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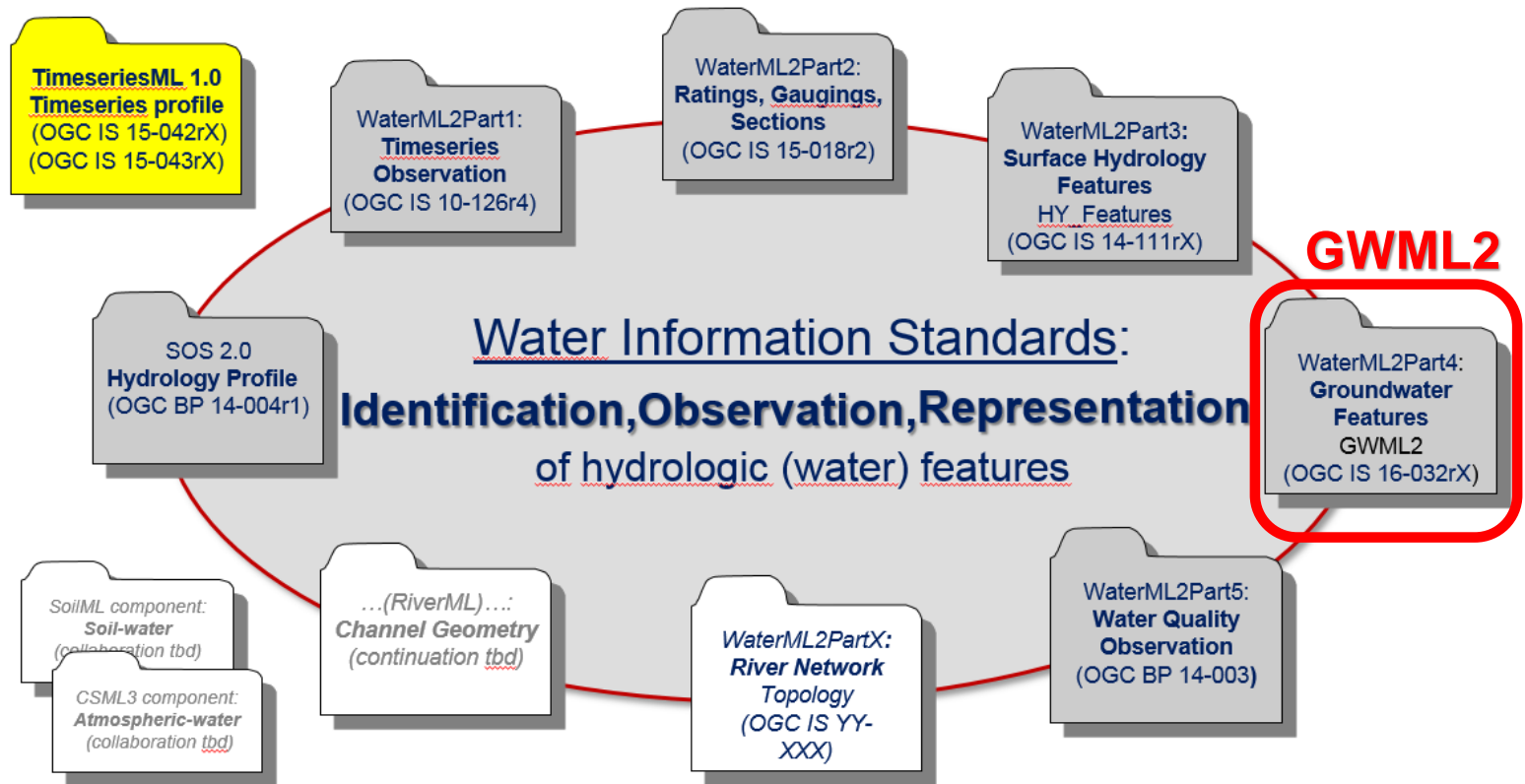
# GroundwaterML2 (GWML2) HDWG Update

103rd OGC Technical Committee Meeting  
St. John's, Newfoundland and Labrador, Canada  
Boyan Brodaric – Geological Survey of Canada  
28 June 2017

# WaterML2



- OGC Hydro Domain Working Group (HDWG)
- WaterML2 suite of OGC hydrologic data standards



# GWML2: History



- **2009-2011: GW1 IE (OGC HDWG)**

Test GW data interoperability: OGC standards and GWML1

- **2012-2015: GW2 IE (OGC HDWG)**

**Objectives:** develop and test **GWML2** candidate standard

**Participants:** 13 agencies (N. America, EU, AU/NZ)

**Activities:** 49 meetings since June 2012 Kick-off

**Results:** Eng Report (15-082), 14 web services, 17 change requests

- **2016-2017: GWML2 (OGC GW SWG)**

**Objectives:** refine and submit **GWML2** (from 15-082)

**Participants:** ~ same as above

**Activities:** 5 meetings (>Feb 2016); 3 reviews: *OAB, OGC-NA, Public*

**Results:** 16-032, 16-032r1, 16-032r2

# GWML2: Recent Progress



... since OGC TC Dublin June 2016

- **2016 July** **GWML2** spec submitted
- **2016 Aug** **GWML2** spec approved (OGC TC)
- **2016 Sept** **GWML2** spec approved (OGC PC)
- **2017 Feb** **GWML2** paper submitted (HJ)
- **2017 Mar** **GWML2 spec published!**

The screenshot shows the OGC website header with the logo and navigation links. The main content area is titled "OGC WaterML 2: Part 4 – GroundWaterML 2 (GWML2)". It includes a table of contents with links for Overview, Downloads, Official Schemas, and Related News. The "Overview" section is selected and shows a brief description of the standard. Below this is a "Downloads" section with a table listing the available document.

Version	Document Title (click to download)	Document #	Type
2.2	<a href="#">OGC WaterML 2: Part 4 – GroundWaterML 2 (GWML2)</a>	16-032r2	IS

# GWML2: Use Cases

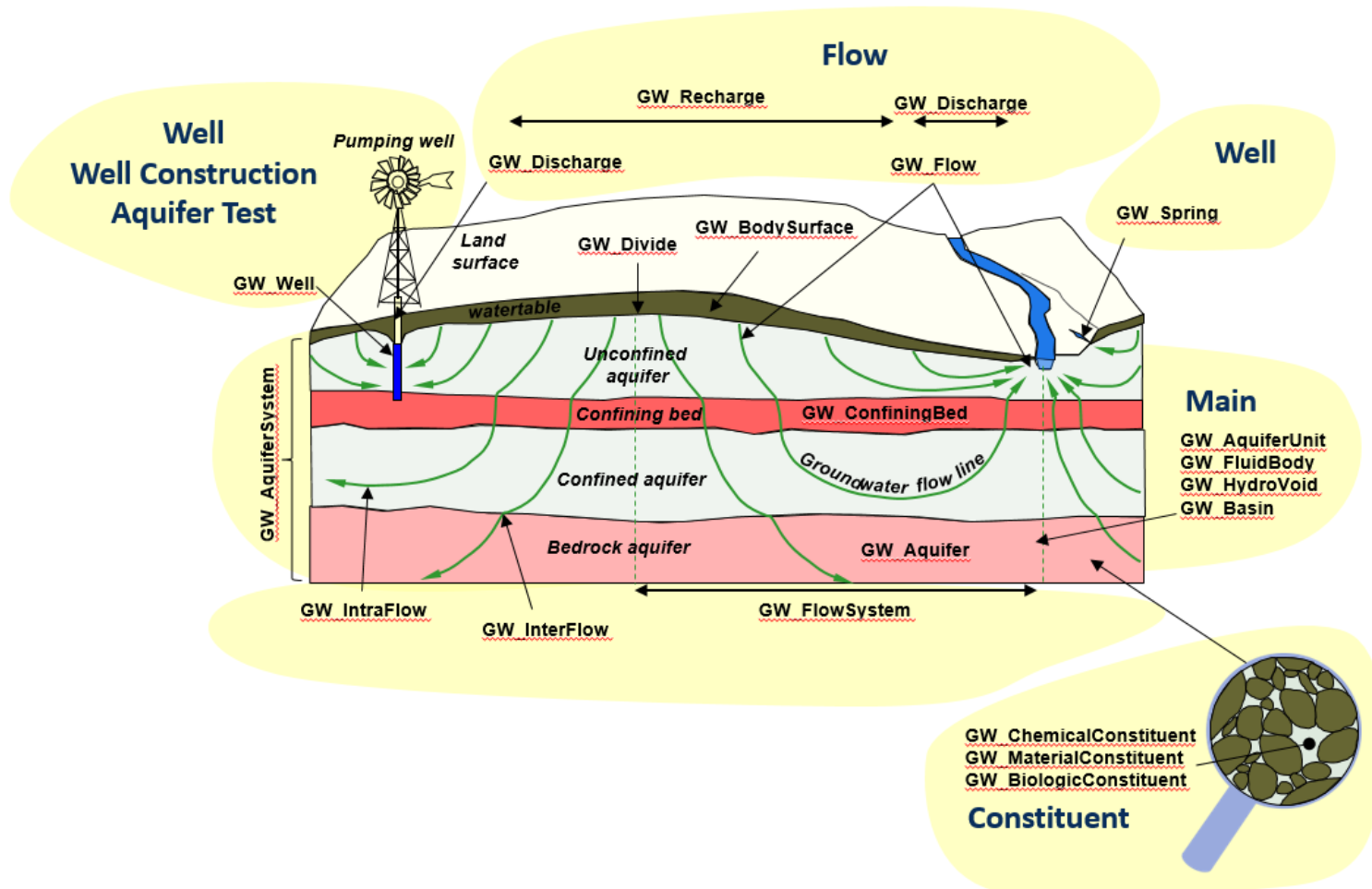


- 1. Commercial** - find water wells, estimate water well cost  
[http://external.opengis.org/twiki\\_public/HydrologyDWG/UseCase1](http://external.opengis.org/twiki_public/HydrologyDWG/UseCase1)
- 2. Policy** - meet EU Water Framework Directive needs  
[http://external.opengis.org/twiki\\_public/HydrologyDWG/UseCase2](http://external.opengis.org/twiki_public/HydrologyDWG/UseCase2)
- 3. Environmental** - risks to gw dependent ecosystems  
[http://external.opengis.org/twiki\\_public/HydrologyDWG/UseCase3](http://external.opengis.org/twiki_public/HydrologyDWG/UseCase3)
- 4. Scientific** - groundwater flow modeling  
[http://external.opengis.org/twiki\\_public/HydrologyDWG/UseCase4](http://external.opengis.org/twiki_public/HydrologyDWG/UseCase4)
- 5. Technologic** – map GWML2 to existing info models  
[http://external.opengis.org/twiki\\_public/HydrologyDWG/UseCase5](http://external.opengis.org/twiki_public/HydrologyDWG/UseCase5)

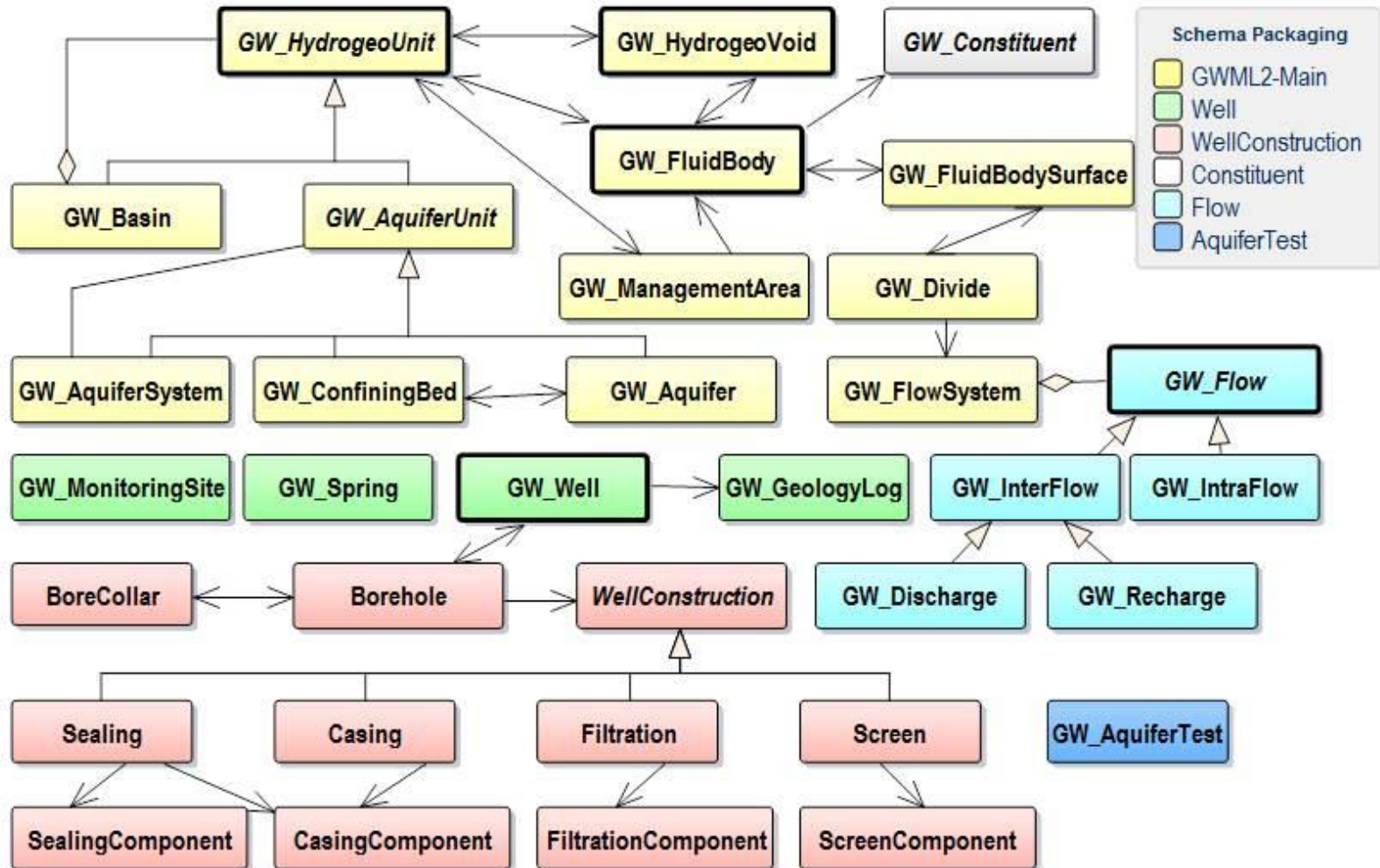
# GWML2: Scope and Packaging



- subsurface water features and observations



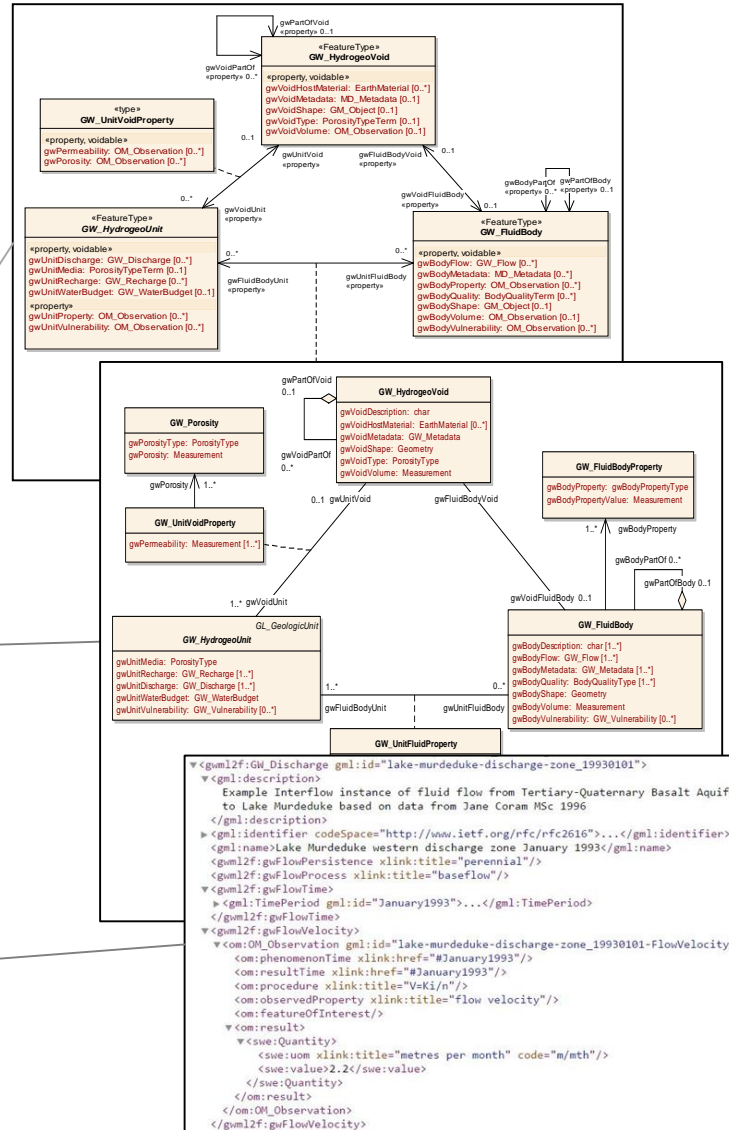
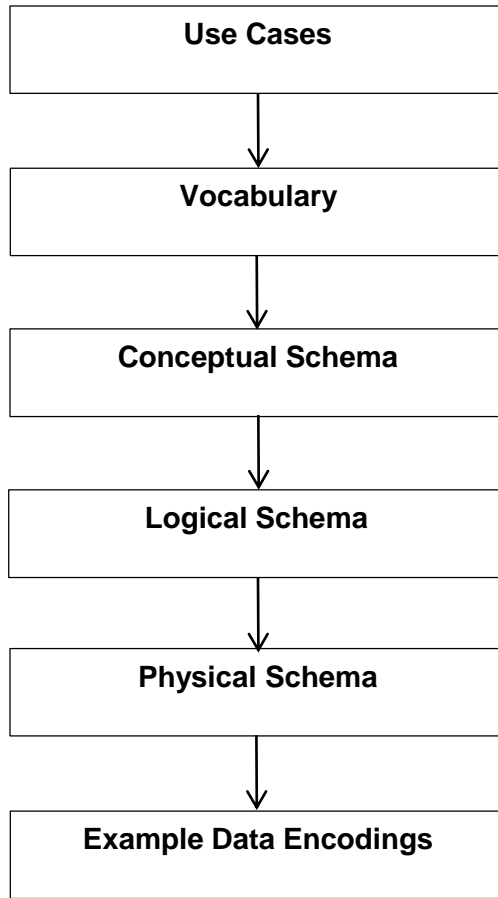
# GWML2: Scope and Packaging



# GWML2: Development Method



## • In GWIE2





# GWML2: Testing



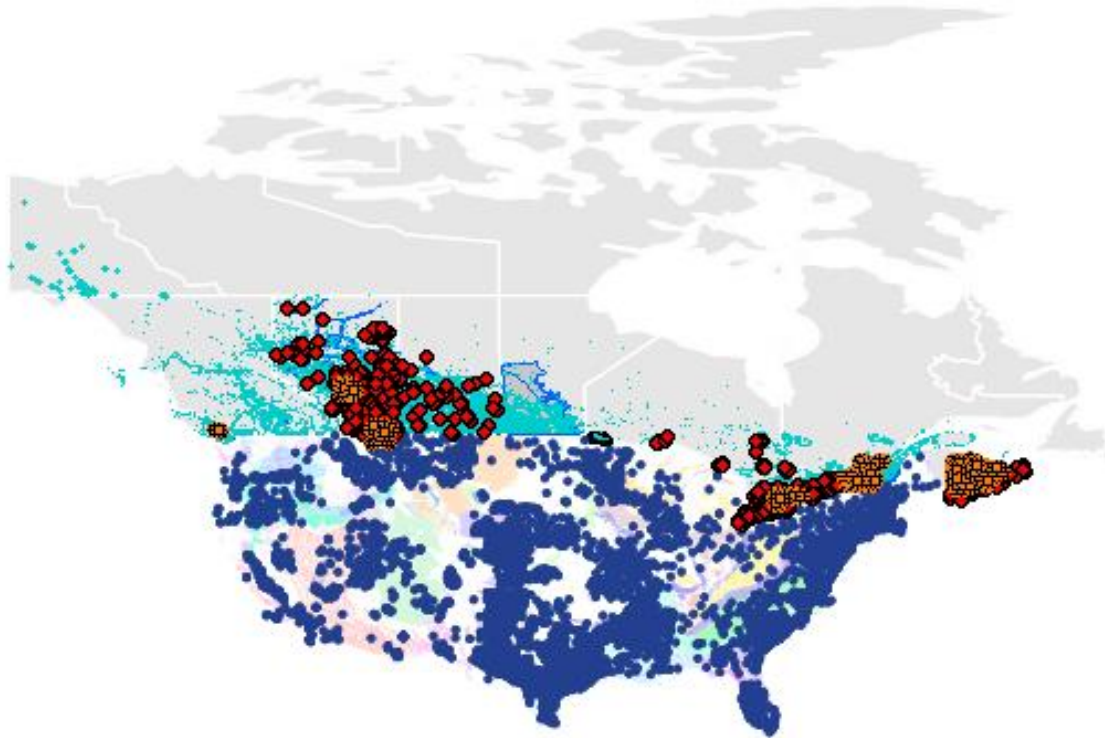
- In GWIE2

<i>GWML2 Feature Type</i>	<i>OGC Service</i>	<i>Provider</i>	<i>URL</i>
<a href="#">GW_Well</a> <a href="#">GW_Aquifer</a> <a href="#">GW_AquiferSystem</a> <a href="#">GW_ConfiningBed</a> <a href="#">GW_MonitoringSite</a>	WMS	GSC  USGS	<a href="http://gin.gw-info.net/service/gin/wms/mediator/gin_en?service=WMS&amp;version=1.1.0&amp;request=GetCapabilities">http://gin.gw-info.net/service/gin/wms/mediator/gin_en?service=WMS&amp;version=1.1.0&amp;request=GetCapabilities</a>  <a href="http://cida.usgs.gov/ngwmn-geoserver/ows?service=wms&amp;version=1.3.0&amp;request=GetCapabilities">http://cida.usgs.gov/ngwmn-geoserver/ows?service=wms&amp;version=1.3.0&amp;request=GetCapabilities</a>
<a href="#">GW_Aquifer</a> <a href="#">GW_AquiferSystem</a> <a href="#">GW_ConfiningBed</a> <a href="#">GW_Discharge</a> <a href="#">GW_FluidBody</a> <a href="#">GW_ManagementArea</a> <a href="#">GW_MonitoringSite</a> <a href="#">GW_Recharge</a> <a href="#">GW_Well</a> <a href="#">GW_Spring</a> Borehole	WFS	GSC  BOM/CSIRO  BRGM  USGS  <a href="#">FedUni</a>  GNS / Z_GIS	<a href="http://gin.gw-info.net/GinService/wfs?request=GetCapabilities&amp;acceptversions=2.0.0&amp;service=WFS">http://gin.gw-info.net/GinService/wfs?request=GetCapabilities&amp;acceptversions=2.0.0&amp;service=WFS</a>  <a href="http://gwservices.it.csiro.au:8080/geoserver/ows?service=wfs&amp;version=1.1.0&amp;request=GetCapabilities">http://gwservices.it.csiro.au:8080/geoserver/ows?service=wfs&amp;version=1.1.0&amp;request=GetCapabilities</a>  <a href="http://ressource.brgm-rec.fr/service/GWML2Poc/service=WFS&amp;version=2.0.0&amp;request=GetCapabilities">http://ressource.brgm-rec.fr/service/GWML2Poc/service=WFS&amp;version=2.0.0&amp;request=GetCapabilities</a>  <a href="https://cida.usgs.gov/ngwmn_cache/wfs?version=1.1.0&amp;service=wfs&amp;REQUEST=GetCapabilities">https://cida.usgs.gov/ngwmn_cache/wfs?version=1.1.0&amp;service=wfs&amp;REQUEST=GetCapabilities</a>  <a href="http://data.vvg.org.au:8080/geoserver/wfs?version=1.1.0&amp;request=GetCapabilities">http://data.vvg.org.au:8080/geoserver/wfs?version=1.1.0&amp;request=GetCapabilities</a>  <a href="http://portal.smart-project.info/gsmart/wfs?request=GetCapabilities&amp;service=WFS">http://portal.smart-project.info/gsmart/wfs?request=GetCapabilities&amp;service=WFS</a>
<a href="#">WML2::TimeSeries</a>	SOS	GSC  USGS  GNS / Z_GIS	<a href="http://gin.gw-info.net/GinService/sos/gw?request=GetCapabilities&amp;service=SOS&amp;ACCEPTVERSIONS=2.0.0">http://gin.gw-info.net/GinService/sos/gw?request=GetCapabilities&amp;service=SOS&amp;ACCEPTVERSIONS=2.0.0</a>  <a href="https://cida.usgs.gov/ngwmn_cache/sos?service=SOS&amp;AcceptVersions=2.0.0&amp;request=GetCapabilities">https://cida.usgs.gov/ngwmn_cache/sos?service=SOS&amp;AcceptVersions=2.0.0&amp;request=GetCapabilities</a>  <a href="http://portal.smart-project.info/sos-smart/service/kvp?request=GetCapabilities&amp;service=SOS">http://portal.smart-project.info/sos-smart/service/kvp?request=GetCapabilities&amp;service=SOS</a>
Same as WFS and SOS above	WPS	GNS / Z_GIS	<a href="http://portal.smart-project.info/wps/WebProcessingService?Request=GetCapabilities&amp;Service=WPS">http://portal.smart-project.info/wps/WebProcessingService?Request=GetCapabilities&amp;Service=WPS</a>

# GWML2: In Action



- **CAN-US groundwater data interoperability**
  - Canadian Groundwater Information Network (GIN)
  - US National Groundwater Monitoring Network (NGWMN)



# GWML2: Next Steps



- **ongoing maintenance:** e.g. change requests (none)
- **paper revision** (Sept 2017)
- **GW SWG meeting** soon – to regroup
- **WMO submission:** within WaterML2 suite

## CHy-15 Pre-Session

The screenshot shows the WMO website interface. On the left is the WMO logo, which includes a globe and a sun. Below the logo, the text "WORLD METEOROLOGICAL ORGANIZATION" is displayed. On the right side of the page, there is a white box with the following text: "WaterML 2: Part 4 – GroundWaterML 2 (GWML2) Data Exchange for Groundwater Features". Below this box, there is a paragraph of text: "A significant portion of the global water supply can be attributed to groundwater resources. Effective management of such resources requires the collection, management and delivery of related data, but these data are distributed globally across many agencies resulting in major data heterogeneity. Discovering, accessing, processing, reformatting and using these...". At the bottom of the page, there is a navigation bar with several links: "Home", "About the e-Board", "HWRP", "CHy-15 Pre-Session" (which is highlighted in orange), and "Login". The background of the page features a blue sky and a portion of the Colosseum in Rome.

# Thank you



<http://www.opengeospatial.org/standards/gwml2>

The screenshot shows a web browser window with the address bar containing the URL [www.opengeospatial.org/standards/gwml2](http://www.opengeospatial.org/standards/gwml2). The page header features the OGC logo with the tagline "Making location count." and a navigation menu with items: About, Standards, Innovation, News & Events, Membership, and Resources. The main content area is titled "OGC WaterML 2: Part 4 – GroundWaterML 2 (GWML2)" and includes a list of links: 1) Overview, 2) Downloads, 3) Official Schemas, and 4) Related News. Under "1) Overview", it states: "This standard describes a conceptual and logical model for the exchange of groundwater data, as well as a GML/XML encoding with examples." Under "2) Downloads", there is a table with the following data:

Version	Document Title (click to download)	Document #	Type
2.2	<a href="#">OGC WaterML 2: Part 4 – GroundWaterML 2 (GWML2)</a>	16-032r2	IS

Below the table, it says: "Submit a Change Request, Requirement, or Comment for this OGC standard." Under "3) Official Schemas", it says: "The schemas are posted at: <http://schemas.opengis.net/gwml/>". On the right side of the page, there is a sidebar menu titled "OGC® Standards" with a list of standards including ARML2.0, Cat: eBRIM App Profile: Earth Observation Products, Catalogue Service, CDB, CityGML, Coordinate Transformation, Filter Encoding, GML in JPEG 2000, GeoAPI, GeoPackage, GeoSciML, GeoSparql, Geography Markup Language, Geospatial eXtensible Access Control Markup Language (GeoXACML), Geospatial User Feedback (GUF), GroundwaterML, IndoorGML, KML, LandInfra, Location Services (OpenLS), Moving Features, NetCDF, Observations and Measurements, and Open GeoSMS.