an independently identified re-  
266 source from the resource it describes. The described resource identifier is the Unique resource identifier  
267 (`DatasetURI`, 4.8, below).

### 268 4.2 Metadata hierarchy

269 The ISO19115 specification (especially Annex H) discusses the use of metadata hierarchy, in which a re-  
270 source may inherit metadata properties from parent metadata records in the hierarchy. For example a da-  
271 set in a dataset series might inherit all of the metadata content from the parent dataset series metadata  
272 record, except for dataset-specific data quality metadata. The linkage would be made through  
273 `MD_Metadata/parentIdentifier`. This kind of nesting seems problematic in a CSW environment in terms  
274 of how queries could be constructed, and the kind of client behavior that would be required to navigate  
275 the parent links to acquire 'inherited' properties from 'parent' records. For catalog service purposes, US-  
276 GIN mandates that in metadata records returned by services, all inherited properties in such a hierarchy  
277 should be included explicitly in the metadata document, as opposed to implicitly through the `parentIden-`  
278 `tifier` link. Internal document links may be used where allowed by the xml schema for identified ele-  
279 ments repeated in a single response document.

### 280 4.3 Metadata Contact vs. Resource Citation vs. Resource Contact

281 There are various locations to store contact information within an ISO 19139 metadata record. Here is a  
282 summary of the required contact properties and their significance as it pertains to the USGIN Profile.

- 283 • `MD_Metadata/contact/CI_ResponsibleParty` or "metadata point of contact" describes how to con-  
284 tact the party responsible for the **metadata** record to allow users to report errors, updates to me-  
285 tadata etc. The mandatory `CI_RoleCode` is set to "pointOfContact".
- 286 • `MD_Metadata/identificationInfo/[MD_DataIdentification || SV_ServiceIdentification]/-`  
287 `citation/CI_Citation/citedResponsibleParty/CI_ResponsibleParty` provides information to  
288 identify the **intellectual origin** of the content in the described resource. This is straight forward  
289 when citing library resources (books, journals, etc.) but less clear when defining the intellectual  
290 origin of, for example, physical samples. The mandatory `CI_RoleCode` is set to one of the ISO  
291 codelist values {custodian, owner, distributor, originator, pointOfContact,  
292 principalInvestigator, publisher, author}. NAP codelist values {collaborator,  
293 editor, rights holder} may also apply.
- 294 • `MD_Metadata/identificationInfo/[MD_DataIdentification || SV_ServiceIdentification]/-`  
295 `pointOfContact/CI_ResponsibleParty` or "resource point of contact" contains information on who  
296 to contact to **access** the described resource. The mandatory `CI_RoleCode` is set to one of the ISO  
297 codelist values {resourceProvider, custodian, owner, user, distributor, ori-  
298 ginator, pointOfContact, principalInvestigator, processor, publisher,  
299 author}. NAP codelist values {collaborator, editor, mediator, rights holder}  
300 may also apply.

301 Optional contact information in the distribution section of the metadata provides point of contact for indi-  
302 vidual distribution processes.

303 **4.4 Resource Title**

304 Resource titles should provide sufficient information to distinguish the resource for other similar re-  
305 sources. They are not required to be globally unique, but users will be presented only with the resource  
306 title in CSW brief response documents. It is thus a disservice to have significant duplication of title strings.

307 **4.5 Resource Abstract**

308 Ideally the resource abstract provides a succinct summary of the content of the resource, the purpose for  
309 which it was originally created, some indication of important quality parameters to help evaluate fitness for  
310 other purposes, any significant constraints on use of the resource, and a list of distribution options.

311 **4.6 Resource Type**

312 The ISO 19115 `MD_Metadata/hierarchyLevel` property provides a high level categorization of resource  
313 types. The European INSPIRE Implementing Rules (MD\_IR\_and\_ISO\_20090218) proscribes the code list  
314 for the first hierarchyLevel xml element in an MD\_Metadata document to be one of {dataset, ser-  
315 vice, series}, or the metadata set will be considered out of scope for the directive. Thus, metadata  
316 meant to be utilized by INSPIRE catalogs must follow this rule. The full ISO MD\_ScopeCode list has a  
317 wider (and more useful) variety of resource categories; one or more hierarchyLevel elements using these  
318 codes could follow the first one with an INSPIRE-valid code in the first element to maintain INSPIRE  
319 compliance.

320 Table 1 in this document includes a more geoscience-domain-specific list of resource types, and values  
321 from this list should be used in one or more `hierarchyLevelName` elements. To enable resource-category-  
322 type searches to find narrower subcategories without complex query processing, `hierarchyLevelName`  
323 elements for the resource type and all broader/more general resource type categories should be included.  
324 The hierarchical categorization of the resources is encoded with the most specific category first, and pro-  
325 gressively broader categories listed subsequently. Thus, harvesters that only take the first `hierarchy-`  
326 `LevelName` element will get the most specific value. For example, if the resource is a photograph:

327 `<gmd:hierarchyLevelName>`  
328     `<gco:CharacterString>Photograph</gco:CharacterString>`  
329 `</gmd:hierarchyLevelName>`  
330 `<gmd:hierarchyLevelName>`  
331     `<gco:CharacterString>StillImage</gco:CharacterString>`  
332 `</gmd:hierarchyLevelName>`  
333 `<gmd:hierarchyLevelName>`  
334     `<gco:CharacterString>Image</gco:CharacterString>`  
335 `</gmd:hierarchyLevelName>`  
336 `<gmd:hierarchyLevelName>`  
337     `<gco:CharacterString>Document</gco:CharacterString>`  
338 `</gmd:hierarchyLevelName>`

339 Note that the distinction of resource type and format is not always clear. Table 1 attempts to define re-  
340 source types that are not specifically bound to a particular format, but are defined based on the kind of  
341 content. Format is interpreted as relating to specific approaches to encoding content and committing it to  
342 some sort of media.

343 **4.7 Resource Locator**

344 URL's for online access to resources are encoded in USGIN ISO 19139 metadata documents in the ele-  
345 ment `MD_Distribution/transferOptions/MD_DigitalTransferOptions/online/CI_OnlineResource`. Con-  
346 sistent use of this rule eliminates ambiguity on where to locate the URL to access a resource. Work still  
347 remains to develop conventions for use of the `CI_OnlineResource` subelements `protocol`, `application-`  
348 `Profile`, `name`, `description`, and `function` to enable metadata clients to reliably access referenced re-  
349 sources.

350 **4.8 Unique Resource Identifier**

351 The MD\_Metadata/DataSetURI property should be a globally unique identifier for the described resource.  
352 The protocol used for this identifier is not proscribed by the USGIN Profile, but if it does not have a known  
353 resolution service, the capabilities document for a CSW service providing the metadata should have at  
354 least a text explanation of how to resolve URI's used by the service. Protocols with available resolvers in-  
355 clude http (use the WWW DNS system) and doi (<http://dx.doi.org/>). Some authorities using urn: protocols  
356 are also implementing or have resolver services in place.

357 **4.9 Browse Graphics**

358 NAP profile (INCITS 453-2009) defines napMD\_FileFormatCode\_PropertyType using the ISO19139  
359 extension procedure; including this as an xsi>Type attribute on gmd:fileType adds codespace and code-  
360 ListValue to the gmd:fileType element, but this causes validation problems with imported xml schema in  
361 the schema defining the new property type. USGIN mandates use of napMD\_FileFormatCode list  
362 ([http://www.fgdc.gov/nap/metadata/register/codelists.html#IC\\_115](http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_115)) simply by using the format name  
363 strings in that codelist as the characterString values in gmd:FileType.

```
364 <gmd:MD_BrowseGraphic>
365   <gmd:fileName>
366     <gco:CharacterString>http://publicdocs.mnr.gov.on.ca/View.asp?-
367           Document\_ID=9632&Attachment\_ID=18204</gco:CharacterString>
368   </gmd:fileName>
369   <gmd:fileDescription>
370     <gco:CharacterString>Base Map from OMNR</gco:CharacterString>
371   </gmd:fileDescription>
372   <gmd:fileType>
373     <!-- this is a napMD_FileFormatCode_PropertyType codelist value -->
374     <gco:CharacterString>jpg</gco:CharacterString>
375   </gmd:fileType>
376 </gmd:MD_BrowseGraphic>
```

377 *Code example 1. Encoding url, display name and file type for browse graphic.*

378 **4.10 Resolution and equivalentScale**

379 For spatial datasets, some indication of the resolution of the data is very useful for evaluating fitness for  
380 use. From a data perspective, resolution is specified by a distance that represents the smallest length be-  
381 tween two resolvable points in the dataset. For a grid or coverage, this would be the average distance be-  
382 tween sample points. From data portrayal perspective, an equivalentScale is reported, representing the  
383 scale at which the portrayal was intended to be viewed. To calculate equivalentScale given a resolution  
384 distance, recommended practice is to divide the resolution distance in meters by 0.0005. This assumes  
385 that the smallest distance resolvable in a map display for human usage is 0.5 mm.

386 **4.11 Resource Language**

387 USGIN metadata is assumed to use American English and by default documents should be returned.  
388 Other localizations may be implemented, but in order to avoid complexity with PT\_Text and LocalizedChar-  
389 acterString, USGIN recommended practice is to implement services for different languages as different  
390 services, each of which serves CharacterStrings in the language specified by the MD\_Metadata/language  
391 element.

392 **4.12 Encoding of Vertical Extents**

393 A vertical extent must specify the vertical coordinate reference system (CRS). In many cases this will be  
394 reference to Earth mean sea level or some similar datum, but for boreholes, vertical referencing is defined  
395 relative to a borehole trace, with the datum at the ground surface (borehole collar, or Kelly bushing). For  
396 interoperability, vertical extents should be converted to meters measured vertically positive from mean

397 sea level. This puts the onus to convert down hole coordinates for deviated holes on the metadata pro-  
398 vider. Users searching for resources specific to some depth below the surface will have to convert this to  
399 an elevation relative to sea level in order to query the CSW providing this metadata.

400 EX\_VericalElement has `minimumValue`, `maximumValue` that are real numbers, and a `verticalCRS`, which  
401 has (minimally) an `xlink:href` attribute which references an EPSG registry code (<http://www.epsg-registry.org/>). For interoperability, USGIN mandates use of a `VerticalCRS` with origin at World mean sea  
402 level (MSL), with elevations measured up positive in meters; the URI for this VerticalCRS is  
403 "urn:ogc:def:crs:EPSG::5714"

405 Other vertical extent elements may be included referenced to ground surface, Kelly bushing or other ref-  
406 erence systems. These will be useful only is as far as they are understood by client software. The vertical  
407 CRS must be specified by an `SC_VericalCRS` element, which has (minimally):

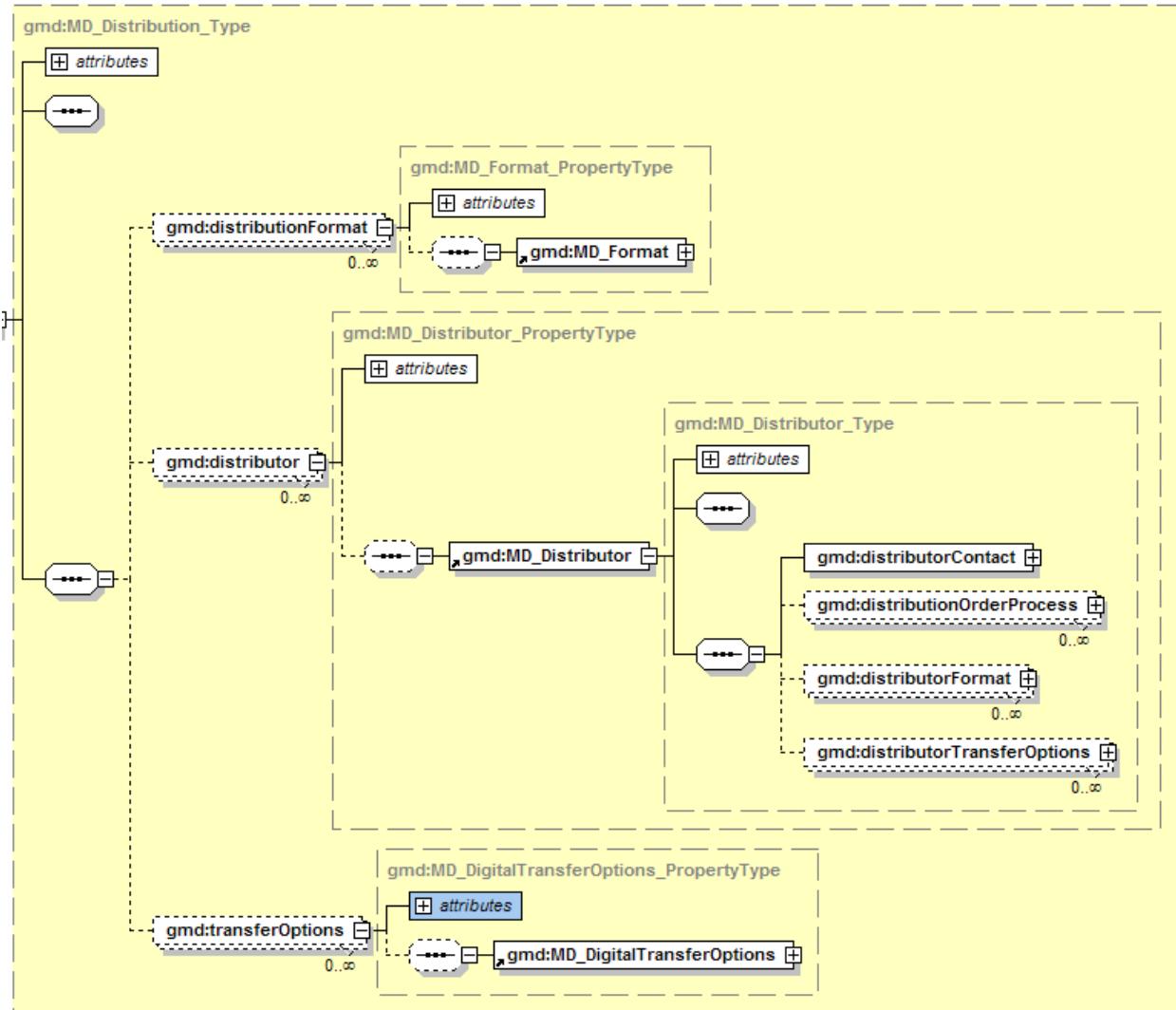
- 408
  - a `name/RS_Identifier`,
  - a `scope characterString`,
  - exactly one `datum/CD_VerticalDatum`, which requires a `scope CharacterString`, and for USGIN an  
411 `anchorDefinition character string`
  - exactly one `coordinateSystem/CS_VerticalCS`, which has a `name/RS_Identifier`, and one axis  
413 with `axisAbbrev`, `axisDirection/CS_AxisDirection`, and `axisUnitID/UnitOfMeasure`.

## 414 **4.13 Use of MD\_Distribution and MD\_Distributor**

415 The ISO19115 model provides two possible paths for specifying information about how a resource is dis-  
416 tributed, i.e. how a user can access the resource. The `MD_Distribution` element may have 0 to many  
417 `distributionFormat`, `distributor`, and `transferOptions` child elements (see Figure 1). On the other  
418 hand, each of the `distributor` child elements may have 0 to many `distributorFormat` and `distributor-`  
419 `TransferOption` elements. Several major existing applications that consume ISO19139 xml metadata files  
420 (ESRI GeoPortal Toolkit and GeoNetwork) are configured out of the box to expect format and transfer op-  
421 tion information to be at the `MD_Distribution/distributionFormat` and `MD_Distribution/transferOptions`  
422 path. This works fine as long as there are not different format or transfer options from different distribu-  
423 tors, or different transferOptions for different formats. In these cases, a binding between distributor, for-  
424 mat, and transfer options necessitates use of the `MD_Distribution/distributor/MD_Distributor` path to  
425 `distributorFormat` and `distributorTransferOptions` (and `distributionOrderProcess`) information that  
426 works together.

427 In order to accommodate both existing applications that utilize content in the `MD_Distribution/dis-`  
428 `dributionFormat` and `MD_Distribution/transferOptions` elements, and situations that require binding be-  
429 tween distributor, order process, format, and transfer options, the USGIN profile mandates that if multiple  
430 `MD_Distribution/distributionFormat` or `MD_Distribution/transferOptions` elements are included in a  
431 document, all formats must be available via all the specified transfer options, and the content of these  
432 elements should be included in line. If multiple `MD_Distribution/distributor` elements are present, with-  
433 out child `MD_Distributor/distributorFormat` or `MD_Distributor/distributorTransferOptions` elements,  
434 then all formats and transfer options are available from all distributors.

435 To specify different bindings between distributor, order process, format, and transfer options, a separate  
436 `MD_Distribution/distributor/MD_Distributor` instance is included for each binding. One  
437 `MD_Distributor/distributorFormat` and one `MD_Distributor/distributorTransferOptions` element  
438 should be included for applications that expect content in these elements, and the format and transfer op-  
439 tions specified by these elements should apply to the first `distributor/MD_Distributor` element. Re-  
440 peated `CI_ResponsibleParty`, `MD_StandardOrderProcess`, `MD_Format` or `MD_DigitalTransferOption`  
441 elements in the `distributor/MD_Distributor` elements should be specified by reference (`xlink:href` to `gml:id`  
442 of first occurrence of the element within the document). The implication is that the `distributionOrderPro-`  
443 `cess/ MD_StandardOrderProcess`, `distributorFormat/MD_Format`, and `distributorTransferOptions/-`  
444 `MD_DigitalTransferOptions` child elements of a single `MD_Distributor` are all compatible with each other.  
445 USGIN differs from NAP by allowing multiple `distributor` elements, but since this is schema valid under  
446 ISO19139 xml schema, and the extra elements can be ignored by applications expecting only a single  
447 `distributor` element, this should not cause incompatibility.



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450

*Figure 1. gmd:MD\_Distribution\_Type diagram*

## 4.14 Distribution Format

452 If the resource is a physical resource, like a book, rock sample, paper document, the `distribu-`  
 453 `tion/./MD_Format/name` is mandatory, and USGIN recommends use of terms from `distribution format`  
 454 codelist (see Table 6). Note that format is partially orthogonal from resource type (Table 1). A document  
 455 may be available in various digital (pdf, tiff, doc, txt) or non-digital (book, loose sheets) formats

### 4.14.1 Digital resources

457 The format vocabulary needs to be designed to work in the framework of the `distribution/./-`  
 458 `MD_DigitalTransferOptions`, which provides protocol, applicationProfile, name, and function subelements  
 459 for online resources, and medium name and `MD_MediumFormatCode` for offline resources. For digital re-  
 460 sources it provides a place to record file-format information that does not have any other obvious home.  
 461 Examples in INCITS 453, INSPIRE 19115/19, and ANZLIC 2007 populate `MD_Format/name` with values  
 462 like 'ESRI ARC/INFO Coverage', 'ESRI shapefile', 'ESRI ARC/INFO Export e00', and 'MapInfo MID/MIF'  
 463 all pertain to digital resources. If a MIME format (<http://www.iana.org/assignments/media-types/>) is de-  
 464 fined for a digital file format, the MIME media-type code should be used. If no appropriate MIME type is

465 registered with IANA, USGIN mandates that the distribution format for digital resources should specify the  
466 file format using a pattern that includes vendor, application name, and file extension.

467 Pattern for digital resources: [ vendor : applicationName ] / fileExtension. The vendor and applica-  
468 tion names may not be applicable, and could be omitted, but the '/' and file extension should always be  
469 present. If the format consists of a single file, the file extension is a three letter file-type abbreviation as-  
470 signed by the vendor. If the format consists of a package of files (e.g. an ArcGIS file geodatabase), the  
471 file extension is a name that in most cases should be obvious from vendor usage. The accompanying  
472 MD\_Format/version value should indicate the version of application software if the format is specific to  
473 some version.

474 Service metadata includes distribution information as well as dataset metadata. OGC services commonly  
475 allow specification of different output formats, and the formats offered are listed in the OGC capabilities  
476 document. It is tempting to list the output formats offered by the service in `distributioninfo` as a collec-  
477 tion of `distributionFormat/MD_Format` elements, but this is only useful if all formats are applicable to all  
478 service requests, or if the mapping between requests and formats is obvious. Version 2.4 of GeoNetwork  
479 harvests OGC getCapabilities documents, and puts the format information in a collection of  
480 `srv:connectPoint/CI_OnlineResource/protocol` elements, with `connectPoint` elements for each format  
481 available on each request. ISO 19119 defines `connectPoint` as 'handle for accessing the service inter-  
482 face'. Using this to encode different available output formats seems a bit of a stretch. Because of the  
483 USGIN decision that operation metadata is best conveyed to metadata consumers by providing a link to a  
484 service-specific description file (getCapabilities or WSDL), the `SV_OperationMetadata` element is not used  
485 by the USGIN profile. Thus the recommendation is to list the output formats offered by the service in `distribu-`  
486 `tioninfo` as a collection of `distributionFormat/MD_Format` elements if all formats are applicable to  
487 all service requests, or if the mapping between requests and formats is obvious. Encoding of the format  
488 name should use whatever convention is used by the service to specify that output format in requests  
489 made to the service.

490 *Table 5. Example format strings for digital files. These are to be used only if an appropriate MIME type is  
491 not defined.*

ESRI:ARCINFO/Coverage
/shapefile
ESRI:ARCINFO/e00
PitneyBowes:MapInfo/mid
ESRI:ArcGIS/mdb
ESRI:ArcGIS/fileGeodatabase
Microsoft:Access/mdb

## 492 4.14.2 Non digital resources

493 The `MD_Format` element is the only format information for resources that do not have digital transfer op-  
494 tions, and USGIN proposes Table 6 as a vocabulary for use to specify format of non-digital resources. Al-  
495 though this codelist could be implemented as a schema extension, for the time being we propose to use it  
496 as a controlled vocabulary specified by profile and practice, rather than schema. Use of such controlled  
497 vocabulary can be indicated by using `xsi:type` on the `gco:characterString` element to make the type  
498 `gml:CodeType`, which then requires a `codeSpace` attribute. The distribution format Identifier from Table 6  
499 should be used as the element value. Example encoding:

```
500 <gco:CharacterString xsi:type="gml:CodeType"  
501   codeSpace="http://resources.usgin.org/registry/distributionFormatNames201001">sample:core</gco:  
502   CharacterString>
```

503

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*Table 6. USGIN Distribution formats for non digital resources. URI for this codelist is <http://resources.usgin.org/registry/distributionFormatNames201001>*

Identifier	Name	Parent format	Scope
physicalArtifact	Physical artifact		described resource is a physical object
sample	Sample	physicalArtifact	Use for uncategorized sample. A
sample:core	Core	sample	Cylindrical rock sample extracted from Earth with a coring drill
sample:cuttings	Cuttings	sample	Small rock fragments recovered from drilling process as sample of material being drilled
sample:fluid	Fluid	sample	Sample of a fluid
sample:handSample	Hand sample	sample	Single piece or pieces of material.
hardCopy	Hard copy manuscript	physicalArtifact	A physical copy of a document on paper, film, or other similar material.
hardCopy:book	Book	hardcopy	Manuscript printed on paper, bound into a single volume
hardCopy:manuscript	Manuscript	hardCopy	Other printed or written representation on physical media, usually paper or mylar, includes unbound books, index cards, loose notes, file folders of papers
hardCopy:printedImage	Printed image	hardCopy	Image on paper or other opaque or semi-opaque media.
printedImage:paperMap	Paper map	printedImage	Map image on a single sheet
hardCopy:filmImage	Film image	hardCopy	Image on film, viewed by passing light through the film. Includes single still images and collections of connected images for a movie.
fieldSite	Field site		resource is a station located on or in the Earth, generally of interest as a sampling site at which other resources were collected or originated.
tapeRecording	Tape recording		use for sound resources that are recorded on magnetic tape.

507

508

## 4.15 CI\_OnlineResource

509 For USGIN profile, each `distributor/MD_Distributor` is a binding between one or more transfer options  
 510 and the distributor formats that are available through that/those transfer options (`MD_DigitalTransfer-`  
 511 `Options/onLine/CI_OnlineResource` in particular). If different formats are available from the same distribu-  
 512 tor, but have different transfer options, these should be represented as different `distributor/-`  
 513 `MD_Distributor` instances.

514 In order to enable client applications to determine how to directly connect to a resource, there needs to be  
 515 agreement on what content is required in the `CI_OnlineResource` element, and how it will be encoded.

516 The linkage property provides a URL for accessing the resource. The role of the protocol, application-  
517 Profile, name and function properties is to provide sufficient additional information for a client application  
518 to automatically connect a user with the online resource. The description property may be used to pro-  
519 vide information about the online resource, and more usefully, to provide an explanation of how the other  
520 content of the CI\_OnlineResource element is to be used to access the resource.

521 The ESRI GeoPortal toolkit looks for the presence of MD\_Metadata/distributionInfo/MD\_Distribution/  
522 transferOptions/MD\_DigitalTransferOptions/online/CI\_OnlineResource/function/  
523 CI\_OnlineFunctionCode/@codeListValue attribute with a non-null value. Only one content type is allowed  
524 for each resource. The values must either be an integer between 1 and 10, or a string from the codelist  
525 (see Table 7). The value is made lower case, stripped of white space, and then converted to a numeric  
526 value ranging from 001 to 010 if its numeric, or compared to see if it starts with a value from the codelist.  
527 Thus 'live data', 'lIVe data', 'livE DataAnd maps ArcIMS image service' are all valid and would match 'li-  
528 vedata'. Note that this use of the codeListValue attribute is not consistent with its definition as an identifier  
529 for the codelist entry (see section 4.17.3 *Codelists*).

530 *Table 7. OnlineFunctionCode values from NAP (INCITS 453) and ESRI Geoportal toolkit v. 3.1. ISO co-*  
531 *delist terms are indicated by '(ISO)' after the code in column 1. ESRI content types and codes are from*  
532 *the GeoPortal Toolkit v3.1 User Guide (2007); correlation of these with NAP OnlineFunctionCodes is*  
533 *based on the user guide and interpretation by this profile.*

OnLine- FunctionCode	USGIN profile usage	ESRI resource types	ESRI code
browsing	CI_OnlineResource/linkage is a valid URL for a web application that enables user to explore and seek information about the resource from a Web browser		
browsing	Use case not documented by ESRI	application	006
browsing	Use case not documented by ESRI	geographicactivity	010
download	Use case not documented by ESRI. Infer that URL provides an ArcGIS layer file (or functionally similar file) with links to data and portrayal instructions.	mapfile	009
download (ISO)	CI_OnlineResource/linkage is a valid URL that will initiate transfer of data to the local system. ESRI GPT requires that file extension for file is one of .zip, .e00, .gz, .tgz, .dbf, .tar, .shp, .rar, .xls, .txt, .dwg, .dxf, .dgn	download, down- loadabledata	002
download (ISO)	ESRI GPT requires one of following file extensions: .gif, .jpg, .jpeg, .bmp, .pdf, .pmf, .tif, .tiff, .cal, .pct, .pict, .eps, .mxd, .av, .mpg, .mpeg, .wmv, .img, .rm.	staticmapimage	004
emailService (NAP)	USGIN not used; functionally equivalent to ISO 'information'. CI_OnlineResource/linkage is a valid URL that accesses instructions for connection to an email service providing the described resource content via emails		
fileAccess (NAP)	USGIN not used; functionally equivalent to ISO 'information'. CI_OnlineResource/linkage is a valid URL for direct retrieval of a file containing the described resource, typically through the use of http or ftp protocol (or their secure variants)		

OnLine-FunctionCode	USGIN profile usage	ESRI resource types	ESRI code
information (ISO)	CI_OnlineResource/linkage is a valid URL that will access a web page providing information about the resource content.	Information, other-document, document	005
offlineAccess (ISO)	CI_OnlineResource/linkage is a valid URL that will access a web page providing instructions for requesting the resource from the provider.	offlinedata, offlineAccess	003
order (ISO)	CI_OnlineResource/linkage is a valid URL that will access a web page to initiate an ordering process for obtaining the resource.	order, geographic-service	007
search (ISO)	CI_OnlineResource/linkage is a valid URL that will access a search interface for seeking out specific information content contained by resource, e.g. the metadata describes a database, and this linkage accesses a search interface to search the database	search, clearing-house	008
upload (NAP)	CI_OnlineResource/linkage is a valid URL for a web interface to transfer data from a local storage device or system to be included in the described resource.		
webMapService (NAP)	CI_OnlineResource/linkage is a valid URL for Web-based map request service, which may return custom georeferenced map images, streamed features, raster data, or surface data to a mapping client, e.g. ArcIMS, OCG WMS, WFS, WCS service	livedata	001
webService (NAP)	CI_OnlineResource/linkage is a valid URL that accesses a standard web service description document with instructions for the connection to a Web service (other than a Web map service) providing direct online access to the described resource. Example description document may be a Web Services Description Language (WSDL) file or OGC getCapabilities file.		001

534

## 535 4.16 Responsible parties and logos

536 Metadata should include a URL that locates a thumbnail logo for organizations related to the metadata  
 537 origination, the organization hosting the catalog that returned the metadata, the organization that origi-  
 538 nated the data, and the organization hosting online services that provide access to the data. The standard  
 539 place to put URL's in ISO19139 metadata is in the CI\_Contact/onlineResource/CI\_OnlineResource/-  
 540 linkage attribute. For URL's that indicate icon thumbnails, the CI\_OnlineResource/name should be 'icon'.  
 541 The metadata originator information should be in a MD\_Metadata/contact/CI\_ResponsibleParty element  
 542 with role code 'originator' to identify the original source of the metadata record, for which the  
 543 CI\_Contact./CI\_OnlineResource/linkage is a URL that points to an Icon for the metadata originator. This  
 544 Icon will be displayed in search results to credit the metadata originator. Metadata harvesters should  
 545 harvest and maintain this information so that the origin of metadata records can be credited.

546 The organization hosting the catalog that returned the metadata record should be specified in a  
 547 `MD_Metadata/contact/CI_ResponsibleParty` element with role code 'distributor', for which the `CI_Contact/`  
 548 `/CI_OnlineResource/linkage` is a URL that points to an icon for the metadata server hosting organization.  
 549 This information need not be harvested, because it will be replaced by information describing the harvesting  
 550 catalog service.

551 The organization that originated the data is specified by `MD_Metadata/identificationInfo/MD_Data-`  
 552 `Identification/citation/../CI_ResponsibleParty` with `RoleCode = 'originator'`, and  
 553 `/CI_OnlineResource/name='icon'`. This will distinguish the citation responsible party element containing the  
 554 icon linkage from `CI_ResponsibleParty` elements with `RoleCode='author'` or '`editor`', which would provide  
 555 an online linkage directly to the responsible party as specified by `CI_OnlineResource protocol, applica-`  
 556 `tionProfile, name, function, and description elements.`

557 The organization hosting a service providing online access to described data is specified by  
 558 `MD_Metadata/distributionInfo/MD_Distribution/distributor/MD_Distributor/distributorContact/-`  
 559 `CI_ResponsibleParty` with `RoleCode = 'resourceProvider'` or '`distributor`', and  
 560 `../CI_OnlineResource/name='icon'`. Because the cardinality of distributorContact responsible party and  
 561 online resources is 1, only one linkage can be provided for a distributor, and the metadata author must  
 562 decide whether that will be a link to an icon, or a link to a web site or other resource related to the distributor.  
 563

```

564 <gmd:contact>
565   <gmd:CI_ResponsibleParty>
566     <gmd:organisationName>
567       <gco:CharacterString>Arizona Geological Survey</gco:CharacterString>
568     </gmd:organisationName>
569     <gmd:contactInfo>
570       <gmd:CI_Contact>
571         <gmd:onlineResource>
572           <gmd:CI_OnlineResource>
573             <gmd:linkage>
574               <gmd:URL>http://www.azgs.az.gov/logo/metadata/azgs.png</gmd:URL>
575             </gmd:linkage>
576             <gmd:name>
577               <gco:CharacterString>icon</gco:CharacterString>
578             </gmd:name>
579             </gmd:CI_OnlineResource>
580           </gmd:onlineResource>
581         </gmd:CI_Contact>
582       </gmd:contactInfo>
583       <gmd:role>
584         <gmd:CI_RoleCode codeL-
585           ist="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\_19139\_Schemas/resources/Codelists/gmxCodeLists.xml#CI\_RoleCode">
586           codeListValue="originator">originator</gmd:CI_RoleCode>
587         </gmd:role>
588       </gmd:CI_ResponsibleParty>
589     </gmd:contact>
  
```

## 591 4.17 Extensions to CharacterString

### 592 4.17.1 Web extensions

593 ISO 19139 defines several extensions to `gco:CharacterString` in the `gmx` namespace. These are defined  
 594 as members of an XML substitution group for `gco:CharacterString`, and include `gmx:Anchor`,  
 595 `gmx:FileName`, and `gmx:MimeType`. `gmx:Anchor` is used for URL's linking to online web resources, and  
 596 include a `URI` attribute associated with the character string that is the human-readable label for the link.  
 597 `gmx:FileName` adds a filename `URI` attribute that specifies a machine-readable absolute path to the loca-

598 tion of the file, the human readable file name specified by the character string. gmx:MimeType adds a  
599 MIME type/subtype attribute to a character string that specifies a human readable file type. The gmx  
600 namespace is not imported into other ISO19139 schema in the normative schema. In order to create sche-  
601 ma-valid documents that use these extensions, explicit namespace-declaration must be made to the gmx  
602 schema in instance documents. At the present time, use of these elements does not seem widespread.  
603 The current version of GeoNetwork, a commonly used catalog service implementation, does not support  
604 use of gmx:Anchor. Thus, in this version of the USGIN profile, these extension classes are not used.

## 605 4.17.2 Language localization

606 Another extension to gco:CharacterString allows substitution by PT\_FreeText or LocalisedCharacter-  
607 String. LocalisedCharacterString adds a locale/PT\_Locale property to the CharacterString element  
608 that can specify the language, country, and character encoding for the string. PT\_FreeText allow substitu-  
609 tion of a collection of LocalisedCharacterString elements for any CharacterString, each localized to a  
610 different language/country.

611 These various possibilities create potential to break interoperability. To avoid this problem, Other localiza-  
612 tions may be implemented, but in order to avoid complexity with PT\_Text and LocalizedCharacterString,  
613 USGIN recommended practice is to implement services for different languages as different services, each  
614 of which serves CharacterStrings in the language specified by the MD\_Metadata/language element.

## 615 4.17.3 Codelists

616 ISO 19139 defines a "CodeListValue\_Type" XML Class Type with three attributes:

```
617 <xs:complexType name="CodeListValue_Type">  
618   <xs:simpleContent>  
619     <xs:extension base="xs:string">  
620       <xs:attribute name="codeList" type="xs:anyURI" use="required"/>  
621       <xs:attribute name="codeListValue" type="xs:anyURI" use="required"/>  
622       <xs:attribute name="codeSpace" type="xs:anyURI"/>  
623     </xs:extension>  
624   </xs:simpleContent>  
625 </xs:complexType>
```

626 The **codeList** attribute contains a URL that references a codeList definition within a registry or a codelist  
627 catalogue. As currently used in the metadata services we have studied, the codeList is not used to identi-  
628 fy a vocabulary; rather it provides a locator (functionally equivalent to xlink:href) for an online resource,  
629 typically a web page or xml file, that contains a listing of the codelist with the code values and scope  
630 notes. Different services provide different URL's, possibly linking to different kinds of resources (e.g. web  
631 page or xml file), for the same codelist. Thus, the values in this attribute can not be used for automated  
632 determination of the code list in use in a metadata document.

633 The **codeListValue** attribute carries the identifier of the codelist value definition. This identifier is the  
634 value expressed in the name column of the tables in ISO 19115, Annex B. The codelist catalogue (or re-  
635 gistry) located by the **codeList** attribute is expected to contain an explicit name and definition of the val-  
636 ue in the default language of the metadata, as well as alternate expressions in different code spaces,  
637 some of them corresponding to the different locales supported by the metadata.

638 The **codeSpace** attribute is an optional identifier (URI); when present it refers to an alternative expres-  
639 sion of the codelist value definition.. In the example in ISO19139, section 8.5.5.1 (p. 30), the codeSpace  
640 URI for the domain code is the string "domainCode", and the value from the domainCode column in a co-  
641 delist definition table in ISO 19115, Annex B is included as the value of the xml CodeList element in this  
642 case.

643 Codelist elements in the ISO19139 XML schema are assigned to type CodeListValue\_Type, and also in-  
644 cluded in a substitution group for gco:CharacterString. These codeList elements are thus substitutable for  
645 elements typed gco:CharacterString. Consequently, any CodeList instance is an XML element that takes  
646 a string value and has three XML attributes defined by the CodeListValue\_Type XML Class Type. A cor-  
647 responding XML Class Property Type is defined for each of these CodeList elements, and this property  
648 type is used to restrict the values in XML CharacterString attributes to the code list.

649 The ISO specification uses an unfortunate choice of name for the 'codeListValue' attribute that is defined  
650 to be a identifier, apparently with the intention that it is a language-neutral concept identifier that might be  
651 associated with various language-localized labels for the concept. NAP CodeList registries  
652 (<http://www.fgdc.gov/nap/metadata/register>) contrast with the codelists defined in the tables in ISO 19115  
653 Annex B in that the identifier (the 'name' column the ISO19115 Annex B tables) is an integer identifier  
654 with the prefix 'RI\_'. This would appear to correspond functionally to the 'domainCode' values in the  
655 ISO19115 Annex B tables, which ISO19139 indicates should be the codeListValue when the `code-  
656 Space="domainCode".`

657 NAP and INSPIRE usage is consistent with the ISO19139 definition of codeListValue as an identifier, with  
658 the name or label for the codeList concept included as the value of the CodeList element. The 'name' col-  
659 umn in ISO 19115, Annex B tables, which is described as the content for the codeListValue by ISO19139,  
660 contains English words that are the same as the labels one would use in English. In the  
661 CT\_CodeListCatalogues in the ISO publicly available standards registry for ISO 19139  
662 ([http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\\_19139\\_Schemas/resources](http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources)), which one  
663 would think are normative, the CodeListDictionary/codeEntry/CodeDefinition elements only include  
664 gml:description and gml:identifier elements, but no gml:name elements. So based on this ISO guidance, it  
665 appears that one would have to encode CodeList element thus:

666 <gmd:CI\_DateTypeCode  
667     codeList="[http://asdd.ga.gov.au/asdd/profileInfo/gmxCodelists.xml#CI\\_DateTypeCode](http://asdd.ga.gov.au/asdd/profileInfo/gmxCodelists.xml#CI_DateTypeCode)"  
668     codeListValue="creation"/>  
669 or  
670 <MD\_CharacterSetCode  
671     codeList="[http://wis.wmo.int/2006/catalogues/gmxCodelists.xml#MD\\_CharacterSetCode](http://wis.wmo.int/2006/catalogues/gmxCodelists.xml#MD_CharacterSetCode)"  
672     codeListValue="utf8"/>.

673 Extensions to ISO codelists are implemented in two ways. If new values are added to an ISO codelist, the  
674 CodeListProperty\_Type still points at the ISO CodeList\_Type, but the codeList attribute on instances of  
675 this element points to the extended codelist. The following example shows use of a DateTypeCode added  
676 to the ISO19115 date type code list in the North American Profile:

677 <gmd:CI\_DateTypeCode  
678     codeList="[http://www.fgdc.gov/nap/metadata/register/registerItemClasses.html#IC\\_87](http://www.fgdc.gov/nap/metadata/register/registerItemClasses.html#IC_87)"  
679     codeListValue="RI\_373">superseded</gmd:CI\_DateTypeCode>

680 Note that the ISO codelists use the codeListValue name as the codeList identifier, creating ambiguity be-  
681 tween the human-readable label/name for the codeListValue concept, and its opaque/language-neutral  
682 identifier. USGIN NAP codeList usage follows the example metadata encoding in Appendix E of NAP pro-  
683 file document (INCITS 453, 2009). In these examples the codeListValue is the identifier from the NAP re-  
684 gistry specified by the codeList, with the prefix 'RI\_' added, and the code name/label is the value of the  
685 codeList xml element. NAP provides names and identifiers for codes.

686 INSPIRE guidelines (INSPIRE ISO19115/119, 2009-02-18) recommend a similar approach, using the ISO  
687 identifier string for the code list element value, which appears to match the intention of ISO19139.

688 <gmd:CI\_DateTypeCode  
689     codeList=  
690         "[http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\\_19139\\_Schemas/resources/Cod](http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/Cod)  
691         elist/ML\_gmxCodelists.xml#CI\_DateTypeCode"  
692     codeListValue="publication">publication</gmd:CI\_DateTypeCode>

693 The unfortunate situation is that NAP and ISO define different identifiers for the same codelist values, and  
694 because the 'codeList' attribute is defined as a locator for a codelist resource (not a vocabulary identifi-  
695 er) and is used differently by different metadata providers, there is no reliable automated test one can  
696 make to determine if NAP or ISO identifiers are being used. In order to avoid interoperability problems,  
697 USGIN profile mandates that elements with a data type that is a CodeList\_PropertyType use the following  
698 encoding, following the NAP and INSPIRE pattern:

699 For elements that use ISO codelists:

700 <gmd:CI\_DateTypeCode  
701     codeList=  
702         "[http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\\_19139\\_Schemas/resources/Code](http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/Code)

```

703     list/gmxCodelists.xml#CI_DateTypeCode"
704     codeListValue="creation">creation</gmd:CI_DateTypeCode>
705 For elements that use NAP codelists:
706 <gmd:CI_DateTypeCode
707   codeList="http://www.fgdc.gov/nap/metadata/register/registerItemClasses.html#IC_87"
708   codeListValue="RI_366">creation</gmd:CI_DateTypeCode>
709 Note that in these encodings, the codeList attribute value functions as an identifier; thus the exact strings
710 in the examples should be used (with the #localAnchor at the end modified as appropriate for the identi-
711 fied codelist). The ISO codelists are in much wider use at this time than the NAP codelists (as far as we
712 can tell from surveying existing services), but we recognize that some of the terms added in the NAP
713 codelists may be required for metadata describing some of the resources in the USGIN scope (Table 1).
714 Table 8 summarizes differences between the ISO and NAP codelists. The recommended practice is to
715 use ISO codelists wherever possible, encoded as in the examples above. NAP codes may be used where
716 necessary, but if the above convention is followed, and the NAP name is equivalent to the ISO identifier
717 for codelists that are the same, which is generally the case, then the two approaches are interoperable if
718 search criteria for a particular value look for the element value (e.g. 'creation' in the example above), not
719 the codeListValue attribute value (e.g. 'creation' or 'RI_366').
720 If a new codelist is created to restrict text in an ISO element whose type is simply CharacterString (e.g.
721 HierarchyLevelName), then characterString values are encoded by soft-typing the element that takes the
722 character string using the xsi:type attribute. The following example uses the FileFormatCodeList, which is
723 the only code list vocabulary added to the collection of codelists defined by ISO 19115 by the North
724 American Profile.
725 <gmd:fileType xsi:type="napm:napMD_FileFormatCode_PropertyType"
726   codeList="http://www.fgdc.gov/nap/metadata/register/registerItemClasses.html#IC_115"
727   codeListValue="RI_711">
728   <gco:CharacterString>jpg</gco:CharacterString>
729 </gmd:fileType>
730 A NAP-defined codelist property type is defined in a NAP-defined namespace (URI = http://www.cits.-.
731 rncan.gc.ca/html/brodeurj/.protege/.napMetadata/napMetadataWebsite/napMetadataTools/napXsd-.
732 napm), defined in an xml schema made available by the profile developers, and this namespace must be
733 defined in xml documents using the xsi:type. In order for the document to validate, the namespace must
734 provide a schema location in the xml document root element as well. Schema fragment from the XML
735 schema defining the napm namespace
736 (http://www.cits.rncan.gc.ca/html/brodeurj/.protege/.napMetadata/tools/napXsd/napm.xsd ). Unfor-
737 untunately, because of conflicting element definitions in imported and included schema from other names-
738 paces, this schema may not validate with some validation tools. The following fragment defines the prop-
739 erty type used to restrict a value domain to the new code list in the xml fragment above:
740 <xss:complexType name="napMD_FileFormatCode_PropertyType">
741   <xss:complexContent>
742     <xss:extension base="gco:CharacterString_PropertyType">
743       <xss:attribute name="codeList" type="xs:anyURI" use="required"/>
744       <xss:attribute name="codeSpace" type="xs:anyURI" use="optional"/>
745       <xss:attribute name="codeListValue" type="xs:anyURI" use="required"/>
746     </xss:extension>
747   </xss:complexContent>
748 </xss:complexType>
749 As a convention for using controlled vocabularies on characterString elements without the overhead of a
750 new namespace and xml schema, USGIN proposes that use a controlled vocabulary be indicated by us-
751 ing xsi:type on the gco:characterString element to make the type gml:CodeType, which then requires a
752 codeSpace attribute (see 4.14.2 Non digital resources and 7.2 Linkage name conventions). This codeS-
753 pace should be the URI for the vocabulary used, with the implication that the CharacterString element
754 value will then be an identifier from that vocabulary. This essentially turns the CharacterString into a GML
755 scoped name or gco:LocalName element.

```

Table 8. Codelist crosswalk between ISO, NAP and USGIN.

Codelist (ISO / NAP)	Coded Values/Names	Comments
CI_DateTypeCode napCI_DateTypeCode	creation, publication, revision	ISO 19115 (B.5.2)
	..., notAvailable, inForce, adopted, deprecated, superseded	NAP expansion
CI_OnLineFunction-Code nap-CI_OnLineFunction-Code	download, information, offlineAccess, order, search	ISO 19115 (B.5.3)
	..., upload, webService, emailService, browsing, fileAccess, webMapService	NAP expansion
CI_PresentationForm-Code nap-CI_PresentationForm-Code	documentDigital, documentHardcopy, imageDigital, imageHardcopy, mapDigital, mapHardcopy, modelDigital, modelHardcopy, profileDigital, profileHardcopy, tableDigital, tableHardcopy, videoDigital, videoHardcopy, audioDigital	ISO 19115 (B.5.4)
	..., audioHardcopy, multimediaDigital, multimediaHardcopy, diagramDigital, diagramHardcopy	NAP expansion
CI_RoleCode napCI_RoleCode	resourceProvider, custodian, owner, user, distributor, originator, pointOfContact, principalInvestigator, processor, publisher, author	ISO 19115 (B.5.5)
	..., collaborator, editor, mediator, rightsHolder	NAP expansion
DQ_EvaluationMethod-TypeCode napDQ_Evaluation-MethodTypeCode	directInternal, directExternal, indirect	ISO 19115 (B.5.6)
DS_AssociationType-Code napDS_Association-TypeCode	crossReference, largerWorkCitation, partOfSeamlessDatabase, source, stereoMate	ISO 19115 (B.5.7)
	..., isComposedOf	NAP expansion
DS_InitiativeType-Code napDS_Initiative-TypeCode	campaign, collection, exercise, experiment, investigation, mission, sensor, operation, platform, process, program, project, study, task, trial	ISO 19115 (B.5.8)
MD_CellGeometryCode napMD_CellGeometry-Code	point, area	ISO 19115 (B.5.9)
	..., voxel	NAP expansion

Codelist (ISO / NAP)	Coded Values/Names	Comments
MD_CharacterSetCode napMD_CharacterSet-Code	ucs2, ucs4, utf7, utf8, utf16, 8859part1, 8859part2, 8859part3, 8859part4, 8859part5, 8859part6, 8859part7, 8859part8, 8859part9, 8859part10, 8859part11, 8859part13, 8859part14, 8859part15, 8859part16, jis, shiftJIS, eucJP, usAscii, ebcdic, eucKR, big5, GB2312	ISO 19115 (B.5.10)
MD_Classification-Code napMD_Classification-Code	unclassified, restricted, confidential, secret, topSecret	ISO 19115 (B.5.11)
	..., sensitive, forOfficialUseOnly	NAP expansion
MD_CoverageContent-TypeCode napMD_Coverage-Content-TypeCode	image, thematicClassification, physicalMeasurement	ISO 19115 (B.5.12)
MD_DataTypeCode not used by NAP and USGIN	class, codelist, enumeration, codelistElement, abstractClass, aggregateClass, specifiedClass, datatypeClass, interfaceClass, unionClass, metaClass, typeClass, characterString, integer, association	ISO 19115 (B.5.13) – The MD_MetadataExtension Information element and its codelists are not used by NAP and USGIN.
MD_DimensionName-TypeCode napMD_DimensionName-TypeCode	row, column, vertical, track, crossTrack, line, sample, time	ISO 19115 (B.5.14)
MD_GeometricObject-TypeCode napMD_Geometric-Object-TypeCode	complex, composite, curve, point, solid, surface	ISO 19115 (B.5.15)
MD_ImagingCondition-Code napMD_Imaging-ConditionCode	blurredImage, cloud, degradingObliquity, fog, heavySmokeOrDust, night, rain, semiDarkness, shadow, snow, terrainMasking	ISO 19115 (B.5.16)
MD_KeywordTypeCode napMD_KeywordType-Code	discipline, place, stratum, temporal, theme	ISO 19115 (B.5.17)
	..., product, subTopicCategory	NAP expansion
MD_Maintenance-FrequencyCode napMD_Maintenance-FrequencyCode	continual, daily, weekly, fortnightly, monthly, quarterly, biannually, annually, asNeeded, irregular, notPlanned, unknown	ISO 19115 (B.5.18)
	..., semimonthly	NAP expansion
MD_MediumFormatCode napMD_MediumFormat-Code	cpio, tar, highSierra, iso9660, iso9660RockRidge, iso9660AppleHFS	ISO 19115 (B.5.19)
	..., UDF	NAP expansion

Codelist (ISO / NAP)	Coded Values/Names	Comments
MD_MediumNameCode napMD_MediumNameCode	cdRom, dvd, dvdRom, 3halfinchFloppy, 5quarterInchFloppy, 7trackTape, 9trackTape, 3480Cartridge, 3490Cartridge, 3580Cartridge, 4mmCartridgeTape, 8mmCartridgeTape, digitalLinearTape, onLine, satellite, telephoneLink, hardcopy, hardcopyDiazoPolyester08, hardcopyCardMicrofilm, hardcopyMicrofilm240, hardcopyMicrofilm35, hardcopyMicrofilm70, hardcopyMicrofilmGeneral, hardcopyMicrofilmMicrofiche, hardcopyNegativePhoto, hardcopyPaper	ISO 19115 (B.5.20)
	..., hardcopyDiazo, hardcopyPhoto, hardcopyTracedPaper, hardDisk, USBFlashDrive, 1quarterInchCartridgeTape	NAP expansion
MD_ObligationCode not used by NAP and USGIN	mandatory, optional, conditional	ISO 19115 (B.5.21) - The MD_MetadataExtension Information element and its codelists are not used by NAP and USGIN.
MD_PixelOrientationCode napMD_PixelOrientationCode	center, lowerLeft, lowerRight, upperRight, upperLeft	ISO 19115 (B.5.22)
MD_ProgressCode napMD_ProgressCode	completed, historicalArchive, obsolete, onGoing, planned, required, underDevelopment	ISO 19115 (B.5.23)
	..., proposed	NAP expansion
MD_RestrictionCode napMD_RestrictionCode	copyright, patent, patentPending, trademark, license, intellectualPropertyRights, restricted, otherRestrictions	ISO 19115 (B.5.24)
	..., licenseUnrestricted, licenseEndUser, licenseDistributor, privacy, statutory, confidential, sensitivity	NAP expansion
MD_ScopeCode napMD_ScopeCode	attribute, attributeType, collectionHardware, collectionSession, dataset, series, nonGeographicDataset, dimensionGroup, feature, featureType, propertyType, fieldSession, software, service, model, tile	ISO 19115 (B.5.25)

Codelist (ISO / NAP)	Coded Values/Names	Comments
MD_Spatial-RepresentationType-Code napMD_Spatial-RepresentationType-Code	vector, grid, textTable, tin, stereo-Model, video	ISO 19115 (B.5.26)
MD_TopicCategoryCode napMD_TopicCategory-Code	farming, biota, boundaries, climatologyMeterologyAtmosphere, economy, elevation, environment, geoscientificInformation, health, imageryBaseMap-sEarthCover, intelligenceMilitary, inlandWater, location, oceans, planning-Cadastre, society, structure, transportation, utilitiesCommunication	ISO 19115 (B.5.27)
MD_TopologyLevelCode napMD_TopologyLevel-Code	geometryOnly, topology1D, planarGraph, fullPlanarGraph, surfaceGraph, full-SurfaceGraph, topology3D, fullTopology3D, abstract	ISO 19115 (B.5.28)
SV_CouplingType napSV_CouplingType	loose, mixed, tight	ISO 19119 (Amendment 1; C.2.8)
SV_Parameter-Direction napSV_Parameter-Direction	in, out, in/out	ISO 19119 (Amendment 1; C.2.9)
LanguageCode	see <a href="http://www.loc.gov/standards/iso639-2/php/code_list.php">http://www.loc.gov/standards/iso639-2/php/code_list.php</a>	no complete NAP or ISO registry found
not used by ISO nap_DCPList	XML, CORBA, JAVA, COM, SQL, WebServices	NAP specific codelist – not used by USGIN due to poorly defined semantics and use.
not used by ISO napMD_FileFormatCode	bil, bmp, bsq, bzip2, cdr, cgm, cover, csv, dbf, dgn, doc, dwg, dxf, e00, ecw, eps, ers, gdb, geotiff, gif, gml, grid, gzip, html, jpg, mdb, mif, pbm, pdf, png, ps, rtf, sdc, shp, sid, svg, tab, tar, tiff, txt, xhtml, xls, xml, xwd, zip, wpd	NAP specific codelist – not formally used by USGIN, but these character strings should be used to populate fileType elements.

## 757 **4.18 Geographic bounding box**

758 USGIN profile requires that if an EX\_Extent/geographicElement is supplied, it include a geographic bound-  
759 ing box with bounding latitude and longitude expressed using WGS 84 decimal degrees.

760 The corner coordinates for the geographic bounding box must not coincide in one point, because this may  
761 result in fatal errors with some CSW implementations. Point locations must thus be represented as tiny  
762 rectangles. USGIN recommended practice is to place the actual point location in the lower left corner of  
763 the rectangle.

## 764 **4.19 Data quality for individual parts of a resource**

765 The use of dataQualityInfo/DQ\_DataQuality/scope presents challenges for determining how to represent  
766 metadata with finer granularity about particular feature or attribute instances, some attribute in the scope  
767 of a single dataset, some particular dataset within a series.

768 Determining best practices for finer-granularity metadata requires consideration of likely use cases. Note  
769 that data quality statements may provide information on lineage, completeness, logical consistency, the-  
770 matic accuracy, temporal accuracy, or positional accuracy. Note also that the USGIN profile is designed  
771 for use in a geoscience domain-wide resource catalog meant to enable discovery, evaluation, and access  
772 to information resources. Use cases involve filtering metadata records based on data quality statements,  
773 or using those statement to evaluate datasets or feature instances for fitness to a user's purpose. These  
774 might include:

- 775 1) data quality statements for individual datasets in a series, to determine if a dataset in the series  
776 might be appropriate for the desired use.
- 777 2) data quality statements associated with different attributes of a feature on the dataset series level,  
778 e.g. all structure orientations (the attribute) have some standard quantitative attribute accuracy for all  
779 features in all datasets in a series, to determine if any data in the series might be appropriate for the  
780 desired use.
- 781 3) data quality statements associated with different attributes of a feature on the dataset level, e.g. all  
782 structure orientations have some standard quantitative attribute accuracy for all features in a particu-  
783 larly subset of datasets in a series. This may be assigned on an individual dataset level, or to sub-  
784 sets, e.g. a measurement procedure changed at some point during development of the series that  
785 changes the attribute accuracy for all subsequently acquired data. These quality statements might be  
786 used to determine which dataset in a series might be appropriate for the desired use, or if a particular  
787 dataset is useful.
- 788 4) data quality statements for one or more particular features that are contained in a dataset. These  
789 statements might be used to select particular feature instances to download or use for an analysis.
- 790 5) data quality statements for particular attribute value assignments on particular features in a dataset.  
791 These statements might be used to select particular feature instances to download or use for an  
792 analysis.

793 In a dataspace environment of the sort envisioned for a community data network (Franklin et al, 2005),  
794 the ISO19115 hierarchy level 'series' is useful for high-level data discovery and evaluation, but actual da-  
795 ta acquisition and usage occur at the dataset level. Attribute- and feature-scoped data quality information  
796 would be useful in dataset and series level metadata for discovery and evaluation, but featureInstance  
797 and attributeInstance data quality information only come in to play for the data acquisition and usage in  
798 the context of a dataset.

799 In the architecture of the system as currently envisioned, only the lineage and accuracy aspects (not the  
800 completeness and logical consistency, which apply at a dataset level) of data quality make sense for fea-  
801 ture and attribute instance level metadata, and this information is better accounted for by an observation  
802 and measurement view of the data (e.g. ISO 19156) through a feature service, not a metadata service.  
803 Inclusion of instance level dataQuality statements might make sense in metadata that is bundled with a  
804 data collection in a data delivery package, but this is out of scope for this profile. In the CSW environ-  
805 ment, if a data provider wishes to enable search using feature- or attribute-instance data quality criteria,  
806 these should be exposed by presentation metadata records for each feature- or attribute-instance.

807 The ISO19115 content model provides several possible approaches to fine-granularity metadata:  
 808 1) using MD\_Metadata/hierarchyLevel and MD\_Metadata/parentIdentifier  
 809 2) using MD\_Metadata/identificationInfo/MD\_DataIdentification/aggregationInfo associations  
 810 3) using MD\_Metadata/ dataQualityInfo/DQ\_DataQuality/scope/levelDescription elements to bind data  
 811 quality assertions to parts of the larger resource that are identified by object references from the  
 812 metadata document.  
 813 The USGIN profile does not use approach 1, with parentIdentifier links associating MD\_Metadata records  
 814 with parent metadata. This approach is useful for metadata that is packaged with data collections in order  
 815 to reduce duplication of metadata information that is inherited from series to datasets in that series, and  
 816 perhaps to individual features and attributes in the application schema for the series, or feature and  
 817 attribute instances in particular datasets. In the context of resource discovery using a CSW service, que-  
 818 ries cannot be posed in terms of these kinds of inheritance relationships, and result sets should be com-  
 819 plete metadata records for the resources located by a search.  
 820 The USGIN profile uses approach 2, aggregationInfo associations between metadata records for related  
 821 resources. In a data discovery environment, links to related resources may be very useful to lead users to  
 822 other resources that their search criteria did not directly uncover. The associationType property on these  
 823 links provides additional useful information for assessing whether the related resources might be useful.  
 824 Given this approach, data quality information for datasets in a series would not be accessed through  
 825 DQ\_DataQuality elements in the series metadata, with levelDescription/MD\_ScopeDescription/Dataset  
 826 elements providing DataSetURI's for each described component dataset. Under the USGIN profile, identifi-  
 827 cation of datasets in a series that meet some data quality criteria would search for datasets that have  
 828 MD\_Metadata/identificationInfo/MD\_DataIdentification/aggregationInfo/MD\_AggregateInformation/-  
 829 aggregateDataSetIdentifier equal to the dataSetURI for the series, with ../AggregateInformation/-  
 830 associationType/DS\_AssociationTypeCode equal to 'largerWorkCitation', along with whatever quality crite-  
 831 ria were required.  
 832 USGIN profile uses multiple dataQualityInfo/DQ\_DataQuality elements to provide optional data quality  
 833 statements for individual attributes and features in a dataset, with one dataQualityInfo element for each  
 834 attribute on each feature about which the data quality is described. According to the ISO19139  
 835 (20060504) schema implementing ISO19115, each of these dataQualityInfo elements has exactly one  
 836 ../DQ\_Scope, which in turn may have 0 to many levelDescription/MD\_ScopeDescription elements. Each  
 837 levelDescription/MD\_ScopeDescription contain only one of attributes, features, featureInstances,  
 838 attributeInstances, dataset or other elements. An individual MD\_ScopeDescription may specify multiple  
 839 attributes, features, featureInstances, or attributeInstances. MD\_ScopeDescription/other is not  
 840 used in the USGIN profile at this time. MD\_ScopeDescription/dataset is not used because data quality  
 841 statements about a dataset are indicated by dataQualityInfo/../DQ\_Scope/level/MD\_ScopeCode =  
 842 'dataset', in which case DQ\_Scope/levelDescription/MD\_ScopeDescription elements will be ignored; data  
 843 quality statements about a dataset in a series are included in a metadata record for the dataset that is as-  
 844 sociated with the series through MD\_Metadata/MD\_DataIdentification../MD\_AggregateInformation/-  
 845 aggregateDataSetIdentifier.  
 846 DQ\_Scope/levelDescription/MD\_ScopeDescription/attributes and ../features are specified using ob-  
 847 ject references to GF\_AttributeType and GF\_FeatureType elements according to section B.4.4 of  
 848 ISO19115(2003). These are metaclasses defined in ISO19109, and their implementation is out of scope  
 849 for this profile. Table 9 presents recommendations for use of ../DQ\_DataQuality/scope/-  
 850 levelDescription/MD\_ScopeDescription child elements based on consideration of the above use cases,  
 851 interpretation of the UML diagrams for ISO19109 and the sketchy text in section B.4.4 of  
 852 ISO19115(2003).

853 *Table 9. Usage of data quality scope description elements*

scopeDescription type (and cardinality)	Reference target	USGIN profile provisions
attributes (1..*)	Identifier for an attribute type defined in the application schema identified by	Use for specifying attribute level data quality for all attributes of a particular type in a particular feature in a dataset or series. levelDescrip-

<b>scopeDescription type (and cardinality)</b>	<b>Reference target</b>	<b>USGIN profile provisions</b>
	<code>MD_Metadata/application-SchemaInfo/.../CI_Citation</code>	<code>tion/MD_ScopeDescription/attributes</code> elements are allowed only when <code>DQ_Scope/-level/MD_ScopeCode = 'attributeType'</code> . The element value is an <code>xlink:href</code> or <code>uuidref</code> to an attribute defined in the application schema for the dataset. The <code>xlink:title</code> may be used to give the name of the attribute as it appears in the dataset if this is useful. To be useful, the <code>MD_Metadata/applicationSchemaInfo</code> element must provide sufficient information to resolve the attribute identifier.
<code>features (1..*)</code>	Identifier for an feature type defined in the application schema identified by <code>MD_Metadata/application-SchemaInfo/.../CI_Citation</code>	Use for specifying feature level data quality for all features of a particular type in a dataset or series. <code>levelDescription/MD_ScopeDescription/-attributes</code> elements are allowed only when <code>DQ_Scope/level/MD_ScopeCode = 'featureType'</code> or <code>'attributeType'</code> . The identified feature type is the target of the data quality statement if <code>MD_ScopeCode</code> is <code>'featureType'</code> , else it identifies the feature that contains the described attribute. The element value is an <code>xlink:href</code> or <code>uuidref</code> to a feature defined in the application schema for the dataset. The <code>xlink:title</code> may be used to give the name of the feature as it appears in the dataset if this is useful. To be useful, the <code>MD_Metadata/-applicationSchemaInfo</code> element must provide sufficient information to resolve the <code>featureType</code> identifier.
<code>featureInstances (1..*)</code>	A resolvable identifier for a particular featureInstance within the scope of the resource identified by <code>MD_Metadata/DataSetURI</code>	Out of scope, not used by USGIN. Instance level quality statements are provided via a feature service.
<code>attributeInstances (1..*)</code>	A resolvable identifier for a particular attributeInstance within the scope of the resource identified by <code>MD_Metadata/DataSetURI</code>	Out of scope, not used by USGIN. Instance level quality statements are provided via a feature service.
<code>dataset (1)</code>	A resolvable identifier for a particular dataset within the scope of the resource identified by <code>MD_Metadata/-DataSetURI</code>	Not used by USGIN. Dataset data quality is described in records with <code>DQ_Scope/-level/MD_ScopeCode = 'dataset'</code> , and metadata for datasets in a series is represented by separate dataset records for CSW purposes.
<code>other (1)</code>	A resolvable identifier for some other resource within the scope of the resource identified by <code>MD_Metadata/-DataSetURI</code>	Not used by USGIN, undefined semantics.

855 **4.20 Lineage**

856 Lineage in data quality section has to do with processing steps that have altered the resource in some  
857 fashion. Each step has some input resources, identified by source citations associated with the process  
858 step. The LI\_ProcessStep element does not directly identify its output resource, so in a lineage that in-  
859 volves a chain of steps with intermediate resources, the sourceStep association from LI\_Source links a  
860 resource to a processing step that it is output from.

861 If a resource has simply been downloaded from some online repository, or copied from some physical  
862 media (CD, DVD), with no modification, then it is considered an identical resource, and no lineage is im-  
863 plied. The MD\_DataIdentification/citation/CI\_Citation should identify this source; the  
864 MD\_Metadata/distributionInfo should report information on how the data were obtained. Based on this  
865 approach, a LI\_Lineage that reports no processSteps, only a source link, does not make sense.  
866 LI\_Lineage/source/LI\_Source is thus not used by USGIN metadata.

867 A GIS dataset originally digitized from a published geologic map, put online, obtained by an online down-  
868 load, and reprojected would report one processStep (reprojection) with source/LI\_Source that has a  
869 CI\_Citation for the downloaded data. This LI\_Source would have a sourceStep pointing to an  
870 LI\_ProcessStep for the original digital conversion from the paper map, and the  
871 LI\_ProcessStep/source/LI\_Source would contain the citation for the original paper map.

872 In order to enable xpath queries for any of the sources or processSteps in a processing chain, all related  
873 LI\_Source and LI\_ProcessStep elements should be directly nested within the LI\_Lineage element, and  
874 the processStep/source and LI\_Source/sourceStep associations should be by reference.

875

876 Code example 1: Simplified example of a complex processing and source history using LI\_Lineage.

```
<?xml version="1.0" encoding="UTF-8"?>
<LI_Lineage
    xmlns="http://www.isotc211.org/2005/gmd"
    xmlns:gco="http://www.isotc211.org/2005/gco"
    xmlns:xlink="http://www.w3.org/1999/xlink"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://www.isotc211.org/2005/gmd
    http://schemas.opengis.net/iso/19139/20070417/gmd/dataQuality.xsd">
    <statement>
        <LocalisedCharacterString>The digital data described by this metadata was
        originally compiled digitally from two published maps; this digital dataset
        was then reprojected to produce the described re-
        source.</LocalisedCharacterString>
    </statement>
    <processStep>
        <LI_ProcessStep id="1">
            <description>
                <LocalisedCharacterString>digital compilation of 2
maps</LocalisedCharacterString>
            </description>
            <source xlink:href="#10"/>
            <source xlink:href="#20"/>
        </LI_ProcessStep>
    </processStep>
    <processStep>
        <LI_ProcessStep id="2">
            <description>
                <LocalisedCharacterString>digital map compilation reprojected, should
have some way to specify projection parameters?, output is LI_Source id=70
            </LocalisedCharacterString>
            </description>
            <source xlink:href="#40"/>
        </LI_ProcessStep>
    </processStep>
</LI_Lineage>
```

```

909      </LI_ProcessStep>
910  </processStep>
911  <source>
912    <LI_Source id="40">
913      <description>
914        <LocalisedCharacterString>a digital compilation of 2 maps, output of
915 processStep ID=1, input into reprojection process</LocalisedCharacterString>
916      <description>
917        <sourceStep xlink:href="1"/>
918    </LI_Source>
919  </source>
920  <source>
921    <LI_Source id="10">
922      <description>
923        <LocalisedCharacterString>ultimate source--some published
924 map</LocalisedCharacterString>
925      </description>
926      <!--no source processing recorded for production of paper map so no sourceS-
927 tep-->
928    </LI_Source>
929  </source>
930  <source>
931    <LI_Source id="20">
932      <description>
933        <LocalisedCharacterString>another published
934 map</LocalisedCharacterString>
935      </description>
936    </LI_Source>
937  </source>
938  <source>
939    <LI_Source id="70">
940      <description>
941        <LocalisedCharacterString>a reprojected version of the digital compi-
942 lation</LocalisedCharacterString>
943      </description>
944      <sourceStep xlink:href="2"/>
945    </LI_Source>
946  </source>
947</LI_Lineage>
```

948 An LI\_Lineage may be constructed that involves a number of resources and processing steps, and this li-  
 949 neage may be referenced by metadata for all the resources involved in the processing. The  
 950 LI\_Lineage/source/LI\_Source/sourceCitation/CI\_Citation/identifier/MD\_Identifier is a reference to  
 951 the MD\_Metadata/fileIdentifier for the metadata for each resource in the chain. This approach allows  
 952 the metadata record to record relationships through process steps between resources.

## 953 4.21 Temporal extents

954 Resource temporal extent (identificationInfo/MD\_DataIdentification/extent/EX\_Extent/-  
 955 temporalElement/EX\_TemporalExtent/extent/ TimePeriod) is used to specify the temporal interval to  
 956 which the content of a resource applies. Default reference frame for time is calendar date and time en-  
 957 coded using ISO-8601:

```

958 <gml:TimePeriod gml:id="Id2010">
959   <!-- USGIN requires the beginPosition and endPosition's frame property
960   to be defined. The default value is #ISO-8601. -->
961     <gml:beginPosition frame="#ISO-8601">2010-01-00T00:00:00</gml:beginPosition>
962     <gml:endPosition frame="#ISO-8601">2010-12-31T24:00:00</gml:endPosition>
963   </gml:TimePeriod>
964   <gml:endPosition indeterminatePosition="now" /> is the correct way to represent "Present" in ISO or
965   GML as one of the boundaries of a timePeriod.
966   The ISO 19139 xml schema allows TM_PeriodTimePeriod to be quantified by a gml:TimelInstant or
967   gml:TimePeriod element. In order to promote interoperability, the USGIN profile mandates use of
968   gml:TimePeriod for specifying temporal extent for a resource.
969   For geologic time extents, the time coordinates for the beginPosition and endPosition should be ex-
970   pressed numerically in Ma. This convention allows search for resources pertinent to intervals of geologic
971   time using simple numeric comparisons instead of the complex hierarchical concept expansions that
972   would be necessary to use named eras from a stratigraphic time scale. Encoding example:
973   <EX_TemporalExtent>
974     <extent>
975       <gml:TimePeriod gml:id="y34096">
976         <gml:beginPosition
977           frame="urn:CGI:TemporalCRS:cgi:standardGeologyMa">220
978         </gml:beginPosition>
979         <gml:endPosition
980           frame="urn:CGI:TemporalCRS:cgi:standardGeologyMa">140
981         </gml:endPosition>
982       </gml:TimePeriod>
983     </extent>
984   </EX_TemporalExtent>
985   The frame for the beginPosition and endPosition is a URI for standard geologic time, measured positive
986   getting older, with an origin at 1950 CE, in units of millions of years.

```

## 987 4.22 Operation metadata

988 The srv namespace elements based on ISO 19119 are inadequate to provide the content necessary to  
 989 automate connection to a generic service. This is due in part to poorly defined semantics and use cases  
 990 for the elements that are there (DCP, applicationProfile, protocol, MD\_Format, serviceType, operation-  
 991 Name vs. invocationName, connectPoint), and partly due to incomplete content model (where to put al-  
 992 lowed outputFormat parameter values or supported query operations for CSW or WMS). The ISO 19119  
 993 model for service metadata does not include a mechanism to specify valid values for operation pa-  
 994 rameters. For instance, OGC WMS and CSW services both support an output format parameter, and OGC ca-  
 995 pabilities documents provide a listing of the supported output formats, but where do these go in ISO19139  
 996 xml documents? Does the described service support http POST or GET method? This information is ne-  
 997 cessary in order to compose valid service requests.

998 USGIN proposes to follow the INSPIRE (INSPIRE 19115/119, 2009) guideline to use a distribution-  
 999 Info/.../transferOptions/.../online/.../linkage element point to a WSDL or OGC getCapabilities doc-  
 1000 ument (see xml files at <http://www.webservice-energy.org/metadata/>), and make srv:SV\_Operation-  
 1001 Metadata nil. WSDL and getCapabilities were designed to describe service operation, and it seems coun-  
 1002 terproductive to invent another scheme to do the same thing. Because of the difficulty in creating usable  
 1003 abstract model that accounts for any and all possible services, it makes more sense to allow service de-  
 1004 scription documents specific to different service frameworks.

1005 In order to identify the linkage element that locates the service description document, USGIN mandates  
 1006 using CI\_OnlineResource/name = "serviceDescription" (from the table in section 7.2 Linkage name con-  
 1007 ventions) as the in the CI\_OnlineResource element with the linkage to the service description. It may also  
 1008 be useful to provide a mapping between ServiceType and a guidance for the kind of document the  
 1009 CI\_OnlineResource/linkage URL locates.

---

1010

## 5 Abbreviations

CSW	Metadata Catalog for the Web. Also abbreviated as CS-W and CS/W
GeoSciML	Geoscience Markup Language
GML	Geographic Markup Language
GUID	Global Unique Identifier
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
UML	Unified Modeling Language
URI	Universal Resource Identifier
USGIN	U.S. Geoscience Information Network
WCS	Web coverage Service
WFS	Web Feature Service
XML	eXtensible Markup Language
XSD	XML Schema Definition
XSL	eXtensible Stylesheet Language
XSLT	XSL Transformations
XLink	XML Linking Language

1011

---

1012

## 6 References

1013

### 6.1 Cited literature

1014

[Dublin Core] 2008-01-14 Dublin core Metadata Element Set, Version 1.1: Dublin Core Metadata Initiative, accessed at <http://dublincore.org/documents/dces/>.

1015

Franklin, Michael, Halevy, Alon, and Maier, David, 2005, From databases to dataspaces: a new abstraction for information management: ACM SIGMOD Record, V. 34, No. 4, ISSN:0163-5808.

1016

[ANZLIC, 2007] ANZLIC Metadata Profile Guidelines, Version 1.0: Turner, ACT, ANZLIC - the Spatial Information Council, ISBN: 978-0-646-46940-9, 372 p.

1017

[INSPIRE ISO19115/119] Drafting Team Metadata and European Commision Joint Research Centre, 2009-02-18, INSPIRE Metadata Implementing Rules: Technical Guidelines based on EN ISO 19115 and EN ISO 19119,v. 1.1: European Commission Joint Research Centre, MD\_IR\_and\_ISO\_20090218.

1024

## 7 Codelists

1025

### 7.1 ServiceType

1026

INSPIRE metadata Implementing Rules (OJ L 326, 4.12.2008) section D3 mandate the use of the value domain listed in Table 10 to categorize spatial data service types. These values are better suited for CI\_OnlineFunctionCode used to specify CI\_OnlineResource/online/Function. The USGIN team interprets the ISO scope notes to allow more useful content for service type, specifying an actual service specification like OGC WMS. USGIN draft ServiceType vocabulary is reported in Table 11.

1027

1031

1032 *Table 10. INSPIRE SPATIAL DATA SERVICE TYPE (for information only, not used by USGIN)*

Type	Description
discovery	Discovery Service
view	View Service
download	Download Service
transformation	Transformation Service
invoke	Invoke Spatial Data Service
other	Other Services

1033

1034

*Table 11. USGIN service type vocabulary. This is an interim listing of serviceTypes. The code list URI for this registry is <http://resources.usgin.org/registry/serviceType201001>.*

Identifier	Name	Description
WMS	OGC Web Map service	provides a simple HTTP interface for requesting geo-registered map images from one or more distributed geospatial databases. A WMS request defines the geographic layer(s) and area of interest to be processed. The response to the request is one or more geo-registered map images (returned as JPEG, PNG, etc) that can be displayed in a browser application. The interface also supports the ability to specify whether the returned images should be transparent so that layers from multiple servers can be combined or not. ( <a href="http://www.opengeospatial.org/standards/wms">http://www.opengeospatial.org/standards/wms</a> )
WFS	OGC Web Feature service	<a href="http://www.opengeospatial.org/standards/wfs">http://www.opengeospatial.org/standards/wfs</a>
WCS	OGC Web coverage service	defines a standard interface and operations that enables interoperable access to geospatial "coverages" [ <a href="http://www.opengeospatial.org/ogc/glossary/c">http://www.opengeospatial.org/ogc/glossary/c</a> ]. The term "grid coverages" typically refers to content such as satellite images, digital aerial photos, digital elevation data, and other phenomena represented by values at each measurement point.
CSW	OGC Web catalog service	supports the ability to publish and search collections of descriptive information (metadata) about geospatial data, services and related resources. Providers of resources use catalogues to register metadata that conform to the provider's choice of an information model; such models include descriptions of spatial references and thematic information. ( <a href="http://www.opengeospatial.org/standards/cat">http://www.opengeospatial.org/standards/cat</a> )

<b>Identifier</b>	<b>Name</b>	<b>Description</b>
SOS	OGC Sensor observation service	provides an API for managing deployed sensors and retrieving sensor data and specifically "observation" data. Whether from in-situ sensors (e.g., water monitoring) or dynamic sensors (e.g., satellite imaging), measurements made from sensor systems contribute most of the geospatial data by volume used in geospatial systems today. ( <a href="http://www.opengeospatial.org/standards/sos">http://www.opengeospatial.org/standards/sos</a> )
WPS	OGC Web Processing service	provides rules for standardizing how inputs and outputs (requests and responses) for geospatial processing services, such as polygon overlay. The standard also defines how a client can request the execution of a process, and how the output from the process is handled. It defines an interface that facilitates the publishing of geospatial processes and clients' discovery of and binding to those processes. The data required by the WPS can be delivered across a network or they can be available at the server. ( <a href="http://www.opengeospatial.org/standards/wps">http://www.opengeospatial.org/standards/wps</a> )
SPS	OGC Sensor planning service	defines interfaces for queries that provide information about the capabilities of a sensor and how to task the sensor. The standard is designed to support queries that have the following purposes: to determine the feasibility of a sensor planning request; to submit such a request; to inquire about the status of such a request; to update or cancel such a request; and to request information about other OGC Web services that provide access to the data collected by the requested task.
OpenDAP	Open source data access protocol	( <a href="http://opendap.org/">http://opendap.org/</a> )
OAI-PMH	Open Archives Initiative Protocol for Metadata Harvesting	provides an application-independent interoperability framework based on metadata harvesting.

1035 Example usage:

```

1036   <srv:serviceType>
1037     <gco:LocalName
1038     codeSpace="http://resources.usgin.org/registry/serviceType201001">WMS</gco:LocalName>
1039   </srv:serviceType>
```

1040

## 1041 7.2 Linkage name conventions

1042 The cardinality of the `online` element in `DigitalTransferOptions` is `0..*`. In order to distinguish the nature of  
 1043 various linkages that might be provided, above and beyond function, protocol, and `applicationProfile`,  
 1044 USGIN profile mandates use of the following names to associate with links to identify important linkages.

1045 *Table 12. USGIN Names to identify special linkage URL's for CI\_Online Resource. CodeList URI =*  
 1046 *<http://resources.usgin.org/registry/linkageName201001>*

<b>Identifier</b>	<b>Name (eng)</b>	<b>Usage</b>
icon	icon	linkage url is link to a thumbnail icon. Icon pixel height and width range?
serviceDescription	Service Description	linkage url is link to <code>getCapabilities</code> or <code>WSDL</code> that describes a service using a formal syntax such that computer programs can automate connection to the

		service.
baseURL	Base URL	Base url for service. Assumes that ServiceType specifies a well known service type such that requests can be constructed without significant additional information.
serviceClient	Service Client	URL is linkage to a web application that allows the user to access the service
webpage	Web page	URL locates a web page with instructions for accessing the service. This provides the user with information to implement a connection to the service, but does not enable automated service access.

1047 Example usage:

```

1048 </gmd:CI_OnlineResource>
1049   <gmd:linkage>
1050     <gmd:URL>http://75.101.143.247:8080/gsvr/wms?SERVICE=WMS&REQUEST=getCapabilities</gmd:URL>
1051   </gmd:linkage>
1052   <gmd:protocol>
1053     <gco:CharacterString>http</gco:CharacterString>
1054   </gmd:protocol>
1055   <gmd:name>
1056     <gco:CharacterString xsi:type="gml:CodeType"
1057       codeSpace="http://resources.usgin.org/registry/linkageName201001">
1058       serviceDescription</gco:CharacterString>
1059     </gmd:name>
1060   </gmd:CI_OnlineResource>
```

1061 Use of such controlled vocabulary can be indicated by using xsi:type on the gco:characterString element  
 1062 to make the type gml:CodeType, which then requires a codeSpace attribute. The distribution format Identifier  
 1063 from Table 6 should be used as the element value. For compatibility with systems that can not  
 1064 process this encoding, the code identifier should be included as the element value as well as the code-  
 1065 ListValue.

---

## 1066 8 Examples

### 1067 8.1 USGIN ISO 19139 Minimum Dataset Metadata

1068 In the following listing, text in **green** is comments; XML elements are in **blue**, XML attributes are in **black**,  
1069 and attribute values are in **purple**.

1070

```
1071 <?xml version="1.0" encoding="UTF-8"?>
1072 <!--
1073 **** Minimum example of a ISO 19139 Geospatial Dataset Metadata
1074 **** based on the USGIN v1.1 Profile
1075 **** by USGIN Standards and Protocols Drafting Team
1076 **** U.S. Geoscience Information System (USGIN) - http://lab.usgin.org
1077 **** Contributors: Wolfgang Grunberg, Stephen M Richard
1078 **** 01/20/2010
1079 ***
1080 ***
1081 *** DISCLAIMER: this is not an authoritative metadata example but an aide to get started.
1082 *** Scope notes are mostly from NAP or ISO documentation; refer to
1083 *** the USGIN profile document for more specific and reliable guidelines.
1084 ***
1085 *** Validated against http://www.isotc211.org/2005/gmd (ISO 19115, CSW 2.0.2 AP ISO 1.0).
1086 *** Follows the USGIN ISO 19139 Dataset Metadata Profile v1.1.
1087 *** a derivative of the North American Profile (NAP)
1088 ***
1089 *** NOTES:
1090 *** - Codelists:
1091 *** Most ISO metadata profiles and applications use ISO codelists or codelists that use ISO's
1092 codelist names. NAP does not use ISO codelist names. USGIN recommends using ISO over NAP
1093 codelists to ensure interoperability. Remember, the codeList attribute points to a Uniform
1094 Resource Identifier (URI) which defines an item's identity. It can be a URN or a URL.
1095 *** - napm schema extension:
1096 ***
1097 http://www.cits.rncan.gc.ca/html/brodeurj/.protege/.napMetadata/napMetadataWebsite/napMetadataToo
1098 ls/napXsd/napm is the namespace for NAP extensions in xmlns:napm. Its schema is located at
1099 http://www.cits.rncan.gc.ca/html/brodeurj/.protege/.napMetadata/tools/napXsd/napm/napm.xsd.
1100 However, that schema does not resolve properly because it also references a local copy of gmd.
1101 USGIN does not follow this NAP requirement because it constitutes a barrier to interoperability.
1102 ***
1103 *** - Language code:
1104 *** NAP demands <ISO639-2/T three letter language code - lower case></><blank space><ISO3166-1
1105 three letter country code - upper case>. However, NAP's requirement is not interoperable and
1106 USGIN prefers ISO's <ISO639-2/T three letter language code - lower case> formatting.
1107 ***
1108 *** KEY: (NAP-USGIN) - M/C/O/X (Mandatory, Conditional, Optional, Not Used)
1109 ***
1110 <!-- USGIN ISO 19139 geospatial dataset metadata record -->
1111 <gmd:MD_Metadata
1112   xmlns:gmd="http://www.isotc211.org/2005/gmd"
1113   xmlns:gco="http://www.isotc211.org/2005/gco"
1114   xmlns:gml="http://www.opengis.net/gml"
1115   xmlns:xlink="http://www.w3.org/1999/xlink"
1116   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
1117   xsi:schemaLocation="http://www.isotc211.org/2005/gmd
1118   http://schemas.opengis.net/csw/2.0.2/profiles/apiso/1.0.0/apiso.xsd">
1119   <!-- (M-M) Metadata file identifier - A unique File Identifier (GUID) - USGIN recommends using
1120 a valid Universally Unique Identifier (UUID) -->
1121   <gmd:fileIdentifier>
1122     <gco:CharacterString>08fb00c8-0882-4bf7-b07f-fd37050c5efc</gco:CharacterString>
1123   </gmd:fileIdentifier>
1124   <!-- (M-M) Metadata language - NAP demands <ISO639-2/T three letter language code - lower
1125 case></><blank space><ISO3166-1 three letter country code - upper case>. However, NAP's
1126 requirement is not interoperable and USGIN prefers ISO's <ISO639-2/T three letter language code -
1127 lower case> formatting. -->
```

```

1129 <!-- NAP Example -->
1130 <!--
1131 <gmd:language>
1132   <gco:CharacterString>eng; USA</gco:CharacterString>
1133 </gmd:language>
1134 -->
1135 <!-- ISO Example -->
1136 <gmd:language>
1137   <gco:CharacterString>eng</gco:CharacterString>
1138 </gmd:language>
1139 <!-- (M-M) Metadata character set - NAP specifies default is "utf8", codelist =
1140 napMD_CharacterSetCode. USGIN requires that a character set code is defined to facilitate CSW
1141 servers (degreee, GeoNetwork, etc.). -->
1142 <gmd:characterSet>
1143   <!-- MD_CharacterSetCode names: {ucs2, ucs4, utf7, utf8, utf16, 8859part1, 8859part2,
1144 8859part3, 8859part4, 8859part5, 8859part6, 8859part7, 8859part8, 8859part9, 8859part10,
1145 8859part11, 8859part13, 8859part14, 8859part15, 8859part16, jis, shiftJIS, eucJP, usAscii,
1146 ebdic, euckR, big5, GB2312} -->
1147   <!-- NAP example -->
1148   <!--
1149   <gmd:MD_CharacterSetCode
1150     codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_95"
1151     codeListValue="RI_458">utf8</gmd:MD_CharacterSetCode>
1152   -->
1153   <!-- ISO example -->
1154   <gmd:MD_CharacterSetCode
1155
1156   codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1157 Codelist/gmxCodelists.xml#MD_CharacterSetCode"
1158     codeListValue="utf8">UTF-8</gmd:MD_CharacterSetCode>
1159   </gmd:characterSet>
1160   <!-- (M-M) Resource type - Define if this record is a: dataset (default), service, feature,
1161 software, etc. -->
1162   <gmd:hierarchyLevel>
1163     <!-- MD_ScopeCode code names: {attribute, attributeType, collectionHardware,
1164 collectionSession, dataset, series, nonGeographicDataset, dimensionGroup, feature, featureType,
1165 propertyType, fieldSession, software, service, model, tile}. -->
1166     <!-- NAP example -->
1167     <!--
1168     <gmd:MD_ScopeCode
1169       codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_108"
1170       codeListValue="RI_622">dataset</gmd:MD_ScopeCode>
1171     -->
1172     <!-- ISO example -->
1173     <gmd:MD_ScopeCode
1174
1175   codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1176 Codelist/gmxCodelists.xml#MD_ScopeCode"
1177     codeListValue="dataset">dataset</gmd:MD_ScopeCode>
1178   </gmd:hierarchyLevel>
1179   <!-- (O-M) Resource hierarchy level name - ISO 19115 assumes that the metadata hierarchy level
1180 name defaults to "dataset" if it is not documented. NAP does not use it, recognizing that it is
1181 redundant. USGIN makes this property mandatory to identify the USGIN resource type (see USGIN
1182 Profile, "Resources of Interest"). Default USGIN hierarchyLevelName.CharacterString is "Dataset."
1183 Encode hierarchy by including hierarchyLevelName elements for all broader resource categories.
1184 E.g. default should also include a hierarchyLevelName="Collection" element. For services USGIN
1185 hierarchyLevelName.CharacterString is "Service". As use cases develop that provide rationale for
1186 definition of sub-categories of service, the resource category list will be expanded. -->
1187   <gmd:hierarchyLevelName>
1188     <gco:CharacterString>dataset</gco:CharacterString>
1189   </gmd:hierarchyLevelName>
1190   <!-- (M-M) Metadata point of contact - Point of contact for the metadata record, e.g. for users
1191 to report errors, updates to metadata, etc. -->
1192   <gmd:contact>
1193     <gmd:CI_ResponsibleParty>
1194       <!-- (M-M) (individualName + organisationName + positionName) > 0 -->
1195       <!--
1196       <gmd:individualName>
1197         <gco:CharacterString>Stephen Richard</gco:CharacterString>
1198       </gmd:individualName>
1199       -->
1200     <gmd:organisationName>
```

```

1201      <gco:CharacterString>Arizona Geological Survey</gco:CharacterString>
1202    </gmd:organisationName>
1203    <!--
1204    <gmd:positionName>
1205      <gco:CharacterString>Metadata Czar</gco:CharacterString>
1206    </gmd:positionName>
1207    -->
1208    <gmd:contactInfo>
1209      <gmd:CI_Contact>
1210        <!-- Phone -->
1211        <!--
1212        <gmd:phone>
1213          <gmd:CI_Telephone>
1214            <gmd:voice>
1215              <gco:CharacterString>520.770.3500</gco:CharacterString>
1216            </gmd:voice>
1217            <gmd:facsimile>
1218              <gco:CharacterString>520.770.3505</gco:CharacterString>
1219            </gmd:facsimile>
1220          </gmd:CI_Telephone>
1221        </gmd:phone>
1222        -->
1223        <!-- Address -->
1224        <gmd:address>
1225          <gmd:CI_Address>
1226            <!--
1227            <gmd:deliveryPoint>
1228              <gco:CharacterString>416 W. Congress St., Suite 100</gco:CharacterString>
1229            </gmd:deliveryPoint>
1230            <gmd:city>
1231              <gco:CharacterString>Tucson</gco:CharacterString>
1232            </gmd:city>
1233            <gmd:administrativeArea>
1234              <gco:CharacterString>Arizona</gco:CharacterString>
1235            </gmd:administrativeArea>
1236            <gmd:postalCode>
1237              <gco:CharacterString>85701-1381</gco:CharacterString>
1238            </gmd:postalCode>
1239            <gmd:country>
1240              <gco:CharacterString>USA</gco:CharacterString>
1241            </gmd:country>
1242            -->
1243            <!-- (O-M) Metadata point of contact e-mail address - mandatory in USGIN -->
1244            <gmd:electronicMailAddress>
1245              <gco:CharacterString>metadata@azgs.az.gov</gco:CharacterString>
1246            </gmd:electronicMailAddress>
1247          </gmd:CI_Address>
1248        </gmd:address>
1249        </gmd:CI_Contact>
1250      </gmd:contactInfo>
1251      <!-- (M-M) ISO 19139 Mandatory: contact role -->
1252      <gmd:role>
1253        <!-- CI_RoleCode names: {resourceProvider, custodian, owner, user, distributor,
1254 originator, pointOfContact, principalInvestigator, processor, publisher, author} - NAP expands
1255 with {collaborator, editor, mediator, rightsHolder}. -->
1256        <!-- NAP example -->
1257        <!--
1258        <gmd:CI_RoleCode
1259          codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC\_90"
1260          codeListValue="RI_414">pointOfContact</gmd:CI_RoleCode>
1261        -->
1262        <!-- ISO example -->
1263        <gmd:CI_RoleCode
1264
1265          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\_19139\_Schemas/resources/Codelist/gmxCodelists.xml#CI\_RoleCode"
1266            codeListValue="pointOfContact">point of contact</gmd:CI_RoleCode>
1267          </gmd:role>
1268        </gmd:CI_ResponsibleParty>
1269      </gmd:contact>

```

```

1271 <!-- (M-M) Metadata date stamp - USGIN profile requires use of dateStamp/gco:DateTime (Note  

1272 this contrasts with INSPIRE mandate to use dateStamp/gco:Date). This is the date and time when  

1273 the metadata record was created or updated (following NAP). -->  

1274 <gmd:dateStamp>  

1275   <!-- Requires an extended ISO 8601 formatted combined UTC date and time string (2009-11-  

1276 17T10:00:00) -->  

1277   <gco:DateTime>2010-01-14T10:00:00</gco:DateTime>  

1278 </gmd:dateStamp>  

1279 <!-- (M-M) metadata standard - NAP specifies "NAP - Metadata". USGIN profile conformant  

1280 metadata is indicated by using "ISO-NAP-USGIN" -->  

1281 <gmd:metadataStandardName>  

1282   <gco:CharacterString>ISO-NAP-USGIN</gco:CharacterString>  

1283 </gmd:metadataStandardName>  

1284 <!-- (O-M) USGIN profile version -->  

1285 <gmd:metadataStandardVersion>  

1286   <gco:CharacterString>1.1</gco:CharacterString>  

1287 </gmd:metadataStandardVersion>  

1288 <!-- ***** -->  

1289 <!-- (M-M) Resource identification information - At least one of MD_DataIdentification  

1290 (dataset, dataset series) or SV_ServiceIdentification (service) is required. -->  

1291 <gmd:identificationInfo>  

1292   <!-- Resource Dataset or Dataset Series Identification -->  

1293   <gmd:MD_DataIdentification>  

1294     <gmd:citation>  

1295       <!-- (M-M) Resource citation - For USGIN purposes, this should be viewed as information  

1296 to identify the intellectual origin of the content in the described resource, along the lines of  

1297 a citation in a scientific journal. Required content for a CI_Citation element are title, date,  

1298 and responsibleParty -->  

1299     <gmd:CI_Citation>  

1300       <!-- (M-M) Resource title - USGIN recommends using titles that inform the human reader  

1301 about the dataset's content as well as its context. -->  

1302       <gmd:title>  

1303         <gco:CharacterString>USGIN minimum metadata example XML file. Note that this example  

1304 includes conditional minimum elements that may or may not apply to a specific resource and its  

1305 metadata.</gco:CharacterString>  

1306       </gmd:title>  

1307       <!-- (M-M) Resource reference date - Best practice is to include at least the date of  

1308 publication or creation of the resource. The date of the resource reported in the citation  

1309 corresponds to the resource's last update version according to its update frequency. CI_Date  

1310 content includes a date and dateType. Date for USGIN profile uses xs:date data type, defined thus  

1311 "date uses the date/timeSevenPropertyModel, with hour, minute, and second required to be absent.  

1312 timezoneOffset• remains optional" (http://www.w3.org/TR/xmlschema1-2). -->  

1313     <gmd:date>  

1314       <gmd:CI_Date>  

1315         <gmd:date>  

1316           <!-- Requires an extended ISO 8601 formatted combined UTC date and time string  

1317 (2001-12-17T09:30:47) -->  

1318           <gco:DateTime>2010-01-14T09:30:47</gco:DateTime>  

1319         </gmd:date>  

1320         <gmd:dateType>  

1321           <!-- CI_DateTypeCode names: {creation, publication, revision} - NAP expands with  

1322 {notAvailable, inForce, adopted, deprecated, superseded}. -->  

1323           <!-- NAP example -->  

1324           <!--  

1325             <gmd:CI_DateTypeCode  

1326               codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC\_87"  

1327               codeListValue="RI_367">publication</gmd:CI_DateTypeCode>  

1328             -->  

1329             <!-- ISO example -->  

1330             <gmd:CI_DateTypeCode  

1331               codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\_19139\_Schemas/resources/Codelist/gmxCodelists.xml#CI\_DateTypeCode"  

1332               codeListValue="publication">publication</gmd:CI_DateTypeCode>  

1333             </gmd:dateType>  

1334             </gmd:CI_Date>  

1335           <!-- (C-C) Unique resource identifier - NAP makes MD_Identifier mandatory for dataset  

1336 and dataset series.  

1337           For USGIN purposes, this element content value should be only considered an identifier  

1338 for the citation, without any assumption that it will use http protocol. The identifier may be  

1339 resolvable to a URL, if a protocol prefix specifies an identifier scheme that is resolvable (e.g.  

1340
1341
1342

```

```

1343 http, urn...), but this is not necessary for a valid document, and should not be assumed when
1344 processing metadata documents.
1345 For USGIN, IF the Citation has an identifier that is different from the identifier for
1346 the described resource (MD_Metadata/dataSetURI), it must be included here. RS_Identifier may
1347 substitute for MD_Identifier in the ISO19139 schema, but the USGIN profile requires use of
1348 MD_Identifier. If additional codespace and version content is associated with the identifier, it
1349 should be encoded as MD_Identifier/authority/ CI_Citation/ alternateTitle and MD_Identifier/
1350 authority/ CI_Citation/ edition -->
1351     <gmd:identifier>
1352         <gmd:MD_Identifier>
1353             <gmd:code>
1354                 <!-- 13 digit ISBN example -->
1355                 <gco:CharacterString>isbn:000-0-000-00000-0</gco:CharacterString>
1356             </gmd:code>
1357         </gmd:MD_Identifier>
1358     </gmd:identifier>
1359     <!-- (M-M) Resource responsible party - The citation attribute provides information for
1360 citing the described resource. Citation is defined by Webster as "an act of quoting". The precise
1361 semantics of what an identification/citation is supposed to be are not very well articulated in
1362 ISO19115. For USGIN purposes, this should be viewed as information to identify the intellectual
1363 origin (or property) of the content in the described resource, along the lines of a citation in a
1364 scientific journal. Required content for a CI_Citation element are title, date, and
1365 'responsibleParty'. -->
1366     <gmd:citedResponsibleParty>
1367         <gmd:CI_ResponsibleParty>
1368             <!-- (C-C) (individualName + organisationName + positionName) > 0 -->
1369             <!--
1370                 <gmd:individualName>
1371                     <gco:CharacterString>Wolfgang Grunberg</gco:CharacterString>
1372                 </gmd:individualName>
1373             -->
1374             <gmd:organisationName>
1375                 <gco:CharacterString>Arizona Geological Survey</gco:CharacterString>
1376             </gmd:organisationName>
1377             <!--
1378                 <gmd:positionName>
1379                     <gco:CharacterString>IT Specialist</gco:CharacterString>
1380                 </gmd:positionName>
1381             -->
1382             <!-- (O-C) Contact Information - (phone + deliveryPoint + electronicMailAddress ) >
1383 0 -->
1384         <gmd:contactInfo>
1385             <gmd:CI_Contact>
1386                 <gmd:phone>
1387                     <gmd:CI_Telephone>
1388                         <gmd:voice>
1389                             <gco:CharacterString>520-770-3500</gco:CharacterString>
1390                         </gmd:voice>
1391                         <gmd:facsimile>
1392                             <gco:CharacterString>520-770-3505</gco:CharacterString>
1393                         </gmd:facsimile>
1394                     </gmd:CI_Telephone>
1395                 </gmd:phone>
1396                 <!--
1397                 <gmd:address>
1398                     <gmd:CI_Address>
1399                         <gmd:deliveryPoint>
1400                             <gco:CharacterString>416 W. Congress St., Suite 100</gco:CharacterString>
1401                         </gmd:deliveryPoint>
1402                         <gmd:city>
1403                             <gco:CharacterString>Tucson</gco:CharacterString>
1404                         </gmd:city>
1405                         <gmd:administrativeArea>
1406                             <gco:CharacterString>Arizona</gco:CharacterString>
1407                         </gmd:administrativeArea>
1408                         <gmd:postalCode>
1409                             <gco:CharacterString>85701</gco:CharacterString>
1410                         </gmd:postalCode>
1411                         <gmd:country>
1412                             <gco:CharacterString>USA</gco:CharacterString>
1413                         </gmd:country>
1414                     <gmd:electronicMailAddress>
```

```

1415             <gco:CharacterString>metadata@azgs.az.gov</gco:CharacterString>
1416             </gmd:electronicMailAddress>
1417             </gmd:CI_Address>
1418             </gmd:address>
1419             -->
1420             </gmd:CI_Contact>
1421             </gmd:contactInfo>
1422             <!-- (M-M) ISO 19139 Mandatory: contact role - Guidance on use of role codes would
1423             be helpful for consistency, but has not been developed as yet.. -->
1424             <gmd:role>
1425                 <!-- CI_RoleCode names: {resourceProvider, custodian, owner, user, distributor,
1426                 originator, pointOfContact, principalInvestigator, processor, publisher, author} - NAP expands
1427                 with {collaborator, editor, mediator, rightsHolder}. -->
1428                 <!-- NAP example -->
1429                 <!--
1430                 <gmd:CI_RoleCode
1431                     codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_90"
1432                     codeListValue="RI_414">pointOfContact</gmd:CI_RoleCode>
1433                     -->
1434                     <!-- ISO example -->
1435                     <gmd:CI_RoleCode
1436
1437                     codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1438                     Codelist/gmxCodelists.xml#CI_RoleCode"
1439                         codeListValue="pointOfContact">point of contact</gmd:CI_RoleCode>
1440                         </gmd:role>
1441                         </gmd:CI_ResponsibleParty>
1442                         </gmd:citedResponsibleParty>
1443                         </gmd:CI_Citation>
1444                         </gmd:citation>
1445                         <!-- (M-M) Resource Abstract - A free text summary of the content, significance, purpose,
1446                         scope, etc. of the resource. Exactly one value. -->
1447                         <gmd:abstract>
1448                             <gco:CharacterString>Example for the minimum required elements in a USGIN dataset
1449 metadata record.</gco:CharacterString>
1450                         </gmd:abstract>
1451                         <!-- (M-M) Resource Status - -->
1452                         <gmd:status>
1453                             <!-- Value is from MD_ProgressCode names: {completed, historicalArchive, obsolete,
1454                             onGoing, planned, required, underDevelopment} - NAP expands with {proposed}. Obsolete is
1455                             synonymous with deprecated. -->
1456                             <!-- NAP example -->
1457                             <!--
1458                             <gmd:MD_ProgressCode
1459                                 codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_106"
1460                                 codeListValue="RI_593">completed</gmd:MD_ProgressCode>
1461                             -->
1462                             <!-- ISO Example -->
1463                             <gmd:MD_ProgressCode
1464
1465                             codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1466                             Codelist/gmxCodelists.xml#MD_ProgressCode"
1467                                 codeListValue="completed">completed</gmd:MD_ProgressCode>
1468                                 </gmd:status>
1469                                 <!-- (O-C) Resource point of contact (access contact) - CI_ResponsibleParty element here
1470                                 would contain information for point of contact to access the resource. This information is
1471                                 mandatory for physical resources such as core, cuttings, samples, manuscripts. -->
1472                                 <gmd:pointOfContact>
1473                                     <gmd:CI_ResponsibleParty>
1474                                         <!-- (M-M) (individualName + organisationName + positionName) > 0 -->
1475                                         <!--
1476                                         <gmd:individualName>
1477                                             <gco:CharacterString>Steve Rauzi</gco:CharacterString>
1478                                         </gmd:individualName>
1479                                         -->
1480                                         <gmd:organisationName>
1481                                             <gco:CharacterString>Arizona Geological Survey</gco:CharacterString>
1482                                         </gmd:organisationName>
1483                                         <!--
1484                                         <gmd:positionName>
1485                                             <gco:CharacterString>Oil and Gas Administrator</gco:CharacterString>
1486                                         </gmd:positionName>
```

```

1487      -->
1488      <!-- (O-C) Contact Information - If a resource point of contact is required then (phone
1489 + deliveryPoint + electronicMailAddress) > 0 -->
1490      <gmd:contactInfo>
1491          <gmd:CI_Contact>
1492              <!--
1493                  <gmd:phone>
1494                      <gmd:CI_Telephone>
1495                          <gmd:voice>
1496                              <gco:CharacterString>520-770-3500</gco:CharacterString>
1497                          </gmd:voice>
1498                          <gmd:facsimile>
1499                              <gco:CharacterString>520-770-3505</gco:CharacterString>
1500                          </gmd:facsimile>
1501                      </gmd:CI_Telephone>
1502                  </gmd:phone>
1503              -->
1504              <gmd:address>
1505                  <gmd:CI_Address>
1506                      <!--
1507                          <gmd:deliveryPoint>
1508                              <gco:CharacterString>416 W. Congress St., Suite 100</gco:CharacterString>
1509                          </gmd:deliveryPoint>
1510                          <gmd:city>
1511                              <gco:CharacterString>Tucson</gco:CharacterString>
1512                          </gmd:city>
1513                          <gmd:administrativeArea>
1514                              <gco:CharacterString>Arizona</gco:CharacterString>
1515                          </gmd:administrativeArea>
1516                          <gmd:postalCode>
1517                              <gco:CharacterString>85701</gco:CharacterString>
1518                          </gmd:postalCode>
1519                          <gmd:country>
1520                              <gco:CharacterString>USA</gco:CharacterString>
1521                          </gmd:country>
1522                      -->
1523                      <gmd:electronicMailAddress>
1524                          <gco:CharacterString>Steve.rauzi@azgs.az.gov</gco:CharacterString>
1525                      </gmd:electronicMailAddress>
1526                  </gmd:CI_Address>
1527              </gmd:address>
1528          </gmd:CI_Contact>
1529      </gmd:contactInfo>
1530      <!-- (M-M) ISO 19139 Mandatory: contact role - Guidance on use of role codes would be
1531 helpful for consistency, but has not been developed as yet. -->
1532      <gmd:role>
1533          <!-- The CI_ResponsibleParty/role/CI_RoleCode is from CI_RoleCode names:
1534 {resourceProvider, custodian, owner, user, distributor, originator, pointOfContact,
1535 principalInvestigator, processor, publisher, author} - NAP expands with {collaborator, editor,
1536 mediator, rightsHolder}. -->
1537          <!-- NAP example -->
1538          <!--
1539              <gmd:CI_RoleCode
1540                  codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_90"
1541                  codeListValue="RI_414">pointOfContact</gmd:CI_RoleCode>
1542          -->
1543          <!-- ISO example -->
1544          <gmd:CI_RoleCode
1545
1546      codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1547      Codelist/gmxCodelists.xml#CI_RoleCode"
1548          codeListValue="pointOfContact">point of contact</gmd:CI_RoleCode>
1549          </gmd:role>
1550          </gmd:CI_ResponsibleParty>
1551      </gmd:pointOfContact>
1552      <!-- (M-M) Resource language - Multiple instances of this element indicate that the
1553 linguistic content of the resource is available in multiple languages -->
1554      <gmd:language>
1555          <!-- ISO 639-2/T three-letter language code in lowercase
1556 (http://www.loc.gov/standards/iso639-2/). -->
1557          <gco:CharacterString>eng</gco:CharacterString>
1558      </gmd:language>
```

```

1559      <!-- (C-C) Topic category - NAP specifies that topicCategory code shall be provided when
1560 hierarchyLevel is set to "dataset" or "dataset series". Most USGIN resources will have
1561 topicCategory="geoscientificInformation", which is the default value for this profile. More
1562 specific topic categorization should be done using keywords. NAP declares not applicable to
1563 services. -->
1564      <gmd:topicCategory>
1565          <!-- MD_TopicCategoryCode names: {farming, biota, boundaries,
1566 climatologyMeteorologyAtmosphere, economy, elevation, environment, geoscientificInformation,
1567 health, imageryBaseMapsEarthCover, intelligenceMilitary, inlandWater, location, oceans,
1568 planningCadastre, society, structure, transportation, utilitiesCommunication} -->
1569          <gmd:MD_TopicCategoryCode>geoscientificInformation</gmd:MD_TopicCategoryCode>
1570      </gmd:topicCategory>
1571      <!-- (C-C) Resource content extent - Defines the spatial (horizontal and vertical) and
1572 temporal region to which the content of the resource applies. For USGIN, the spatial extent is a
1573 rectangle that bounds the geographic extent to which resource content applies. NAP specifies
1574 required when hierarchyLevel is set to 'dataset'. USGIN specifies (description +
1575 geographicElement + temporalElement) > 0. -->
1576      <gmd:extent>
1577          <gmd:EX_Extent>
1578              <!-- (C-C) Resource Content extent description - Free text that describes the spatial
1579 and temporal extent of the dataset. USGIN specifies that description is mandatory if a
1580 geographicElement or temporalElement is not provided. Note that if geographic place names are
1581 used to express the geographic extent, USGIN profile specifies that these should be encoded using
1582 keyword with keyword type code = 'place.' Geographic names may be duplicated in the
1583 EX_Extent/description. -->
1584              <!--
1585                  <gmd:description>
1586                      <gco:CharacterString>Some spatio-temporal description.</gco:CharacterString>
1587                  </gmd:description>
1588              -->
1589              <!-- (O-C) Resource content extent bounding box -USGIN profile requires that if an
1590 EX_Extent/geographicElement is supplied, it include a geographic bounding box with bounding
1591 latitude and longitude expressed using WGS 84 decimal degrees. The corner coordinates for the
1592 geographic bounding box must not coincide in one point, because this may result in fatal errors
1593 with some CSW implementations. Point locations must thus be represented as tiny rectangles. USGIN
1594 recommended practice is to place the actual point location in the lower left corner of the
1595 rectangle. -->
1596                  <gmd:geographicElement>
1597                      <gmd:EX_GeographicBoundingBox>
1598                          <gmd:extentTypeCode>
1599                              <gco:Boolean>1</gco:Boolean>
1600                          </gmd:extentTypeCode>
1601                          <gmd:westBoundLongitude>
1602                              <gco:Decimal>-109.911001</gco:Decimal>
1603                          </gmd:westBoundLongitude>
1604                          <gmd:eastBoundLongitude>
1605                              <gco:Decimal>-109.910999</gco:Decimal>
1606                          </gmd:eastBoundLongitude>
1607                          <gmd:southBoundLatitude>
1608                              <gco:Decimal>34.772899</gco:Decimal>
1609                          </gmd:southBoundLatitude>
1610                          <gmd:northBoundLatitude>
1611                              <gco:Decimal>34.772901</gco:Decimal>
1612                          </gmd:northBoundLatitude>
1613                      </gmd:EX_GeographicBoundingBox>
1614                  </gmd:geographicElement>
1615                  </gmd:EX_Extent>
1616              </gmd:extent>
1617              <!-- (O-O) Resource temporal extent - -->
1618              <!--
1619                  <gmd:extent>
1620                      <gmd:EX_Extent>
1621                          <gmd:temporalElement>
1622                              <gmd:EX_TemporalExtent>
1623                                  <gmd:extent>
1624                                      --><!-- Default ISO time frame example --><!--
1625                                      <gml:TimePeriod gml:id="#IdModern">
1626                                          <gml:name>Y2KX</gml:name>
1627                                      --><!-- USGIN requires the beginPosition and endPosition's frame property to be
1628 defined. The default value is #ISO-8601. --><!--
1629                                          <gml:beginPosition frame="#ISO-8601">2010-01-00T00:00:00</gml:beginPosition>
1630                                          <gml:endPosition frame="#ISO-8601">2010-12-31T24:00:00</gml:endPosition>

```

```
1631      </gml:TimePeriod>
1632      --><!-- Geologic time frame example --><!--
1633      <gml:TimePeriod gml:id="IdJurassic">
1634          <gml:name>Jurassic</gml:name>
1635          --><!-- USGIN requires the beginPosition and endPosition's frame property to be
1636 defined. The default value is #ISO-8601. --><!--
1637          <gml:beginPosition
1638              frame="urn:cgi:trs:CGI:StandardGeologicTimeMa">203</gml:beginPosition>
1639              <gml:endPosition frame="urn:cgi:trs:CGI:StandardGeologicTimeMa
1640          ">135</gml:endPosition>
1641          </gml:TimePeriod>
1642          </gmd:extent>
1643          </gmd:EX_TemporalExtent>
1644          </gmd:temporalElement>
1645          </gmd:EX_Extent>
1646          </gmd:extent>
1647          -->
1648          </gmd:MD_DataIdentification>
1649          </gmd:identificationInfo>
1650          <!-- **** -->
1651      </gmd:MD_Metadata>
1652
```

1653

## 1654 8.2 USGIN ISO 19139 Dataset Metadata

1655 In the following listing, text in green is comments; XML elements are in blue, XML attributes are in black,  
1656 and attribute values are in purple.

1657

```
1658 <?xml version="1.0" encoding="UTF-8"?>
1659 <!--
1660 **** Example ISO 19139 Geospatial Dataset Metadata based on the USGIN v1.1 Profile
1661 *** by USGIN Standards and Protocols Drafting Team
1662 *** U.S. Geoscience Information System (USGIN) - http://lab.usgin.org
1663 *** Contributors: Wolfgang Grunberg, Stephen M Richard
1664 *** 01/20/2010
1665 ***
1666 ***
1667 *** DISCLAIMER: this is not an authoritative metadata example but an aide to get started.
1668 *** Scope notes are mostly from NAP or ISO documentation; refer to
1669 *** the USGIN profile document for more specific and reliable guidelines.
1670 ***
1671 *** Validated against http://www.isotc211.org/2005/gmd (ISO 19115, CSW 2.0.2 AP ISO 1.0).
1672 *** Follows the USGIN ISO 19139 Dataset Metadata Profile v1.1.
1673 *** a derivative of the North American Profile (NAP)
1674 ***
1675 *** NOTES:
1676 *** - Codelists:
1677 *** Most ISO metadata profiles and applications use ISO codelists or codelists that use ISO's
1678 codelist names. NAP does not use ISO codelist names. USGIN recommends using ISO over NAP
1679 codelists to ensure interoperability. Remember, the codeList attribute points to a Uniform
1680 Resource Identifier (URI) which defines an item's identity. It can be a URN or a URL.
1681 *** - napm schema extension:
1682 ***
1683 http://www.cits.rncan.gc.ca/html/brodeurj/.protege/.napMetadata/napMetadataWebsite/napMetadataToo
1684 ls/napXsd/napm is the namespace for NAP extensions in xmlns:napm. Its schema is located at
1685 http://www.cits.rncan.gc.ca/html/brodeurj/.protege/.napMetadata/tools/napXsd/napm/napm.xsd.
1686 However, that schema does not resolve properly because it also references a local copy of gmd.
1687 USGIN does not follow this NAP requirement because it constitutes a barrier to interoperability.
1688 *** - Language code:
1689 *** NAP demands <ISO639-2/T three letter language code - lower case></><blank space><ISO3166-1
1690 three letter country code - upper case>. However, NAP's requirement is not interoperable and
1691 USGIN prefers ISO's <ISO639-2/T three letter language code - lower case> formatting.
1692 ***
1693 *** KEY: (NAP-USGIN) - M/C/O/X (Mandatory, Conditional, Optional, Not Used)
1694 ***
1695 ****
1696 <!-- USGIN ISO 19139 geospatial dataset metadata record -->
1697 <gmd:MD_Metadata
1698   xmlns:gmd="http://www.isotc211.org/2005/gmd"
1699   xmlns:gco="http://www.isotc211.org/2005/gco"
1700   xmlns:gml="http://www.opengis.net/gml"
1701   xmlns:xlink="http://www.w3.org/1999/xlink"
1702   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
1703   xsi:schemaLocation="http://www.isotc211.org/2005/gmd
1704     http://schemas.opengis.net/csw/2.0.2/profiles/apiso/1.0.0/apiso.xsd">
1705   <!-- (M-M) Metadata file identifier - A unique File Identifier (GUID) - USGIN recommends using
1706 a valid Universally Unique Identifier (UUID) -->
1707   <gmd:fileIdentifier>
1708     <gco:CharacterString>00C02E67-F1ED-473D-A240-068CCB041A73</gco:CharacterString>
1709   </gmd:fileIdentifier>
1710   <!-- (M-M) Metadata language - NAP demands <ISO639-2/T three letter language code - lower
1711 case></><blank space><ISO3166-1 three letter country code - upper case>. However, NAP's
1712 requirement is not interoperable and USGIN prefers ISO's <ISO639-2/T three letter language code -
1713 lower case> formatting. -->
1714   <!-- NAP Example -->
1715   <!--
1716   <gmd:language>
1717     <gco:CharacterString>eng; USA</gco:CharacterString>
1718   </gmd:language>
1719 
```

```

1720-->
1721<!-- ISO Example -->
1722<gmd:language>
1723  <gco:CharacterString>eng</gco:CharacterString>
1724</gmd:language>
1725  <!-- (M-M) Metadata character set - NAP specifies default is "utf8", codelist =
1726  napMD_CharacterSetCode. USGIN requires that a character set code is defined to facilitate CSW
1727  servers (degreee, GeoNetwork, etc.). -->
1728<gmd:characterSet>
1729  <!-- MD_CharacterSetCode names: {ucs2, ucs4, utf7, utf8, utf16, 8859part1, 8859part2,
1730  8859part3, 8859part4, 8859part5, 8859part6, 8859part7, 8859part8, 8859part9, 8859part10,
1731  8859part11, 8859part13, 8859part14, 8859part15, 8859part16, jis, shiftJIS, eucJP, usAscii,
1732  ebcdic, eucKR, big5, GB2312}. -->
1733  <!-- NAP example -->
1734  <!--
1735  <gmd:MD_CharacterSetCode
1736    codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_95"
1737    codeListValue="RI_458">utf8</gmd:MD_CharacterSetCode>
1738-->
1739  <!-- ISO example -->
1740<gmd:MD_CharacterSetCode
1741
1742  codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1743  Codelist/gmxCodelists.xml#MD_CharacterSetCode"
1744    codeListValue="utf8">UTF-8</gmd:MD_CharacterSetCode>
1745</gmd:characterSet>
1746  <!-- (M-M) Resource type - Define if this record is a: dataset (default), service, feature,
1747  software, etc. -->
1748<gmd:hierarchyLevel>
1749  <!-- MD_ScopeCode code names: {attribute, attributeType, collectionHardware,
1750  collectionSession, dataset, series, nonGeographicDataset, dimensionGroup, feature, featureType,
1751  propertyType, fieldSession, software, service, model, tile}. -->
1752  <!-- NAP example -->
1753  <!--
1754  <gmd:MD_ScopeCode
1755    codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_108"
1756    codeListValue="RI_622">dataset</gmd:MD_ScopeCode>
1757-->
1758  <!-- ISO example -->
1759<gmd:MD_ScopeCode
1760
1761  codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1762  Codelist/gmxCodelists.xml#MD_ScopeCode"
1763    codeListValue="dataset">dataset</gmd:MD_ScopeCode>
1764</gmd:hierarchyLevel>
1765  <!-- (O-M) Resource hierarchy level name - ISO 19115 assumes that the metadata hierarchy level
1766  name defaults to "dataset" if it is not documented. NAP does not use it, recognizing that it is
1767  redundant. USGIN makes this property mandatory to identify the USGIN resource type (see USGIN
1768  Profile, "Resources of Interest"). Default USGIN hierarchyLevelName.CharacterString is "Dataset."
1769  Encode hierarchy by including hierarchyLevelName elements for all broader resource categories.
1770  E.g. default should also include a hierarchyLevelName="Collection" element. For services USGIN
1771  hierarchyLevelName.CharacterString is "Service". As use cases develop that provide rationale for
1772  definition of sub-categories of service, the resource category list will be expanded. -->
1773<gmd:hierarchyLevelName>
1774  <gco:CharacterString>Dataset</gco:CharacterString>
1775</gmd:hierarchyLevelName>
1776  <!-- (M-M) Metadata point of contact - Point of contact for the metadata record, e.g. for users
1777  to report errors, updates to metadata, etc. -->
1778<gmd:contact>
1779  <gmd:CI_ResponsibleParty>
1780    <!-- (M-M) (individualName + organisationName + positionName) > 0 -->
1781    <gmd:individualName>
1782      <gco:CharacterString>Stephen Richard</gco:CharacterString>
1783    </gmd:individualName>
1784    <gmd:organisationName>
1785      <gco:CharacterString>Arizona Geological Survey</gco:CharacterString>
1786    </gmd:organisationName>
1787    <gmd:positionName>
1788      <gco:CharacterString>Metadata Czar</gco:CharacterString>
1789    </gmd:positionName>
1790    <gmd:contactInfo>
1791      <gmd:CI_Contact>
```

```

1792      <!-- Phone -->
1793      <gmd:phone>
1794          <gmd:CI_Telephone>
1795              <gmd:voice>
1796                  <gco:CharacterString>520.770.3500</gco:CharacterString>
1797              </gmd:voice>
1798              <gmd:facsimile>
1799                  <gco:CharacterString>520.770.3505</gco:CharacterString>
1800              </gmd:facsimile>
1801          </gmd:CI_Telephone>
1802      </gmd:phone>
1803      <!-- Address -->
1804      <gmd:address>
1805          <gmd:CI_Address>
1806              <gmd:deliveryPoint>
1807                  <gco:CharacterString>416 W. Congress St., Suite 100</gco:CharacterString>
1808              </gmd:deliveryPoint>
1809              <gmd:city>
1810                  <gco:CharacterString>Tucson</gco:CharacterString>
1811              </gmd:city>
1812              <gmd:administrativeArea>
1813                  <gco:CharacterString>Arizona</gco:CharacterString>
1814              </gmd:administrativeArea>
1815              <gmd:postalCode>
1816                  <gco:CharacterString>85701-1381</gco:CharacterString>
1817              </gmd:postalCode>
1818              <gmd:country>
1819                  <gco:CharacterString>USA</gco:CharacterString>
1820              </gmd:country>
1821          <!-- (O-M) Metadata point of contact e-mail address - mandatory in USGIN -->
1822          <gmd:electronicMailAddress>
1823              <gco:CharacterString>metadata@azgs.az.gov</gco:CharacterString>
1824          </gmd:electronicMailAddress>
1825      </gmd:CI_Address>
1826      </gmd:address>
1827      <!-- (O-O) online resources - this is the online resource to contact the metadata
1828 person-->
1829          <gmd:onlineResource>
1830              <gmd:CI_OnlineResource>
1831                  <gmd:linkage>
1832                      <gmd:URL>http://www.azgs.az.gov</gmd:URL>
1833                  </gmd:linkage>
1834                  <gmd:protocol>
1835                      <gco:CharacterString>http</gco:CharacterString>
1836                  </gmd:protocol>
1837                  <gmd:description>
1838                      <gco:CharacterString>Arizona Geological Survey Web Site</gco:CharacterString>
1839                  </gmd:description>
1840                  </gmd:CI_OnlineResource>
1841          </gmd:onlineResource>
1842          <!-- (O-O) hours of service -->
1843          <gmd:hoursOfService>
1844              <gco:CharacterString>8 AM to 5 PM Mountain Standard time (no daylight
1845 savings)</gco:CharacterString>
1846          </gmd:hoursOfService>
1847          <!-- (O-O) contact instructions -->
1848          <gmd:contactInstructions>
1849              <gco:CharacterString>Contact Steve Rauzi [Steve.Rauzi@azgs.az.gov] or call Oil and Gas
1850 Commission Staff at Arizona Geological Survey, 520-770-3500.</gco:CharacterString>
1851          </gmd:contactInstructions>
1852          <gmd:CI_Contact>
1853      </gmd:contactInfo>
1854      <!-- (M-M) ISO 19139 Mandatory: contact role -->
1855      <gmd:role>
1856          <!-- CI_RoleCode names: {resourceProvider, custodian, owner, user, distributor,
1857 originator, pointOfContact, principalInvestigator, processor, publisher, author} - NAP expands
1858 with {collaborator, editor, mediator, rightsHolder}. -->
1859          <!-- NAP example -->
1860          <!--
1861          <gmd:CI_RoleCode
1862              codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC\_90"
1863              codeListValue="RI_414">pointOfContact</gmd:CI_RoleCode>

```

```

1864      -->
1865      <!-- ISO example -->
1866      <gmd:CI_RoleCode
1867
1868      codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1869      Codelist/gmxCodelists.xml#CI_RoleCode"
1870          codeListValue="pointOfContact">point of contact</gmd:CI_RoleCode>
1871      </gmd:role>
1872      </gmd:CI_ResponsibleParty>
1873      </gmd:contact>
1874      <!-- (X-O) Metadata should include a URL that locates a thumbnail logo for organizations
1875      related to the metadata origination, the organization hosting the catalog that returned the
1876      metadata, the organization that originated the data, and the organization hosting online services
1877      that provide access to the data. -->
1878      <gmd:contact>
1879          <gmd:CI_ResponsibleParty>
1880              <gmd:organisationName>
1881                  <gco:CharacterString>Arizona Geological Survey</gco:CharacterString>
1882              </gmd:organisationName>
1883              <gmd:contactInfo>
1884                  <gmd:CI_Contact>
1885                      <gmd:onlineResource>
1886                          <gmd:CI_OnlineResource>
1887                              <!-- Icon image file (e.g. tif, png, jpg, gif) for the metadata originator. This
1888                              icon will be displayed in search results to credit the metadata originator. -->
1889                              <gmd:linkage>
1890                                  <gmd:URL>http://www.azgs.az.gov/logo/metadata/azgs.png</gmd:URL>
1891                              </gmd:linkage>
1892                              <!-- (X-C) For URL's that indicate icon thumbnails, the CI_OnlineResource/name
1893      should be 'icon'. -->
1894          <gmd:name>
1895              <gco:CharacterString>icon</gco:CharacterString>
1896          </gmd:name>
1897          </gmd:CI_OnlineResource>
1898          </gmd:onlineResource>
1899      </gmd:CI_Contact>
1900      </gmd:contactInfo>
1901      <gmd:role>
1902          <!-- CI_RoleCode names: {resourceProvider, custodian, owner, user, distributor,
1903      originator, pointOfContact, principalInvestigator, processor, publisher, author} - NAP expands
1904      with {collaborator, editor, mediator, rightsHolder}. -->
1905          <!-- NAP example -->
1906          <!--
1907          <gmd:CI_RoleCode
1908              codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_90"
1909              codeListValue="RI_413">originator</gmd:CI_RoleCode>
1910          -->
1911          <!-- ISO example -->
1912          <gmd:CI_RoleCode
1913
1914      codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1915      Codelist/gmxCodelists.xml#CI_RoleCode"
1916          codeListValue="originator">originator</gmd:CI_RoleCode>
1917      </gmd:role>
1918      </gmd:CI_ResponsibleParty>
1919      </gmd:contact>
1920      <!-- (M-M) Metadata date stamp - USGIN profile requires use of dateStamp/gco:DateTime (Note
1921      this contrasts with INSPIRE mandate to use dateStamp/gco:Date). This is the date and time when
1922      the metadata record was created or updated (following NAP). -->
1923      <gmd:dateStamp>
1924          <!-- Requires an extended ISO 8601 formatted combined UTC date and time string (2009-11-
1925      17T10:00:00) -->
1926          <gco:DateTime>2009-11-17T10:00:00</gco:DateTime>
1927      </gmd:dateStamp>
1928      <!-- (M-M) metadata standard - NAP specifies "NAP - Metadata". USGIN profile conformant
1929      metadata is indicated by using "ISO-NAP-USGIN" -->
1930      <gmd:metadataStandardName>
1931          <gco:CharacterString>ISO-NAP-USGIN</gco:CharacterString>
1932      </gmd:metadataStandardName>
1933      <!-- (O-M) USGIN profile version -->
1934      <gmd:metadataStandardVersion>
1935          <gco:CharacterString>1.1</gco:CharacterString>

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1936 </gmd:metadataStandardVersion>
1937   <!-- (O-C) Dataset Identifier - For USGIN, this is a string that uniquely identifies the
1938 described resource. If the resource has an identifier, it should be included here; if the
1939 resource will be referenced from other metadata, it must have an identifier here. If the dataset
1940 is coupled to a service, the value of the MD_Metadata/dataSetURI attribute is the unique resource
1941 identifier used by srv:coupledResource to link the service with the dataset. For the USGIN
1942 profile, the MD_Distribution/transferOptions/MD_DigitalTransferOptions/ online/CI_OnlineResource
1943 is used to specify URLs for access to the resource. -->
1944   <gmd:dataSetURI>
1945     <!-- Uniform Resource Identifier (URI) -->
1946     <gco:CharacterString>http://azgs.az.gov/resource/00C02E67-F1ED-473D-A240-068CCB041A73</gco:CharacterString>
1947   </gmd:dataSetURI>
1948   <!-- (C-C) Other Languages - If description in more than one language is provided, this
1949 property should indicate what those languages are. The primary language used for metadata
1950 description is identified with MD_Metadata/language and characterSet and any additional languages
1951 are identified by MD_Metadata/locale/PT_locale elements, in which the language is provided
1952 according to ISO 639-2/T three-letter terminology codes in lowercase, and an optional country is
1953 provided according to ISO 3166-1 three-letter codes in uppercase, and mandatory
1954 characterEncoding. -->
1955   <!-- This locale element example implies that all character string elements are available in
1956 English (from the MD_Metadata/language element), and in French. -->
1957   <!--
1958     <gmd:locale>
1959       <gmd:PT_Locale id="FR">
1960         <gmd:languageCode>
1961           <gmd:LanguageCode
1962             codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1963               Codelist/ML_gmxCodelists.xml#LanguageCode"
1964                 codeListValue="fra">Français</gmd:LanguageCode>
1965               </gmd:languageCode>
1966               <gmd:characterEncoding>
1967                 --><!-- ISO example --><!--
1968                 <gmd:MD_CharacterSetCode
1969                   codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1970                     Codelist/gmxCodelists.xml#MD_CharacterSetCode"
1971                       codeListValue="utf8">UTF-8</gmd:MD_CharacterSetCode>
1972                     </gmd:characterEncoding>
1973                     </gmd:PT_Locale>
1974                   </gmd:locale>
1975                   -->
1976                   <!-- (O-O) Resource spatial representation - Spatial representation information for the dataset
1977 (resource). Best practice is to include metadata for spatial representation if the described
1978 resource is a georeferenced dataset. -->
1979                   <gmd:spatialRepresentationInfo>
1980                     <gmd:MD_VectorSpatialRepresentation>
1981                       <gmd:topologyLevel>
1982                         <!-- MD_TopoLevelCode names: {geometryOnly, topology1D, planarGraph, fullPlanarGraph,
1983                           surfaceGraph, fullSurfaceGraph, topology3D, fullTopology3D, abstract} -->
1984                           <!-- NAP Example -->
1985                           <!--
1986                             <gmd:MD_TopoLevelCode
1987                               codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_111"
1988                               codeListValue="RI_510">geometryOnly</gmd:MD_TopoLevelCode>
1989                           -->
1990                           <!-- ISO Example -->
1991                           <gmd:MD_TopoLevelCode
1992
1993                             codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
1994                               Codelist/gmxCodelists.xml#MD_TopoLevelCode"
1995                               codeListValue="geometryOnly">geometry only</gmd:MD_TopoLevelCode>
1996                             </gmd:topologyLevel>
1997                             <!-- (C-C) Identification of the objects used to represent features in the dataset - -->
1998                             <gmd:geometricObjects>
1999                               <gmd:MD_GeometricObjects>
2000                                 <gmd:geometricObjectType>
2001                                   <!-- MD_GeometricObjectTypeCode names: {complex, composite, curve, point, solid,
2002                                     surface} -->
2003                                   <!-- NAP Example -->
2004                                   <!--
2005                                     <!--
2006                                       <!--
2007                                         <!--

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2008      <gmd:MD_GeometricObjectTypeCode
2009          codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_99"
2010          codeListValue="RI_510">surface</gmd:MD_GeometricObjectTypeCode>
2011      -->
2012      <!-- ISO Example -->
2013      <gmd:MD_GeometricObjectTypeCode
2014
2015          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2016          Codelist/gmxCodelists.xml#MD_GeometricObjectTypeCode"
2017          codeListValue="surface">surface</gmd:MD_GeometricObjectTypeCode>
2018      </gmd:geometricObjectType>
2019      </gmd:MD_GeometricObjects>
2020      </gmd:geometricObjects>
2021      </gmd:MD_VectorSpatialRepresentation>
2022      </gmd:spatialRepresentationInfo>
2023      <!-- (O-O) Resource's spatial reference system - Description of the spatial and/or temporal
2024      reference systems used in the dataset. NAP specifies
2025      {identificationInfo/spatialRepresentationType/MD_SpatialRepresentationTypeCode = "vector") or
2026      (.../MD_SpatialRepresentationTypeCode = "grid") or (.../MD_SpatialRepresentationTypeCode =
2027      ""tin"") implies count referenceSystemInfo >= 1 } -->
2028      <gmd:referenceSystemInfo>
2029          <gmd:MD_ReferenceSystem>
2030              <!-- ISO 19115:2003 Corrigendum 1:2006 removes CRS and projection parameter information,
2031              and uses ISO 19111 instead -->
2032              <gmd:referenceSystemIdentifier>
2033                  <!-- (C-C) Reference System identifier code - For USGIN the code should be a value from
2034                  the EPSG Geodetic Parameter Dataset register (http://www.epsg-registry.org/) in the form
2035                  "EPSG:nnnn" where nnnn is the EPSG code number for the CRS. -->
2036                  <gmd:code>
2037                      <gco:CharacterString>EPSG:5701</gco:CharacterString>
2038                  </gmd:code>
2039                  <gmd:codeSpace>
2040                      <gco:CharacterString>urn:ogc:def:crs</gco:CharacterString>
2041                  </gmd:codeSpace>
2042                  </gmd:RS_Identifier>
2043                  </gmd:referenceSystemIdentifier>
2044          </gmd:MD_ReferenceSystem>
2045          </gmd:referenceSystemInfo>
2046      <!-- (X-X) Metadata extension information - not used in USGIN -->
2047      <!--
2048      <gmd:metadataExtensionInfo/>
2049      -->
2050      <!-- **** -->
2051      <!-- (M-M) Resource identification information - At least one of MD_DataIdentification
2052      (dataset, dataset series) or SV_ServiceIdentification (service) is required. -->
2053      <gmd:identificationInfo>
2054          <!-- Resource Dataset or Dataset Series Identification -->
2055          <gmd:MD_DataIdentification>
2056              <gmd:citation>
2057                  <!-- (M-M) Resource citation - For USGIN purposes, this should be viewed as information
2058                  to identify the intellectual origin of the content in the described resource, along the lines of
2059                  a citation in a scientific journal. Required content for a CI_Citation element are title, date,
2060                  and responsibleParty -->
2061                  <gmd:CI_Citation>
2062                      <!-- (M-M) Resource title - USGIN recommends using titles that inform the human reader
2063                      about the dataset's content as well as its context. -->
2064                      <gmd:title>
2065                          <gco:CharacterString>Scanned Borehole Compensated Sonic Log for 0391, Kerr-McGee08
2066                          Navajo</gco:CharacterString>
2067                      </gmd:title>
2068                      <!-- (O-O) Alternate title -->
2069                      <!--
2070                      <gmd:alternateTitle>
2071                          <gco:CharacterString>some alternate title</gco:CharacterString>
2072                      </gmd:alternateTitle>
2073                      -->
2074                      <!-- (M-M) Resource reference date - Best practice is to include at least the date of
2075                      publication or creation of the resource. The date of the resource reported in the citation
2076                      corresponds to the resource's last update version according to its update frequency. CI_Date
2077                      content includes a date and dateType. Date for USGIN profile uses xs:date data type, defined thus
2078      
```

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2079 "date uses the date/timeSevenPropertyModel, with hour, minute, and second required to be absent.
2080 timezoneOffset• remains optional" (http://www.w3.org/TR/xmlschemall-2). -->
2081     <gmd:date>
2082         <gmd:CI_Date>
2083             <gmd:date>
2084                 <!-- Requires an extended ISO 8601 formatted combined UTC date and time string
2085 (2001-12-17T09:30:47) --&gt;
2086                 &lt;gco:DateTime&gt;<b>2001-12-17T09:30:47</gco:DateTime>
2087             </gmd:date>
2088             <gmd:dateType>
2089                 <!-- CI_DateTypeCode names: {creation, publication, revision} _ NAP expands with
2090 {notAvailable, inForce, adopted, deprecated, superseded}.--&gt;
2091                 &lt;!-- NAP Example --&gt;
2092                 &lt;!--
2093                     &lt;gmd:CI_DateTypeCode
2094                         codeList="<a href="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_87">http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_87">
2095                         codeListValue="RI_367">publication</gmd:CI_DateTypeCode>
2096                     -->
2097                     <!-- ISO Example -->
2098                     <gmd:CI_DateTypeCode
2099
2100                     codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\_19139\_Schemas/resources/Codelist/gmxCodelists.xml#CI\_DateTypeCode">
2101                         codeListValue="publication">publication</gmd:CI_DateTypeCode>
2102                     -->
2103                     </gmd:CI_DateTypeCode>
2104                 </gmd:CI_Date>
2105             </gmd:date>
2106             <!-- (C-C) Unique resource identifier - NAP makes MD_Identifier mandatory for dataset
2107 and dataset series.
2108             For USGIN purposes, this element content value should be only considered an identifier
2109 for the citation, without any assumption that it will use http protocol. The identifier may be
2110 resolvable to a URL, if a protocol prefix specifies an identifier scheme that is resolvable (e.g.
2111 http, urn...), but this is not necessary for a valid document, and should not be assumed when
2112 processing metadata documents.
2113             For USGIN, IF the Citation has an identifier that is different from the identifier for
2114 the described resource (MD_Metadata/dataSetURI), it must be included here. RS_Identifier may
2115 substitute for MD_Identifier in the ISO19139 schema, but the USGIN profile requires use of
2116 MD_Identifier. If additional codespace and version content is associated with the identifier, it
2117 should be encoded as MD_Identifier/authority/ CI_Citation/ alternateTitle and MD_Identifier/
2118 authority/ CI_Citation/ edition -->
2119             <!--
2120             <gmd:identifier>
2121                 <gmd:MD_Identifier>
2122                     <gmd:code>
2123                         --><!-- 13 digit ISBN example --><!--
2124                         <gco:CharacterString>urn:isbn:000-0-000-00000-0</gco:CharacterString>
2125                     </gmd:code>
2126                 </gmd:MD_Identifier>
2127             </gmd:identifier>
2128             -->
2129             <!-- (M-M) Resource responsible party - USGIN requires at least one CI_ResponsibleParty
2130 following the NAP rule. Best practice is to include point of contact information for the resource
2131 in MD_DataIdentification/pointOfContact/CI_ResponsibleParty. -->
2132             <gmd:citedResponsibleParty>
2133                 <gmd:CI_ResponsibleParty>
2134                     <!-- (C-C) (individualName + organisationName + positionName) > 0 -->
2135                     <gmd:individualName>
2136                         <gco:CharacterString>Steve Rauzi</gco:CharacterString>
2137                     </gmd:individualName>
2138                     <gmd:organisationName>
2139                         <gco:CharacterString>Arizona Geological Survey</gco:CharacterString>
2140                     </gmd:organisationName>
2141                     <gmd:positionName>
2142                         <gco:CharacterString>Oil and Gas Administrator</gco:CharacterString>
2143                     </gmd:positionName>
2144                     <!-- (O-C) Contact Information - (phone + deliveryPoint + electronicMailAddress ) >
2145 0. -->
2146             <gmd:contactInfo>
2147                 <gmd:CI_Contact>
2148                     <gmd:phone>
2149                         <gmd:CI_Telephone>
2150                         <gmd:voice>
```

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2151                               <gco:CharacterString>520-770-3500</gco:CharacterString>
2152                           </gmd:voice>
2153                           <gmd:facsimile>
2154                               <gco:CharacterString>520-770-3505</gco:CharacterString>
2155                           </gmd:facsimile>
2156                           </gmd:CI_Telephone>
2157                         </gmd:phone>
2158                         <gmd:address>
2159                           <gmd:CI_Address>
2160                             <gmd:deliveryPoint>
2161                               <gco:CharacterString>416 W. Congress St., Suite 100</gco:CharacterString>
2162                             </gmd:deliveryPoint>
2163                           <gmd:city>
2164                               <gco:CharacterString>Tucson</gco:CharacterString>
2165                           </gmd:city>
2166                           <gmd:administrativeArea>
2167                             <gco:CharacterString>Arizona</gco:CharacterString>
2168                           </gmd:administrativeArea>
2169                           <gmd:postalCode>
2170                             <gco:CharacterString>85701</gco:CharacterString>
2171                           </gmd:postalCode>
2172                           <gmd:country>
2173                             <gco:CharacterString>USA</gco:CharacterString>
2174                           </gmd:country>
2175                           <gmd:electronicMailAddress>
2176                             <gco:CharacterString>Steve.rauzi@azgs.az.gov</gco:CharacterString>
2177                           </gmd:electronicMailAddress>
2178                         </gmd:CI_Address>
2179                         </gmd:address>
2180                         </gmd:CI_Contact>
2181                         </gmd:contactInfo>
2182                         <!-- (M-M) ISO 19139 Mandatory: contact role - Guidance on use of role codes would
2183 be helpful for consistency, but has not been developed as yet.. -->
2184                         <gmd:role>
2185                           <!-- CI_RoleCode names: {resourceProvider, custodian, owner, user, distributor,
2186 originator, pointOfContact, principalInvestigator, processor, publisher, author} - NAP expands
2187 with {collaborator, editor, mediator, rightsHolder}. -->
2188                           <!-- NAP example -->
2189                           <!--
2190                           <gmd:CI_RoleCode
2191                             codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_90"
2192                             codeListValue="RI_414">pointOfContact</gmd:CI_RoleCode>
2193                           -->
2194                           <!-- ISO example -->
2195                           <gmd:CI_RoleCode
2196
2197                           codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2198 Codelist/gmxCodelists.xml#CI_RoleCode"
2199                             codeListValue="pointOfContact">point of contact</gmd:CI_RoleCode>
2200                           </gmd:role>
2201                           </gmd:CI_ResponsibleParty>
2202                           </gmd:citedResponsibleParty>
2203                           <!-- (O-C) Dataset Presentation Form - USGIN mandates required if there is a significant
2204 difference between the resource's presentation format and distribution format. -->
2205                           <!--
2206                           <gmd:presentationForm>
2207                             --><!-- CI_PresentationFormCode names: {documentDigital, documentHardcopy, imageDigital,
2208 image-Hardcopy, mapDigital, mapHardcopy, modelDigital, model-Hardcopy, profileDigital,
2209 profileHardcopy, tableDigital, tableHardcopy, videoDigital, videoHardcopy, audioDigital} - NAP
2210 expands with {audioHardcopy, multimediaDigital, multimediaHardcopy, diagramDigital,
2211 diagramHardcopy}.-->
2212                           <!-- NAP Example -->
2213                           <!--
2214                           <gmd:CI_PresentationFormCode
2215                             codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_89"
2216                             codeListValue="RI_391">mapDigital</gmd:CI_PresentationFormCode>
2217                           -->
2218                           <!-- ISO Example -->
2219                           <!--
2220                           <gmd:CI_PresentationFormCode

```

```

2221
2222     codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2223     Codelist/gmxCodelists.xml#CI_PresentationFormCode"
2224         codeListValue="mapDigital">digital map</gmd:CI_PresentationFormCode>
2225     </gmd:presentationForm>
2226     -->
2227     <!-- (O-O) Resource series - Information about the series or collection of which the
2228 cited resource is a part. Follow NAP rule (name + issueIdentification) > 0. -->
2229     <!--
2230     <gmd:series>
2231         <gmd:CI_Series>
2232             <gmd:name>
2233                 --><!-- Name of the publication series or aggregate dataset of which the
2234 referenced dataset is a part. --><!--
2235                 <gco:CharacterString>Borehole Collection</gco:CharacterString>
2236             </gmd:name>
2237             <gmd:issueIdentification>
2238                 --><!-- Identification of the series' issue information. --><!--
2239                 <gco:CharacterString>Volume 10</gco:CharacterString>
2240             </gmd:issueIdentification>
2241             <gmd:page>
2242                 --><!-- Identification of the articles' page number(s). --><!--
2243                 <gco:CharacterString>100-110</gco:CharacterString>
2244             </gmd:page>
2245         </gmd:CI_Series>
2246     </gmd:series>
2247     -->
2248     <!-- (O-O) Resource other citation details -->
2249     <!--
2250     <gmd:otherCitationDetails/>
2251     -->
2252     <!-- (O-C) Resource collective title - Title of the combined resource that the cited
2253 resource is part of, for example the cited resource may be a paper in an anthology, in which case
2254 the anthology title would be the collective title. Required if the cited resource is part of such
2255 a collective work. -->
2256     <!--
2257     <gmd:collectiveTitle/>
2258     -->
2259     </gmd:CI_Citation>
2260 </gmd:citation>
2261     <!-- (M-M) Resource Abstract - A free text summary of the content, significance, purpose,
2262 scope, etc. of the resource. Exactly one value. -->
2263     <gmd:abstract>
2264         <gco:CharacterString>Digital files containing Tiff images of scanned logs. Scanned using
2265 Neutra scanner hardware.</gco:CharacterString>
2266     </gmd:abstract>
2267     <!-- (O-O) Resource purpose - Summary of the intentions for which the dataset was
2268 developed. Purpose includes objectives for creating the dataset and what the dataset is to
2269 support. -->
2270     <!--
2271     <gmd:purpose/>
2272     -->
2273     <!-- (M-M) Resource Status - -->
2274     <gmd:status>
2275         <!-- MD_ProgressCode names: {completed, historicalArchive, obsolete, onGoing, planned,
2276 required, underDevelopment} - NAP expands with {proposed}. Obsolete is synonymous with
2277 deprecated. -->
2278         <!-- NAP Example -->
2279         <!--
2280         <gmd:MD_ProgressCode
2281             codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_106"
2282             codeListValue="RI_593">completed</gmd:MD_ProgressCode>
2283         -->
2284         <!-- ISO Example -->
2285         <gmd:MD_ProgressCode
2286
2287             codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2288             Codelist/gmxCodelists.xml#MD_ProgressCode"
2289             codeListValue="completed">completed</gmd:MD_ProgressCode>
2290         </gmd:status>

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2291      <!-- (O-C) Resource point of contact - CI_ResponsibleParty element here would contain
2292      information for point of contact to access the resource. This information is mandatory for
2293      physical resources such as core, cuttings, samples, manuscripts. -->
2294      <gmd:pointOfContact>
2295          <gmd:CI_ResponsibleParty>
2296              <!-- (M-M) (individualName + organisationName + positionName) > 0 -->
2297              <gmd:individualName>
2298                  <gco:CharacterString>Steve Rauzi</gco:CharacterString>
2299                  </gmd:individualName>
2300                  <gmd:organisationName>
2301                      <gco:CharacterString>Arizona Geological Survey</gco:CharacterString>
2302                      </gmd:organisationName>
2303                  <gmd:positionName>
2304                      <gco:CharacterString>Oil and Gas Administrator</gco:CharacterString>
2305                      </gmd:positionName>
2306              <!-- (O-C) Contact Information - If a resource point of contact is required then (phone
2307 + deliveryPoint + electronicEmailAddress) > 0. -->
2308          <gmd:contactInfo>
2309              <gmd:CI_Contact>
2310                  <gmd:phone>
2311                      <gmd:CI_Telephone>
2312                          <gmd:voice>
2313                              <gco:CharacterString>520-770-3500</gco:CharacterString>
2314                          </gmd:voice>
2315                          <gmd:facsimile>
2316                              <gco:CharacterString>520-770-3505</gco:CharacterString>
2317                              </gmd:facsimile>
2318                          </gmd:CI_Telephone>
2319                  </gmd:phone>
2320                  <gmd:address>
2321                      <gmd:CI_Address>
2322                          <gmd:deliveryPoint>
2323                              <gco:CharacterString>416 W. Congress St., Suite 100</gco:CharacterString>
2324                          </gmd:deliveryPoint>
2325                          <gmd:city>
2326                              <gco:CharacterString>Tucson</gco:CharacterString>
2327                          </gmd:city>
2328                          <gmd:administrativeArea>
2329                              <gco:CharacterString>Arizona</gco:CharacterString>
2330                          </gmd:administrativeArea>
2331                          <gmd:postalCode>
2332                              <gco:CharacterString>85701</gco:CharacterString>
2333                          </gmd:postalCode>
2334                          <gmd:country>
2335                              <gco:CharacterString>USA</gco:CharacterString>
2336                          </gmd:country>
2337                          <gmd:electronicEmailAddress>
2338                              <gco:CharacterString>Steve.rauzi@azgs.az.gov</gco:CharacterString>
2339                          </gmd:electronicEmailAddress>
2340                      </gmd:CI_Address>
2341                  </gmd:address>
2342                  </gmd:CI_Contact>
2343          </gmd:contactInfo>
2344      <!-- (M-M) ISO 19139 Mandatory: contact role - Guidance on use of role codes would be
2345      helpful for consistency, but has not been developed as yet. -->
2346          <gmd:role>
2347              <!-- CI_RoleCode names: {resourceProvider, custodian, owner, user, distributor,
2348      originator, pointOfContact, principalInvestigator, processor, publisher, author} - NAP expands
2349      with {collaborator, editor, mediator, rightsHolder}. -->
2350              <!-- NAP example -->
2351              <!--
2352                  <gmd:CI_RoleCode
2353                      codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_90"
2354                      codeListValue="RI_414">pointOfContact</gmd:CI_RoleCode>
2355                  -->
2356              <!-- ISO example -->
2357                  <gmd:CI_RoleCode
2358                      codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2359          Codelist/gmxCodelists.xml#CI_RoleCode"
2360                      codeListValue="pointOfContact">point of contact</gmd:CI_RoleCode>
2361                  </gmd:role>

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2363      </gmd:CI_ResponsibleParty>
2364      </gmd:pointOfContact>
2365      <!-- (O-O) Resource Maintenance - This element provides information about the maintenance
2366      schedule or history of the resource (or some subset/part of the resource specified by the scope
2367      and scope description) described by the metadata record. 0 to many MD_MaintenanceInformation
2368      elements may be included. -->
2369      <gmd:resourceMaintenance>
2370          <gmd:MD_MaintenanceInformation>
2371              <gmd:maintenanceAndUpdateFrequency>
2372                  <!-- MD_MaintenanceFrequencyCode names: {continual, daily, weekly, fortnightly,
2373                  monthly, quarterly, biannually, annually, asNeeded, irregular, not-Planned, unknown} - NAP
2374                  expands with {semimonthly}. -->
2375                  <!-- NAP Example -->
2376                  <!--
2377                  <gmd:MD_MaintenanceFrequencyCode
2378                      codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_102"
2379                      codeListValue="RI_540">asNeeded</gmd:MD_MaintenanceFrequencyCode>
2380                  -->
2381                  <!-- ISO Example -->
2382                  <gmd:MD_MaintenanceFrequencyCode
2383
2384                      codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2385                      Codelist/gmxCodelists.xml#MD_MaintenanceFrequencyCode"
2386                      codeListValue="asNeeded">as needed</gmd:MD_MaintenanceFrequencyCode>
2387                  </gmd:maintenanceAndUpdateFrequency>
2388                  </gmd:MD_MaintenanceInformation>
2389                  </gmd:resourceMaintenance>
2390                  <!-- (O-O) Graphic overview of resource - USGIN best practice is to provide xlink:href URL
2391                  to file if it is available online, as an attribute of the MD_BrowseGraphic element. If
2392                  MD_BrowseGraphic is included, MD_BrowseGraphic/filename character string is mandatory.
2393                  Recommended practice is to use the Anchor extension of CharacterString xml element from ISO19139,
2394                  which provides a url as an attribute and a text string as a label for the link. -->
2395                  <gmd:graphicOverview>
2396                      <gmd:MD_BrowseGraphic>
2397                          <gmd:fileName>
2398                              <gco:CharacterString>http://azgs.az.gov/resource/00C02E67-F1ED-473D-A240-
2399 068CCB041A73/preview.jpg</gco:CharacterString>
2400                          </gmd:fileName>
2401                          <gmd:fileDescription>
2402                              <gco:CharacterString>preview map</gco:CharacterString>
2403                          </gmd:fileDescription>
2404                          <!-- Use napMD_FileFormatCode code list
2405 (http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_115). List names are {bil, bmp, bsq,
2406 bzip2, cdr, cgm, cover, csv, dbf, dgn, doc, dwg, dxf, e00, ecw, eps, ers, gdb, geotiff, gif, gml,
2407 grid, gzip, html, jpg, mdb, mif, pbm, pdf, png, ps, rtf, sdc, shp, sid, svg, tab, tar, tiff, txt,
2408 xhtml, xls, xml, xwd, zip, wpd} See Codelists section for discussion of encoding of codelist
2409 values. Note that to use this napm namespace extension in a valid xml document, the namespace
2410 declaration
2411 xmlns:napm=http://www.cits.rnccan.gc.ca/html/brodeurj/.protege/.napMetadata/napMetadataWebsite/nap
2412 MetadataTools/napXsd/napm must be included in the root element of the document. -->
2413                  <!-- The current napm.xsd schema conflicts with gmd because it references a local copy of
2414                  the OGC gmd schema at
2415 http://www.cits.rnccan.gc.ca/html/brodeurj/.protege/.napMetadata/tools/napXsd/gmd/ Until this is
2416 resolved, the gmd:fileType attributes can be omitted. However, USGIN requires the use of
2417 napMD_FileFormatCode names. -->
2418                  <!-- NAP Example -->
2419                  <!--
2420                  <gmd:fileType
2421                      xsi:type="napm:napMD_FileFormatCode_PropertyType"
2422                      codeList="http://www.fgdc.gov/nap/metadata/register/registerItemClasses.html#IC_115"
2423                      codeListValue="RI_711">
2424                      <gco:CharacterString>jpg</gco:CharacterString>
2425                  </gmd:fileType>
2426                  -->
2427                  <!-- ISO Example -->
2428                  <gmd:fileType>
2429                      <gco:CharacterString>jpg</gco:CharacterString>
2430                  </gmd:fileType>
2431                  </gmd:MD_BrowseGraphic>
2432                  </gmd:graphicOverview>
2433                  <!-- (X-X) Resource Format - This element is not used by NAP or USGIN; this information is
2434 encoded in MD_Metadata/distributionInfo/MD_Distribution/ in USGIN metadata. -->
```

```

2435      <!--
2436      <gmd:resourceForma/>
2437      -->
2438      <!-- (0-0) Resource keywords - Best Practice for USGIN profile metadata is to supply
2439      keywords to facilitate the discovery of metadata records relevant to the user. USGIN requires
2440      that MD_Keyword/keyword contain a CharacterString. USGIN best practice is to include keywords in
2441      English -->
2442      <!-- Theme keywords -->
2443      <gmd:descriptiveKeywords>
2444          <gmd:MD_Keywords>
2445              <gmd:keyword>
2446                  <gco:CharacterString>Scanned Gamma Ray Neutron</gco:CharacterString>
2447              </gmd:keyword>
2448              <gmd:keyword>
2449                  <gco:CharacterString>NMAL</gco:CharacterString>
2450              </gmd:keyword>
2451              <gmd:keyword>
2452                  <gco:CharacterString>borehole</gco:CharacterString>
2453              </gmd:keyword>
2454          <!-- Keyword Type - allowed values from MD_KeywordTypeCode names: {discipline, place,
2455      stratum, temporal, theme} - NAP expands with {product, subTopicCategory}. -->
2456          <gmd:type>
2457              <!-- NAP Example -->
2458              <!--
2459              <gmd:MD_KeywordTypeCode
2460                  codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_101"
2461                  codeListValue="RI_528">theme</gmd:MD_KeywordTypeCode>
2462              -->
2463              <!-- ISO Example -->
2464          <gmd:MD_KeywordTypeCode
2465
2466      codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2467      Codelist/gmxCodelists.xml#MD_KeywordTypeCode"
2468          codeListValue="theme">theme</gmd:MD_KeywordTypeCode>
2469          </gmd:type>
2470          </gmd:MD_Keywords>
2471      </gmd:descriptiveKeywords>
2472      <!-- Temporal keywords -->
2473      <gmd:descriptiveKeywords>
2474          <gmd:MD_Keywords>
2475              <gmd:keyword>
2476                  <gco:CharacterString>Frasian</gco:CharacterString>
2477              </gmd:keyword>
2478              <gmd:keyword>
2479                  <gco:CharacterString>Upper Devonian</gco:CharacterString>
2480              </gmd:keyword>
2481              <gmd:keyword>
2482                  <gco:CharacterString>Devonian</gco:CharacterString>
2483              </gmd:keyword>
2484              <gmd:keyword>
2485                  <gco:CharacterString>Paleozoic</gco:CharacterString>
2486              </gmd:keyword>
2487          <!-- Keyword Type - allowed values from MD_KeywordTypeCode names: {discipline, place,
2488      stratum, temporal, theme} - NAP expands with {product, subTopicCategory}. -->
2489          <gmd:type>
2490              <!-- NAP Example -->
2491              <!--
2492              <gmd:MD_KeywordTypeCode
2493                  codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_101"
2494                  codeListValue="RI_527">temporal</gmd:MD_KeywordTypeCode>
2495              -->
2496              <!-- ISO Example -->
2497          <gmd:MD_KeywordTypeCode
2498
2499      codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2500      Codelist/gmxCodelists.xml#MD_KeywordTypeCode"
2501          codeListValue="temporal">temporal</gmd:MD_KeywordTypeCode>
2502          </gmd:type>
2503          </gmd:MD_Keywords>
2504      </gmd:descriptiveKeywords>
2505      <!-- Place keywords -->
2506      <gmd:descriptiveKeywords>
```

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2507      <gmd:MD_Keywords>
2508        <gmd:keyword>
2509          <gco:CharacterString>Arizona</gco:CharacterString>
2510        </gmd:keyword>
2511        <gmd:keyword>
2512          <gco:CharacterString>T41N R27E S22 NE NE</gco:CharacterString>
2513        </gmd:keyword>
2514        <!-- Keyword Type - allowed values from MD_KeywordTypeCode names: {discipline, place,
2515 stratum, temporal, theme} - NAP expands with {product, subTopicCategory}. -->
2516        <gmd:type>
2517          <!-- NAP Example -->
2518          <!--
2519            <gmd:MD_KeywordTypeCode
2520              codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_101"
2521              codeListValue="RI_525">place</gmd:MD_KeywordTypeCode>
2522            --
2523            <!-- ISO Example -->
2524            <gmd:MD_KeywordTypeCode
2525
2526            codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2527            Codelist/gmxCodelists.xml#MD_KeywordTypeCode"
2528              codeListValue="place">place</gmd:MD_KeywordTypeCode>
2529            </gmd:type>
2530            </gmd:MD_Keywords>
2531            </gmd:descriptiveKeywords>
2532            <!-- (0-0) Condition applying to access and use of resource - Follow NAP for specification
2533            of resourceConstraints. This attribute provides information for access control to the described
2534            resource itself. In some situations, the metadataConstraints may allow a user to learn of the
2535            existence of a resource that they may not actually be able to access without further clearance.
2536            Constraints may be represented by MD_Constraint, MD_LegalConstraint, or MD_SecurityConstraint. -->
2537        >
2538          <gmd:resourceConstraints>
2539            <gmd:MD_LegalConstraints>
2540              <gmd:useLimitation>
2541                <gco:CharacterString>none</gco:CharacterString>
2542              </gmd:useLimitation>
2543            </gmd:MD_LegalConstraints>
2544            </gmd:resourceConstraints>
2545            <!-- (0-0) Aggregation information - The citation for or name of an aggregate dataset, the
2546            type of aggregate dataset, and optionally the activity which produced the dataset. -->
2547            <gmd:aggregationInfo>
2548              <!-- MD_AggregateInformation requires either aggregateDataSetName/CI_Citation or
2549              aggregateDataSetIdentifier/MD_Identifier. -->
2550              <gmd:MD_AggregateInformation>
2551                <!-- Related dataset name -->
2552                <gmd:aggregateDataSetName>
2553                  <gmd:CI_Citation>
2554                    <gmd:title>
2555                      <gco:CharacterString>Related Resource's Title</gco:CharacterString>
2556                    </gmd:title>
2557                    <gmd:date>
2558                      <gmd:CI_Date>
2559                        <gmd:date>
2560                          <gco:DateTime>2001-12-17T09:30:47</gco:DateTime>
2561                        </gmd:date>
2562                      <gmd:dateType>
2563                        <!-- NAP Example -->
2564                        <!--
2565                          <gmd:CI_DateTypeCode
2566                            codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_87"
2567                            codeListValue="RI_367">publication</gmd:CI_DateTypeCode>
2568                        --
2569                        <!-- ISO Example -->
2570                        <gmd:CI_DateTypeCode
2571
2572            codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2573            Codelist/gmxCodelists.xml#CI_DateTypeCode"
2574              codeListValue="publication">publication</gmd:CI_DateTypeCode>
2575              </gmd:dateType>
2576              <gmd:CI_Date>
2577                </gmd:date>
2578            </gmd:CI_Citation>

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2579      </gmd:aggregateDataSetName>
2580      <!-- Data Set Identifier -->
2581      <gmd:aggregateDataSetIdentifier>
2582          <gmd:MD_Identifier>
2583              <gmd:code>
2584                  <gco:CharacterString>00000000-0000-0000-0000-000000000000</gco:CharacterString>
2585              </gmd:code>
2586          </gmd:MD_Identifier>
2587      </gmd:aggregateDataSetIdentifier>
2588      <!-- (M-M) Association Type is mandatory.. -->
2589      <gmd:associationType>
2590          <!-- Use DS_AssociationTypeCode names: {crossReference, largerWorkCitation,
2591 partOfSeamlessDatabase, source, stereoMate} - NAP expands with {isComposedOf}. -->
2592          <!-- NAP Example -->
2593          <!--
2594          <gmd:DS_AssociationTypeCode
2595              codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_92"
2596              codeListValue="RI_428">crossReference</gmd:DS_AssociationTypeCode>
2597          -->
2598          <!-- ISO Example -->
2599          <gmd:DS_AssociationTypeCode
2600
2601      codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2602      Codelist/gmxCodelists.xml#DS_AssociationTypeCode"
2603          codeListValue="crossReference">cross reference</gmd:DS_AssociationTypeCode>
2604          </gmd:associationType>
2605          </gmd:MD_AggregateInformation>
2606      </gmd:aggregationInfo>
2607      <!-- (O-O) Spatial Representation Type - napMD_SpatialRepresentationTypeCode names {vector,
2608 grid, textTable, tin, stereoModel, video} -->
2609      <!--
2610      <gmd:spatialRepresentationType/>
2611      -->
2612      <!-- (C-C) Resource spatial resolution - USGIN requires use of
2613 equivalentScale/.../denominator to express spatial resolution, in order to be more easily
2614 interoperable. -->
2615      <gmd:spatialResolution>
2616          <gmd:MD_Resolution>
2617              <gmd:equivalentScale>
2618                  <gmd:MD_RepresentativeFraction>
2619                      <gmd:denominator>
2620                          <gco:Integer>100000</gco:Integer>
2621                      </gmd:denominator>
2622                  </gmd:MD_RepresentativeFraction>
2623                  </gmd:equivalentScale>
2624          </gmd:MD_Resolution>
2625      </gmd:spatialResolution>
2626      <!-- (M-M) Resource language - Multiple instances of this element indicate that the
2627 linguistic content of the resource is available in multiple languages -->
2628      <gmd:language>
2629          <!-- (M-M) Metadata language - use the ISO639-2/T three letter language code in lower
2630 case. -->
2631          <gco:CharacterString>eng</gco:CharacterString>
2632      </gmd:language>
2633      <!-- (C-C) Topic category - NAP specifies that topicCategory code shall be provided when
2634 hierarchyLevel is set to "dataset" or "dataset series". Most USGIN resources will have
2635 topicCategory="geoscientificInformation", which is the default value for this profile. More
2636 specific topic categorization should be done using keywords. NAP declares not applicable to
2637 services. -->
2638      <gmd:topicCategory>
2639          <!-- MD_TopicCategoryCode names: {farming, biota, boundaries,
2640 climatologyMeterologyAtmosphere, economy, elevation, environment, geoscientificInformation,
2641 health, imageryBaseMapsEarthCover, intelligenceMilitary, inlandWater, location, oceans,
2642 planningCadastral, society, structure, transportation, utilitiesCommunication} -->
2643          <gmd:MD_TopicCategoryCode>geoscientificInformation</gmd:MD_TopicCategoryCode>
2644      </gmd:topicCategory>
2645      <!-- (C-C) Resource content extent - Defines the spatial (horizontal and vertical) and
2646 temporal region to which the content of the resource applies. For USGIN, the spatial extent is a
2647 rectangle that bounds the geographic extent to which resource content applies. NAP specifies
2648 required when hierarchyLevel is set to 'dataset'. USGIN specifies (description +
2649 geographicElement + temporalElement) > 0. -->
2650      <gmd:extent>
```

```

2651      <gmd:EX_Extent>
2652          <!-- (C-C) Resource Content extent description - Free text that describes the spatial
2653 and temporal extent of the dataset. USGIN specifies that description is mandatory if a
2654 geographicElement or temporalElement is not provided. Note that if geographic place names are
2655 used to express the geographic extent, USGIN profile specifies that these should be encoded using
2656 keyword with keyword type code = 'place.' Geographic names may be duplicated in the
2657 EX_Extent/description. -->
2658      <gmd:description>
2659          <gco:CharacterString>Some spatio-temporal description.</gco:CharacterString>
2660      </gmd:description>
2661          <!-- (O-C) Resource content extent bounding box -USGIN profile requires that if an
2662 EX_Extent/geographicElement is supplied, it include a geographic bounding box with bounding
2663 latitude and longitude expressed using WGS 84 decimal degrees. The corner coordinates for the
2664 geographic bounding box must not coincide in one point, because this may result in fatal errors
2665 with some CSW implementations. Point locations must thus be represented as tiny rectangles. USGIN
2666 recommended practice is to place the actual point location in the lower left corner of the
2667 rectangle. -->
2668      <gmd:geographicElement>
2669          <gmd:EX_GeographicBoundingBox>
2670              <gmd:extentTypeCode>
2671                  <gco:Boolean>1</gco:Boolean>
2672              </gmd:extentTypeCode>
2673              <gmd:westBoundLongitude>
2674                  <gco:Decimal>-109.911001</gco:Decimal>
2675              </gmd:westBoundLongitude>
2676              <gmd:eastBoundLongitude>
2677                  <gco:Decimal>-109.910999</gco:Decimal>
2678              </gmd:eastBoundLongitude>
2679              <gmd:southBoundLatitude>
2680                  <gco:Decimal>34.772899</gco:Decimal>
2681              </gmd:southBoundLatitude>
2682              <gmd:northBoundLatitude>
2683                  <gco:Decimal>34.772901</gco:Decimal>
2684              </gmd:northBoundLatitude>
2685          </gmd:EX_GeographicBoundingBox>
2686      </gmd:geographicElement>
2687          <!-- (C-X) Resource content extent geographic description - Not used by USGIN profile,
2688 use keyword with type code = 'place' (with thesaurus if necessary). -->
2689          <!--
2690      <gmd:geographicElement>
2691          <gmd:EX_GeographicDescription/>
2692      </gmd:geographicElement>
2693      -->
2694          <!-- (C-X) Resource content extent bounding polygon - Not used by USGIN profile. To
2695 improve interoperability, USGIN mandates the use of Geographic Bounding Box instead of bounding
2696 polygon. "An element which describes inclusions or exclusions in a resource. The enclosed
2697 boundary of the dataset expressed in x-y coordinates." NAP mandates this element if no other
2698 Geographic Bounding Box, Geographic Description, Temporal Element, or Vertical Element are
2699 provided. -->
2700          <!--
2701      <gmd:geographicElement>
2702          <gmd:EX_BoundingPolygon/>
2703      </gmd:geographicElement>
2704      -->
2705      </gmd:EX_Extent>
2706  </gmd:extent>
2707  <!-- (O-O) Resource temporal extent - -->
2708  <gmd:extent>
2709      <gmd:EX_Extent>
2710          <gmd:temporalElement>
2711          <gmd:EX_TemporalExtent>
2712              <gmd:extent>
2713                  <!-- Default ISO time frame example -->
2714                  <!--
2715                  <gml:TimePeriod gml:id="IdModern">
2716                      <gml:name>Y2KX</gml:name>
2717                      --><!-- USGIN requires the beginPosition and endPosition's frame property to be
2718 defined. The default value is #ISO-8601. --><!--
2719                      <gml:beginPosition frame="#ISO-8601">2010-01-00T00:00:00</gml:beginPosition>
2720                      <gml:endPosition frame="#ISO-8601">2010-12-31T24:00:00</gml:endPosition>
2721                  </gml:TimePeriod>
2722                  -->

```

```

2723      <!-- Geologic time frame example -->
2724      <gml:TimePeriod gml:id="IdJurassic">
2725          <gml:name>Jurassic</gml:name>
2726          <!-- USGIN requires the beginPosition and endPosition's frame property to be
2727 defined. The default value is #ISO-8601. -->
2728          <gml:beginPosition
2729              frame="urn:cgi:trs:CGI:StandardGeologicTimeMa">203</gml:beginPosition>
2730              <gml:endPosition frame="urn:cgi:trs:CGI:StandardGeologicTimeMa"
2731          ">135</gml:endPosition>
2732          </gml:TimePeriod>
2733          </gmd:extent>
2734          </gmd:EX_TemporalExtent>
2735          </gmd:temporalElement>
2736          </gmd:EX_Extent>
2737      </gmd:extent>
2738      <!-- (O-X) Resource spatio-temporal extent - Not used. Although use of
2739 EX_SpatialTemporalExtent is allowed by ISO19139 and NAP, USGIN mandates encoding space time
2740 location with EX_TemporalExtent and EX_GeographicBoundingBox. -->
2741      <!--
2742      <gmd:extent>
2743          <gmd:EX_Extent>
2744              <gmd:temporalElement>
2745                  <gmd:EX_SpatialTemporalExtent/>
2746              </gmd:temporalElement>
2747          </gmd:EX_Extent>
2748      </gmd:extent>
2749      -->
2750      <!-- (O-O) Resource vertical extent -->
2751      <gmd:extent>
2752          <gmd:EX_Extent>
2753              <gmd:verticalElement>
2754                  <gmd:EX_VerticalExtent>
2755                      <gmd:minimumValue>
2756                          <gco:Real>-100</gco:Real>
2757                      </gmd:minimumValue>
2758                      <gmd:maximumValue>
2759                          <gco:Real>200</gco:Real>
2760                      </gmd:maximumValue>
2761                      <!-- Use EPSG register of geodetic parameters such as at http://www.epsg-
2762 registry.org/. The default VerticalCRS is World mean sea level (MSL): urn:ogc:def:crs:EPSG::5714
2763 -->
2764              <gmd:verticalCRS xlink:href="urn:ogc:def:crs:EPSG::5714 "/>
2765          </gmd:EX_VerticalExtent>
2766          </gmd:verticalElement>
2767      </gmd:EX_Extent>
2768      </gmd:extent>
2769      </gmd:MD_DataIdentification>
2770      </gmd:identificationInfo>
2771      <!-- **** -->
2772      <!-- (O-O) Content information - Characteristics describing the feature cataloguecatalog,
2773 coverage, or image data. USGIN currently makes no recommendation for use of contentInfo; follow
2774 NAP recommendations (see INCITS 453). -->
2775      <!--
2776      <gmd:contentInfo/>
2777      -->
2778      <!-- (O-O) Resource distribution information - This element provides information to inform
2779 users how to obtain or access the described resource. NOTE: there are several ways elements can
2780 be nested within MD_Distribution -->
2781      <gmd:distributionInfo>
2782          <gmd:MD_Distribution>
2783              <!-- (O-O) Resource distribution format - Information on the format or physical
2784 manifestion of the resource. If the resource is a physical resource, like a book, rock sample,
2785 paper document, the distributionFormat/MD_Format/name is mandatory, and must be from the USGIN
2786 distribution format codelist. -->
2787              <!--
2788              <gmd:distributionFormat/>
2789              -->
2790              <!-- (O-C) Resource distributor information - USGIN differs from NAP in this case (but not
2791 with ISO19115) by allowing multiple distributors, and binding between distributors, transfer
2792 options, and formats. -->
2793      <gmd:distributor>
```

```

2794      <!-- For USGIN profile, each distributor/MD_Distributor is a binding between one or more
2795 transfer options and the distributor formats that are available through that/those transfer
2796 options (MD_DigitalTransferOptions/onLine/CI_OnlineResource in particular). If different formats
2797 are available from the same distributor, or have different transfer options, these should be
2798 represented as different distributor/MD_Distributor instances. See the USGIN Profile section 'Use
2799 of MD_Distribution and MD_Distributor' for instructions on use of these elements. -->
2800      <gmd:MD_Distributor>
2801          <gmd:distributorContact>
2802              <!-- (C-C) Distribution responsible party - For CI_ResponsibleParty, count of
2803 (individualName + organisationName + positionName) > 0 -->
2804              <gmd:CI_ResponsibleParty>
2805                  <gmd:organisationName>
2806                      <gco:CharacterString>Arizona Geological Survey</gco:CharacterString>
2807                  </gmd:organisationName>
2808                  <!-- (C-C) If CI_ResponsibleParty exists, the role element is required -->
2809                  <gmd:role>
2810                      <!-- Use CI_RoleCode names {resourceProvider, custodian, owner, user, distributor,
2811 originator, pointOfContact, principalInvestigator, processor, publisher, author} - NAP expands
2812 with {collaborator, editor, mediator, rightsHolder}. -->
2813                      <!-- NAP Example -->
2814                      <!--
2815                      <gmd:CI_RoleCode
2816                          codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_90"
2817                          codeListValue="RI_412">distributor</gmd:CI_RoleCode>
2818                      -->
2819                      <!-- ISO Example -->
2820                      <gmd:CI_RoleCode
2821
2822 codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2823 Codelist/gmxCodelists.xml#CI_RoleCode"
2824             codeListValue="distributor">distributor</gmd:CI_RoleCode>
2825             </gmd:role>
2826             </gmd:CI_ResponsibleParty>
2827             </gmd:distributorContact>
2828             <!-- (O-O) Resource distributor order process - Information on the availability of the
2829 service which includes at least one of fees, available date and time, ordering instructions, or
2830 turnaround. -->
2831             <gmd:distributionOrderProcess>
2832                 <gmd:MD_StandardOrderProcess>
2833                     <gmd:fees>
2834                         <gco:CharacterString>variable fees</gco:CharacterString>
2835                     </gmd:fees>
2836                     <gmd:orderingInstructions>
2837                         <gco:CharacterString>ordering instructions</gco:CharacterString>
2838                     </gmd:orderingInstructions>
2839                     <gmd:turnaround>
2840                         <gco:CharacterString>one to two weeks.</gco:CharacterString>
2841                     </gmd:turnaround>
2842                     </gmd:MD_StandardOrderProcess>
2843                 </gmd:distributionOrderProcess>
2844                 <!-- (O-C) Resource distributor format - USGIN profile specifies that the
2845 distributionInfo/MD_Distribution/distributionFormat may be included in the document (its schema
2846 valid...), but distribution format information must be duplicated in a
2847 distributionInfo/distributor/MD_Distributor/distributorFormat element or the content can be lost
2848 -->
2849                 <gmd:distributorFormat>
2850                     <gmd:MD_Format>
2851                         <!-- Use USGIN distribution format code values. See the "Online resource format
2852 names" section of the USGIN Profile -->
2853                         <gmd:name>
2854                             <gco:CharacterString>Adobe:Acrobat/pdf</gco:CharacterString>
2855                         </gmd:name>
2856                         <gmd:version>
2857                             <gco:CharacterString>8.0</gco:CharacterString>
2858                         </gmd:version>
2859                     </gmd:MD_Format>
2860                 </gmd:distributorFormat>
2861                 <!-- Resource distributor transfer options - Provides information about the technical
2862 means and media used by the distributor. -->
2863                 <gmd:distributorTransferOptions>
2864                     <gmd:MD_DigitalTransferOptions>
2865                         <gmd:onLine>
```

```

2866      <gmd:CI_OnlineResource>
2867          <!-- (M-M) Resource distributor on-line distribution linkage - Digital transfer
2868          options are "technical means and media by which a dataset is obtained from the distributor." NAP
2869          requires CI_OnlineResource/linkage and CI_OnlineResource/protocol in CI_OnlineResource. -->
2870          <gmd:linkage>
2871              <!-- The linkage element should contain the complete URL to access the
2872              resource directly. CI_Online-Resource requires a Linkage element that is a gmd:URL. -->
2873              <gmd:URL>http://azgs.az.gov/resource/00C02E67-F1ED-473D-A240-068CCB041A73/borehole\_report.pdf</gmd:URL>
2874          </gmd:linkage>
2875          <gmd:protocol>
2876              <!-- The protocol element defines a valid internet protocol used to access the
2877              resource. NAP recommended best practice is that the protocol should be taken from an official
2878              controlled list such as the Official Internet Protocol Standards published on the Web at
2879              http://www.rfc-editor.org/rfcxx00.html or the Internet Assigned Numbers Authority (IANA) at
2880              http://www.iana.org/numbers.html. 'ftp' or 'http' are common values. -->
2881                  <gco:CharacterString>http</gco:CharacterString>
2882          </gmd:protocol>
2883          <!-- (C-C) Resource distributor online distribution application profile -
2884          applicationProfile is required if the CI_OnlineResource/linkage does not connect to a web page,
2885          and another software application is needed to use the indicated file resource. The
2886          applicationProfile character string should specify the software using the following recommended
2887          syntax: "vendor:application name/application version", e.g. "Microsoft:Word/2007", or
2888          "ESRI:ArcGIS/9.3" -->
2889          <gmd:applicationProfile>
2890              <gco:CharacterString>Adobe:Acrobat/8.0</gco:CharacterString>
2891          </gmd:applicationProfile>
2892          <gmd:name>
2893              <!-- The CI_OnlineResource/name element may duplicate the file name if the URL
2894              is a link to a file, but it is recommended to provide a user-friendly label for the file that
2895              could be presented in a user interface. -->
2896                  <gco:CharacterString>borehole_report.pdf</gco:CharacterString>
2897          </gmd:name>
2898          <gmd:description>
2899              <gco:CharacterString>Downloadable PDF document</gco:CharacterString>
2900          </gmd:description>
2901          <!-- (O-C) Resource distributor online distribution function -
2902          CI_OnlineResource/function is required by USGIN to indicate how linkage is to be used. If the
2903          resource is accessible as a web service, the metadata for the service should be separate metadata
2904          record with the dataset(s) exposed through the service identified in the service metadata record
2905          as coupledResources. -->
2906          <gmd:function>
2907              <!-- CI_OnlineFunctionCode names: {download, information, offlineAccess,
2908              order, search} - NAP expands with {upload, webService, emailService, browsing, fileAccess,
2909              webMapService}. -->
2910                  <!-- NAP Example -->
2911                  <!--
2912                      <gmd:CI_OnlineFunctionCode
2913                          codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC\_88"
2914                          codeListValue="RI_375">download</gmd:CI_OnlineFunctionCode>
2915                  -->
2916                  <!-- ISO Example -->
2917                  <gmd:CI_OnlineFunctionCode
2918
2919          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\_19139\_Schemas/resources/Codelist/gmxCodelists.xml#CI\_OnlineFunctionCode"
2920          codeListValue="download">download</gmd:CI_OnlineFunctionCode>
2921      </gmd:function>
2922      <gmd:CI_OnlineResource>
2923          <gmd:onLine>
2924              <gmd:MD_DigitalTransferOptions>
2925                  <gmd:distributorTransferOptions>
2926                      <gmd:MD_Distributor>
2927                          <gmd:distributor>
2928                              <!-- (C-C) Resource distribution transfer options - MD_DigitalTransferOptions provides
2929                              information on digital distribution of resource. See USGIN Profile 'Use of MD_Distribution and
2930                              MD_Distributor' for instructions on use of this element. Details on encoding for
2931                              MD_DigitalTransferOptions are above in the distributorTransferOptions elements description. -->
2932
2933                  <!--
2934                      <gmd:transferOptions/>
2935                  -->
2936          </gmd:MD_Distribution>

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2938 </gmd:distributionInfo>
2939 <!-- (C-C) Data quality Information - NAP requires either dataQualityInfo/DQ_DataQuality/report
2940 or dataQualityInfo/ DQ_DataQuality/lineage if
2941 dataQualityInfo/DQ_DataQuality/scope/DQ_Scope/level = 'dataset'. -->
2942 <gmd:dataQualityInfo>
2943 <gmd:DQ_DataQuality>
2944 <!-- (C-C) Data quality scope - Mandatory if DQ_DataQuality is not null. Specifies the
2945 extent of characteristics for which data quality information is reported. -->
2946 <gmd:scope>
2947 <gmd:DQ_Scope>
2948 <gmd:level>
2949 <!-- MD_ScopeCode names: {attribute, attributeType, collectionHardware,
2950 collectionSession, dataset, series, nonGeographicDataset, dimensionGroup, feature, featureType,
2951 propertyType, fieldSession, software, service, model, tile}. -->
2952 <!-- NAP Example -->
2953 <!--
2954 <gmd:MD_ScopeCode
2955 codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_108"
2956 codeListValue="RI_622">dataset</gmd:MD_ScopeCode>
2957 -->
2958 <!-- ISO Example -->
2959 <gmd:MD_ScopeCode
2960
2961 codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
2962 Codelist/gmxCodelists.xml#MD_ScopeCode"
2963 codeListValue="dataset">dataset</gmd:MD_ScopeCode>
2964 </gmd:level>
2965 <!-- (C-C) Data quality scope level description - NAP provision is that
2966 DQ_DataQuality/scope/levelDescription is mandatory if scope/DQ_Scope/level is not equal to
2967 'dataset' or 'series'. USGIN adds requirement that DataQuality/scope/levelDescription is
2968 mandatory if DQ_DataQuality/scope/DQ_Scope/level/MD_ScopeCode.codeListValue is not equal to
2969 MD_MetadataHierarchy/hierarchyLevel/MD_ScopeCode.codeListValue level. -->
2970 <!--
2971 <gmd:levelDescription>
2972 <gmd:MD_ScopeDescription>
2973 <!--><!-- NAP BP: One and only one of the following must be entered: attributes,
2974 features, featureInstances, attributeInstances, dataset, or other as appropriate. Encoding of the
2975 values for the levelDescription element is unclear from the ISO or INCITS documentation. --><!--
2976 <gmd:attributes></gmd:attributes>
2977 </gmd:MD_ScopeDescription>
2978 </gmd:levelDescription>
2979 -->
2980 </gmd:DQ_Scope>
2981 </gmd:scope>
2982 <!-- (C-C) Data quality report - If a DQ_DataQuality/report element is included, at least
2983 one of the 15 possible data quality elements must be present, and multiple report elements are
2984 allowed within each DQ_DataQuality element. -->
2985 <!--
2986 <gmd:report>
2987 <gmd:DQ_CompletenessCommission>
2988 <gmd:nameOfMeasure>
2989 <gco:CharacterString>Name of Measure</gco:CharacterString>
2990 </gmd:nameOfMeasure>
2991 <gmd:result>
2992 <gmd:DQ_QuantitativeResult>
2993 <gmd:valueUnit>a unit</gmd:valueUnit>
2994 <gmd:value>
2995 <gco:Record>a value</gco:Record>
2996 </gmd:value>
2997 </gmd:DQ_QuantitativeResult>
2998 </gmd:result>
2999 </gmd:DQ_CompletenessCommission>
3000 </gmd:report>
3001 -->
3002 <!-- (C-C) Data quality lineage - INSPIRE makes general lineage/LI_Lineage/statement
3003 mandatory. USGIN follows NAP rule that count(lineage/LI_Lineage/source +
3004 lineage/LI_Lineage/sourceStep + lineage/LI_Lineage/statement ) >0 for spatial dataset and
3005 spatial dataset series. Not applicable to services. -->
3006 <gmd:lineage>
3007 <gmd:LI_Lineage>
3008 <!-- (C-C) Data quality lineage statement - General explanation of the data producer's
knowledge of the dataset lineage. -->

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3010      <gmd:statement>
3011          <gco:CharacterString>This dataset is maintained by the Arizona Geological
3012 Survey.</gco:CharacterString>
3013      </gmd:statement>
3014          <!-- (C-C) Data quality lineage source - Each source/LI_Source element describes a
3015 source data resource that is input into a processStep. NAP provision is that
3016 LI_Source/description is mandatory if LI_Source/sourceCitation and LI_Source/sourceExtent are
3017 not provided. The attribute description includes the source medium name code (CodeList
3018 napMD_MediumNameCode) followed by <><blank space> and a free text description, e.g. "dvd; source
3019 satellite image." -->
3020          <!--
3021          <gmd:source/>
3022          -->
3023          <!-- (C-C) Data quality lineage process step - An event in the development of the
3024 dataset. Best practice recommended for USGIN is that source association from a process step is to
3025 inputs to a process, and processStep associations from a source element link an output resource
3026 to a process step that produced it. -->
3027          <!--
3028          <gmd:processStep>
3029              <gmd:LI_ProcessStep>
3030                  <gmd:description>
3031                      <gco:CharacterString></gco:CharacterString>
3032                  </gmd:description>
3033              </gmd:LI_ProcessStep>
3034          </gmd:processStep>
3035          -->
3036          </gmd:LI_Lineage>
3037      </gmd:lineage>
3038      </gmd:DQ_DataQuality>
3039  </gmd:dataQualityInfo>
3040      <!-- (O-O) Portrayal catalog information - A portrayal cataloguecatalog is a collection of
3041 defined symbols used to depict, to humans, features on a map. No documentation in ISO 19115 about
3042 how this is supposed to work. ISO 19117 defines the structure of a Portrayal Catalogue. No USGIN
3043 recommended practices here yet. -->
3044      <!--
3045      <gmd:portrayalCatalogueInfo/>
3046      -->
3047      <!-- (O-O) Metadata constraint information - This element specifies use constraints for access
3048 to the metadata record. -->
3049  <gmd:metadataConstraints>
3050      <!-- Constraints -->
3051  <gmd:MD_Constraints>
3052      <!-- NAP provision is that metadataConstraints/MD_Constraints/useLimitation is mandatory
3053 when MD_Constraints is used to specify metadataConstraints. -->
3054      <gmd:useLimitation>
3055          <gco:CharacterString>fair use</gco:CharacterString>
3056      </gmd:useLimitation>
3057  </gmd:MD_Constraints>
3058 </gmd:metadataConstraints>
3059 <gmd:metadataConstraints>
3060     <!-- Legal constraint -->
3061 <gmd:MD_LegalConstraints>
3062     <!-- When one of the subtypes MD_LegalConstraints or MD_SecurityConstraints is used,
3063 useLimitation is optional. -->
3064     <gmd:useLimitation>
3065         <gco:CharacterString>one</gco:CharacterString>
3066     </gmd:useLimitation>
3067     <gmd:accessConstraints>
3068         <!-- MD_RestrictionCode names: {copyright, patent, patentPending, trademark, license,
3069 intellectualPropertyRights, restricted, otherRestrictions} - NAP expands with
3070 {licenseUnrestricted, licenseEndUser, licenseDistributor, privacy, statutory, confidential,
3071 sensitivity}. -->
3072         <!-- NAP Example -->
3073         <!--
3074         <gmd:MD_RestrictionCode
3075             codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_107"
3076             codeListValue="RI_609">otherRestrictions</gmd:MD_RestrictionCode>
3077         -->
3078         <!-- ISO Example -->
3079         <gmd:MD_RestrictionCode

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3080
3081     codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3082     Codelist/gmxCodelists.xml#MD_RestrictionCode"
3083         codeListValue="otherRestrictions">>other restrictions</gmd:MD_RestrictionCode>
3084     </gmd:accessConstraints>
3085     <gmd:useConstraints>
3086         <!-- MD_RestrictionCode names: {copyright, patent, patentPending, trademark, license,
3087         intellectualPropertyRights, restricted, otherRestrictions} - NAP expands with
3088         {licenseUnrestricted, licenseEndUser, licenseDistributor, privacy, statutory, confidential,
3089         sensitivity}. -->
3090         <!-- NAP Example -->
3091         <!--
3092             <gmd:MD_RestrictionCode
3093                 codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_107"
3094                 codeListValue="RI_609">>otherRestrictions</gmd:MD_RestrictionCode>
3095             -->
3096             <!-- ISO Example -->
3097             <gmd:MD_RestrictionCode
3098
3099     codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3100     Codelist/gmxCodelists.xml#MD_RestrictionCode"
3101         codeListValue="otherRestrictions">>other restrictions</gmd:MD_RestrictionCode>
3102     </gmd:useConstraints>
3103         <!-- (C-C) otherConstraints is a free text element required by NAP if accessConstraints or
3104         useConstraints is set to "otherRestrictions." -->
3105         <gmd:otherConstraints>
3106             <gco:CharacterString>Data only to be used for the purposes for which they were
3107             collected.</gco:CharacterString>
3108         </gmd:otherConstraints>
3109         </gmd:MD_LegalConstraints>
3110     </gmd:metadataConstraints>
3111     <gmd:metadataConstraints>
3112         <!-- Security constraints -->
3113         <gmd:MD_SecurityConstraints>
3114             <gmd:classification>
3115                 <!-- MD_SecurityConstraints has various optional free text values, and a required
3116                 MD_SecurityConstraints/classification from MD_ClassificationCode names: {unclassified,
3117                 restricted, confidential, secret, topSecret} - NAP expands with {sensitive, forOfficialUseOnly}.
3118             -->
3119                 <!-- NAP Example -->
3120                 <!--
3121                     <gmd:MD_ClassificationCode
3122                         codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_96"
3123                         codeListValue="RI_484">>unclassified</gmd:MD_ClassificationCode>
3124                     -->
3125                     <!-- ISO Example-->
3126                     <gmd:MD_ClassificationCode
3127
3128     codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3129     Codelist/gmxCodelists.xml#MD_ClassificationCode"
3130         codeListValue="unclassified">>unclassified</gmd:MD_ClassificationCode>
3131     </gmd:classification>
3132     </gmd:MD_SecurityConstraints>
3133     <!-- (O-O) Application schema information - Information about the conceptual schema of the
3134     dataset. -->
3135     <!--
3136         <gmd:applicationSchemaInfo>
3137             --><!-- (M-M) The applicationSchemaInfo/MD_ApplicationSchemaInformation element has mandatory
3138             name/CI_Citation, schemaLanguage free text, and constraintLanguage free text. --><!--
3139             <gmd:MD_ApplicationSchemaInformation>
3140                 <gmd:name>
3141                     <gmd:CI_Citation>
3142                         <gmd:title>
3143                             <gco:CharacterString>schema title string</gco:CharacterString>
3144                         </gmd:title>
3145                         <gmd:date>
3146                             <gmd:CI_Date>
3147                                 <gmd:date>
3148                                     <gco:DateTime>2001-12-17T09:30:47</gco:DateTime>
3149                                 </gmd:date>
3150                                 <gmd:dateType>
```

```

3152      --><!-- NAP Example -->
3153      <!--
3154      <gmd:CI_DateTypeCode
3155          codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_87"
3156          codeListValue="RI_367">publication</gmd:CI_DateTypeCode>
3157      -->
3158      <!-- ISO Example --><!--
3159          <gmd:CI_DateTypeCode
3160
3161      codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3162      Codelist/gmxCodelists.xml#CI_DateTypeCode"
3163          codeListValue="publication">publication</gmd:CI_DateTypeCode>
3164          </gmd:dateType>
3165          </gmd:CI_Date>
3166          </gmd:date>
3167          </gmd:CI_Citation>
3168          </gmd:name>
3169          <gmd:schemaLanguage>
3170              <gco:CharacterString>some schema language</gco:CharacterString>
3171          </gmd:schemaLanguage>
3172          <gmd:constraintLanguage>
3173              <gco:CharacterString>some constraint language</gco:CharacterString>
3174          </gmd:constraintLanguage>
3175          </gmd:MD_ApplicationSchemaInformation>
3176          </gmd:applicationSchemaInfo>
3177      -->
3178      <!-- (O-O) Metadata maintenance information - This element provides information about the
3179      maintenance schedule or history of the metadata record. -->
3180      <gmd:metadataMaintenance>
3181          <gmd:MD_MaintenanceInformation>
3182              <gmd:maintenanceAndUpdateFrequency>
3183                  <!-- Only one MD_MaintenanceInformation element may be included, with a required
3184                  MD_MaintenanceFrequencyCode names: {continual, daily, weekly, fortnightly, monthly, quarterly,
3185                  biannually, annually, asNeeded, irregular, not-Planned, unknown} - NAP expands with
3186                  {semimonthly}. -->
3187                  <!-- NAP Example -->
3188                  <!--
3189                  <gmd:MD_MaintenanceFrequencyCode
3190                      codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_102"
3191                      codeListValue="RI_540">asNeeded</gmd:MD_MaintenanceFrequencyCode>
3192                  -->
3193                  <!-- ISO Example -->
3194                  <gmd:MD_MaintenanceFrequencyCode
3195
3196          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3197          Codelist/gmxCodelists.xml#MD_MaintenanceFrequencyCode"
3198              codeListValue="asNeeded">as needed</gmd:MD_MaintenanceFrequencyCode>
3199              </gmd:maintenanceAndUpdateFrequency>
3200          </gmd:MD_MaintenanceInformation>
3201          </gmd:metadataMaintenance>
3202      <!-- (X-X) Series information - Not used by USGIN. -->
3203      <!--
3204          <gmd:series/>
3205      -->
3206      <!-- (X-X) Described resource - Not used by USGIN. -->
3207      <!--
3208          <gmd:describes/>
3209      -->
3210      <!-- (X-X) Property type description - Not used by USGIN. -->
3211      <!--
3212          <gmd:propertyType/>
3213      -->
3214      <!-- (X-X) Feature type description - Not used by USGIN -->
3215      <!--
3216          <gmd:featureType/>
3217      -->
3218      <!-- (X-X) Feature attributes - Not used by USGIN -->
3219      <!--
3220          <gmd:featureAttribute/>
3221      -->
3222      </gmd:MD_Metadata>

```

3223

3224

## 3225 8.3 USGIN ISO 19139 Service Metadata

3226 In the following listing, text in green is comments; XML elements are in blue, XML attributes are in black,  
3227 and attribute values are in purple.

3228

```
3229 <?xml version="1.0" encoding="UTF-8"?>
3230 <!--
3231 **** Example ISO 19139 Geospatial Service Metadata based on the USGIN v1.1 Profile
3232 *** with explicitly linked references to coupled resources (map layers) for a WMS service
3233 *** by USGIN Standards and Protocols Drafting Team
3234 *** U.S. Geoscience Information System (USGIN) - http://lab.usgin.org
3235 *** Contributors: Wolfgang Grunberg, Stephen M Richard
3236 *** 01/20/2010
3237 ***
3238 ***
3239 *** DISCLAIMER: this is not an authoritative metadata example but an aide to get started.
3240 *** Scope notes are mostly from NAP or ISO documentation; refer to
3241 *** the USGIN profile document for more specific and reliable guidelines.
3242 ***
3243 *** Validated against http://www.isotc211.org/2005/gmd (ISO 19115, CSW 2.0.2)
3244 *** and http://www.isotc211.org/2005/srv (ISO 19119, CSW 2.0.2)
3245 *** Follows the USGIN ISO 19139 Dataset Metadata Profile v1.1
3246 *** a derivative of the North American Profile (NAP)
3247 ***
3248 *** NOTES:
3249 *** - Codelists:
3250 *** Most ISO metadata profiles and applications use ISO codelists or codelists that use ISO's
3251 codelist names. NAP does not use ISO codelist names. USGIN recommends using ISO over NAP
3252 codelists to ensure interoperability. Remember, the codeList attribute points to a Uniform
3253 Resource Identifier (URI) which defines an item's identity. It can be a URN or a URL.
3254 *** - napm schema extension:
3255 ***
3256 http://www.cits.rncan.gc.ca/html/brodeurj/.protege/.napMetadata/napMetadataWebsite/napMetadataToo
3257 ls/napXsd/napm is the namespace for NAP extensions in xmlns:napm. Its schema is located at
3258 http://www.cits.rncan.gc.ca/html/brodeurj/.protege/.napMetadata/tools/napXsd/napm/napm.xsd.
3259 However, that schema does not resolve properly because it also references a local copy of gmd.
3260 USGIN does not follow this NAP requirement because it constitutes a barrier to interoperability.
3261 *** - Language code:
3262 *** NAP demands <ISO639-2/T three letter language code - lower case></><blank space><ISO3166-1
3263 three letter country code - upper case>. However, NAP's requirement is not interoperable and
3264 USGIN prefers ISO's <ISO639-2/T three letter language code - lower case> formatting.
3265 ***
3266 *** KEY: (NAP-USGIN) - M/C/O/X (Mandatory, Conditional, Optional, Not Used)
3267 ***
3268 ****
3269 <!-- USGIN ISO 19139 geospatial service metadata record with explicitly linked references to
3270 coupled resources (map layers) for a WMS service -->
3271 <gmd:MD_Metadata
3272   xmlns:gmd="http://www.isotc211.org/2005/gmd"
3273   xmlns:gco="http://www.isotc211.org/2005/gco"
3274   xmlns:gml="http://www.opengis.net/gml"
3275   xmlns:srv="http://www.isotc211.org/2005/srv"
3276   xmlns:xlink="http://www.w3.org/1999/xlink"
3277   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
3278   xsi:schemaLocation="
3279     http://www.isotc211.org/2005/gmd http://schemas.opengis.net/iso/19139/20060504/gmd/gmd.xsd
3280     http://www.isotc211.org/2005/srv http://schemas.opengis.net/iso/19139/20060504/srv/srv.xsd
3281   ">
3282   <!-- (M-M) Metadata file identifier - A unique File Identifier (GUID) - USGIN recommends using
3283 a valid Universally Unique Identifier (UUID) -->
3284   <gmd:fileIdentifier>
3285     <gco:CharacterString>53e3ad439d6043e25d875f3959445c3d7d9a1</gco:CharacterString>
3286   </gmd:fileIdentifier>
3287   <!-- (M-M) Metadata language - NAP demands <ISO639-2/T three letter language code - lower
3288 case></><blank space><ISO3166-1 three letter country code - upper case>. However, NAP's
3289 requirement is not interoperable and USGIN prefers ISO's <ISO639-2/T three letter language code -
3290 lower case> formatting. -->
3291   <!-- NAP Example -->
3292 
```

```

3293      <!--
3294      <gmd:language>
3295          <gco:CharacterString>eng; USA</gco:CharacterString>
3296      </gmd:language>
3297      -->
3298      <!-- ISO Example -->
3299      <gmd:language>
3300          <gco:CharacterString>eng</gco:CharacterString>
3301      </gmd:language>
3302      <!-- (M-M) Metadata character set - NAP specifies default is "utf8", codelist =
3303      napMD_CharacterSetCode. USGIN requires that a character set code is defined to facilitate CSW
3304      servers (degreee, GeoNetwork, etc.). -->
3305      <gmd:characterSet>
3306          <!-- MD_CharacterSetCode names: {ucs2, ucs4, utf7, utf8, utf16, 8859part1, 8859part2,
3307          8859part3, 8859part4, 8859part5, 8859part6, 8859part7, 8859part8, 8859part9, 8859part10,
3308          8859part11, 8859part13, 8859part14, 8859part15, 8859part16, jis, shiftJIS, eucJP, usAscii,
3309          ebcdic, euckR, big5, GB2312}. -->
3310          <!-- NAP example -->
3311          <!--
3312          <gmd:MD_CharacterSetCode
3313              codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_95"
3314              codeListValue="RI_458">utf8</gmd:MD_CharacterSetCode>
3315          -->
3316          <!-- ISO example -->
3317          <gmd:MD_CharacterSetCode
3318
3319          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3320          Codelist/gmxCodelists.xml#MD_CharacterSetCode"
3321              codeListValue="utf8">UTF-8</gmd:MD_CharacterSetCode>
3322          </gmd:characterSet>
3323          <!-- (M-M) Resource type - Define if this record is a: dataset (default), service, feature,
3324          software, etc. -->
3325          <gmd:hierarchyLevel>
3326              <!-- MD_ScopeCode code names: {attribute, attributeType, collectionHardware,
3327              collectionSession, dataset, series, nonGeographicDataset, dimensionGroup, feature, featureType,
3328              propertyType, fieldSession, software, service, model, tile}. -->
3329              <!-- NAP example -->
3330              <!--
3331              <gmd:MD_ScopeCode
3332                  codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_108"
3333                  codeListValue="RI_631">service</gmd:MD_ScopeCode>
3334              -->
3335              <!-- ISO example -->
3336              <gmd:MD_ScopeCode
3337
3338          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3339          Codelist/gmxCodelists.xml#MD_ScopeCode"
3340              codeListValue="service">service</gmd:MD_ScopeCode>
3341          </gmd:hierarchyLevel>
3342          <!-- (O-M) Resource hierarchy level name - ISO 19115 assumes that the metadata hierarchy level
3343          name defaults to "dataset" if it is not documented. NAP does not use it, recognizing that it is
3344          redundant. USGIN makes this property mandatory to identify the USGIN resource type (see USGIN
3345          Profile, "Resources of Interest"). Default USGIN hierarchyLevelName.CharacterString is "Dataset."
3346          Encode hierarchy by including hierarchyLevelName elements for all broader resource categories.
3347          E.g. default should also include a hierarchyLevelName="Collection" element. For services USGIN
3348          hierarchyLevelName.CharacterString is "Service". As use cases develop that provide rationale for
3349          definition of sub-categories of service, the resource category list will be expanded. -->
3350          <gmd:hierarchyLevelName>
3351              <gco:CharacterString>Service</gco:CharacterString>
3352          </gmd:hierarchyLevelName>
3353          <!-- (M-M) Metadata point of contact - Point of contact for the metadata record, e.g. for users
3354          to report errors, updates to metadata, etc. -->
3355          <gmd:contact>
3356              <gmd:CI_ResponsibleParty>
3357                  <!-- (M-M) (individualName + organisationName + positionName) > 0 -->
3358                  <gmd:individualName>
3359                      <gco:CharacterString>Ryan Clark</gco:CharacterString>
3360                  </gmd:individualName>
3361                  <gmd:organisationName>
3362                      <gco:CharacterString>Arizona Geological Survey</gco:CharacterString>
3363                  </gmd:organisationName>
3364                  <gmd:positionName>
```

```

3365      <gco:CharacterString>GIS Manager</gco:CharacterString>
3366      </gmd:positionName>
3367      <gmd:contactInfo>
3368          <gmd:CI_Contact>
3369              <!-- Phone -->
3370              <gmd:phone>
3371                  <gmd:CI_Telephone>
3372                      <gmd:voice>
3373                          <gco:CharacterString>520.770.3500</gco:CharacterString>
3374                      </gmd:voice>
3375                      <gmd:facsimile>
3376                          <gco:CharacterString>520.770.3505</gco:CharacterString>
3377                      </gmd:facsimile>
3378                  </gmd:CI_Telephone>
3379              </gmd:phone>
3380              <!-- Address -->
3381              <gmd:address>
3382                  <gmd:CI_Address>
3383                      <gmd:deliveryPoint>
3384                          <gco:CharacterString>416 W. Congress St., Suite 100</gco:CharacterString>
3385                      </gmd:deliveryPoint>
3386                      <gmd:city>
3387                          <gco:CharacterString>Tucson</gco:CharacterString>
3388                      </gmd:city>
3389                      <gmd:administrativeArea>
3390                          <gco:CharacterString>Arizona</gco:CharacterString>
3391                      </gmd:administrativeArea>
3392                      <gmd:postalCode>
3393                          <gco:CharacterString>85701-1381</gco:CharacterString>
3394                      </gmd:postalCode>
3395                      <gmd:country>
3396                          <gco:CharacterString>USA</gco:CharacterString>
3397                      </gmd:country>
3398              <!-- (O-M) Metadata point of contact e-mail address - mandatory in USGIN -->
3399              <gmd:electronicMailAddress>
3400                  <gco:CharacterString>metadata@azgs.az.gov</gco:CharacterString>
3401                  </gmd:electronicMailAddress>
3402          </gmd:CI_Address>
3403      </gmd:address>
3404      <!-- (O-O) online resources - this is the online resource to contact the metadata
3405 person-->
3406          <gmd:onlineResource>
3407              <gmd:CI_OnlineResource>
3408                  <gmd:linkage>
3409                      <gmd:URL>http://www.azgs.az.gov</gmd:URL>
3410                  </gmd:linkage>
3411                  <gmd:protocol>
3412                      <gco:CharacterString>http</gco:CharacterString>
3413                  </gmd:protocol>
3414                  <gmd:description>
3415                      <gco:CharacterString>Arizona Geological Survey Web Site</gco:CharacterString>
3416                  </gmd:description>
3417          </gmd:CI_OnlineResource>
3418      </gmd:onlineResource>
3419      <!-- (O-O) hours of service -->
3420      <gmd:hoursOfService>
3421          <gco:CharacterString>8 AM to 5 PM Mountain Standard time (no daylight
3422 savings)</gco:CharacterString>
3423      </gmd:hoursOfService>
3424      <!-- (O-O) contact instructions -->
3425      <gmd:contactInstructions>
3426          <gco:CharacterString>Fill out contact form at http://www.azgs.az.gov
3427      </gco:CharacterString>
3428          </gmd:contactInstructions>
3429      </gmd:CI_Contact>
3430      </gmd:contactInfo>
3431      <!-- (M-M) ISO 19139 Mandatory: contact role -->
3432      <gmd:role>
3433          <!-- CI_RoleCode names: {resourceProvider, custodian, owner, user, distributor,
3434 originator, pointOfContact, principalInvestigator, processor, publisher, author} - NAP expands
3435 with {collaborator, editor, mediator, rightsHolder}. -->
3436          <!-- NAP example -->

```

```

3437      <!--
3438      <gmd:CI_RoleCode
3439          codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_90"
3440          codeListValue="RI_414">pointOfContact</gmd:CI_RoleCode>
3441      -->
3442      <!-- ISO example -->
3443      <gmd:CI_RoleCode
3444
3445      codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3446      Codelist/gmxCodelists.xml#CI_RoleCode"
3447          codeListValue="pointOfContact">point of contact</gmd:CI_RoleCode>
3448      </gmd:role>
3449      </gmd:CI_ResponsibleParty>
3450      </gmd:contact>
3451      <!-- (X-O) Metadata should include a URL that locates a thumbnail logo for organizations
3452      related to the metadata origination, the organization hosting the catalog that returned the
3453      metadata, the organization that originated the data, and the organization hosting online services
3454      that provide access to the data. -->
3455      <gmd:contact>
3456          <gmd:CI_ResponsibleParty>
3457              <gmd:organisationName>
3458                  <gco:CharacterString>Arizona Geological Survey</gco:CharacterString>
3459              </gmd:organisationName>
3460              <gmd:contactInfo>
3461                  <gmd:CI_Contact>
3462                      <gmd:onlineResource>
3463                          <gmd:CI_OnlineResource>
3464                              <!-- Icon image file (e.g. tif, png, jpg) for the metadata originator. This Icon
3465                              will be displayed in search results to credit the metadata originator. -->
3466                              <gmd:linkage>
3467                                  <gmd:URL>http://www.azgs.az.gov/logo/metadata/azgs.png</gmd:URL>
3468                              </gmd:linkage>
3469                          <!-- (X-C) For URL's that indicate icon thumbnails, the CI_OnlineResource/name
3470                          should be 'icon'. -->
3471                          <gmd:name>
3472                              <gco:CharacterString>icon</gco:CharacterString>
3473                          </gmd:name>
3474                          </gmd:CI_OnlineResource>
3475                      </gmd:onlineResource>
3476                      <gmd:CI_Contact>
3477                  </gmd:contactInfo>
3478                  <gmd:role>
3479                      <!-- CI_RoleCode names: {resourceProvider, custodian, owner, user, distributor,
3480                      originator, pointOfContact, principalInvestigator, processor, publisher, author} - NAP expands
3481                      with {collaborator, editor, mediator, rightsHolder}. -->
3482                      <!-- NAP example -->
3483                      <!--
3484                      <gmd:CI_RoleCode
3485                          codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_90"
3486                          codeListValue="RI_413">originator</gmd:CI_RoleCode>
3487                      -->
3488                      <!-- ISO example -->
3489                      <gmd:CI_RoleCode
3490
3491                      codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3492                      Codelist/gmxCodelists.xml#CI_RoleCode"
3493                          codeListValue="originator">originator</gmd:CI_RoleCode>
3494                          </gmd:role>
3495                          </gmd:CI_ResponsibleParty>
3496                          </gmd:contact>
3497                          <!-- (M-M) Metadata date stamp - USGIN profile requires use of dateStamp/gco:DateTime (Note
3498                          this contrasts with INSPIRE mandate to use dateStamp/gco:Date). This is the date and time when
3499                          the metadata record was created or updated (following NAP). -->
3500                          <gmd:dateStamp>
3501                              <!-- Requires an extended ISO 8601 formatted combined UTC date and time string (2009-11-
3502                              17T10:00:00) -->
3503                              <gco:DateTime>2009-11-17T10:00:00</gco:DateTime>
3504                          </gmd:dateStamp>
3505                          <!-- (M-M) metadata standard - NAP specifies "NAP - Metadata". USGIN profile conformant
3506                          metadata is indicated by using "ISO-NAP-USGIN" -->
3507                          <gmd:metadataStandardName>
3508                              <gco:CharacterString>ISO-NAP-USGIN</gco:CharacterString>

```

```

3509 </gmd:metadataStandardName>
3510 <!-- (O-M) USGIN profile version -->
3511 <gmd:metadataStandardVersion>
3512   <gco:CharacterString>1.1</gco:CharacterString>
3513 </gmd:metadataStandardVersion>
3514 <!-- (O-C) Dataset Identifier - For USGIN, this is a string that uniquely identifies the
3515 described resource. If the resource has an identifier, it should be included here; if the
3516 resource will be referenced from other metadata, it must have an identifier here. If the dataset
3517 is coupled to a service, the value of the MD_Metadata/dataSetURI attribute is the unique resource
3518 identifier used by srv:coupledResource to link the service with the dataset. For the USGIN
3519 profile, the MD_Distribution/transferOptions/MD_DigitalTransferOptions/ online/CI_OnlineResource
3520 is used to specify URLs for access to the resource. -->
3521 <!-- This locale element example implies that all character string elements are available in
3522 English (from the MD_Metadata/language element), and in French. -->
3523 <!--
3524 <gmd:locale>
3525   <gmd:PT_Locale id="FR">
3526     <gmd:languageCode>
3527       <gmd:LanguageCode
3528
3529   codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3530 Codelist/ML_gmxCodelists.xml#LanguageCode"
3531     codeListValue="fra">Français</gmd:LanguageCode>
3532   </gmd:languageCode>
3533   <gmd:characterEncoding>
3534     --><!-- ISO example --><!--
3535   <gmd:MD_CharacterSetCode
3536
3537   codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3538 Codelist/gmxCodelists.xml#MD_CharacterSetCode"
3539     codeListValue="utf8">UTF-8</gmd:MD_CharacterSetCode>
3540   </gmd:characterEncoding>
3541   </gmd:PT_Locale>
3542   </gmd:locale>
3543   -->
3544   <!-- (C-C) Other Languages - If description in more than one language is provided, this
3545 property should indicate what those languages are. The primary language used for metadata
3546 description is identified with MD_Metadata/language and characterSet and any additional languages
3547 are identified by MD_Metadata/locale/PT_locale elements, in which the language is provided
3548 according to ISO 639-2/T three-letter terminology codes in lowercase, and an optional country is
3549 provided according to ISO 3166-1 three-letter codes in uppercase, and mandatory
3550 characterEncoding. -->
3551   <!--
3552   <gmd:locale/>
3553   -->
3554   <!-- (O-O) Resource spatial representation - Spatial representation Information for the dataset
3555 (resource). Best practice is to include metadata for spatial representation if the described
3556 resource is a georeferenced dataset. -->
3557   <!--
3558   <gmd:spatialRepresentationInfo/>
3559   -->
3560   <!-- (O-O) Resource's spatial reference system - Description of the spatial and/or temporal
3561 reference systems used in the dataset.
3562   NAP specifies {
3563   (identificationInfo/spatialRepresentationType/MD_SpatialRepresentationTypeCode= "vector") or
3564   (../MD_SpatialRepresentationTypeCode = "grid") or (../MD_SpatialRepresentationTypeCode = "tin")
3565   implies count referenceSystemInfo >= 1 } -->
3566   <gmd:referenceSystemInfo>
3567     <gmd:MD_ReferenceSystem>
3568       <!-- ISO 19115:2003 Corrigendum 1:2006 removes CRS and projection parameter information. It
3569 uses the new ISO 19111 instead -->
3570     <gmd:referenceSystemIdentifier>
3571       <gmd:RS_Identifier>
3572         <!-- (C-C) Reference System identifier code - For USGIN the code should be a value from
3573 the EPSG Geodetic Parameter Dataset register (http://www.epsg-registry.org/) in the form
3574 "EPSG:nnnn" where nnnn is the EPSG code number for the CRS. -->
3575         <gmd:code>
3576           <gco:CharacterString>EPSG:5701</gco:CharacterString>
3577         </gmd:code>
3578         <gmd:codeSpace>
3579           <gco:CharacterString>urn:ogc:def:crs</gco:CharacterString>
3580         </gmd:codeSpace>

```

```

3581      </gmd:RS_Identifier>
3582      </gmd:referenceSystemIdentifier>
3583    </gmd:MD_ReferenceSystem>
3584  </gmd:referenceSystemInfo>
3585  <!-- (X-X) Metadata extension information - not used in USGIN -->
3586  <!--
3587    <gmd:metadataExtensionInfo/>
3588  -->
3589  <!--*****-->
3590  <!-- (M-M) Resource identification information - At least one of MD_DataIdentification
3591 (dataset, dataset series) or SV_ServiceIdentification (service) is required. -->
3592  <gmd:identificationInfo>
3593    <!-- Resource Service Identification -->
3594    <srsv:SV_ServiceIdentification>
3595      <gmd:citation>
3596        <!-- (M-M) Resource citation - For USGIN purposes, this should be viewed as information
3597 to identify the intellectual origin of the content in the described resource, along the lines of
3598 a citation in a scientific journal. Required content for a CI_Citation element are title, date,
3599 and responsibleParty -->
3600      <gmd:CI_Citation>
3601        <!-- (M-M) Resource title - USGIN recommends using titles that inform the human reader
3602 about the dataset's content as well as its context. -->
3603        <gmd:title>
3604          <gco:CharacterString>Arizona Geological Survey Web Map Service</gco:CharacterString>
3605        </gmd:title>
3606        <!-- (O-O) Alternate title -->
3607        <!--
3608        <gmd:alternateTitle/>
3609        -->
3610        <!-- (M-M) Resource reference date - Best practice is to include at least the date of
3611 publication or creation of the resource. The date of the resource reported in the citation
3612 corresponds to the resource's last update version according to its update frequency. CI_Date
3613 content includes a date and dateType. Date for USGIN profile uses xs:date data type, defined thus
3614 "date uses the date/timeSevenPropertyModel, with hour, minute, and second required to be absent.
3615 timezoneOffset• remains optional" (http://www.w3.org/TR/xmlschema11-2). -->
3616        <gmd:date>
3617          <gmd:CI_Date>
3618            <gmd:date>
3619              <!-- Requires an extended ISO 8601 formatted combined UTC date and time string
3620 (2001-12-17T09:30:47) -->
3621              <gco:DateTime>2009-11-22T23:35:22</gco:DateTime>
3622            </gmd:date>
3623            <gmd:dateType>
3624              <!-- CI_DateTypeCode names: {creation, publication, revision} _ NAP expands with
3625 {notAvailable, inForce, adopted, deprecated, superseded}.-->
3626              <!-- NAP Example -->
3627              <!--
3628              <gmd:CI_DateTypeCode
3629                codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC\_87"
3630                codeListValue="RI_368">revision</gmd:CI_DateTypeCode>
3631              -->
3632              <!-- ISO Example -->
3633            <gmd:CI_DateTypeCode
3634
3635            codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\_19139\_Schemas/resources/Codelist/gmxCodelists.xml#CI\_DateTypeCode"
3636              codeListValue="revision">revision</gmd:CI_DateTypeCode>
3637            </gmd:dateType>
3638            </gmd:CI_Date>
3639          </gmd:date>
3640          <!-- (C-O) Unique resource identifier - For USGIN, because the Citation is for the
3641 service, this identifier should be identical to MD_MetaData/dataSetURI, and is therefore optional.
3642 For USGIN purposes, this element content value is only an identifier for the citation; it is not
3643 a URL for accessing the service. The USGIN profile requires the use of MD_Identifier element to
3644 identify resources. RS_Identifier may substitute for MD_Identifier in the ISO19139 schema, but
3645 the USGIN profile requires use of MD_Identifier. If additional codespace and version content is
3646 associated with the identifier, it should be encoded as
3647 MD_Identifier/authority/CI_Citation/alternateTitle and
3648 MD_Identifier/authority/CI_Citation/edition -->
3649           <!--
3650           <gmd:identifier>
3651             <gmd:RS_Identifier>

```

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3653     <gmd:code>
3654         <gco:CharacterString>00000000000000000000000000000000</gco:CharacterString>
3655     </gmd:code>
3656     </gmd:RS_Identifier>
3657   </gmd:identifier>
3658   -->
3659   <!-- (M-M) Resource responsible party - The citation attribute provides information for
3660 citing the described resource. Citation is defined by Webster as "an act of quoting". The precise
3661 semantics of what an identification/citation is supposed to be are not very well articulated in
3662 ISO19115. For USGIN purposes, this should be viewed as information to identify the intellectual
3663 origin (or property) of the content in the described resource, along the lines of a citation in a
3664 scientific journal. Required content for a CI_Citation element are title, date, and
3665 'responsibleParty'. -->
3666     <gmd:citedResponsibleParty>
3667       <gmd:CI_ResponsibleParty id="R264537">
3668         <!-- (M-M) (individualName + organisationName + positionName) > 0 -->
3669         <!--
3670           <gmd:individualName/>
3671         -->
3672           <gmd:organisationName>
3673             <gco:CharacterString>Arizona Geological Survey</gco:CharacterString>
3674           </gmd:organisationName>
3675           <gmd:positionName>
3676             <gco:CharacterString>GIS Manager</gco:CharacterString>
3677           </gmd:positionName>
3678           <!-- (O-C) Contact Information - (phone + deliveryPoint + electronicMailAddress ) >
3679 0. Best practice is to include at least an e-mail address -->
3680         <gmd:contactInfo>
3681           <gmd:CI_Contact>
3682             <gmd:address>
3683               <gmd:CI_Address>
3684                 <gmd:electronicMailAddress>
3685                   <gco:CharacterString>webServices@azgs.az.gov</gco:CharacterString>
3686                 </gmd:electronicMailAddress>
3687               </gmd:CI_Address>
3688             </gmd:address>
3689             </gmd:CI_Contact>
3690           </gmd:contactInfo>
3691           <!-- (M-M) ISO 19139 Mandatory: contact role - Guidance on use of role codes would
3692 be helpful for consistency, but has not been developed as yet. -->
3693           <gmd:role>
3694             <!-- CI_RoleCode names: {resourceProvider, custodian, owner, user, distributor,
3695 originator, pointOfContact, principalInvestigator, processor, publisher, author} - NAP expands
3696 with {collaborator, editor, mediator, rightsHolder}. -->
3697             <!-- NAP example -->
3698             <!--
3699               <gmd:CI_RoleCode
3700                 codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_90"
3701                 codeListValue="RI_408">resourceProvider</gmd:CI_RoleCode>
3702             -->
3703             <!-- ISO example -->
3704             <gmd:CI_RoleCode
3705
3706             codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3707 Codelist/gmxCodelists.xml#CI_RoleCode"
3708               codeListValue="resourceProvider">resource provider</gmd:CI_RoleCode>
3709             </gmd:role>
3710             </gmd:CI_ResponsibleParty>
3711           </gmd:citedResponsibleParty>
3712           <!-- (O-O) Resource Presentation Form - The form in which the service is available,
3713 which in the case of a service is only through the service implementation described by the
3714 metadata record, so the information here is not generally very useful. Note that the citation is
3715 to the original source of intellectual content in the described resource should be in
3716 MD_DataIdentification/citation/CI_Citation that describes the datasets operated on by the
3717 service. -->
3718             <!--
3719               <gmd:presentationForm gco:nilReason="not applicable"/>
3720             -->
3721             <!-- (O-O) Resource series - Information about the series or collection of which the
3722 cited service is a part. NAP rule: (name + issueIdentification) > 0. At this point there is not
3723 much precedent for aggregating services into a formal series, so in general this element is
3724 probably not applicable to services. -->

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3725      <!--
3726      <gmd:series/>
3727      -->
3728      <!-- (O-O) Resource other citation details -->
3729      <!--
3730      <gmd:otherCitationDetails/>
3731      -->
3732      <!-- (O-C) Resource collective title - At this point there is not much precedent for
3733      aggregating services into a collections, so in general this element is probably not applicable to
3734      services. -->
3735      <!--
3736      <gmd:collectiveTitle/>
3737      -->
3738      </gmd:CI_Citation>
3739      </gmd:citation>
3740      <!-- (M-M) Resource Abstract - A free text summary of the content, significance, purpose,
3741      scope, etc. of the resource. Exactly one value. -->
3742      <gmd:abstract>
3743          <gco:CharacterString>A collection of Web Map Service (WMS) layers created and maintained
3744          by the Arizona Geological Survey.</gco:CharacterString>
3745      </gmd:abstract>
3746      <!-- (O-O) Resource purpose - Summary of the intentions for which the service was
3747      developed, including objectives for creating the service and use cases it is designed to support.
3748      -->
3749      <gmd:purpose>
3750          <gco:CharacterString>To provide geologic data for the state of Arizona at 1:1,000,000
3751          scale online and free-of-charge.</gco:CharacterString>
3752      </gmd:purpose>
3753      <!-- (M-M) Resource Status - -->
3754      <gmd:status>
3755          <!-- MD_ProgressCode names: {completed, historicalArchive, obsolete, onGoing, planned,
3756          required, underDevelopment} - NAP expands with {proposed}. Obsolete is synonymous with
3757          deprecated. -->
3758          <!-- NAP Example -->
3759          <!--
3760          <gmd:MD_ProgressCode
3761              codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_106"
3762              codeListValue="RI_593">completed</gmd:MD_ProgressCode>
3763          -->
3764          <!-- ISO Example -->
3765          <gmd:MD_ProgressCode
3766
3767          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3768          Codelist/gmxCodelists.xml#MD_ProgressCode"
3769              codeListValue="completed">completed</gmd:MD_ProgressCode>
3770          </gmd:status>
3771          <!-- (O-C) Resource service point of contact (access contact) - CI_ResponsibleParty element
3772          here would contain information for point of contact to access the resource. This information is
3773          mandatory for physical resources such as core, cuttings, samples, manuscripts. -->
3774          <gmd:pointOfContact>
3775              <!-- CI_Responsible party has an id in order to allow reuse of this element later in the
3776              document by an internal href; see distributionInfo/.../distributor near end of document -->
3777              <gmd:CI_ResponsibleParty>
3778                  <!-- (M-M) (individualName + organisationName + positionName) > 0 -->
3779                  <gmd:individualName>
3780                      <gco:CharacterString>Ryan Clark</gco:CharacterString>
3781                  </gmd:individualName>
3782                  <gmd:organisationName>
3783                      <gco:CharacterString>Arizona Geological Survey</gco:CharacterString>
3784                  </gmd:organisationName>
3785                  <gmd:positionName>
3786                      <gco:CharacterString>GIS Manager</gco:CharacterString>
3787                  </gmd:positionName>
3788                  <!-- (O-C) Contact Information - If a resource point of contact is required then (phone
3789                  + deliveryPoint + electronicMailAddress) > 0. Best practice is to include at least an email
3790                  address. -->
3791                  <gmd:contactInfo>
3792                      <gmd:CI_Contact>
3793                          <gmd:phone>
3794                              <gmd:CI_Telephone>
3795                              <gmd:voice>
3796                                  <gco:CharacterString>520-770-3500</gco:CharacterString>

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3797          </gmd:voice>
3798          <gmd:facsimile>
3799              <gco:CharacterString>520-770-3505</gco:CharacterString>
3800          </gmd:facsimile>
3801          </gmd:CI_Telephone>
3802      </gmd:phone>
3803      <gmd:address>
3804          <gmd:CI_Address>
3805              <gmd:deliveryPoint>
3806                  <gco:CharacterString>416 W. Congress St. Suite 100</gco:CharacterString>
3807              </gmd:deliveryPoint>
3808              <gmd:city>
3809                  <gco:CharacterString>Tucson</gco:CharacterString>
3810              </gmd:city>
3811              <gmd:administrativeArea>
3812                  <gco:CharacterString>Arizona</gco:CharacterString>
3813              </gmd:administrativeArea>
3814              <gmd:postalCode>
3815                  <gco:CharacterString>85701</gco:CharacterString>
3816              </gmd:postalCode>
3817              <gmd:country>
3818                  <gco:CharacterString>USA</gco:CharacterString>
3819              </gmd:country>
3820              <gmd:electronicMailAddress>
3821                  <gco:CharacterString>ryan.clark@azgs.az.gov</gco:CharacterString>
3822              </gmd:electronicMailAddress>
3823          </gmd:CI_Address>
3824      </gmd:address>
3825      <!--(O-O) "Information about Internet hosted resources: availability; URL; protocol
3826 used; resource name; resource description, and resource function." NAP -->
3827      <gmd:onlineResource>
3828          <gmd:CI_OnlineResource>
3829              <gmd:linkage>
3830                  <gmd:URL>http://75.101.143.247:8080/gsvr/wms</gmd:URL>
3831              </gmd:linkage>
3832              <gmd:protocol>
3833                  <gco:CharacterString>http</gco:CharacterString>
3834              </gmd:protocol>
3835          </gmd:CI_OnlineResource>
3836          </gmd:onlineResource>
3837      </gmd:CI_Contact>
3838  </gmd:contactInfo>
3839  <!-- (M-M) ISO 19139 Mandatory: contact role - Guidance on use of role codes would be
3840 helpful for consistency, but has not been developed as yet. -->
3841      <gmd:role>
3842          <!-- CI_RoleCode names: {resourceProvider, custodian, owner, user, distributor,
3843 originator, pointOfContact, principalInvestigator, processor, publisher, author} - NAP expands
3844 with {collaborator, editor, mediator, rightsHolder}. -->
3845          <!-- NAP example -->
3846          <!--
3847          <gmd:CI_RoleCode
3848              codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC\_90"
3849              codeListValue="RI_414">pointOfContact</gmd:CI_RoleCode>
3850          -->
3851          <!-- ISO example -->
3852          <gmd:CI_RoleCode
3853
3854      codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\_19139\_Schemas/resources/Codelist/gmxCodelists.xml#CI\_RoleCode"
3855          codeListValue="pointOfContact">point of contact</gmd:CI_RoleCode>
3856          </gmd:role>
3857          </gmd:CI_ResponsibleParty>
3858      </gmd:pointOfContact>
3859  <!-- (O-O) Resource Maintenance - This element provides information about the maintenance
3860 schedule or history of the service described by the metadata record. For a service, only one
3861 MD_MaintenanceInformation elements may be included; for which the MD_ScopeDescription
3862 napMD_ScopeCode will be 'service'. If MD_MaintenanceInformation is present, then
3863 maintenanceAndUpdateFrequency is mandatory. -->
3864      <gmd:resourceMaintenance>
3865          <gmd:MD_MaintenanceInformation>
3866              <gmd:maintenanceAndUpdateFrequency>
```

```

3868      <!-- MD_MaintenanceFrequencyCode names: {continual, daily, weekly, fortnightly,
3869 monthly, quarterly, biannually, annually, asNeeded, irregular, notPlanned, unknown} - NAP
3870 expands with {semimonthly}. -->
3871      <!-- NAP Example -->
3872      <!--
3873      <gmd:MD_MaintenanceFrequencyCode
3874          codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_102"
3875          codeListValue="RI_540">asNeeded</gmd:MD_MaintenanceFrequencyCode>
3876      -->
3877      <!-- ISO Example -->
3878      <gmd:MD_MaintenanceFrequencyCode
3879
3880      codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3881 Codelist/gmxCodelists.xml#MD_MaintenanceFrequencyCode"
3882          codeListValue="asNeeded">as needed</gmd:MD_MaintenanceFrequencyCode>
3883          </gmd:maintenanceAndUpdateFrequency>
3884          </gmd:MD_MaintenanceInformation>
3885          </gmd:resourceMaintenance>
3886          <!-- (O-O) Graphic overview of resource - Highly recommended to include a small image
3887 visual representation of the resource provided by a map or image service. For geographic feature
3888 or data services, a graphic overview might show the geographic distribution of available data.
3889 If MD_BrowseGraphic is included, MD_BrowseGraphic/filename character string is mandatory. USGIN
3890 Recommended practice is to provide a complete URL as a gco:characterString value for the filename
3891 property. -->
3892          <!--
3893          <gmd:graphicOverview/>
3894          -->
3895          <!-- (O-X) Resource Format - This element is not used by USGIN; this information is encoded
3896 in MD_Metadata/distributionInfo/MD_Distribution/ in USGIN metadata. -->
3897          <!--
3898          <gmd:resourceFormat>
3899          -->
3900          <!-- (O-O) Resource keywords - Best Practice for USGIN profile metadata is to supply
3901 keywords to facilitate the discovery of metadata records relevant to the user. USGIN requires
3902 that MD_Keyword/keyword contain a CharacterString. USGIN best practice is to include keywords in
3903 English -->
3904          <!-- Theme keywords -->
3905          <gmd:descriptiveKeywords>
3906              <gmd:MD_Keywords>
3907                  <gmd:keyword>
3908                      <gco:CharacterString>WMS</gco:CharacterString>
3909                  </gmd:keyword>
3910                  <gmd:keyword>
3911                      <gco:CharacterString>GEO SERVER</gco:CharacterString>
3912                  </gmd:keyword>
3913                  <gmd:keyword>
3914                      <gco:CharacterString>AZGS</gco:CharacterString>
3915                  </gmd:keyword>
3916                  <gmd:keyword>
3917                      <gco:CharacterString>GEOLOGY</gco:CharacterString>
3918                  </gmd:keyword>
3919                  <!-- Keyword Type - allowed values from MD_KeywordTypeCode names: {discipline, place,
3920 stratum, temporal, theme} - NAP expands with {product, subTopicCategory}. -->
3921              <gmd:type>
3922                  <!-- NAP Example -->
3923                  <!--
3924                  <gmd:MD_KeywordTypeCode
3925                      codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_101"
3926                      codeListValue="RI_528">theme</gmd:MD_KeywordTypeCode>
3927                  -->
3928                  <!-- ISO Example -->
3929                  <gmd:MD_KeywordTypeCode
3930
3931                  codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3932 Codelist/gmxCodelists.xml#MD_KeywordTypeCode"
3933                      codeListValue="theme">theme</gmd:MD_KeywordTypeCode>
3934                      </gmd:type>
3935                      </gmd:MD_Keywords>
3936                      </gmd:descriptiveKeywords>
3937                      <!-- Temporal keywords -->
3938                      <!--
3939                      <gmd:descriptiveKeywords/>
```

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3940      -->
3941      <!-- Place keywords -->
3942      <gmd:descriptiveKeywords>
3943          <gmd:MD_Keywords>
3944              <gmd:keyword>
3945                  <gco:CharacterString>ARIZONA</gco:CharacterString>
3946              </gmd:keyword>
3947          <!-- Keyword Type - allowed values from MD_KeywordTypeCode names: {discipline, place,
3948 stratum, temporal, theme} - NAP expands with {product, subTopicCategory}. -->
3949          <gmd:type>
3950              <!-- NAP Example -->
3951              <!--
3952                  <gmd:MD_KeywordTypeCode
3953                      codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_101"
3954                      codeListValue="RI_525">place</gmd:MD_KeywordTypeCode>
3955              -->
3956              <!-- ISO Example -->
3957          <gmd:MD_KeywordTypeCode
3958
3959      codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
3960      Codelist/gmxCodelists.xml#MD_KeywordTypeCode"
3961          codeListValue="place">place</gmd:MD_KeywordTypeCode>
3962      </gmd:type>
3963      </gmd:MD_Keywords>
3964      </gmd:descriptiveKeywords>
3965      <!-- (O-X) Resource specific usage - NAP excludes this property in INCITS 453, figure 64
3966 p.175, but it is schema valid under
3967 http://schemas.opengis.net/iso/19139/20060504/serviceMetadata.xsd, which is the service metadata
3968 schema imported by apiso.xsd for the OGC CSW profile for ISO19115/19 metadata. Property not USED
3969 by USGIN. -->
3970      <!--
3971          <gmd:resourceSpecificUsage/>
3972      -->
3973      <!-- (O-O) Condition applying to access and use of resource - Restrictions on the access
3974 and use of a service. Follow NAP for specification of resourceConstraints. This attribute
3975 provides information for access control to the described service. In some situations, the
3976 metadataConstraints may allow a user to learn of the existence of a resource that they may not
3977 actually be able to access without further clearance. Follow NAP for specification of
3978 resourceConstraints. -->
3979      <gmd:resourceConstraints>
3980          <gmd:MD_LegalConstraints>
3981              <gmd:useLimitation>
3982                  <gco:CharacterString>Read only</gco:CharacterString>
3983              </gmd:useLimitation>
3984          <gmd:accessConstraints>
3985
3986          <!-- MD_RestrictionCode names: {copyright, patent, patentPending, trademark, license,
3987 intellectualPropertyRights, restricted, otherRestrictions} - NAP expands with
3988 {licenseUnrestricted, licenseEndUser, licenseDistributor, privacy, statutory, confidential,
3989 sensitivity}. -->
3990          <!-- NAP Example -->
3991          <!--
3992              <gmd:MD_RestrictionCode
3993                  codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_107"
3994                  codeListValue="RI_602">copyright</gmd:MD_RestrictionCode>
3995          -->
3996          <!-- ISO Example -->
3997          <gmd:MD_RestrictionCode
3998
3999      codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
4000      Codelist/gmxCodelists.xml#MD_RestrictionCode"
4001          codeListValue="copyright">copyright</gmd:MD_RestrictionCode>
4002          </gmd:accessConstraints>
4003          <gmd:otherConstraints>
4004              <gco:CharacterString>NONE</gco:CharacterString>
4005          </gmd:otherConstraints>
4006          <gmd:MD_LegalConstraints>
4007          </gmd:resourceConstraints>
4008
4009          <!-- (O-X) Aggregation information - The citation for the aggregate service or the name of
4010 the aggregate service, the type of aggregate service, and optionally the activity which produced
4011 the service. The citation for or name of an aggregate dataset, the type of aggregate dataset, and
4012 optionally the activity which produced the dataset. For USGIN profile, this property, rather than

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4012 MD_Metadata/parentIdentifier, should be used to indicate relationships between described
4013 resources. -->
4014     <!--
4015     <gmd:aggregationInfo/>
4016     -->
4017     <!-- (M-M) Service type - Choose a service type name from a registry of services. USGIN
4018 mandates use of a LocalName value from the service type listing in the ServiceType section of the
4019 USGIN ISO19139 profile document, with the codespace http://resources.usgin.org/registry/
4020 serviceType201001 -->
4021     <srv:serviceType>
4022         <!-- Valid values for OGC services would be then {<WMS, WFS, WVS, CSW, ...} -->
4023         <gco:LocalName
4024 codeSpace="http://resources.usgin.org/registry/serviceType201001">WMS</gco:LocalName>
4025
4026     </srv:serviceType>
4027     <!-- (O-C) Resource service type version - Multiple serviceTypeVersion tags may not be
4028 implemented in applications - USGIN recommends a reverse chronological order for supported
4029 versions. Constraint: if various versions are available, mandatory to list versions that are
4030 supported. Default is oldest version of service. -->
4031     <srv:serviceTypeVersion>
4032         <gco:CharacterString>1.3.0</gco:CharacterString>
4033     </srv:serviceTypeVersion>
4034     <srv:serviceTypeVersion>
4035         <gco:CharacterString>1.1.3</gco:CharacterString>
4036     </srv:serviceTypeVersion>
4037     <srv:serviceTypeVersion>
4038         <gco:CharacterString>1.1.1</gco:CharacterString>
4039     </srv:serviceTypeVersion>
4040     <!-- (O-O) Resource service access properties - Information on the availability of the
4041 service which includes attributes from Standard Order Process. Applicable sub elements for
4042 service are: fees, and available date and time. -->
4043     <!--
4044     <srv:accessProperties/>
4045     -->
4046     <!-- (O-X) Resource service restrictions - Not used by USGIN; use resourceConstraints as
4047 per NAP. -->
4048     <!--
4049     <srv:restrictions/>
4050     -->
4051     <!-- (O-X) Keywords - Not used by USGIN; use descriptiveKeywords as per NAP -->
4052     <!--
4053     <srv:keywords/>
4054     -->
4055
4056     <!-- (C-C) Service Extent - Defines the spatial (horizontal and vertical) and temporal
4057 region to which the content of the resource applies. For USGIN, the spatial extent is a rectangle
4058 that bounds the geographic extent to which resource content applies. Best Practice for USGIN is
4059 to include an extent for any resource with content related to some geographic or temporal
4060 location. For geoscience resources, the temporal extent may be expressed using time ordinal eras
4061 from a geologic time scale if the resource is related to some particular geologic time. USGIN
4062 specifies count(description + geographicElement + temporalElement) > 0 -->
4063     <srv:extent>
4064         <gmd:EX_Extent>
4065             <!-- (C-C) Resource Content extent description - Free text that describes the spatial
4066 and temporal extent of the dataset. USGIN specifies that description is mandatory if a
4067 geographicElement or temporalElement is not provided. Note that if geographic place names are
4068 used to express the geographic extent, USGIN profile specifies that these should be encoded using
4069 keyword with keyword type code = 'place.' Geographic names may be duplicated in the
4070 EX_Extent/description. -->
4071             <!--
4072             <gmd:description/>
4073             -->
4074             <!-- (O-C) Resource content extent bounding box -USGIN profile requires that if an
4075 EX_Extent/geographicElement is supplied, it include a geographic bounding box with bounding
4076 latitude and longitude expressed using WGS 84 decimal degrees.
4077 The corner coordinates for the geographic bounding box must not coincide in one point, because
4078 this may result in fatal errors with some CSW implementations. Point locations must thus be
4079 represented as tiny rectangles. USGIN recommended practice is to place the actual point location
4080 in the lower left corner of the rectangle. -->
4081         <gmd:geographicElement>
4082             <gmd:EX_GeographicBoundingBox>
4083                 <gmd:westBoundLongitude>
```

```

4084             <gco:Decimal>-114.815</gco:Decimal>
4085         </gmd:westBoundLongitude>
4086         <gmd:eastBoundLongitude>
4087             <gco:Decimal>-108.984</gco:Decimal>
4088         </gmd:eastBoundLongitude>
4089         <gmd:southBoundLatitude>
4090             <gco:Decimal>31.25</gco:Decimal>
4091         </gmd:southBoundLatitude>
4092         <gmd:northBoundLatitude>
4093             <gco:Decimal>37.004</gco:Decimal>
4094         </gmd:northBoundLatitude>
4095     </gmd:EX_GeographicBoundingBox>
4096   </gmd:geographicElement>
4097   <!-- (C-X) Resource content extent geographic description - Not used by USGIN profile,
4098 use keyword with type code = 'place' (with thesaurus if necessary). -->
4099   <!--
4100     <gmd:geographicElement>
4101       <gmd:EX_GeographicDescription/>
4102     </gmd:geographicElement>
4103   -->
4104   <!-- (C-X) Resource content extent bounding polygon - To improve interoperability, USGIN
4105 mandates use of Geographic Bounding Box; bounding polygons may be present, but may be ignored by
4106 harvesters. -->
4107   <!--
4108     <gmd:geographicElement>
4109       <gmd:EX_BoundingPolygon/>
4110     </gmd:geographicElement>
4111   -->
4112   <!-- (O-O) Resource temporal extent -->
4113   <!--
4114     <gmd:extent>
4115       <gmd:EX_Extent>
4116         <gmd:temporalElement>
4117           <gmd:EX_TemporalExtent>
4118             <gmd:extent>
4119               <!--><!-- Default ISO time frame example --><!--
4120               <gml:TimePeriod gml:id="IdModern">
4121                 <gml:name>Y2KX</gml:name>
4122               --><!-- USGIN requires the beginPosition and endPosition's frame property to
4123 be defined. The default value is #ISO-8601. --><!--
4124               <gml:beginPosition frame="#ISO-8601">2010-01-00T00:00:00</gml:beginPosition>
4125               <gml:endPosition frame="#ISO-8601">2010-12-31T24:00:00</gml:endPosition>
4126             </gml:TimePeriod>
4127             <!--><!-- Geologic time frame example --><!--
4128             <gml:TimePeriod gml:id="IdJurassic">
4129               <gml:name>Jurassic</gml:name>
4130             --><!-- USGIN requires the beginPosition and endPosition's frame property to
4131 be defined. The default value is #ISO-8601. --><!--
4132             <gml:beginPosition
4133               frame="urn:cgi:trs:CGI:StandardGeologicTimeMa">203</gml:beginPosition>
4134               <gml:endPosition frame="urn:cgi:trs:CGI:StandardGeologicTimeMa
4135             ">135</gml:endPosition>
4136               </gml:TimePeriod>
4137             </gmd:extent>
4138             <gmd:EX_TemporalExtent>
4139           </gmd:temporalElement>
4140         </gmd:EX_Extent>
4141       </gmd:extent>
4142     -->
4143     <!-- (O-X) Resource spatio-temporal extent - Not used. Although use of
4144 EX_SpatialTemporalExtent is allowed by ISO19139 and NAP, USGIN mandates encoding space time
4145 location with EX_TemporalExtent and EX_GeographicBoundingBox. -->
4146     <!--
4147     <gmd:extent>
4148       <gmd:EX_Extent>
4149         <gmd:temporalElement>
4150           <gmd:EX_SpatialTemporalExtent/>
4151         </gmd:temporalElement>
4152       </gmd:EX_Extent>
4153     </gmd:extent>
4154   -->
4155   <!-- (O-O) Resource service vertical extent -->

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```

4156      <!--
4157      <gmd:verticalElement>
4158          <gmd:EX_VisualRepresentation>
4159              <gmd:minimumValue>
4160                  <gco:Real>-100</gco:Real>
4161              </gmd:minimumValue>
4162              <gmd:maximumValue>
4163                  <gco:Real>200</gco:Real>
4164              </gmd:maximumValue>
4165          --><!-- Use EPSG register of geodetic parameters such as at http://www.epsg-
4166 registry.org/. The default VerticalCRS is World mean sea level (MSL): urn:ogc:def:crs:EPSG::5714
4167 --><!--
4168      <gmd:verticalCRS xlink:href="urn:ogc:def:crs:EPSG::5714 " />
4169      </gmd:EX_VisualRepresentation>
4170      </gmd:verticalElement>
4171      -->
4172      </gmd:EX_Extent>
4173      </srv:extent>
4174      <!-- (O-O) Coupled Resources - This element correlates operations (identified by
4175 operationName) with datasets (identified by identifier). For logical consistency
4176 SV_coupledResource/identifier values should be equal to
4177 MD_DataIdentification/citation/CI_Citation/identifier/MD_Identifier/code for a dataset that is
4178 the target of a SV_ServiceIdentification/operatesOn element (either in an inline
4179 MD_DataIdentification/citation../code element, or a @uuidref attribute). This element is
4180 necessary to implement the many-to-many relationship between data sources and operations in a
4181 single service. -->
4182      <!-- NOTE: This is an example for TIGHTLY coupled resources with EXPLICIT links. This means
4183 that the example resource service's WMS layers are described in existing and separate metadata
4184 records. -->
4185      <srv:coupledResource>
4186          <srv:SV_CoupledResource>
4187              <!-- (M-M) Coupled resource operation name - Name of the service operation: GetMap,
4188 GetFeature, etc. -->
4189              <srv:operationName>
4190                  <gco:CharacterString>GetMap</gco:CharacterString>
4191              </srv:operationName>
4192              <!-- (M-M) Coupled Resource identifier - Identifier of a given tightly coupled dataset.
4193 Equal to MD_DataIdentification/citation/CI_Citation/identifier/MD_Identifier/code for a dataset
4194 that is the target of a SV_ServiceIdentification/operatesOn element (either in an inline
4195 MD_DataIdentification/citation../code element, or a @uuidref attribute). -->
4196              <srv:identifier>
4197                  <gco:CharacterString>8215ed91-6c92-4ae9-b094-8b58ddd5e7e0</gco:CharacterString>
4198              </srv:identifier>
4199              <!-- (X-O) Coupled Resource scoped name - OGC 07-045 application profile for ISO
4200 metadata using CSW 2.0.2 extends SV_CoupledResource with a ScopedName, defined as a scoped
4201 identifier of the resource in the context of the given service instance (e.g. layer name or
4202 featureTypeName). This is necessary for users to generate service requests (like GetMap or
4203 GetFeature) based on ISO service metadata. Note that if multiple WMS layers are related to a
4204 single dataset, separate coupledResource elements are required for each layer because the
4205 cardinality of ScopedName here is 0 or 1.-->
4206                  <gco:ScopedName>azgs:trace_nonmetals_earthchem</gco:ScopedName>
4207              </srv:SV_CoupledResource>
4208          </srv:coupledResource>
4209          <srv:coupledResource>
4210              <srv:SV_CoupledResource>
4211                  <srv:operationName>
4212                      <gco:CharacterString>GetMap</gco:CharacterString>
4213                  </srv:operationName>
4214                  <srv:identifier>
4215                      <gco:CharacterString>55932c11-67d6-4414-8a5f-a45f7dc3ecf6</gco:CharacterString>
4216                  </srv:identifier>
4217                  <gco:ScopedName>azgs:trace_metals_earthchem</gco:ScopedName>
4218              </srv:SV_CoupledResource>
4219          </srv:coupledResource>
4220          <srv:coupledResource>
4221              <srv:SV_CoupledResource>
4222                  <srv:operationName>
4223                      <gco:CharacterString>GetMap</gco:CharacterString>
4224                  </srv:operationName>
4225                  <srv:identifier>
4226                      <gco:CharacterString>8504f947-39d6-4clf-a4fa-672534f94856</gco:CharacterString>
4227                  </srv:identifier>

```

```

4228      <gco:ScopedName>azgs:trace_alk_alkearth_earthchem</gco:ScopedName>
4229      </srv:SV_CoupledResource>
4230      </srv:coupledResource>
4231      <srv:coupledResource>
4232          <srv:SV_CoupledResource>
4233              <srv:operationName>
4234                  <gco:CharacterString>GetMap</gco:CharacterString>
4235              </srv:operationName>
4236              <srv:identifier>
4237                  <gco:CharacterString>4dbd380c-7ba4-49d6-b34c-7f9415dde6f0</gco:CharacterString>
4238              </srv:identifier>
4239              <gco:ScopedName>azgs:ree_earthchem</gco:ScopedName>
4240          </srv:SV_CoupledResource>
4241      </srv:coupledResource>
4242      <srv:coupledResource>
4243          <srv:SV_CoupledResource>
4244              <srv:operationName>
4245                  <gco:CharacterString>GetMap</gco:CharacterString>
4246              </srv:operationName>
4247              <srv:identifier>
4248                  <gco:CharacterString>a3120268-1fb4-496a-84cc-c3a02dd0be16</gco:CharacterString>
4249              </srv:identifier>
4250              <gco:ScopedName>ncgmp:mapunitpolys</gco:ScopedName>
4251          </srv:SV_CoupledResource>
4252      </srv:coupledResource>
4253      <srv:coupledResource>
4254          <srv:SV_CoupledResource>
4255              <srv:operationName>
4256                  <gco:CharacterString>GetMap</gco:CharacterString>
4257              </srv:operationName>
4258              <srv:identifier>
4259                  <gco:CharacterString>39d94525-b1d6-494f-a739-357088e5a2e9</gco:CharacterString>
4260              </srv:identifier>
4261              <gco:ScopedName>azgs:earthfissures</gco:ScopedName>
4262          </srv:SV_CoupledResource>
4263      </srv:coupledResource>
4264      <srv:coupledResource>
4265          <srv:SV_CoupledResource>
4266              <srv:operationName>
4267                  <gco:CharacterString>GetMap</gco:CharacterString>
4268              </srv:operationName>
4269              <srv:identifier>
4270                  <gco:CharacterString>13ce1e84-c887-4fd8-b888-8d021b1fa4c2</gco:CharacterString>
4271              </srv:identifier>
4272              <gco:ScopedName>azgs:azgeochron</gco:ScopedName>
4273          </srv:SV_CoupledResource>
4274      </srv:coupledResource>
4275      <!-- (M-M) Service coupling type - Type of coupling between service and associated data (if
4276 exists) - "Qualitative information on the tightness with which the service and the associated
4277 data are coupled." NAP. -->
4278      <!-- According to ISO: -->
4279      <!-- 1) loose - service instance is loosely coupled with a data instance, i.e. no
4280 MD_DataIdentification class has to be described (ISO 19119). -->
4281      <!-- 2) mixed - service instance is mixed coupled with a data instance, i.e.
4282 MD_DataIdentification describes the associated data instance and additionally the service
4283 instance might work with other external data instances (ISO 19119 / ISO 19115). -->
4284      <!-- 3) tight - service instance is tightly coupled with a data instance, i.e.
4285 MD_DataIdentification class MUST be described. (ISO 19119 / ISO 19115) -->
4286      <!-- According to OGC: -->
4287      <!-- 1) loose - A service instance that is not associated with a specific dataset or
4288 dataset collection. Loosely coupled services may have an association with data types through the
4289 service type definition. Dataset metadata need not be provided in the service metadata. -->
4290      <!-- 2) mixed - A service that is associated with a specific dataset or dataset collection.
4291 Service metadata shall describe both the service and the geographic dataset, the latter being
4292 defined in accordance with ISO 19115. But this service instance can also be used with external
4293 data (i.e. data that is not described by the operatesOn association). -->
4294      <!-- 3) tight - An information resource that is hosted on a specific set of hardware and
4295 accessible over a network. -->
4296      <srv:couplingType>
4297          <!-- SV_CouplingType names: {loose, mixed, tight} -->
4298          <!-- NAP Example -->
4299          <!--

```

```

4300      <srv:SV_CouplingType
4301          codeList="http://www.fgdc.gov/nap/metadata/register/codelists.html#IC_114"
4302          codeListValue="RI_685">tight</srv:SV_CouplingType>
4303      -->
4304      <!-- ISO Example -->
4305      <srv:SV_CouplingType
4306
4307          codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/
4308          Codelist/gmxCodelists.xml#SV_CouplingType"
4309          codeListValue="tight">tight</srv:SV_CouplingType>
4310      </srv:couplingType>
4311      <!-- *-->
4312      <!-- (M-M) Service operation - "Operations performed by the service" NAP. Each
4313 SV_OperationMetadata element describes the signature of one and only one method provided by the
4314 service. -->
4315      <!-- See WMS GetCapabilities for operation metadata -->
4316      <srv:containsOperations gco:nilReason="missing"/>
4317      <!-- (O-C) Service operates on - "Provides information on the datasets that the service
4318 operates on" ISO 19119. With tightly coupled references, operatesOn must include a map or
4319 feature layer's valid MD_DataIdentification element inline or a @uuidref attribute value that
4320 explicitly links to an existing dataset metadata record that describes the same layer. Mandatory
4321 if linkage to datasets on which the service operates are available. The value of
4322 SV_ServiceIdentification/operatesOn@uuidref or
4323 SV_ServiceIdentification/operatesOn/MD_DataIdentification/citation/CI_Citation/identifier/MD_Iden-
4324 tifier/code must correspond to one of the coupledResource/MD_CoupledResource/identifier values.
4325 If the metadata record for the coupled dataset is a separate gmd:MD_Metadata record, the service
4326 described in the service metadata record should be identified as a distribution for the dataset.
4327 -->
4328      <!-- NOTE: In this explicitly linked reference example, the uuidref property must point to
4329 an existing (already loaded) CSW metadata record! -->
4330      <srv:operatesOn
4331          uidref="13ce1e84-c887-4fd8-b888-8d021b1fa4c2"
4332          xlink:href="http://resources.azgs.org/geonetwork/srv/en/metadata.show?id=8717"
4333          xlink:title="azgs:azgeochron"/>
4334      <srv:operatesOn
4335          uidref="39d94525-b1d6-494f-a739-357088e5a2e9"
4336          xlink:href="http://resources.azgs.org/geonetwork/srv/en/metadata.show?id=8718"
4337          xlink:title="azgs:earthfissures"/>
4338      <srv:operatesOn
4339          uidref="a3120268-1fb4-496a-84cc-c3a02dd0be16"
4340          xlink:href="http://resources.azgs.org/geonetwork/srv/en/metadata.show?id=8719"
4341          xlink:title="ncgmp:mapunitpolys"/>
4342      <srv:operatesOn
4343          uidref="4dbd380c-7ba4-49d6-b34c-7f9415dde6f0"
4344          xlink:href="http://resources.azgs.org/geonetwork/srv/en/metadata.show?id=8720"
4345          xlink:title="azgs:ree_earthchem"/>
4346      <srv:operatesOn
4347          uidref="8504f947-39d6-4clf-a4fa-672534f94856"
4348          xlink:href="http://resources.azgs.org/geonetwork/srv/en/metadata.show?id=8721"
4349          xlink:title="azgs:trace_alk_alkearth_earthchem"/>
4350      <srv:operatesOn
4351          uidref="55932c11-67d6-4414-8a5f-a45f7dc3ecf6"
4352          xlink:href="http://resources.azgs.org/geonetwork/srv/en/metadata.show?id=8722"
4353          xlink:title="azgs:trace_metals_earthchem"/>
4354      <srv:operatesOn
4355          uidref="8215ed91-6c92-4ae9-b094-8b58ddd5e7e0"
4356          xlink:href="http://resources.azgs.org/geonetwork/srv/en/metadata.show?id=8723"
4357          xlink:title="azgs:trace_nonmetals_earthchem"/>
4358      </srv:SV_ServiceIdentification>
4359      </gmd:identificationInfo>
4360      <!--*****-->
4361      <!-- (O-O) Content information - Characteristics describing the feature cataloguecatalog,
4362 coverage, or image data. USGIN currently makes no recommendation for use of contentInfo; follow
4363 NAP recommendations (see INCITS 453). -->
4364      <!--
4365      <gmd:contentInfo gco:nilReason="missing"/>
4366      -->
4367      <!-- (O-O) Resource distribution information - This element provides information to inform
4368 users how to obtain or access the described resource. For service metadata, the only
4369 distribution is the interface offered by the described service. The distributionFormat is nil
4370 because the format depends on the operation and request. TransferOptions is used to provide the
4371 URL's for accessing the service and a serviceDescription resource (WSDL, getCapabilities, web

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4372 page...). Distributor is used to identify the agent that is responsible for hosting the service. - -
4373 ->
4374   <gmd:distributionInfo>
4375     <gmd:MD_Distribution>
4376       <!-- (O-O) Resource distribution format - Information on the format or physical
4377       manifestation of the resource. If the resource is a physical resource, like a book, rock sample,
4378       paper document, the distributionFormat/MD_Format/name is mandatory, and must be from the USGIN
4379       distribution format codelist. In the case of a service, the format information is operation and
4380       request dependent.-->
4381       <!--
4382         <gmd:distributionFormat gco:nilReason="missing"/>
4383       -->
4384       <!-- (O-C) Resource distributor information - For a service, the distributor element
4385       identifies the agent that is responsible for hosting the service, probably the same as the
4386       CI_ResponsibleParty for the service identification citation. -->
4387       <!-- in this example, the distributor is the same as the metadata point of contact, so the
4388       CI_Responsible party is included by reference to the element earlier in the document -->
4389     <gmd:distributor>
4390       <gmd:MD_Distributor>
4391         <gmd:distributorContact xlink:href="#R264537"/>
4392       </gmd:MD_Distributor>
4393     </gmd:distributor>
4394     <!-- (C-C) Resource distribution transfer options - MD_DigitalTransferOptions provides
4395     information on digital distribution of resource. See USGIN Profile 'Use of MD_Distribution and
4396     MD_Distributor' for instructions on use of this element. Details on encoding for
4397     MD_DigitalTransferOptions are above in the distributorTransferOptions elements description. -->
4398     <gmd:transferOptions>
4399       <gmd:MD_DigitalTransferOptions>
4400         <!-- Two online elements are included, one for the serviceDescription and one for the
4401         baseURL, which in this case is the full URL for the OGC getCapabilities document -->
4402         <gmd:onLine>
4403           <gmd:CI_OnlineResource>
4404             <!-- (M-M) Resource distributor on-line distribution linkage - Digital transfer
4405             options are "technical means and media by which a dataset is obtained from the distributor." NAP
4406             requires CI_OnlineResource/linkage and CI_OnlineResource/protocol in CI_OnlineResource. -->
4407             <gmd:linkage>
4408               <!-- This linkage element contains the complete URL to access the getCapabilities
4409               document directly. If the service is described by a WSDL document, this would be a URL for the
4410               WSDL description of service operation. CI_Online-Resource requires a Linkage element that is a
4411               gmd:URL. -->
4412               <gmd:URL>http://75.101.143.247:8080/gsvr/wms?SERVICE=WMS&amp;
4413 http://75.101.143.247:8080/gsvr/wms?SERVICE=WMS&amp;</gmd:URL>
4414             </gmd:linkage>
4415             <!-- The protocol element defines a valid internet protocol used to access the
4416             resource. NAP recommended best practice is that the protocol should be taken from an official
4417             controlled list such as the Official Internet Protocol Standards published on the Web at
4418             http://www.rfc-editor.org/rfcxx00.html or the Internet Assigned Numbers Authority (IANA) at
4419             http://www.iana.org/numbers.html. 'ftp' or 'http' are common values. -->
4420             <gmd:protocol>
4421               <gco:CharacterString>http</gco:CharacterString>
4422             </gmd:protocol>
4423             <!-- Linkage names for service URL's are from "Linkage name conventions" section in
4424             the USGIN ISO19139 profile document. -->
4425             <gmd:name>
4426               <gco:CharacterString>serviceDescription</gco:CharacterString>
4427             </gmd:name>
4428             <!-- Service Description -->
4429             <gmd:description>
4430               <gco:CharacterString>Full URL to request the OGC getCapabilities document. This is
4431               the mechanism used to acquire detailed operation description for USGIN
4432               metadata.</gco:CharacterString>
4433             </gmd:description>
4434             </gmd:CI_OnlineResource>
4435           </gmd:onLine>
4436           <gmd:onLine>
4437             <gmd:CI_OnlineResource>
4438               <!-- (M-M) Resource distributor on-line distribution linkage - Digital transfer
4439               options are "technical means and media by which a dataset is obtained from the distributor." NAP
4440               requires CI_OnlineResource/linkage and CI_OnlineResource/protocol in CI_OnlineResource. -->
4441               <gmd:linkage>
4442                 <!-- This linkage element contains the base URL to compose requests to the
4443                 service. CI_Online-Resource requires a Linkage element that is a gmd:URL. -->

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4444      <gmd:URL>http://75.101.143.247:8080/gsvr/wms?</gmd:URL>
4445      </gmd:linkage>
4446      <!-- The protocol element defines a valid internet protocol used to access the
4447 resource. NAP recommended best practice is that the protocol should be taken from an official
4448 controlled list such as the Official Internet Protocol Standards published on the Web at
4449 http://www.rfc-editor.org/rfcxx00.html or the Internet Assigned Numbers Authority (IANA) at
4450 http://www.iana.org/numbers.html. 'ftp' or 'http' are common values. -->
4451      <gmd:protocol>
4452          <gco:CharacterString>http</gco:CharacterString>
4453      </gmd:protocol>
4454      <!-- Linkage names for service URL's are from "Linkage name conventions" section in the USGIN
4455 ISO19139 profile document -->
4456      <gmd:name>
4457          <gco:CharacterString>baseUrl</gco:CharacterString>
4458      </gmd:name>
4459      <gmd:description>
4460          <gco:CharacterString>Base URL for service access; append standard WMS request
4461 parameters to compose query.</gco:CharacterString>
4462      </gmd:description>
4463      </gmd:CI_OnlineResource>
4464      </gmd:onLine>
4465      </gmd:MD_DigitalTransferOptions>
4466      </gmd:transferOptions>
4467      </gmd:MD_Distribution>
4468      </gmd:distributionInfo>
4469      <!-- (C-C) Data quality Information - NAP requires either dataQualityInfo/DQ_DataQuality/report
4470 or dataQualityInfo/DQ_DataQuality/lineage if dataQualityInfo/DQ_DataQuality/scope/DQ_Scope/level
4471 = 'dataset'. -->
4472      <!--
4473      <gmd:dataQualityInfo/>
4474      -->
4475      <!-- (O-O) Portrayal catalog information - A portrayal cataloguecatalog is a collection of
4476 defined symbols used to depict, to humans, features on a map. No documentation in ISO 19117 about
4477 how this is supposed to work. ISO 19117 defines the structure of a Portrayal Catalogue. No USGIN
4478 recommended practices here yet. -->
4479      <!--
4480      <gmd:portrayalCatalogueInfo/>
4481      -->
4482      <!-- (O-O) Metadata constraint information - This element specifies use constraints for access
4483 to the metadata record. -->
4484      <!--
4485      <gmd:metadataConstraints/>
4486      -->
4487      <!-- (O-O) Application schema information - Information about the conceptual schema of the
4488 dataset. This would be populated with a citation to a schema, or may have an inline binary file
4489 representing the schema. No USGIN provision for usage of this element. -->
4490      <!--
4491      <gmd:applicationSchemaInfo/>
4492      -->
4493      <!-- (O-O) Metadata maintenance information - This element provides information about the
4494 maintenance schedule or history of the metadata record. -->
4495      <!--
4496      <gmd:metadataMaintenance/>
4497      -->
4498      <!-- (X-X) Series information - Not used by USGIN. -->
4499      <!--
4500      <gmd:series/>
4501      -->
4502      <!-- (X-X) Described resource - Not used by USGIN. -->
4503      <!--
4504      <gmd:describes/>
4505      -->
4506      <!-- (X-X) Property type description - Not used by USGIN. -->
4507      <!--
4508      <gmd:propertyType/>
4509      -->
4510      <!-- (X-X) Feature type description - Not used by USGIN -->
4511      <!--
4512      <gmd:featureType/>
4513      -->
4514      <!-- (X-X) Feature attributes - Not used by USGIN -->
4515      <!--

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4516      <gmd:featureAttribute/>  
4517      -->  
4518      </gmd:MD\_Metadata>

4519