

CUAHSI Hydrologic Information System: Part 2 – Hydrologic Information Mapping

CUAHSI Observations Data Model, CUAHSI WaterMl 1 and OGC WaterMl 2 Mapping

Version 0.7

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Distribution

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# Foreword

CUAHSI Hydrologic Information System Project has developed services-based infrastructure for publishing, cataloguing, discovering and accessing hydrologic observations from multiple distributed repositories. The backbone of the HIS service-oriented architecture design is a set of standard web service APIs that define interactions between hydrologic data publication platform (HydroServer), the data cataloguing and discovery system (HydroCatalog) and client applications, such as HydroDesktop. The key standards used in the current operational version of HIS are WaterML 1.x and WaterOneFlow services. These specifications have been designed to unify hydrologic data discovery and access heterogeneous sources of hydrologic observations: academic data sources that store data in CUAHSI Observations Data Model (ODM) and large federal and state water data repositories (e.g. maintained by USGS, EPA, NCDC) that follow their own storage, metadata and access conventions. To establish a higher level of compatibility between a wider group of water data sources, at the national and international scales, and to take advantage of multiple third-party software applications, the CUAHSI HIS Service Oriented Architecture (SOA) is now evolving to ensure that the key interfaces are compatible with OGC standards. Another advantage of this transition is that Open Geospatial Consortium provides transparent and community-accepted procedures and protocols for governing standards development. In particular, OGC has assembled an international group of experts in standards for water data and related fields (as the OGC/WMO Hydrology Domain Working Group) with the mission to examine existing standards, develop standardization priorities, coordinate development of specifications, organize their testing in a series of interoperability experiments, and lead the standards to community adoption.

This document describes the mappings between the ODM, CUAHSI WaterML 1, and OGC WaterML 2 information models, and the WaterML 1 and 2 XML formats.

This document is intended for technical users. It is an unpolished document that has been done to develop and document the WaterML 1.1 to WaterML 2 xslt. This transformation preserves as much of the information as possible by mapping information from the ODM and CUAHSI WaterML by mapping some fields into parameters (found on the procedure, and sampling feature derived Monitoring point).

This document relies on the XML XPath standard to convey the mappings. There will be errors in some of the XPATH information, so the users should know the XML schemas of WaterML1 and WaterML2. Please convey errors and corrections to the author.

Comments on this document are welcome (as track changes submitted to the authors).

# Introduction

The CUAHSI Hydrologic Information System there was an information model and database schema, called ODM, and a data exchange language, WaterML. As CUAHSI migrates towards an OGC based system, the exchange language will be WaterML 2. This document includes two mappings, from the WaterML2 O&M observations model to WaterML, and from the ODM information model/shcema to WaterML.

|  |  |  |
| --- | --- | --- |
| **ODM** | **WaterML 1** | **WaterML 2** |
| Site | Site | FeatureOfInterest/SamplingFeature |
| Variable | Variable | Procedure |
| DataValues | Values | Result |
| Series | Series | ~Observation |
| Method | Method | In Procedure |
| Variable Name Mapping to (HIS) Concept | Variable Name Mapping to (HIS) Concept | Observed Property |

An XSLT has been created to assist in the migration from WaterML 1.1 to WaterML 2, and this document is the documentation of that work.

There are three sections to this document:

1. ODM Information model/schema with mapping to WaterML 1.1 and WaterML 2. model with
2. O&M WaterML 2 information model, with mappings to ODM, WaterML 2, and WaterML 1

.

# Observations Data Model mapping to WaterML 1 and WaterML 2

Not all elements exist in the WaterML 2 specification. Some of these are due to internationalization (state, county), others are due to a change in practices (noDataValue from -9999 to a nil-element), or a renaming/refactoring of the concept, e.g. quality control levels to processing.

For convenience of CUAHSI WaterML 1 community, elements are often added/stored using extensible NameValue elements. In this document those are tagged with (CUAHSI). In addition some concepts are relational, or not included in the ODM model. Terms are bracketed in the ODM field they represent waterml 2 information [eg (spacing) ], or implicit references [eg. (Variable reference)[ that are brought into the table to make usage simpler.

## Site

|  |  |  |
| --- | --- | --- |
| **ODM Field** | **WaterML 1.1 equivalent** | **WaterML 2****Base:** **/wml2:Collection/wml2:samplingFeatureMember/** **wml2:MonitoringPoint** |
| SiteID | siteID | @gml:id (should not be used externally of document) |
| SiteCode | siteCode | gml:identifier |
|  | network | gml:identifier/@codespace |
| SiteName | siteName | gml:name |
| Latitude | latitude | sams:shape/gml:Point/gml:pos |
| Longitude | longitude | sams:shape/gml:Point/gml:pos |
| LatLongDatumID | geogLocation[@srs] | sams:shape/gml:Point/gml:pos/@srs |
| Elevation\_m | elevation\_m | This should be redone as a measure, with a unit of meters sam:parameter/om:NamedValue/om:name[@xlink:href='http://www.cuahsi.org/waterml2/params/elevation\_m/']/../om:value |
| VerticalDatum | verticalDatum | This should be redone to use gml:VerticalCRS sam:parameter/om:NamedValue/om:name[@xlink:href='http://www.cuahsi.org/waterml2/params/verticalDatum/’]/../om:value |
| LocalX | X | GML points are not restricted to Lat-Long.TODO: The could be put in the O&M extension element, with a type for the named value of gml:point. There would need to be a mapping to an ESPG code. |
| LocalY | Y |
| LocalProjectionID | @srs |
| PosAccuracy\_m |  | This should be redone as a measure, with a unit of meters, or a swe common quality  sam:parameter/om:NamedValue/om:name[@xlink:href='http://www.cuahsi.org/waterml2/params/PosAccuracy\_m /']/../om:value |
| State | note[@title='State'] | sam:parameter/om:NamedValue/om:name[@xlink:href='http://www.cuahsi.org/waterml2/params/state/']/../om:value) |
| County | note[@title='County'] | sam:parameter/om:NamedValue/om:name[@xlink:href=’'http://www.cuahsi.org/waterml2/params/county/']../om:value |
| Comments | note[@title='Site Comments'] | sam:parameter/om:NamedValue/om:name[@xlink:href='http://www.cuahsi.org/waterml2/params/'Site\_Comments /]/../om:value |
|  | agencyCode | wml2:owner |
|  | agencyName | wml2:owner |
|  | defaultTimeZoneusesDaylightSavingsTime | wml2:timeZone/wml2:TimeZone**none** |
|  | ZoneAbbreviation | wml2:timeZone/wml2:TimeZone/wml2:zoneAbbreviation |

### WML 1 Site:

<sourceInfo xsi:type="SiteInfoType">
 <siteName>Little Bear River near Wellsville, Utah</siteName>
 <siteCode network="LBR" siteID="10">USU-LBR-Wellsville</siteCode>
 <timeZoneInfo siteUsesDaylightSavingsTime="false">
 <defaultTimeZone zoneOffset="-05:00" zoneAbbreviation="EST"/>
 <daylightSavingsTimeZone zoneOffset="-04:00" zoneAbbreviation="EDT"/>
 </timeZoneInfo>

 <geoLocation>
 <geogLocation xsi:type="LatLonPointType" srs="EPSG:4269">
 <latitude>41.643457</latitude>
 <longitude>-111.917649</longitude>
 </geogLocation>
 <localSiteXY projectionInformation=" NAD83 / UTM zone 12N">
 <X>423579.317</X>
 <Y>4610597.583</Y>
 </localSiteXY>
 </geoLocation>
 <elevation\_m>1365</elevation\_m>
 <verticalDatum>NGVD29</verticalDatum>
 <siteProperty name="County">Cache</siteProperty>
 <siteProperty name="State">Utah</siteProperty>
 <siteProperty name="Site Comments">Located on the upstream side of State Highway 101 bridge.</siteProperty>
 </sourceInfo>

### WML2 Monitoring Point:

 <wml2:MonitoringPoint gml:id="USU-LBR-Wellsville">
 <gml:identifier codeSpace="urn:cuahsi.org/network/LBR">USU-LBR-Wellsville</gml:identifier>
 <gml:name>Little Bear River near Wellsville, Utah</gml:name>
 <!-- <sam:sampledFeature xlink:href="http://example.com/datasource/0/sampledFeatures/3670" xlink:title="A River"/>
 -->
 <sam:parameter>
 <om:NamedValue>
 <om:name xlink:href="http://www.cuahsi.org/waterml2/params/elevation\_m/" xlink:title="elevation in meters" />
 <om:value xsi:type="xsd:string">1365</om:value>
 </om:NamedValue>
 </sam:parameter>
 <sam:parameter>
 <om:NamedValue>
 <om:name xlink:href="http://www.cuahsi.org/waterml2/params/verticalDatum/" xlink:title="Vertical Datum" />
 <om:value xsi:type="xsd:string">NGVD29</om:value>
 </om:NamedValue>
 </sam:parameter>
 <sam:parameter>
 <om:NamedValue>
 <om:name xlink:href="http://www.cuahsi.org/waterml2/params/County" xlink:title="County" />
 <om:value xsi:type="xsd:string">Cache</om:value>
 </om:NamedValue>
 </sam:parameter>
 <sam:parameter>
 <om:NamedValue>
 <om:name xlink:href="http://www.cuahsi.org/waterml2/params/State" xlink:title="State" />
 <om:value xsi:type="xsd:string">Utah</om:value>
 </om:NamedValue>
 </sam:parameter>
 <sam:parameter>
 <om:NamedValue>
 <om:name xlink:href="http://www.cuahsi.org/waterml2/params/Site Comments" xlink:title="Site Comments" />
 <om:value xsi:type="xsd:string">Located on the upstream side of State Highway 101 bridge.</om:value>
 </om:NamedValue>
 </sam:parameter>
 <sams:shape>
 <gml:Point gml:id="USU-LBR-Wellsville\_pos">
 <gml:pos srsName="EPSG:4269">41.643457 -111.917649</gml:pos>
 </gml:Point>
 </sams:shape>
 </wml2:MonitoringPoint>

## Variable:

A variable is mapped to a waterML 2 process. Much of the information is scattered, as the process relates to the methods used, and the results block (datavalues) contains the details.

“*An instance of OM\_Process is often an instrument or sensor, but may be a human observer, a simulator, or a process or algorithm applied to more primitive results used as inputs.*

WaterML2 defines an ObservationProcess feature type. This a generic class to describe processes related to the creation of hydrological results

.

|  |  |  |
| --- | --- | --- |
| **ODM Field** | **WaterML 1.1 equivalent** | **WaterML 2** |
|  |  | **Base Path /wml2:Collection/wml2:observationMember/om:OM\_Observation/om:procedure/wml2:ObservationProcess** |
| VariableName | variableName | wml2:processReference/@xlink:title |
| Speciation |   | (CUAHSI) wml2:parameter/om:NamedValue/om:name[@xlink:href=’speciation’] |
| VariableUnitsID | Link to units table |  |
| variableUnits |  | ../wml2:MeasurementTimeseries/wml2:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:uom |
| SampleMedium | sampleMedium | ../../om:OM\_Observation/om:metadata/wml2:ObservationMetadata/wml2:sampledMedium(CUAHSI) wml2:parameter/om:NamedValue/om:name[@xlink:href=’sampleMedium’] |
| ValueType | valueType | Needs a Mapping: wml2:processType (presently <http://www.opengis.net/def/processType/WaterML/2.0/Unknown> )(CUAHSI) wml2:parameter/om:NamedValue/om:name[@xlink:href=’valueType’] |
| IsRegular | isRegular | If present specified as an ISO time period If times are reported:../../om:OM\_Observation/om:metadata/wml2:ObservationMetadata/wml2:intendedSamplingIntervalIf spacing is regular, and times not reported:../wml2:MeasurementTimeseries/wml2:metadata/wml2:MeasurementTimeseriesMetadata/wml2:spacing |
| (spacing) | TimeSpacing |
| TimeSupport | TimeSupport | If present specified as an ISO time period../wml2:MeasurementTimeseries/wml2:metadata/wml2:MeasurementTimeseriesMetadata/aggregationDuration |
| TimeUnitsID | TimeUnitsID | N/A |
| DataType | dataType | Requires Mapping: ../wml2:MeasurementTimeseries/wml2:defaultPointMetadatawml2:DefaultTVPMeasurementMetadata/wml2:interpolationType(CUAHSI): wml2:parameter/om:NamedValue/om:name[@xlink:href=’dataType’] |
| GeneralCategory | generalCategory | (CUAHSI): wml2:parameter/om:NamedValue/om:name[@xlink:href=’GeneralCategory’] |
| NoDataValue | NoDataValue | In the future, the XSLT should output NoDataValues as nil values.(CUAHSI): wml2:parameter/om:NamedValue/om:name[@xlink:href=’noDataValue’] |
| (concept) |  | ../../../om:observedPropertyOR/wml2:Collection/wml2:observationMember[/om:OM\_Observation/om:observedProperty |
|  | (WML2) ProcessType | At present. All are mapped to ‘Unknown’: ../../wml2:processType[@xlink:href=’http://www.opengis.net/def/processType/WaterML/2.0/Unknown’] |

Mappings (see Permanent References for CUAHSI Vocabularies)

* Interpolation Type/Data Type
* processes/ODM Value Type
* Sample Medium

### Variable – Raw. Time Support 0

 <variable>
 <variableCode vocabulary="LBR" default="true" variableID="10">USU10</variableCode>
 <variableName>Temperature</variableName>
 <valueType>Field Observation</valueType>
 <dataType>Continuous</dataType>
 <generalCategory>Water Quality</generalCategory>
 <sampleMedium>Surface Water</sampleMedium>
 <unit>
 <unitName>degree celcius</unitName>
 <unitType>Temperature</unitType>
 <unitAbbreviation>degC</unitAbbreviation>
 <unitCode>96</unitCode>
 </unit>
 <noDataValue>-9999</noDataValue>
 <timeScale isRegular="true">
 <unit>
 <unitName>second</unitName>
 <unitType>Time</unitType>
 <unitAbbreviation>s</unitAbbreviation>
 <unitCode>100</unitCode>
 </unit>
 <timeSupport>0</timeSupport>
 </timeScale>
 <speciation>Not Applicable</speciation>
 </variable>

<wml2:observationMember>
 <om:OM\_Observation gml:id="observation-8">
 <om:metadata>
 <wml2:ObservationMetadata>
 <!-- snip -->
 <!--wml2:intendedSamplingInterval-->
 <wml2:sampledMedium xlink:href="http://www.opengis.net/def/waterml/2.0/medium/SurfaceWater" xlink:title="Surface Water" />
 </wml2:ObservationMetadata>
 </om:metadata>
 <om:phenomenonTime>
 <gml:TimePeriod gml:id="phen\_time-8">
 <gml:beginPosition>2005-08-05T23:30:00</gml:beginPosition>
 <gml:endPosition>2005-08-06T00:00:00</gml:endPosition>
 </gml:TimePeriod>
 </om:phenomenonTime>
 <om:resultTime>
 <gml:TimeInstant gml:id="eor-8">
 <gml:timePosition>2005-08-06T00:00:00</gml:timePosition>
 </gml:TimeInstant>
 </om:resultTime>
 <om:procedure>
 <wml2:ObservationProcess gml:id="process-8">
 <wml2:processType xlink:href="http://www.opengis.net/def/waterml/2.0/processType/Sensor" xlink:title="Water temperature measured using a Forest Technology Systems DTS-12 turbidity sensor." />
 <wml2:processReference xlink:href="http://www.ftsinc.com/" xlink:title="Water temperature measured using a Forest Technology Systems DTS-12 turbidity sensor." />
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="valueType" xlink:href="valueType" />
 <om:value xsi:type="xsd:string">Field Observation</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="noDataValue" xlink:href="noDataValue" />
 <om:value xsi:type="xsd:string">-9999</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="sampleMedium" xlink:href="sampleMedium" />
 <om:value xsi:type="xsd:string">Surface Water</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="speciation" xlink:href="speciation" />
 <om:value xsi:type="xsd:string">Not Applicable</om:value>
 </om:NamedValue>
 </wml2:parameter>
 </wml2:ObservationProcess>
 </om:procedure>
 <om:observedProperty xlink:href="#LBR-USU10" xlink:title="SampleConcept" />
 <om:featureOfInterest xlink:href="#USU-LBR-Mendon" xlink:title="Little Bear River at Mendon Road near Mendon, UtahUSU-LBR-Mendon" />
 <om:result>
 <wml2:MeasurementTimeseries gml:id="\_TS-8">
 <wml2:temporalExtent xlink:href="#phen\_time-8" />
 <wml2:metadata>
 <wml2:MeasurementTimeseriesMetadata>
 <wml2:cumulative>false</wml2:cumulative>
 </wml2:MeasurementTimeseriesMetadata>
 </wml2:metadata>
 <wml2:defaultPointMetadata>
 <wml2:DefaultTVPMeasurementMetadata>
 <wml2:quality xlink:href="http://www.opengis.net/def/timeseriesType/WaterML/2.0/nc" xlink:title="nc" />
 <!-- snip -->
 <wml2:uom uom="C" />

 <wml2:interpolationType xlink:href="http://www.opengis.net/def/timeseriesType/WaterML/2.0/Continuous" xlink:title="Continuous" />
 </wml2:DefaultTVPMeasurementMetadata>
 </wml2:defaultPointMetadata>
 <!-- snip -->
 </wml2:MeasurementTimeseries>
 </om:result>
</wml2:observationMember>

### Variable. – Raw- Time Support non- zero

<variable>
 <variableCode vocabulary="LBR" default="true" variableID="4">USU4</variableCode>
 <variableName>Turbidity</variableName>
 <valueType>Field Observation</valueType>
 <dataType>Average</dataType>
 <generalCategory>Water Quality</generalCategory>
 <sampleMedium>Surface Water</sampleMedium>
 <unit>
 <unitName>nephelometric turbidity units</unitName>
 <unitType>Turbidity</unitType>
 <unitAbbreviation>NTU</unitAbbreviation>
 <unitCode>221</unitCode>
 </unit>
 <noDataValue>-9999</noDataValue>
 <timeScale isRegular="true">
 <unit>
 <unitName>second</unitName>
 <unitType>Time</unitType>
 <unitAbbreviation>s</unitAbbreviation>
 <unitCode>100</unitCode>
 </unit>
 <timeSupport>5</timeSupport>
 </timeScale>
 <speciation>Not Applicable</speciation>
 </variable>

<wml2:observationMember>
 <om:OM\_Observation gml:id="observation-2">
 <om:metadata>
 <wml2:ObservationMetadata>

 <!-- snip -->
 <wml2:sampledMedium xlink:href="http://www.opengis.net/def/waterml/2.0/medium/SurfaceWater"
 xlink:title="Surface Water"/>
 </wml2:ObservationMetadata>
 </om:metadata>
 <om:phenomenonTime>
 <gml:TimePeriod gml:id="phen\_time-2">
 <gml:beginPosition>2005-08-05T23:30:00</gml:beginPosition>
 <gml:endPosition>2005-08-06T00:00:00</gml:endPosition>
 </gml:TimePeriod>
 </om:phenomenonTime>
 <om:resultTime>
 <gml:TimeInstant gml:id="eor-2">
 <gml:timePosition>2005-08-06T00:00:00</gml:timePosition>
 </gml:TimeInstant>
 </om:resultTime>
 <om:procedure>
 <wml2:ObservationProcess gml:id="process-2">
 <gml:description>Turbidity measured using a Forest Technology Systems DTS-12 turbidity sensor.</gml:description>
 <gml:identifier codeSpace="urn:cuashi/his/methodCode">2</gml:identifier>
 <wml2:processType xlink:href="http://www.opengis.net/def/waterml/2.0/processType/Sensor"
 xlink:title="Turbidity measured using a Forest Technology Systems DTS-12 turbidity sensor."/>
 <wml2:aggregationPeriod>PT5S</wml2:aggregationPeriod>
 <wml2:processReference xlink:href="http://www.ftsinc.com/"
 xlink:title="Turbidity measured using a Forest Technology Systems DTS-12 turbidity sensor."/>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="valueType" xlink:href="valueType"/>
 <om:value xsi:type="xsd:string">Field Observation</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="noDataValue" xlink:href="noDataValue"/>
 <om:value xsi:type="xsd:string">-9999</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="sampleMedium" xlink:href="sampleMedium"/>
 <om:value xsi:type="xsd:string">Surface Water</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="speciation" xlink:href="speciation"/>
 <om:value xsi:type="xsd:string">Not Applicable</om:value>
 </om:NamedValue>
 </wml2:parameter>
 </wml2:ObservationProcess>
 </om:procedure>
 <om:observedProperty xlink:href="#LBR-USU4" xlink:title="SampleConcept"/>
 <om:featureOfInterest xlink:href="#USU-LBR-Mendon"
 xlink:title="Little Bear River at Mendon Road near Mendon, UtahUSU-LBR-Mendon"/>
 <om:result>
 <wml2:MeasurementTimeseries gml:id="\_TS-2">
 <wml2:temporalExtent xlink:href="#phen\_time-2"/>
 <wml2:metadata>
 <wml2:MeasurementTimeseriesMetadata>
<!-- snip -->
 <wml2:cumulative>true</wml2:cumulative>
 <wml2:aggregationDuration>PT5S</wml2:aggregationDuration>
 </wml2:MeasurementTimeseriesMetadata>
 </wml2:metadata>
 <wml2:defaultPointMetadata>
 <wml2:DefaultTVPMeasurementMetadata>
 <wml2:quality xlink:href="http://www.opengis.net/def/timeseriesType/WaterML/2.0/nc"
 xlink:title="nc"/>
 <wml2:qualifier xlink:href="#methodCode-2"
 xlink:role="http://www.opengis.net/def/qualifiertype/waterml2/method"/>
 <wml2:processing xlink:href="urn:cuahsi/qualityControlLevel0" xlink:title="Raw data"/>
 <wml2:uom uom="[NTU]"/>
 <wml2:interpolationType xlink:href="http://www.opengis.net/def/timeseriesType/WaterML/2.0/AverageSucc"
 xlink:title="Average"/>
 </wml2:DefaultTVPMeasurementMetadata>
 </wml2:defaultPointMetadata>
 <!-- snip -->
 </wml2:MeasurementTimeseries>
 </om:result>
</wml2:observationMember>

### Variable – Aggregation

### Variable – Water Sample

 <variable>
 <variableCode vocabulary="LBR" default="true" variableID="39">USU39</variableCode>
 <variableName>Phosphorus, total as P</variableName>
 <valueType>Sample</valueType>
 <dataType>Sporadic</dataType>
 <generalCategory>Water Quality</generalCategory>
 <sampleMedium>Surface Water</sampleMedium>
 <unit>
 <unitName>milligrams per liter</unitName>
 <unitType>Concentration</unitType>
 <unitAbbreviation>mg/L</unitAbbreviation>
 <unitCode>199</unitCode>
 </unit>
 <noDataValue>-9999</noDataValue>
 <timeScale>
 <unit>
 <unitName>second</unitName>
 <unitType>Time</unitType>
 <unitAbbreviation>s</unitAbbreviation>
 <unitCode>100</unitCode>
 </unit>
 <timeSupport>0</timeSupport>
 </timeScale>
 <speciation>P</speciation>
 </variable>

<wml2:observationMember>
 <om:OM\_Observation gml:id="observation-1">
 <om:metadata>
 <wml2:ObservationMetadata>
 <!-- snip -->
 <!--wml2:intendedSamplingInterval-->
 <!-- wml2:status should be a mapping based on QC level... but there is no fixed qcvocab-->
 <wml2:sampledMedium xlink:href="http://www.opengis.net/def/waterml/2.0/medium/SurfaceWater" xlink:title="Surface Water" />
 </wml2:ObservationMetadata>
 </om:metadata>
 <om:phenomenonTime>
 <gml:TimePeriod gml:id="phen\_time-1">
 <gml:beginPosition>2007-11-07T13:00:00</gml:beginPosition>
 <gml:endPosition>2007-12-20T14:05:00</gml:endPosition>
 </gml:TimePeriod>
 </om:phenomenonTime>
 <!-- snip --></om:OM\_Observation>
 <om:procedure>
 <wml2:ObservationProcess gml:id="process-1">
 <gml:description>Water chemistry grab sample collected by technicians in the field.</gml:description>
 <gml:identifier codeSpace="urn:cuashi/his/methodCode">25</gml:identifier>
 <wml2:processType xlink:href="http://www.opengis.net/def/waterml/2.0/processType/ManualMethod" xlink:title="Water chemistry grab sample collected by technicians in the field." />
 <wml2:processReference xlink:href="urn:cuahsi/wof/method:25" xlink:title="Water chemistry grab sample collected by technicians in the field." />
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="valueType" xlink:href="valueType" />
 <om:value xsi:type="xsd:string">Sample</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="noDataValue" xlink:href="noDataValue" />
 <om:value xsi:type="xsd:string">-9999</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="sampleMedium" xlink:href="sampleMedium" />
 <om:value xsi:type="xsd:string">Surface Water</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="speciation" xlink:href="speciation" />
 <om:value xsi:type="xsd:string">P</om:value>
 </om:NamedValue>
 </wml2:parameter>
 </wml2:ObservationProcess>
 </om:procedure>
 <om:observedProperty xlink:href="#LBR-USU39" xlink:title="SampleConcept" />
 <om:featureOfInterest xlink:href="#USU-LBR-Wellsville" xlink:title="Little Bear River near Wellsville, UtahUSU-LBR-Wellsville" />

 <om:result>
 <wml2:MeasurementTimeseries gml:id="\_TS-1">
 <wml2:temporalExtent xlink:href="#phen\_time-1" />
 <wml2:metadata>
 <wml2:MeasurementTimeseriesMetadata>

 <wml2:cumulative>false</wml2:cumulative>
 </wml2:MeasurementTimeseriesMetadata>
 </wml2:metadata>
 <wml2:defaultPointMetadata>
 <wml2:DefaultTVPMeasurementMetadata>
<!-- snip -->
 <wml2:uom uom="mg/L" />

 <wml2:interpolationType xlink:href="http://www.opengis.net/def/timeseriesType/WaterML/2.0/Sporadic" xlink:title="Sporadic" />
 </wml2:DefaultTVPMeasurementMetadata>
 </wml2:defaultPointMetadata>
 <!-- snip -->
 </wml2:MeasurementTimeseries>
 </om:result>
</wml2:observationMember>

### Units

|  |  |  |
| --- | --- | --- |
| **ODM Field** | **WaterML 1.1 equivalent** |  |
| UnitsID | units[@unitsCode] |  |
| UnitsName | units  |  |
| UnitsType | units[@unitsType] |  |
| UnitsAbbreviation | units[@unitsAbbreviation] |  |
|  | UnitDescription |  |

A unit of measure is defined by the UCUM standard (<http://unitsofmeasure.org/>).

Some examples:

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |  |
|  |  |

### Category

The ODM store categorical data as dataValues mapped numeric values. In WaterML 2, there is an explicit categorical data value type.

|  |  |  |
| --- | --- | --- |
| **ODM Field** | **WaterML 1.1 equivalent** |  |
| VariableID | ../Variable/variableCode/@variableId |  |
| DataValue | value[@codedVocabulary=’true’] |  |
| CategoryDescription | Value/@codedVocabularyTerm |  |

A separate CategoricalTimeseries specialization accommodates categories.

<wml2:CategoricalTimeseries xmlns:wml2="http://www.opengis.net/waterml/2.0"
 xmlns:gml="http://www.opengis.net/gml/3.2"
 xmlns:xlink="http://www.w3.org/1999/xlink"
 xmlns:swe="http://www.opengis.net/swe/2.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="http://www.opengis.net/waterml/2.0
 file:../../timeseries.xsd" gml:id="ts\_id33">
 <gml:description>This is an example showing a categorical time series in waterml2.0.
 Describes a timeseries of manual weather observations. </gml:description>
 <wml2:temporalExtent>
 <gml:TimePeriod gml:id="tp\_1">
 <gml:beginPosition>2011-11-16T00:00:00+11:00</gml:beginPosition>
 <gml:endPosition>2011-11-18T00:00:00+11:00</gml:endPosition>
 </gml:TimePeriod>
 </wml2:temporalExtent>
 <wml2:point>
 <wml2:CategoricalTVP>
 <wml2:time>2011-11-16T00:00:00+11:00</wml2:time>
 <wml2:value>
 <swe:Category optional="true">
 <swe:description>Fairly uniform precipitation composed exclusively of very small water droplets (less than 0.5 mm in diameter)
 very close to one another</swe:description>

 <swe:codeSpace xlink:href="http://www.bom.gov.au/info/wwords/" xlink:title="BoM weather words"/>
 <swe:value>Drizzle</swe:value>
 </swe:Category>
 </wml2:value>
 </wml2:CategoricalTVP>
 </wml2:point>
 <wml2:point>
 <wml2:CategoricalTVP>
 <wml2:time>2011-11-17T00:00:00+11:00</wml2:time>
 <wml2:value>
 <swe:Category>

 <swe:description>Usually begin and end suddenly. Relatively short-lived, but may last half an hour.
 Fall from cumulus clouds, often separated by blue sky. Showers may fall in patches rather than across
 the whole forecast area. Range in intensity from light to very heavy</swe:description>
 <swe:codeSpace xlink:href="http://www.bom.gov.au/info/wwords/" xlink:title="BoM weather words"/>

 <swe:value>Showers</swe:value>

 </swe:Category>
 </wml2:value>
 </wml2:CategoricalTVP>
 </wml2:point>
 <wml2:point>
 <wml2:CategoricalTVP>
 <wml2:time>2011-11-18T00:00:00+11:00</wml2:time>
 <wml2:value xsi:nil="true"></wml2:value>
 <wml2:metadata>
 <wml2:TVPMetadata>
 <wml2:nilReason nilReason="missing"/>
 <wml2:comment>No observation performed.</wml2:comment>
 </wml2:TVPMetadata>
 </wml2:metadata>
 </wml2:CategoricalTVP>
 </wml2:point>
</wml2:CategoricalTimeseries>

### Time Support

See Variable

## Data Value

There are two types of time series in WaterML 2,

1. MeasurementTimeSeries, with a MeasurementTVP
2. CategoricalTimeSeries with a CategoricalTVP

MeasurementTimeSeries Base: /wml2:Collection/wml2:observationMember/om:OM\_Observation/om:result/wml2:MeasurementTimeseries/wml2:point/wml2:MeasurementTVP

CategoricalTimeSeries Base

/wml2:Collection/wml2:observationMember/om:OM\_Observation/om:result/wml2:CategoricalTimeseries/wml2:point/wml2:CategoricalTVP

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ODM Field** | **Has CV** | **WaterML 1.1 equivalent****Base:** **/timeSeriesResponse/timeSeries[values/value]** | **WaterML 2**MeasurementTimeSeries  | **WaterML 2**CategoricalTimeSeries |
|  |  |  |  |  |
| ValueID |   |  |  |  |
| DataValue |   | value/text() | wml2:value | wml2:value/swe:Category/swe:value |
| Category |  |  |  | Name:wml2:value/swe:Category/ swe:codeSpace/@xlink:titleVocabulary Reference:wml2:value/swe:Category/ swe:codeSpace/@xlink:href |
| Category Description |  |  |  | wml2:value/swe:Category/swe:description |
| (noDataValue) |  | ../../Variable/NoDataValue | wml2:value[@xsi:nil="true"] |
| ValueAccuracy |   | @accuracyStdDev | N/A to Categorical:wml2:metadata/wml2:TVPMeasurementMetadata/wml2:accuracy (contains a swe quantity with a definition, and a value) |
| LocalDateTime |   | @dateTime | The wml2:time contains this information in the ISO date time. |
| UTCOffset |   | @timeOffsetOffset may be derived from siteInfotimeSeriesResponse/timeSeries/sourceInfo/ timeZoneInfo/defaultTimeZone[@zoneOffset] |
| DateTimeUTC |   | @dateTimeUTC |
| DateTime With TimeZone |  |  | wml2:time |
| SiteID |   | ../../wml:sourceInfo/wml:siteCode[@siteId] | If Inline: ../../om:featureOfInterest/wml2:MonitoringPoint/gml:identifier(CUAHSI) (find the sampling feature with the gml:id same as the href)//wml2:samplingFeatureMember/wml2:MonitoringPoint[@gml:id =substring(../../om:featureOfInterest/@xlink:href,2)] |
| VariableID |   | [@variableId |  |
|  |  | ../../wml:Variable/wml:variableCode[@variableId] | ../../om:procedure/wml2:ObservationProcess |
| CensorCode | yes | @censorCode | N/A to categorical. Use nilReason or commentFor information exchange a simplified list using the Quality Categories Table (5):wml2:metadata/wml2:TVPMeasurementMetadata/wml2:quality If applicable to an entire series:../../wml2:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:quality(CUAHSI) are mapped to: wml2:CensoredReason[@xlink:href="urn:cuahsi.og/censoredReason/non-detect"]Mapping to CensoredReason, and quality for items out an exact match: wml2:CensoredReason[@xlink:href= substring(“@gmlid of item in vocabulary”,2]Link to internal Dictionary:<gml:Definition gml:id="censorCode-nc"> <gml:identifier codeSpace="http://www.cuahsi.org/">nc</gml:identifier> <gml:name codeSpace="http://www.cuahsi.org/">not censored</gml:name> </gml:Definition> |
| CensorCode Description |  | ../CensorCode/ |
| QualifierID |   | @qualifiers | Default for series: ../../wml2:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:qualifierAt the point levelwml2:metadata/wml2:TVPMeasurementMetadata/wml2: qualifier | Default for series:../../wml2:defaultPointMetadata/wml2:DefaultTVPMetadata/wml2: qualifierAt the point levelwml2:metadata/wml2:TVPMetadata/wml2: qualifier |
| (Qualifier Reference) |  | ../wml:qualifier/wml:quailiferCode= @qualifiers |
| Link to a dictionary using gml:id |
| MethodID |   | @methodCode | Method is part of the procedure, and can be linked from the processReference../../om:procedure/wml2:ObservationProcess/wml2:processReferenceIf more than one method, we will need to use a dictionary, and a qualifier |
| (Method Reference) |  | ../wml:Method/wml:methodCode=@methodCode |
| SourceID |   | @sourceCode | Default for series: ../../wml2:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:sourceAt the point levelwml2:metadata/wml2:TVPMeasurementMetadata/wml2: source | Default for series:../../wml2:defaultPointMetadata/wml2:DefaultTVPMetadata/wml2: sourceAt the point levelwml2:metadata/wml2:TVPMetadata/wml2: source |
| Source Reference |  | ../wml:Source/wml:sourceCode=@souceCode |
|  | Link to a dictionary using gml:id |
| SampleID |   | @labSampleCode | Samples are handled by linking to a related observationswml2:metadata/wml2:TVPMeasurementMetadata/wml2:relatedObservation/om:ObservationContext<wml2:relatedObservation> <om:ObservationContext> <om:role xlink:href="http://www.opengis.net/def/relatedObservation/WaterML/2.0/analyticalSample" xlink:title="Analytical Sample Observation"/> <om:relatedObservation xlink:href="(Provide.wqxBase.Endpoint)CEAP102905-PAR-F" xlink:title="LabCode:CEAP102905-PAR-F"/> </om:ObservationContext> </wml2:relatedObservation> |
| (Sample Reference) |  | ../wml:sample/wml:labSampleCode=@labSampleCode |
|  |   |   |  |  |
| QualityControlLevelID |   | ../wml: qualityControlLevel/wml: qualityControlLevelCode =@qualityControlLevel  | Default for series: ../../wml2:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:processingAt the point levelwml2:metadata/wml2:TVPMeasurementMetadata/wml2:processing | Default for series:../../wml2:defaultPointMetadata/wml2:DefaultTVPMetadata/wml2:processingAt the point levelwml2:metadata/wml2:TVPMetadata/wml2:processing |
| OffsetValue |   | @offsetValue | Profiles are not well handled. Option1: Each offset would have a separate procedure.Option2: use a qualifier |
| OffsetTypeID |   | @offsetTypeCode |
| OffsetInfomration |  | ../wml:offset/wml:offsetTypeCode = @offsetTypeID |
| DerivedFromID |  |  |  |  |

Mappings(see Permanent References for CUAHSI Vocabularies):

* Quality categories to ODM Censor Code

### SWE Quality

More examples: text, quantity range

<swe:Quantity definition="http://sweet.jpl.nasa.gov/2.0/sciUncertainty.owl#Accuracy">
 <swe:label>Relative Accuracy</swe:label>
 <swe:uom code="%"/>
 <swe:value>2</swe:value>
</swe:Quantity>

### Measurement Data Value Examples

There are several types of data values demonstrated:

* Simple
* NoDataValue
* With Value Accuracy
* With Sample
* With Qualifier
* With OffsetType and Value

#### Simple

<value dateTime="2011-11-17T00:00:00" timeOffset="-07:00" dateTimeUTC="2011-11-17T07:00:00" >2.0</value>

WML2

<!-- with data value -->

<wml2:point>
 <wml2:MeasurementTVP>
 <wml2:time>2011-11-17T00:00:00-07:00</wml2:time>
 <wml2:value>2.0</wml2:value>
 </wml2:MeasurementTVP>
</wml2:point>

#### No Data Value

Variable/NoDataValue = -9999

<value censorCode="nc" dateTime="2011-11-17T00:00:00" timeOffset="-07:00" dateTimeUTC="2011-11-17T07:00:00" methodCode="9" sourceCode="2" offsetTypeCode="1" qualityControlLevelCode="0">-9999</value>

This still needs to be worked on, but when there is a no data value, that should to be transformed into a nil value. We will assume that this is missing, if the censorCode is ‘nc’. In the future, the reasons may be mapped from @censorCode to other reasons.

<!-- noDataValue -->

<wml2:point>
 <wml2:MeasurementTVP>
 <wml2:time>2011-11-17T00:00:00-07:00</wml2:time>

 <wml2:value xsi:nil="true"/>
 <wml2:metadata>
 <wml2:TVPMeasurementMetadata>
 <wml2:nilReason xlink:href="http://www.opengis.net/def/nil/OGC/0/missing" xlink:title="missing"/>
 </wml2:TVPMeasurementMetadata>
 </wml2:metadata>
 </wml2:MeasurementTVP>
</wml2:point>

#### With Value Accuracy

<value dateTime="2011-11-17T00:00:00" timeOffset="-07:00" dateTimeUTC="2011-11-17T07:00:00" valueAccuracy="50" >-9999</value>

I’m not sure exactly what the measure is, but ODM paper talks about Total Error. What are the units?

<wml2:point>
 <wml2:MeasurementTVP>
 <wml2:time>2011-11-16T00:00:00+11:00</wml2:time>
 <wml2:value>2.0</wml2:value>
 <wml2:metadata>
 <wml2:TVPMeasurementMetadata>
 <wml2:accuracy>
 <swe:Quantity definition="http://sweet.jpl.nasa.gov/2.0/sciUncertainty.owl#Error ">
 <swe:label>Total Error</swe:label>
 <swe:uom code="unity"/>
 <swe:value>2</swe:value>
 </swe:Quantity>
 </wml2:accuracy>
 </wml2:TVPMeasurementMetadata>
 </wml2:metadata>
 </wml2:MeasurementTVP>
 </wml2:point>

Or as an accuracy

<wml2:point>
 <wml2:MeasurementTVP>
 <wml2:time>2011-11-16T00:00:00+11:00</wml2:time>
 <wml2:value>2.0</wml2:value>
 <wml2:metadata>
 <wml2:TVPMeasurementMetadata>
 <wml2:accuracy>
 <swe:Quantity definition="http://sweet.jpl.nasa.gov/2.0/sciUncertainty.owl#Accuracy">
 <swe:label>Relative Accuracy</swe:label>
 <swe:uom code="%"/>
 <swe:value>2</swe:value>
 </swe:Quantity>
 </wml2:accuracy>
 </wml2:TVPMeasurementMetadata>
 </wml2:metadata>
 </wml2:MeasurementTVP>
 </wml2:point>

#### With Censor Code

<value censorCode="lt" dateTime="2011-11-17T00:00:00" timeOffset="-07:00" dateTimeUTC="2011-11-17T07:00:00" methodCode="9" sourceCode="2" offsetTypeCode="1" qualityControlLevelCode="0">2.0</value>

For CUAHSI data, a censored data point references a dictionary containing the list of censor codes. If an ODM value is not (not censored), then it will be flagged with a data quality attribute, suspect, and a censored reason using the CUAHSI vocabulary. A simple set of quality terms allows for better data exchange.

 <wml2:localDictionary>
 <gml:Dictionary gml:id="censorCode

 <gml:identifier codeSpace="http://www.cuahsi.org/waterml2/dictionaries/">censorCode</gml:identifier>
 <gml:dictionaryEntry>
 <gml:Definition gml:id="censorCode-lt">
 <gml:identifier codeSpace="http://www.cuahsi.org/">lt</gml:identifier>
 <gml:name codeSpace="http://www.cuahsi.org/">less than</gml:name>
 </gml:Definition>
 </gml:dictionaryEntry>
 </gml:Dictionary>
 </wml2:localDictionary>

<!-- snip -->

<wml2:point>
 <wml2:MeasurementTVP>
 <wml2:time>2011-11-16T00:00:00+11:00</wml2:time>
 <wml2:value>2.0</wml2:value>
 <wml2:metadata>
 <wml2:TVPMeasurementMetadata>
 <wml2:quality xlink:href="http://www.opengis.net/def/waterml/quality/suspect"
 xlink:title="suspect"/>

 <wml2:censoredReason xlink:href="#censorCode=lt"
 xlink:title="less than"/>
 </wml2:TVPMeasurementMetadata>
 </wml2:metadata>
 </wml2:MeasurementTVP>
 </wml2:point>

#### With Sample

 <value censorCode="nc" dateTime="2007-11-07T13:00:00" timeOffset="-07:00" dateTimeUTC="2007-11-07T20:00:00" labSampleCode="9188" qualityControlLevelCode="0">10.5</value>

<wml2:point>
 <wml2:MeasurementTVP>
 <wml2:time>2007-11-07T13:00:00</wml2:time>
 <wml2:value>10.5</wml2:value>
 <wml2:metadata>
 <wml2:TVPMeasurementMetadata>
 <wml2:quality xlink:href="#qclevel-0"/>
 <wml2:relatedObservation>
 <om:ObservationContext>
 <om:role xlink:href="http://www.opengis.net/def/relatedObservation/WaterML/2.0/analyticalSample"
 xlink:title="Analytical Sample Observation"/>
 <om:relatedObservation xlink:href="(Provide.wqxBase.Endpoint)9188" xlink:title="LabCode:9188"/>
 </om:ObservationContext>
 </wml2:relatedObservation>
 <wml2:processing xlink:href="#qclevel-0"/>
 </wml2:TVPMeasurementMetadata>
 </wml2:metadata>
 </wml2:MeasurementTVP>
</wml2:point>

#### With Qualifier

USGS. Timezone -08:00

<ns1:value qualifiers="P" dateTime="2010-10-06T00:00:00.000">7.9</ns1:value>

A local dictionary stores the definition of the qualifier, and that is referenced

<wml2:localDictionary>
 <gml:Dictionary gml:id="qualifier">
 <gml:identifier codeSpace="http://www.cuahsi.org/waterml2/dictionaries/">qualifier</gml:identifier>
 <gml:dictionaryEntry>
 <gml:Definition gml:id="qualifier-A">
 <gml:identifier codeSpace="http://www.cuahsi.org/">A</gml:identifier>
 <gml:name codeSpace="http://www.cuahsi.org/">Approved for publication -- Processing and review completed.</gml:name>
 </gml:Definition>
 </gml:dictionaryEntry>
 <gml:dictionaryEntry>
 <gml:Definition gml:id="qualifier-P">
 <gml:identifier codeSpace="http://www.cuahsi.org/">P</gml:identifier>
 <gml:name codeSpace="http://www.cuahsi.org/">Provisional data subject to revision.</gml:name>
 </gml:Definition>
 </gml:dictionaryEntry>
 </gml:Dictionary>
 </wml2:localDictionary>

<!-- snip -->

<wml2:point>
 <wml2:MeasurementTVP>
 <wml2:time>2010-10-12T00:00:00.000-08:00</wml2:time>
 <wml2:value>0.69</wml2:value>
 <wml2:metadata>
 <wml2:TVPMeasurementMetadata>
 <wml2:qualifier xlink:href="#qualifer-P" xlink:role="http://www.opengis.net/def/qualifiertype/waterml2/generic" />
 </wml2:TVPMeasurementMetadata>
 </wml2:metadata>
 </wml2:MeasurementTVP>
</wml2:point>

With Offset

 <value dateTime="2008-01-01T00:00:00" timeOffset="-07:00" dateTimeUTC="2008-01-01T07:00:00" offsetValue="2.44" offsetTypeCode="1" >148.6912</value>
<!-- snip -->
 <offset offsetTypeID="1">
 <offsetTypeCode>1</offsetTypeCode>
 <offsetDescription>Distance above ground level</offsetDescription>
 <unit>
 <unitName>meter</unitName>
 <unitType>Length</unitType>
 <unitAbbreviation>m</unitAbbreviation>
 <unitCode>52</unitCode>
 </unit>
 <offsetIsVertical>true</offsetIsVertical>
 </offset>

<wml2:localDictionary>
 <gml:Dictionary gml:id="offset">
 <gml:identifier codeSpace="http://www.cuahsi.org/waterml2/dictionaries/">censorCode</gml:identifier>
 <gml:dictionaryEntry>
 <gml:DefinitionCollection aggregationType="set" gml:id="offsetType-1">
 <gml:dictionaryEntry>
 <gml:Definition gml:id="offsetTypeDescripton-1">
 <gml:identifier codeSpace="http://www.cuahsi.org/">1</gml:identifier>
 <gml:name codeSpace="http://www.cuahsi.org/">Distance above ground level</gml:name>
 </gml:Definition>
 </gml:dictionaryEntry>
 <gml:dictionaryEntry>
 <gml:UnitDefinition gml:id="offsetTypeUnits-1">
 <gml:identifier codeSpace="URN:UOM">unit of measure</gml:identifier>
 <gml:name codeSpace="http://www.cuahsi.org/">m</gml:name>
 </gml:UnitDefinition>
 </gml:dictionaryEntry>
 </gml:DefinitionCollection>
 </gml:dictionaryEntry>
 </gml:Dictionary>
 </wml2:localDictionary>

<!-- snip -->

 <wml2:point>
 <wml2:MeasurementTVP>
 <wml2:time>2008-01-01T00:00:00-07:00</wml2:time>
 <wml2:value>148.6912</wml2:value>
 <wml2:metadata>
 <wml2:TVPMeasurementMetadata>
 <wml2:qualifier>
 <swe:Quantity definition="urn:cuahsi/wml/offsetValue">
 <swe:identifier>#offsetTypeCode-1</swe:identifier>
 <swe:uom code="m"/>
 <swe:value>2.44</swe:value>
 </swe:Quantity>
 </wml2:qualifier>
 </wml2:TVPMeasurementMetadata>
 </wml2:metadata>
 </wml2:MeasurementTVP>
 </wml2:point>

### Categorical Data Value Examples

 <wml2:point>
 <wml2:CategoricalTVP>
 <wml2:time>2011-11-16T00:00:00+11:00</wml2:time>
 <wml2:value>
 <swe:Category optional="true">
 <swe:description>Fairly uniform precipitation composed exclusively of very small water droplets (less than 0.5 mm in diameter)
 very close to one another</swe:description>

 <swe:codeSpace xlink:href="http://www.bom.gov.au/info/wwords/" xlink:title="BoM weather words"/>
 <swe:value>Drizzle</swe:value>
 </swe:Category>
 </wml2:value>
 </wml2:CategoricalTVP>
 </wml2:point>

 <wml2:point>
 <wml2:CategoricalTVP>
 <wml2:time>2011-11-17T00:00:00+11:00</wml2:time>
 <wml2:value>
 <swe:Category>

 <swe:description>Usually begin and end suddenly. Relatively short-lived, but may last half an hour.
 Fall from cumulus clouds, often separated by blue sky. Showers may fall in patches rather than across
 the whole forecast area. Range in intensity from light to very heavy</swe:description>
 <swe:codeSpace xlink:href="http://www.bom.gov.au/info/wwords/" xlink:title="BoM weather words"/>

 <swe:value>Showers</swe:value>

 </swe:Category>
 </wml2:value>
 </wml2:CategoricalTVP>
 </wml2:point>

 <wml2:point>
 <wml2:CategoricalTVP>
 <wml2:time>2011-11-18T00:00:00+11:00</wml2:time>
 <wml2:value xsi:nil="true"></wml2:value>
 <wml2:metadata>
 <wml2:TVPMetadata>
 <wml2:nilReason nilReason="missing"/>
 <wml2:comment>No observation performed.</wml2:comment>
 </wml2:TVPMetadata>
 </wml2:metadata>
 </wml2:CategoricalTVP>
 </wml2:point>

### Attributes of Data Values:

|  |  |  |  |
| --- | --- | --- | --- |
| **ODM Table** | **ODM Field** | **WaterML 1.1 equivalent** | **WaterML 2** |
|  |  |  | BASE: /wml2:Collection/wml2:observationMember/om:OM\_Observation/om:metadata/wml2:ObservationMetadata/ |
| Sources | SourceID | sourceID | Can be expressed in the observation Member Metadata Block as a gmd:contact. |
| Sources | Organization | Organization |  gmd:contact/gmd:CI\_ResponsibleParty/gmd:organisationName/gmd:LocalisedCharacterString |
| Sources | SourceDescription | SourceDescription | gmd:contact/gmd:CI\_ResponsibleParty/ |
| Sources | SourceLink | SourceLink |  |
| Sources | ContactName | ContactName | gmd:contact/gmd:CI\_ResponsibleParty/gmd:organisationName/gmd:LocalisedCharacterString |
| Sources | Phone | Phone | gmd:contact/gmd:CI\_ResponsibleParty/ gmd:contactInfo/ gmd:CI\_Contact/ gmd:contactInfo/ gmd:CI\_Contact/ gmd:phone/ gmd:CI\_Telephone/ gmd:voice/ gco:CharacterString |
| Sources | Email | Email | gmd:contact/gmd:CI\_ResponsibleParty/ gmd:contactInfo/ gmd:CI\_Contact/ gmd:contactInfo/ gmd:CI\_Contact/ gmd:address/ gmd:CI\_Address/ gmd:electronicMailAddress/ gco:CharacterString |
| Sources | Address | \*via Address | gmd:contact/gmd:CI\_ResponsibleParty/ gmd:contactInfo/ gmd:CI\_Contact/ gmd:contactInfo/ gmd:CI\_Contact gmd:address/ gmd:CI\_Address/ |
| Sources | City | \*via Address |
| Sources | State | \*via Address |
| Sources | ZipCode | \*via Address |
| Sources | Citation |   |  |
| Sources | MetadataID |   |  |
| ISOMetadata | MetadataID |   | Can be expressed in the observation Member Metadata Block as a gmd: identificationInfo./wml2:Collection/wml2:observationMember/om:OM\_Observation/om:metadata/wml2:ObservationMetadata gmd:identificationInfo/gmd:MD\_DataIdentification/gmd:citation |
| ISOMetadata | TopicCategory | TopicCategory |  |
| ISOMetadata | Title | Title | gmd:identificationInfo/gmd:MD\_DataIdentification/gmd:citation/gmd:CI\_Citation/ gmd:title |
| ISOMetadata | Abstract | Abstract | gmd:identificationInfo/gmd:MD\_DataIdentification/gmd:citation/gmd:CI\_Citation/ gmd:abstract |
| (metadata) | (dataset date) |  | gmd:date/gmd:CI\_Date/gmd:date/gco:DateTime |
| (metadata) | (language) |  | gmd:language/gco:CharacterString |
| ISOMetadata | ProfileVersion | ProfileVersion | Not fully equivalent, but the WML version is here/wml2:Collection/wml2:metadata/wml2:DocumentMetadata/wml2:version |
| ISOMetadata | MetadataLink | MetadataLink | /wml2:Collection/wml2:metadata/wml2:DocumentMetadata/wml2:version/@xlink:href |
|  |  |  |  |
| Methods | MethodID | methodID | /wml2:Collection/wml2:observationMember/om:OM\_Observation/om:procedure/wml2:ObservationProcess |
| Methods | MethodDescription | MethodDescription |
| Methods | MethodLink | MethodLink |
|  |  |  |  |
| Samples | SampleID | sampleID | Not internal a Water Ml2 timeseries document. Initially we will use WQX to wrap up sample data.. |
| Samples | SampleType | SampleType |
| Samples | LabSampleCode | labSampleCode |
| Samples | LabMethodID | labMethodID |
| LabMethods | LabMethodID | labMethodID |
| LabMethods | LabName | labName |
| LabMethods | LabOrganization | labOrganization |
| LabMethods | LabMethodName | LabMethodName |
| LabMethods | LabMethodDescription | labMethodDescription |
| LabMethods | LabMethodLink | labMethodLink |
|  |  |  |  |

## Series Catalog (Summary Table):

The notion of series is attached to a site and returned from a WaterOneFlow GetSiteInfo method, which returns a WaterML 1 sitesResponse. In WaterML 2, there is presently no independent site description. The CUAHSI Observation Metadata paper presents a method of delivering such content.
Two mappings are presented: wml1:sitesResponse to WML 2, and a wml1:timeSeriesResponse to a WML 2.

|  |  |  |
| --- | --- | --- |
| **ODM Field** | **WaterML 1.0 Site Response****Base: /sitesResponse/site/seriesCatalog/series** | **WaterML 2.0****Base:wml2:observationMember/om:OM\_Observation** |
| BeginDateTime |  variableTimeInterval/beginDateTime | om:result/wml2:MeasurementTimeseries/wml2:temporalExtent/gml:TimePeriodom:result/wml2:CategoricalTimeseries/wml2:temporalExtent/gml:TimePeriod(CUAHSI) These are xlink references to om:phenomenonTime/gml:TimePeriod[@gml:id=substring((somepath)gml:TimePeriod/@gml:id,2)] |
| EndDateTime | variableTimeInterval/endDateTime |
| BeginDateTimeUTC | variableTimeInterval/beginDateTimeUTC |
| EndDateTimeUTC | variableTimeInterval/endDateTimeUTC |
|  |  |  |
| SeriesID |   | Internal to system, but could be put in the DataIdentification Block:om:metadata/wml2:ObservationMetadata/gmd:identificationInfo/gmd:MD\_DataIdentification |
| SiteID | ../,,/siteInfo/siteCode[@siteID] |  |
| SiteCode | ../,,/siteInfo/siteCode | Determine from feature of interestom:featureOfInterest |
| SiteName | ../,,/siteInfo/siteName |
| VariableID | variable/variableCode[@variableId] | Determine from feature of interestom:featureOfInterest(CUAHSI) These are xlink references to ../../wml2:samplingFeatureMember/wml2:MonitoringPoint[@gml:id=substring((somepath) om:featureOfInterest/@gml:id,2)] |
| VariableCode | variable/variableCode[@default=true] |
| VariableName | variable/variableName |
| Speciation |  variable/speciation | om:procedure/wml2:ObservationProcess/wml2:parameter/om:NamedValue/om:name[@xlink:href=’speciation’] |
| VariableUnitsID |  | /om:result/wml2:MeasurementTimeseries/wml2:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:uomN/A to Categorical:  |
| VariableUnitsName | variable/unit/unitName |
| SampleMedium | variable/sampleMedium | Metadata for an observation:om:metadata/wml2:ObservationMetadata/wml2:sampledMedium |
| ValueType | variable/valueType | Per Point Metadata default set at:om:result/wml2:MeasurementTimeseries/wml2:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:interpolationType |
| TimeSupport |  variable/timeScale/timeSupport | ../wml2:MeasurementTimeseries/wml2:metadata/wml2:MeasurementTimeseriesMetadata/wml2:aggregationDurationThis is an defined as an ISO time period, so time is embedded |
| TimeUnitsID |   |
| TimeUnitsName |  variable/timeScale/unit/unitName |
| DataType | variable/dataType | om:result/wml2:MeasurementTimeseries/wml2:defaultPointMetadatawml2:DefaultTVPMeasurementMetadata/wml2:interpolationType |
| GeneralCategory | variable/ generalCategory | om:procedure/wml2:ObservationProcess/wml2:parameter/om:NamedValue/om:name@xlink:href=’ GeneralCategory’] |
| MethodID | method[@methodID] | As part of procedureom:procedure/wml2:ObservationProcess |
| MethodDescription | method/methodDescription |
| SourceID | sourceID | Complex definition based on full GML metadata:om:metadata/wml2:ObservationMetadata/gmd:contact//wml2:Collection/wml2:observationMember/om:OM\_Observation/om:metadata/wml2:ObservationMetadata/gmd:contact/gmd:CI\_ResponsibleParty/gmd:organisationName/gmd:LocalisedCharacterString |
| Organization | source/organization |
| SourceDescription | source/sourceDescription |
| Citation | source/citation |
| QualityControlLevelID | qualityControlLevel[@qualityControlLevelID] | Measurement Seriesom:result/wml2:MeasurementTimeseries/wml2:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:processingCategorical Series:om:result/wml2:CategoricalTimeseries/wml2:defaultPointMetadata/wml2:DefaultTVPMetadata/wml2:processing |
| QualityControlLevelCode | qualityControlLevel/qualityControlLevelCode |
|  |  |  |
| ValueCount | valueCount |  |

|  |  |  |
| --- | --- | --- |
| **ODM Field** | **WaterML 1.0 TimeSeriesResponse****Base: /timeSeriesResponse/timeSeries** | **WaterML 2.0****Base:/wml2:collection/wml2:observationMember/om:OM\_Observation** |
| BeginDateTime | Applies to included datavalues in request: ../queryInfo/criteria/parameter[@name=’startDate’]../queryInfo/criteria/parameter[@name=’endDate’] | om:result/wml2:MeasurementTimeseries/wml2:temporalExtent/gml:TimePeriodom:result/wml2:CategoricalTimeseries/wml2:temporalExtent/gml:TimePeriod(CUAHSI) These are xlink references to om:phenomenonTime/gml:TimePeriod[@gml:id=substring((somepath)gml:TimePeriod/@gml:id,2)]  |
| EndDateTime |
| BeginDateTimeUTC |
| EndDateTimeUTC |
|  |  |  |
| SeriesID |   | Internal to system, but could be put in the DataIdentification Block:om:metadata/wml2:ObservationMetadata/gmd:identificationInfo/gmd:MD\_DataIdentification |
| SiteID | sourceInfo[xsi:type=’SiteInfoType’]/siteCode[@siteID] | Determine from feature of interestom:featureOfInterest(CUAHSI) These are xlink references to ../../wml2:samplingFeatureMember/wml2:MonitoringPoint[@gml:id=substring((somepath) om:featureOfInterest/@gml:id,2)] |
| SiteCode | sourceInfo[xsi:type=’SiteInfoType’]/siteCode |
| SiteName | sourceInfo[xsi:type=’SiteInfoType’]/siteInfo/siteName |
| VariableID | variable/variableCode[@variableId] | om:procedure/wml2:ObservationProcess |
| VariableCode | variable/variableCode[@default=true] |
| VariableName | variable/variableName |
| Speciation |  variable/speciation | om:procedure/wml2:ObservationProcess/wml2:parameter/om:NamedValue/om:name[@xlink:href=’speciation’] |
| VariableUnitsID |  |  |
| VariableUnitsName | variable/unit/unitName |
| SampleMedium | variable/sampleMedium | Metadata for an observation:om:metadata/wml2:ObservationMetadata/wml2:sampledMedium |
| ValueType | variable/valueType | Per Point Metadata default set at:om:result/wml2:MeasurementTimeseries/wml2:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:interpolationType |
| TimeSupport |  variable/timeScale/timeSupport | ../wml2:MeasurementTimeseries/wml2:metadata/wml2:MeasurementTimeseriesMetadata/aggregationDuration |
| TimeUnitsID |   |  |
| TimeUnitsName |  variable/timeScale/unit/unitName |  |
| DataType | variable/dataType | om:result/wml2:MeasurementTimeseries/wml2:defaultPointMetadatawml2:DefaultTVPMeasurementMetadata/wml2:interpolationType |
| GeneralCategory | variable/ generalCategory | om:procedure/wml2:ObservationProcess/wml2:parameter/om:NamedValue/om:name[@xlink:href=’GeneralCategory’] |
| MethodID | values/method[@methodID] | As part of procedureom:procedure/wml2:ObservationProcess |
| MethodDescription | values/method/methodDescription |
| SourceID | values/sourceID | Ugly:om:metadata/wml2:ObservationMetadata/gmd:contact |
| Organization | values/source/organization |
| SourceDescription | values/source/sourceDescription |
| Citation | values/source/citation |
| QualityControlLevelID | values/qualityControlLevel[@qualityControlLevelID] | Measurement Seriesom:result/wml2:MeasurementTimeseries/wml2:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:processingCategorical Series:om:result/wml2:CategoricalTimeseries/wml2:defaultPointMetadata/wml2:DefaultTVPMetadata/wml2:processing |
| QualityControlLevelCode | values/qualityControlLevel/qualityControlLevelCode |
|  |  |  |
| ValueCount | values[@Count] (not always present)count(values/value) |  |

# WaterML 2 Mapping to Observations Data Model and WaterML 1

The WaterML 2 specification details the basic concepts of a hydrologic time series.

* Sampling Feature
	+ Monitoring Point
* TimeSeries Observation
	+ Time Extent
	+ Procedure
	+ Observed Property
	+ + Sampling Feature
	+ + TimeSeries
* TimeSeries
	+ Measurement Time Series
	+ Categorical Time Series
* Data Value

The following sections contain the mapping information for mapping the O&M based WaterML2 information model to ODM and WaterML 1.1.

## Sampling Feature

The Sampling Feature can be inline (included) or referred to by reference at the XPath. In a WaterML 2 collection, it can be a incorporated via a wml2:samplingFeature.

BasePath: /wml2:Collection/wml2:observationMember/om:OM\_Observation/om:featureOfInterest/

By reference: /wml2:Collection/wml2:observationMember/om:OM\_Observation/om:featureOfInterest[@xlink:href]]

 The Monitoing point should be located at a URL, or if internal to the wml2:Collection within the wml2:samplingFeatureMember

Collection:

Inline BasePath: /wml2:Collection/wml2:samplingFeature/

Inline By Feature: /wml2:Collection/wml2:observationMember/om:OM\_Observation/om:featureOfInterest/

|  |  |  |  |
| --- | --- | --- | --- |
| **Information** | **ODM** | **WaterML 2** | **WaterML 1** **base: /timeSeriesResponse/timeSeries** |
| identifier | SiteCode | wml2:MonitoringPoint/gml:identifier | {SiteInfoType}/siteCode |
| Code codespace | None4-  | wml2:MonitoringPoint/gml:identifier[@codeSpace] | {SiteInfoType}/siteCode[@network] |
| Name | SiteName | wml2:MonitoringPoint/gml:name | {SiteInfoType}/siteName |
| Location | LatitudeLongitude | wml2:MonitoringPoint/sams:shape/gml:Point | {SiteInfoType}/Geolocation/GeogLocation/{Point} |
| Detailed Reference 2 |  | wml2:MonitoringPoint/wml2:descriptionReference |  |
| Time Zone |  | wml2:MonitoringPoint/wml2:timeZone/wml2:TimeZone | {SiteInfoType}/Geolocation/GeogLocation/ |
| Site Type | Comment | wml2:MonitoringPoint/wml2:monitoringType | { wml10:SiteInfoType}/note[@name=’site type’]{wml11:SiteInfoType}/siteProperty[@name=’site type’] |
| Properties (like state, county, HUC} | StateCountyCountry | wml2:MonitoringPoint/sf:parameter/om:NamedValue | {SiteInfoType}/note[@name=’property name’][SiteInfoType}/siteProperty[@name=’property name’] |
| Comment | Comment | wml2:MonitoringPoint/wml2:descriptionReference | {wml10:SiteInfoType}/note[@name=’comment’]{wml11:SiteInfoType}/siteProperty[@name=’comment’] |
| Owner | source | wml2:MonitoringPoint/wml2:owner |  |
| Relative Position 1  |  | wml2:MonitoringPoint/wml2:relativePosition |  |
| Sampled Feature | n/a | *ByReference:*wml2:MonitoringPoint/sf:sampledFeature/@\*[namespace-uri()='http://www.w3.org/1999/xlink' and local-name()='href'] |  |
| Related Sampling Feature 3 |  | wml2:MonitoringPoint/sf:releatedSamplingFeature |  |

1- Can be used to describe the location of the point relative to some other location.

2- Provide extra description about a monitoring point. This could be a link to an HTML page describing the location, photos of a monitoring point, history records etc.

3- Sampling features are frequently related to each other, as parts of complexes, through sub-sampling, and in other ways.

4 – In ODM and generic web services a single database/datasource is associated with a network code.

<wml2:MonitoringPoint gml:id="xsd-monitoring-point.example" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:om="http://www.opengis.net/om/2.0" xmlns:xlink="http://www.w3.org/1999/xlink"
 xmlns:wml2="http://www.opengis.net/waterml/2.0" xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco"
 xmlns:sam="http://www.opengis.net/sampling/2.0" xmlns:sams="http://www.opengis.net/samplingSpatial/2.0"
 xsi:schemaLocation="http://www.opengis.net/waterml/2.0 ../../waterml2.xsd">
 <gml:description>Example monitoring point for XML http://www.opengis.net/spec/waterml/2.0/req/xsd-monitoring-point. Nile river at Deddington, South
 Esk catchment, Tasmania</gml:description>
 <gml:name codeSpace="http://www.csiro.au/">Deddington</gml:name>
 <sam:sampledFeature xlink:href="http://csiro.au/features/rivers/nile" xlink:title="Nile river"/>

 <sams:shape>
 <gml:Point gml:id="location\_deddington">
 <gml:pos srsName="urn:ogc:def:crs:EPSG::4326">-41.814935 147.568517 </gml:pos>
 </gml:Point>
 </sams:shape>
 <wml2:owner>
 <gmd:CI\_ResponsibleParty>
 <gmd:organisationName>
 <gco:CharacterString>Department of Primary Industries, Parks,
 Water and Environment (DPIPWE)</gco:CharacterString>
 </gmd:organisationName>
 <gmd:role>
 <gmd:CI\_RoleCode codeList="http://asdd.ga.gov.au/asdd/profileinfo/gmxCodelists.xml#CI\_RoleCode"
 codeListValue="CI\_RoleCode\_owner">Owner</gmd:CI\_RoleCode>
 </gmd:role>
 </gmd:CI\_ResponsibleParty>
 </wml2:owner>
 <wml2:gaugeDatum xlink:href="urn:ogc:def:crs:EPSG::5711" xlink:title="Australian height datum"/>
 <wml2:timeZone>
 <wml2:TimeZone>
 <wml2:zoneOffset>+11:00</wml2:zoneOffset>
 <wml2:zoneAbbreviation>AEDT</wml2:zoneAbbreviation>
 </wml2:TimeZone>
 </wml2:timeZone>
</wml2:MonitoringPoint>

## Observed Property

This should be a reference to a controlled list of terminology, such as a hydrologic ontology. While this is defined by reference in O&M, one practice will be to embed the details in a local dictionary. Two example dictionaries are below.

|  |  |  |  |
| --- | --- | --- | --- |
| **Information** | **ODM** | **WaterML 2** | **WaterML 1 base: /timeSeriesResponse/timeSeries/** |
| ObservedProperty | VariableName | wml2:Collection/om:observationMember/ om:OM\_Observation/om:observedProperty | ../variable/variableNameConcept associated in HIS central |

### Example Element linking to the Sweet Ontologies

<om:observedProperty xlink:href="http://sweet.jpl.nasa.gov/2.3/phenHydro.owl#Discharge" xlink:title="streamflow"/>

### Example Element Pointed to a local dictionary

 <om:observedProperty xlink:href="#LBR-USU41" xlink:title="SampleConcept"/>

### Example local dictionary Fragment

While this example uses the ODM variable name and identifiers, the details of a variable are in the process elements (next section).

 <gml:Dictionary gml:id="phenomena">
 <gml:identifier codeSpace="http://www.cuahsi.org/waterml2/dictionaries/">phenomena</gml:identifier>
 <!-- Requirements Class:Reference needed--><gml:dictionaryEntry xmlns:swe="http://www.opengis.net/swe" xmlns:op="http://schemas.opengis.net/op">
 <gml:Definition gml:id="LBR-USU41">
 <gml:description xlink:href="http://example.com/rest/properties/LBR:USU41"
 xlink:title="Solids, total Suspended"/>
 <gml:identifier codeSpace="urn:cuahsi.org\localidentfier\">LBR:USU41</gml:identifier>
 <gml:name codeSpace="urn:cuashi/ontology/SampleConcept">Sample Concept</gml:name>
 <gml:name codeSpace="http://example.com/rest/properties/LBR:USU41"/>
 </gml:Definition>
 </gml:dictionaryEntry>
 </gml:Dictionary>

 <wml2:localDictionary>
 <gml:Dictionary gml:id="USGS\_phenom\_codes">
 <gml:identifier codeSpace="http://waterdata.usgs.gov/nwis">phenom\_codes\_dict</gml:identifier>
 <gml:dictionaryEntry>
 <gml:Definition gml:id="usgs\_water\_temp">
 <gml:identifier codeSpace="http://waterdata.usgs.gov/nwis/parameters">00010</gml:identifier>
 <gml:name codeSpace="http://waterdata.usgs.gov/nwis/parameters">Temperature, water, degrees Celsius</gml:name>
 <gml:remarks>USGS code for water temperature in celsius as adapted from http://waterdata.usgs.gov/nwis</gml:remarks>
 </gml:Definition>
 </gml:dictionaryEntry>
 </gml:Dictionary>
 </wml2:localDictionary>

## Process

“*An instance of OM\_Process is often an instrument or sensor, but may be a human observer, a simulator, or a process or algorithm applied to more primitive results used as inputs.*

WaterML2 defines an ObservationProcess feature type. This a generic class to describe processes related to the creation of hydrological results

Table - available types of processes

|  |  |
| --- | --- |
| **Process type** | **OGC Name** |
| Simulation | [http://www.opengis.net/def/waterml/2.0/processType/Simulation](http://www.opengis.net/def/processType/WaterML/2.0/Simulation) |
| Manual Method | [http://www.opengis.net/def/waterml/2.0/processType/ManualMethod](http://www.opengis.net/def/processType/WaterML/2.0/ManualMethod) |
| Sensor | [http://www.opengis.net/def/waterml/2.0/processType/Sensor](http://www.opengis.net/def/processType/WaterML/2.0/Sensor) |
| Algorithm | [http://www.opengis.net/def/waterml/2.0/processType/Algorithm](http://www.opengis.net/def/processType/WaterML/2.0/Algorithm) |
| Unknown | [http://www.opengis.net/def/waterml/2.0/processType/Unknown](http://www.opengis.net/def/processType/WaterML/2.0/Unknown)  |

The following tables describe the properties available in *ObservationProcess*.

|  |  |  |  |
| --- | --- | --- | --- |
| **Information** | **ODM** | **WaterML 2****/wml2:Collection/wml2:observationMember/om:OM\_Observation/om:procedure** | **WaterML 1** **base:/timeSeriesResponse/timeSeries** |
| Process Type |  | wml2:ObservationProcess/wml2:processType=[http://www.opengis.net/def/waterml/2.0/processType/Unknown](http://www.opengis.net/def/processType/WaterML/2.0/Unknown)1 |  |
| Identifier |  | Wm2l:ObservationProcess/gml:identifier |  |
| Process Reference |  | Pointer to Internal wml2:WaterObservationProcess/wm2l:processReference | variable/variableCodevalues/methodCode |
| aggregationPeriod | timeSupport | wml2:ObservationProcess/wml2:aggregationPeriod | variable/timescale/timeSupport |
| Provenance |  | wml2:ObservationProcess/wml2:originatingProcess |  |
| Parameter |  | wml2:ObservationProcess/om:parameter | All Variable Components |
| Operator | Organization | wml2:ObservationProcess/om:operator | values/source |
| CUAHSI ValueType\* |  | wml2:ObservationProcess/om:parameter/om:NamedValue/om:name/[@xlink:href =’valueType’] | variable/valueType |
| CUAHSI SampleMedium\* |  | wml2rObservationProcess/om:parameter/om:NamedValue/om:name/[@xlink:href =’sampleMedium’] | variable/sampleMedium |
| CUAHSI Speciation\* |  | wml2:ObservationProcess/om:parameter/om:NamedValue/om:name/[@xlink:href = ‘speciation’] | variable/speciation |
| CUAHSI DataType |  | wml2:ObservationProcess/om:parameter/om:NamedValue/om:name/[@xlink:href =’dataType’] | variable/valueType |
| CUAHSI Method | Values/Method | wml2:ObservationProcess/om:parameter/om:NamedValue/[@xlink:href =’method’] | dataValue/@methodCodevalues/method |

\*Parameters of the process, such as properties of the CUAHSI variable can be placed in “om:parameter” elements.

1- This is the default. A mapping based on value type is outlined in the WaterML 1 mapping section below..

### Example Observation Process Fragment from the WML2 document

<wml2:ObservationProcess gml:id="xsd-observation-process.example" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:om="http://www.opengis.net/om/2.0"
 xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:wml2="http://www.opengis.net/waterml/2.0"
 xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco"
 xsi:schemaLocation="http://www.opengis.net/waterml/2.0 ../../waterml2.xsd">
 <gml:description>Example observation process for XML encoding http://www.opengis.net/spec/waterml/2.0/req/xsd-observation-process</gml:description>

 <wml2:processType
 xlink:href="http://www.opengis.net/def/procvessType/WaterML/2.0/Algorithm"
 xlink:title="Algorithmic Process"/>
 <wml2:originatingProcess
 xlink:href="http://www.example.com/observations/1.8"
 xlink:title="Timeseries Observation 1.8"/>
 <wml2:aggregationPeriod>P1D</wml2:aggregationPeriod>
 <wml2:gaugeDatum xlink:href="urn:ogc:def:crs:EPSG::5711" xlink:title="Australian height datum"/>
 <wml2:processReference
 xlink:href="http://kisters.de/tsm\_agent/min\_daily\_mean\_monthly"
 xlink:title="Minimum Daily Mean Monthly"/>
 <wml2:input
 xlink:href="http://sweet.jpl.nasa.gov/2.2/propSpaceTickness.owl#WaterHeight"
 xlink:title="Water Height"/>
 <wml2:parameter>
 <om:NamedValue>
 <om:name
 xlink:href="http://sweet.jpl.nasa.gov/2.2/propDifference.owl#Bias"
 xlink:title="Bias"/>
 <om:value>-0.1</om:value>
 </om:NamedValue>
 </wml2:parameter>
</wml2:ObservationProcess>

### Example observation Process Fragment mapped from a WML 1 document

 <wml2:ObservationProcess gml:id="process-1">
 <wml2:processType xlink:href="http://www.opengis.net/def/processType/WaterML/2.0/Unknown"
 xlink:title="Water chemistry grab sample collected by technicians in the field."/>
 <wml2:processReference xlink:href="urn:cuahsi/wof/method:25"
 xlink:title="Water chemistry grab sample collected by technicians in the field."/>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="valueType" xlink:href="urn:cuahsi/variable/valueType"/>
 <om:value xsi:type="xsd:string">Sample</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="noDataValue" xlink:href="urn:cuahsi/variable/noDataValue"/>
 <om:value xsi:type="xsd:string">-9999</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="sampleMedium" xlink:href="urn:cuahsi/variable/sampleMedium"/>
 <om:value xsi:type="xsd:string">Surface Water</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="speciation" xlink:href="urn:cuahsi/variable/speciation"/>
 <om:value xsi:type="xsd:string">Not Applicable</om:value>
 </om:NamedValue>
 </wml2:parameter>
 </wml2:ObservationProcess>

## Result – (observation) Timeseries

|  |  |  |  |
| --- | --- | --- | --- |
| **Information** | **ODM** | **WaterML 2** **base:/wml2:Collection/wml2:observationMember** | **WaterML 1** **base: /TimeSeriesResponse/TimeSeries/** |
| Site | Site | om:OM\_Observation/om:featureOfInterest | ../{SiteInfoType}/ |
| Phenomena Time | SeriesCatalog beginDate/endDate | om:OM\_Observation/om:result/wml2:Timeseries/wml2:temporalExtent*Reference to:* om:OM\_Observation/om:phenomenonTime/gml:TimePeriod | GetSiteInfo Response |
| Processing | DataTypeMethod | om:OM\_Observation/om:procedure/wml:WaterObservationProces] | ../Variable/DataTypeDataValue/Methods/Method |
| Units | Units | om:OM\_Observation/om:result/wml2:MeasurementTimeseries/:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:uom | ../Variable/Units |
| Processing Level | QualityControlLeveL | om:OM\_Observation/om:result/wml2:MeasurementTimeseries /:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:processing | DataValue/QualityControlLevel |
| Interpolation Type | DataType |  | ../Variable/DataType |
| Aggregation Period | timeSupport | om:OM\_Observation/om:result/wml2:MeasurementTimeseries /wml2:metadata/wml2:TSMetadata/wml2:aggrgationDuration | wml11:./Variable/timescale/timeSupport |
| Spacing | isRegular=true; TimeSpacing | om:OM\_Observation/om:result/wml2:MeasurementTimeseries /wml2:metadata/wml2:TSMetadata/wml2:spacing | wml11:./Variable/timeSupport wml11:./Variable/timescale/timeSpacing |
| Cumulative (flag is cumulative) | valueType (cumulative) |  | wml11:./Variable/valueType =’cummulative’ |
| Accumulation length | timeSupport | om:OM\_Observation/om:result/wml2:MeasurementTimeseries /wml2:metadata/wml2:TSMetadata/wml2:accumulationIntervalLength |  |
| Sample Media | Sample media | om:OM\_Observation/om:result/wml2:MeasurementTimeseries /wml2:metadata/wml2:TSMetadata/sampleMedia/ | ../Variable/SampleMedium |
| Status |  | om:OM\_Observation/om:metadata/wml2:ObservationMetadataType/status |  |
| Intended Sampling Interval |  | om:OM\_Observation/om:metadata/wml2:ObservationMetadataType/wml2:status |  |
| Maximum Gap |  | om:OM\_Observation/om:metadata/wml2:ObservationMetadataType/wml2:maximumGap |  |
| offset | OfestValueOffsetTypeId | om:OM\_Observation/om:parameter/om:NamedValue | DataValue[@offsetValue]DataValue[@offsetId]../Offset[@offsetTypeID=(value from datavalue)] |

Offset – Offset can be done in multiple methods. Best practices and data management will dictate the output.

1) Parameter of the Observation

2) Qualifier of the observation

Table . Defined Sample Media from WaterML.

|  |  |
| --- | --- |
| **Medium** | **OGC Name** |
| Water | [http://www.opengis.net/def/waterml/2.0/medium/Water](http://www.opengis.net/def/medium/WaterML/2.0/Water) |
| Ground Water | [http://www.opengis.net/def/waterml/2.0/medium/GroundWater](http://www.opengis.net/def/medium/WaterML/2.0/GroundWater) |
| Surface Water | [http://www.opengis.net/def/waterml/2.0/medium/SurfaceWater](http://www.opengis.net/def/medium/WaterML/2.0/SurfaceWater) |
| Sediment | [http://www.opengis.net/def/waterml/2.0/medium/SedimentWater](http://www.opengis.net/def/medium/WaterML/2.0/SedimentWater) |
| Pore Water | [http://www.opengis.net/def/waterml/2.0/medium/PoreWater](http://www.opengis.net/def/medium/WaterML/2.0/PoreWater) |
| Pore Air | [http://www.opengis.net/def/waterml/2.0/medium/PoreAir](http://www.opengis.net/def/medium/WaterML/2.0/PoreAir) |
| Soil | [http://www.opengis.net/def/waterml/2.0/medium/Soil](http://www.opengis.net/def/medium/WaterML/2.0/Soil) |
| Soil Air | [http://www.opengis.net/def/waterml/2.0/medium/SoilAir](http://www.opengis.net/def/medium/WaterML/2.0/SoilAir)  |
| Soil Water | [http://www.opengis.net/def/waterml/2.0/medium/SoilWater](http://www.opengis.net/def/medium/WaterML/2.0/SoilWater)  |
| Atmosphere | [http://www.opengis.net/def/waterml/2.0/medium/Atmosphere](http://www.opengis.net/def/medium/WaterML/2.0/Atmosphere)  |
| Tissue | [http://www.opengis.net/def/waterml/2.0/medium/Tissue](http://www.opengis.net/def/medium/WaterML/2.0/Tissue) |
| Ground snow | [http://www.opengis.net/def/waterml/2.0/medium/GroundSnow](http://www.opengis.net/def/medium/WaterML/2.0/GroundSnow) |
| Unknown | [http://www.opengis.net/def/waterml/2.0/medium/Unknown](http://www.opengis.net/def/medium/WaterML/2.0/Unknown) |

WML provides a list as guidance. Extendable using the coespace (OGC name)

Two examples are presented. A fragment from the WML2 specification, and a WaterML2 document generated from a WaterML 1.1 document.

### Example of Minimal Measurementtimeseries element Fragment from the WaterML 2. spec

<wml2:MeasurementTimeseries gml:id="xsd-encoding-rules.example"

 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:gml="http://www.opengis.net/gml/3.2"

 xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:wml2="http://www.opengis.net/waterml/2.0"

 xsi:schemaLocation="http://www.opengis.net/waterml/2.0 ../../waterml2.xsd">

 <gml:description>Example timeseries for XML encoding http://www.opengis.net/spec/waterml/2.0/req/xsd-encoding-rules</gml:description>

 <wml2:temporalExtent>

 <gml:TimePeriod gml:id="time-period.1">

 <gml:beginPosition>2011-11-21T12:26:00+10:00</gml:beginPosition>

 <gml:endPosition>2011-11-21T12:27:00+10:00</gml:endPosition>

 </gml:TimePeriod>

 </wml2:temporalExtent>

 <wml2:metadata>

 <wml2:MeasurementTimeseriesMetadata> </wml2:MeasurementTimeseriesMetadata>

 </wml2:metadata>

 <wml2:defaultPointMetadata>

 <wml2:DefaultTVPMeasurementMetadata>

 <wml2:uom uom="http://www.opengis.net/def/uom/UCUM/0/m"/>

 </wml2:DefaultTVPMeasurementMetadata>

 </wml2:defaultPointMetadata>

 <wml2:point>

 <wml2:MeasurementTVP>

 <wml2:time>2011-11-21T12:27:00+10:00</wml2:time>

 <wml2:value>3.45</wml2:value>

 <wml2:metadata>

 <wml2:TVPMeasurementMetadata>

 <wml2:interpolationType

 xlink:href="http://www.opengis.net/def/timeseriesType/WaterML/2.0/continuous"

 xlink:title="Instantaneous"/>

 </wml2:TVPMeasurementMetadata>

 </wml2:metadata>

 </wml2:MeasurementTVP>

 </wml2:point>

</wml2:MeasurementTimeseries>

### Example of Measurementtimeseries element Fragment from the WaterML 2. spec

The MeasurementtimeSeries element does not contain all the elements detailed in the above mapping

<wml2:MeasurementTimeseries gml:id="xsd-measurement-timeseries-tvp.example"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xmlns:gml="http://www.opengis.net/gml/3.2"
 xmlns:xlink="http://www.w3.org/1999/xlink"
 xmlns:wml2="http://www.opengis.net/waterml/2.0"
 xmlns:swe="http://www.opengis.net/swe/2.0"
 xsi:schemaLocation="http://www.opengis.net/waterml/2.0 ../../waterml2.xsd"
 >
 <gml:description>Example timeseries for XML encoding http://www.opengis.net/spec/waterml/2.0/req/xsd-timeseries-time-value-pair</gml:description>

 <wml2:temporalExtent>
 <gml:TimePeriod gml:id="time-period.1">
 <gml:beginPosition>2011-11-21T12:26:00+10:00</gml:beginPosition>
 <gml:endPosition>2011-11-21T12:30:00+10:00</gml:endPosition>
 </gml:TimePeriod>
 </wml2:temporalExtent>
 <wml2:metadata>
 <wml2:MeasurementTimeseriesMetadata>
 <wml2:baseTime>2011-11-21T12:27:00+10:00</wml2:baseTime>
 <wml2:spacing>PT1M</wml2:spacing>
 </wml2:MeasurementTimeseriesMetadata>
 </wml2:metadata>
 <wml2:defaultPointMetadata>
 <wml2:DefaultTVPMeasurementMetadata>
 <wml2:uom uom="http://www.opengis.net/def/uom/UCUM/0/m"/>
 <wml2:interpolationType
 xlink:href="http://www.opengis.net/def/timeseriesType/WaterML/2.0/continuous"
 xlink:title="Instantaneous"/>
 </wml2:DefaultTVPMeasurementMetadata>
 </wml2:defaultPointMetadata>
 <wml2:point>
 <wml2:MeasurementTVP>
 <wml2:value uom="m">3.0</wml2:value>
 </wml2:MeasurementTVP>
 </wml2:point>
 <wml2:point>
 <wml2:MeasurementTVP>
 <wml2:value>3.2</wml2:value>
 <wml2:metadata>
 <wml2:TVPMeasurementMetadata>
 <wml2:accuracy>
 <swe:Quantity>
 <swe:uom code="m"/>
 <swe:value>0.1</swe:value>
 </swe:Quantity>
 </wml2:accuracy>
 </wml2:TVPMeasurementMetadata>
 </wml2:metadata>
 </wml2:MeasurementTVP>
 </wml2:point>
 <wml2:point>
 <wml2:MeasurementTVP>
 <wml2:value xsi:nil="true"/>
 <wml2:metadata>
 <wml2:TVPMeasurementMetadata>
 <wml2:nilReason xlink:href="http://www.opengis.net/def/nil/OGC/0/missing" xlink:title="missing"/>
 </wml2:TVPMeasurementMetadata>
 </wml2:metadata>
 </wml2:MeasurementTVP>
 </wml2:point>
 <wml2:point>
 <wml2:MeasurementTVP>
 <wml2:value>3.63</wml2:value>
 </wml2:MeasurementTVP>
 </wml2:point>
</wml2:MeasurementTimeseries>

### Example of WaterML 2 Timeseries Using a Measurementtimeseries from WaterML 1 mapping.

 <om:OM\_Observation gml:id="observation-1">
 <om:metadata>
 <wml2:ObservationMetadata>
 <!—snip removed some details -->
 <gmd:identificationInfo xmlns:gco="http://www.isotc211.org/2005/gco"
 xmlns:gss="http://www.isotc211.org/2005/gss"
 xmlns:gmd="http://www.isotc211.org/2005/gmd">
 <gmd:MD\_DataIdentification>
 <gmd:citation>
 <gmd:CI\_Citation>
 <gmd:title>
 <gco:CharacterString>Water chemistry monitoring data collected by Jeff Horsburgh, David Stevens, David Tarboton, Nancy Mesner, Amber Spackman, and Sandra Gurrero at Utah State University as part of a National Science Foundation funded WATERS Network Test Bed project.</gco:CharacterString>
 </gmd:title>
 <gmd:date>
 <gmd:CI\_Date>
 <gmd:date>
 <gco:DateTime>2006-05-04T18:13:51.0Z</gco:DateTime>
 </gmd:date>
 <gmd:dateType>
 <gmd:CI\_DateTypeCode codeList="ISO" codeListValue="ISO" codeSpace="ISO"/>
 </gmd:dateType>
 </gmd:CI\_Date>
 </gmd:date>
 </gmd:CI\_Citation>
 </gmd:citation>
 <gmd:abstract>
 <gco:CharacterString>Water chemistry monitoring data collected by Utah State University as part of a National Science Foundation funded test bed project.</gco:CharacterString>
 </gmd:abstract>
 <gmd:language>
 <gco:CharacterString>EN-US</gco:CharacterString>
 </gmd:language>
 </gmd:MD\_DataIdentification>
 </gmd:identificationInfo>
 </wml2:ObservationMetadata>
 </om:metadata>
 <om:phenomenonTime>
 <gml:TimePeriod gml:id="phen\_time-1">
 <gml:beginPosition>2007-11-07T13:00:00</gml:beginPosition>
 <gml:endPosition>2007-12-20T14:05:00</gml:endPosition>
 </gml:TimePeriod>
 </om:phenomenonTime>
 <om:resultTime>
 <gml:TimeInstant gml:id="eor-1">
 <gml:timePosition>2007-12-20T14:05:00</gml:timePosition>
 </gml:TimeInstant>
 </om:resultTime>
 <om:procedure>
 <!-- http://www.opengis.net/spec/waterml/2.0/req/xml-water-observation/procedure
 The XML element “om:procedure” shall contain a subelement of “wml:WaterObservationProcess” or a member of its substitution group, or a xlink:href attribute referencing a such an element.-->
 <wml2:ObservationProcess gml:id="process-1">
 <wml2:processType xlink:href="http://www.opengis.net/def/processType/WaterML/2.0/Unknown"
 xlink:title="Water chemistry grab sample collected by technicians in the field."/>
 <wml2:processReference xlink:href="urn:cuahsi/wof/method:25"
 xlink:title="Water chemistry grab sample collected by technicians in the field."/>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="valueType" xlink:href="urn:cuahsi/valueType"/>
 <om:value xsi:type="xsd:string">Sample</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="noDataValue" xlink:href="urn:cuahsi/noDataValue"/>
 <om:value xsi:type="xsd:string">-9999</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="sampleMedium" xlink:href="urn:cuahsi/sampleMedium"/>
 <om:value xsi:type="xsd:string">Surface Water</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="speciation" xlink:href="urn:cuahsi/speciation"/>
 <om:value xsi:type="xsd:string">Not Applicable</om:value>
 </om:NamedValue>
 </wml2:parameter>
 </wml2:ObservationProcess>
 </om:procedure>
 <om:observedProperty xlink:href="LBR-USU41#variableCode-SampleConcept" xlink:title="SampleConcept"/>
 <om:featureOfInterest xlink:href="http://www.example.com/wfs?service=WFS&amp;request=GetFeature&amp;USU-LBR-Wellsville"/>

 <om:result>
 <wml2:MeasurementTimeseries gml:id="\_TS-1">
 <!--domainExtent refers to time described
 above-->
 <wml2:temporalExtent xlink:href="#phen\_time-1"/>
 <!--8.2.8 metadata (OM\_Observation) basetime spacing
 startAnchorPoint endAnchorPoint accumulationAnchorTime
 accumulationIntervalLength aggregationDuration -->
 <wml2:metadata>
 <wml2:MeasurementTimeseriesMetadata>
 <!--8.2.8 metadata (OM\_Observation) basetime
 spacing commentblock startAnchorPoint endAnchorPoint
 cumulative accumulationAnchorTime
 accumulationIntervalLength aggregationDuration -->
 <wml2:cumulative>false</wml2:cumulative>
 </wml2:MeasurementTimeseriesMetadata>
 </wml2:metadata>
 <wml2:defaultPointMetadata>
 <wml2:DefaultTVPMeasurementMetadata>
 <wml2:quality xlink:href="http://www.opengis.net/def/timeseriesType/WaterML/2.0/nc"
 xlink:title="nc"/>
 <!--8.6.5 Data type mapping to
 InterpolationType
 breaking in the RFC schema-->
 <wml2:interpolationType xlink:href="http://www.opengis.net/def/timeseriesType/WaterML/2.0/Sporadic"
 xlink:title="Sporadic"/>

 <wml2:processing xlink:href="urn:cuahsi/qualityControlLevel0" xlink:title="Raw Data"/>
 <!--8.6.3 unitOfMeasure. Mapping. only one or two
 are done presently. The unit of measure is specified
 using the ISO19103 UnitOfMeasure type. -->

 </wml2:DefaultTVPMeasurementMetadata>
 </wml2:defaultPointMetadata>
 <wml2:point>
 <wml2:TimeValuePair>
 <wml2:time>2007-11-07T13:00:00</wml2:time>
 <wml2:value>10.5</wml2:value>
 <wml2:metadata>
 <wml2:TVPMeasureMetadata>
 <wml2:quality xlink:href="#qclevel-0"/>
 <!--link not functional.
 relatedObservation for sample 9188-->
 <wml2:uom uom="mg/L"/>

 </wml2:TVPMeasureMetadata>
 </wml2:metadata>
 </wml2:TimeValuePair>
 </wml2:point>
 <wml2:point>
 <wml2:TimeValuePair>
 <wml2:time>2007-11-07T13:00:00</wml2:time>
 <wml2:value>10.5</wml2:value>
 <wml2:metadata>
 <wml2:TVPMeasurementMetadata>
 <wml2:quality xlink:href="#qclevel-0"/>
 <wml2:processing xlink:href="#qclevel-0"/>

 </wml2:TVPMeasurementMetadata>
 </wml2:metadata>
 </wml2:TimeValuePair>
 </wml2:point>
 <wml2:point>
 <wml2:TimeValuePair>
 <wml2:time>2007-11-07T13:00:00</wml2:time>
 <wml2:value >10.5</wml2:value>
 <wml2:TVPMeasurementMetadata>
 <wml2:TVPMetadata>
 <wml2:quality xlink:href="#qclevel-0"/>

 </wml2:TVPMetadata>
 </wml2:TVPMeasurementMetadata>
 </wml2:TimeValuePair>
 </wml2:point>
 <wml2:point>
 <wml2:TimeValuePair>
 <wml2:time>2007-11-07T13:00:00</wml2:time>
 <wml2:value>10.5</wml2:value>

 </wml2:TimeValuePair>
 </wml2:point>
 <wml2:point>
 <wml2:TimeValuePair>
 <wml2:time>2007-11-07T13:00:00</wml2:time>
 <wml2:value codepace="urn:example">ABC</wml2:value>

 </wml2:TimeValuePair>
 </wml2:point>
 </wml2:MeasurementTimeseries>
 </om:result>
 </om:OM\_Observation>

## Result – Data Values

Defaults can be, and should be set for a set of values.

ADD SAMPLE LINKING,

|  |  |  |  |
| --- | --- | --- | --- |
| Information | ODM | WaterML 2/wml2:Collection/wml2:observationMember/om:OM\_Observation[/om:result/wml2:Timeseries/ | WaterML 1 base: /timeSeriesResponse/timeSeries/values/ |
| Time | DateTime | wml2:point/wml2:TimeValuePairMeasure/wml2:time | value[@dateTime] |
| value | DataValue | wml2:point/wml2:TimeValuePairMeasure/wml2:value | value[text()] |
| units | Variable/Unts | wml2:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:uomorwml2:point/wml2:TimeValuePairMeasure wml2:TVPMeasurementMetadata/wml2:uom | ../../variable/units |
| Data Quality | CensorCode | wml2:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2/wml2:qualityorwml2:point/wml2:TimeValuePairMeasure wml2:TVPMeasurementMetadata/wml2:quality | value[@censorCode] |
| Processing Level | QualityControlLevel | q | value[@qualityControlLevelCode]valesualityControlLevels3 |
| Interpolation Type | Variable/DataType | wml2:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:interpolationTypeorwml2:point/wml2:TimeValuePairMeasure wml2:TVPMeasurementMetadata/wml2:interpolationType | ../../Variable/DataType  |
| Related Observation | SampleCode | *reference to a WQX document* wml2:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:relatedObservation | value[@sampleCode]Samples |
| Qualifiers | Qualifier (0..1) | wml2:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:qualifierorwml2:point/wml2:TimeValuePairMeasure wml2:TVPMeasurementMetadata/wml2:qualifier | value[@qualifier]qualifiers3 |
| comment |  | wml2:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:comment |  |

Data Quality: Censored simply informs the user of the data (Good/Bad/Suspect). A second field will allow for agency specified data quality codes that required business rules.

Offset – Offset can be done in multiple methods. Best practices and data management will dictate the output.

1) Parameter of the Observation

2) Qualifier of the observation

3) In WML2, qualifiers and quality control levels can be described in the local dictionary.

### Example Single Data Value using MeasurementTVP with no metadata. time explicitly specified

<wml2:point>
 <wml2:MeasurementTVP>
 <wml2:time>2000-01-01T00:00:00.000Z</wml2:time>
 <wml2:value>266</wml2:value>
</wml2:MeasurementTVP>

### Example Single Data Value using MeasurementTVP with quality and Accuracy. time explicitly specified

<wml2:point>
 <wml2:MeasurementTVP>
 <wml2:time>2011-11-16T00:00:00+11:00</wml2:time>
 <wml2:value>2.0</wml2:value>
 <wml2:metadata>
 <wml2:TVPMeasurementMetadata>
 <wml2:quality xlink:href="http://www.opengis.net/def/waterml/quality/suspect"
 xlink:title="suspect"/>
 <wml2:accuracy>
 <swe:Quantity definition="http://sweet.jpl.nasa.gov/2.0/sciUncertainty.owl#Accuracy">
 <swe:label>Relative Accuracy</swe:label>
 <swe:uom code="%"/>
 <swe:value>2</swe:value>
 </swe:Quantity>
 </wml2:accuracy>
 </wml2:TVPMeasurementMetadata>
 </wml2:metadata>
 </wml2:MeasurementTVP>
 </wml2:point>

### Example Single Data Value using MeasurementTVP using with accuracy for a regularly spaced series

 <wml2:point>
 <wml2:MeasurementTVP>
 <wml2:value>3.2</wml2:value>
 <wml2:metadata>
 <wml2:TVPMeasurementMetadata>
 <wml2:accuracy>
 <swe:Quantity>
 <swe:uom code="m"/>
 <swe:value>0.1</swe:value>
 </swe:Quantity>
 </wml2:accuracy>
 </wml2:TVPMeasurementMetadata>
 </wml2:metadata>
 </wml2:MeasurementTVP>
 </wml2:point>

### Example Single Data Value using MeasurementTVP: Nil Measure for a regularly spaced time series

<wml2:point>
 <wml2:MeasurementTVP>
 <wml2:value xsi:nil="true"/>
 <wml2:metadata>
 <wml2:TVPMeasurementMetadata>
 <wml2:nilReason xlink:href="http://www.opengis.net/def/nil/OGC/0/missing" xlink:title="missing"/>
 </wml2:TVPMeasurementMetadata>
 </wml2:metadata>
 </wml2:MeasurementTVP>
 </wml2:point>

### Example Single Categorical Value using CategoricalTVP

<wml2:point>
 <wml2:CategoricalTVP>
 <wml2:time>2011-11-17T00:00:00+11:00</wml2:time>
 <wml2:value>
 <swe:Category>

 <swe:description>Usually begin and end suddenly. Relatively short-lived, but may last half an hour.
 Fall from cumulus clouds, often separated by blue sky. Showers may fall in patches rather than across
 the whole forecast area. Range in intensity from light to very heavy</swe:description>
 <swe:codeSpace xlink:href="http://www.bom.gov.au/info/wwords/" xlink:title="BoM weather words"/>

 <swe:value>Showers</swe:value>

 </swe:Category>
 </wml2:value>
 </wml2:CategoricalTVP>
 </wml2:point>

### Example Single Categorical Value using CategoricalTVP Nil Value

 <wml2:point>
 <wml2:CategoricalTVP>
 <wml2:time>2011-11-18T00:00:00+11:00</wml2:time>
 <wml2:value xsi:nil="true"></wml2:value>
 <wml2:metadata>
 <wml2:TVPMetadata>
 <wml2:nilReason nilReason="missing"/>
 <wml2:comment>No observation performed.</wml2:comment>
 </wml2:TVPMetadata>
 </wml2:metadata>
 </wml2:CategoricalTVP>
 </wml2:point>

## Result – Data Value Defaults.

The fields are the same as DataValue

|  |  |  |  |
| --- | --- | --- | --- |
| **Information** | **ODM** | **WaterML 2****/wml2:Collection/wml2:observationMember/om:OM\_Observation/om:result/wml2:MeasurementTimeseries**  | **WaterML 1 base: /timeSeriesResponse/timeSeries/values/** |
| units | Variable/Unts | wml2:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:uom | ../../variable/units |
| Data Quality | CensorCode | wml2:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:quality | Value[@censorCode] |
| Processing Level | QualityControlLevel | wml2:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:processing | value[@qualityControlLevelCode]value/qualityControlLevel |
| Interpolation Type | Variable/DataType | wml2:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:interpolationType | ../../variable/dataType  |
| Qualifiers | Qualifier (0..1) | wml2:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:qualifier | value@qualifiersqualifier |
| offset |  | wml2:defaultPointMetadata/wml2:DefaultTVPMeasurementMetadata/wml2:qualifier |  |

Offset – Offset can be done in multiple methods. Best practices and data management will dictate the output.

1) Parameter of the Observation

2) Qualifier of the observation

### Example of Default Metadata using DefaultTVPMeasurementMetadata

 <wml2:defaultPointMetadata>
 <wml2:DefaultTVPMeasurementMetadata>
 <wml2:uom uom="http://www.opengis.net/def/uom/UCUM/0/m"/>
 <wml2:interpolationType
 xlink:href="http://www.opengis.net/def/timeseriesType/WaterML/2.0/continuous"
 xlink:title="Instantaneous"/>
 </wml2:DefaultTVPMeasurementMetadata>
 </wml2:defaultPointMetadata>

### Example of Categorical Default Metadata using DefaultTVPCategoricalMetadata

 <wml2:defaultPointMetadata>
 <wml2:DefaultTVPCategoricalMetadata>
 <wml2:quality
 xlink:href="http://www.opengis.net/WaterML/2.0/def/quality/good"
 xlink:title="Good"
 />
 <wml2:codeSpace>http://www.example.com/terms/2.3</wml2:codeSpace>
 </wml2:DefaultTVPCategoricalMetadata>
 </wml2:defaultPointMetadata>

### Example XML fragment using DefaultTVPMeasurementMetadata from a mapped WaterML 1 document

 <wml2:defaultPointMetadata>
 <wml2:DefaultTVPMeasurementMetadata>
 <wml2:quality xlink:href="http://www.opengis.net/def/timeseriesType/WaterML/2.0/nc"
 xlink:title="nc"/>
 <!--8.6.5 Data type mapping to
 InterpolationType-->

 <wml2:interpolationType xlink:href="http://www.opengis.net/def/timeseriesType/WaterML/2.0/Sporadic"
 xlink:title="Sporadic"/>
 <wml2:comment xlink:href="#method-25"/>
 <wml2:processing xlink:href="urn:cuahsi/qualityControlLevel0" xlink:title="Raw Data"/>

 <wml2:uom uom="mg/L"/>
 </wml2:DefaultTVPMeasurementMetadata>

# Codespace and URL references

OGC standards utilize codespaces and referencing.

In order to not repeat elements, document often use xlink referencing.

## Dictionaries

Base: http://hiscentral.cuahsi.org/waterml2/dictionaries/

|  |  |
| --- | --- |
| Dictionary | Description |
| phenomena |  |
| quality |  |
| qualifier |  |
| method |  |
| censored |  |

## Codespace Mappings

Information that does not have a direct mapping, such as US geographic authority properties of a location ( State, County) are mapped to parameters.

In addition, even information with mappings, such as ValueType and DataType, are mapped into properties in order to store the original information.

<wml2:ObservationProcess gml:id="process-1">
 <!—snip 🡪

 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="valueType" xlink:href="http://his.cuahsi.org/wml/valueType " />
 <om:value xsi:type="xsd:string">Sample</om:value>
 </om:NamedValue>
 </wml2:parameter>

|  |  |  |
| --- | --- | --- |
| ODM | Codespace | WML2 element |
| SiteCode | http://hiscentral.cuahsi.org/network/{NETWORK}/ | MonitoringPoint/gml:identifier |
|  |  |  |
| SiteInfo/State | http://hiscentral.cuahsi.org/wml/siteProperty/State |  |
| SiteInfo/County | http://hiscentral.cuahsi.org/wml/siteProperty/County |  |
| SiteInfo/Elevation\_M | http://hiscentral.cuahsi.org/wml/siteProperty/Elevation\_M |  |
| SiteInfo/Site Comments | http://hiscentral.cuahsi.org/wml/siteProperty/comments |  |
| SiteInfo/verticalDatum | <http://hiscentral.cuahsi.org/wml/siteProperty/verticalDatum>(possible ogc: <http://www.opengis.net/def/verticalDatumType/OGC/1.0/geoidal.rdf>) |  |
|  |  |  |
| VariableCode | http://hiscentral.cuahsi.org/network/{NETWORK}/ |  |
| VariableName |  |  |
| Concept | http://hiscentral.cuahsi.org/ontology/SampleConcept |  |
| Variable/generalCategory | http://his.cuahsi.org/wml/generalCategory |  |
| Variable/dataType | http://his.cuahsi.org/wml/dataType |  |
| Variable/valueType | http://his.cuahsi.org/wmlvalueType |  |
| Variable/sampleMedium | http://his.cuahsi.org/wml/sampleMedium |  |
| Variable/noDataValue | http://his.cuahsi.org/wml/noDataValue |  |
| Variable/speciation | http://his.cuahsi.org/wml/speciation |  |
|  |  |  |
| qualiferCode | http://hiscentral.cuahsi.org/wml/qualifierCode |  |
| qualityControlLevel |  |  |
| censorCode |  |  |
|  |  |  |
| USGS SiteType | http://hiscentral.cuahsi.org/wml/siteProperty/siteTypeCd |  |
| USGS HUC | http://hiscentral.cuahsi.org/wml/siteProperty/hucCd |  |
| USGS State | http://hiscentral.cuahsi.org/wml/siteProperty/stateCd |  |
| USGS County | http://hiscentral.cuahsi.org/wml/siteProperty/countyCd |  |

## Xlink Roles and references

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |
| processReference | @Dictionary |  |
|  | @xlink:href | http://hiscentral.cuahsi.org/wml/method/{methodCode} |
|  | @xlink:title | {MethodName} |
| Qualifier (generic) | @Dictionary |  |
|  | @xlink:href | #qualifer-{CODE} |
|  | @xlink:role | http://hiscentral.cuahsi.org/def/qualifiertype/waterml2/generic |
|  |  |  |
|  |  |  |
| Analytical Sample | om:role @xlink:href | http://hiscentral.cuahsi.org/wml2/relatedObservation/WaterML/2.0/analyticalSample |
|  | om:role @xlink:title | Analytical Sample Observation |
|  |  |  |
| sampleMedium |  | See Vocabulary Mappings- Sample Medium and WaterM2 specification |
| processType |  | See Vocabulary Mappings- processes/ODM Value Type and WaterM2 specification |
| InterpolationType |  | See Vocabulary Mappings- Interpolation Type/Data Type and WaterM2 specification  |
| quality |  | See Vocabulary Mappings--Quality categories to ODM Censor Code and WaterM2 specification  |
| (wml1)Variable/options/option/ |  | http://hiscentral.cuahsi.org/wml/option/NWIS:UnitValues-Statistic |

## SWE Qualifiers

|  |  |  |
| --- | --- | --- |
|  |  |  |
| Offset | @definition | http://hiscentral.cuahsi.org/wml/offsetValue |
|  | @Idenfitier | (link to offsetType eg ) #offsetTypeCode-1 |
|  | swe:uom @code | (UCUM Unit eg. ) m |

# Permanent References for CUAHSI Vocabularies

The CUAHSI vocabularies will require URI’s. It is preferred that these be URL’s so the CUAHSI vocabulary system will need to be modified.

Terms will be mapped to a template such as this one, where the fields in brackets {} will be replaced with information from the database.

<rdf:RDF
 xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
 xmlns:skos="http://www.w3.org/2004/02/skos/core#"
 xmlns:wml2="http://www.opengis.net/waterml/2.0/"
 xmlns:gml="http://www.opengis.net/gml/3.2/"
 xmlns:dcterms="http://purl.org/dc/terms/"
 xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#" >
 <rdf:Description rdf:about="http://his.cuahsi.org/def/his/1.1/{ControlledVocabulary}/{VocabularyTermID}">
 <skos:prefLabel>{VocabularyTerm}</skos:prefLabel>
 <rdf:type rdf:resource="http://www.opengis.net/gml/3.2/Definition"/>
 <skos:inScheme rdf:resource="http://his.cuahsi.org/def/his/1.1/{ControlledVocabulary}/"/>
 <rdfs:comment>The layer of gases surrounding the planet Earth</rdfs:comment>
 <!-- <rdfs:isDefinedBy rdf:resource="https://portal.opengeospatial.org/files/?artifact\_id=47130"/> -->
 <rdfs:label>{VocabularyTerm}</rdfs:label>
 <rdfs:subClassOf rdf:resource="http://his.cuahsi.org/def/his/1.1/{ControlledVocabulary}/"/>
 <dcterms:description>http://his.cuahsi.org/def/his/1.1/{ControlledVocabulary}/</dcterms:description>
 <rdf:type rdf:resource="http://www.w3.org/2004/02/skos/core#Concept"/>
 <skos:definition>{VocabularyTermDefinition}</skos:definition>
 <rdf:type rdf:resource="http://www.w3.org/2000/01/rdf-schema#Class"/>
 </rdf:Description>
 <rdf:Description rdf:about="http://his.cuahsi.org/def/his/1.1/{ControlledVocabulary}/{VocabularyTermID}.rdf">
 <dcterms:created rdf:datatype="http://www.w3.org/2001/XMLSchema#date">{date}</dcterms:created>
 <dcterms:creator>CUAHSI HIS</dcterms:creator>
 <dcterms:subject rdf:resource="http://his.cuahsi.org/def/his/1.1/{ControlledVocabulary}/{VocabularyTermID}"/>
 </rdf:Description>
</rdf:RDF>

## Mappings in the XSLT

The XSLT mappings are in two files, at present:

1) DataType, ValueType, Sample medium, “WaterML1\_1\_common\_to\_waterml2.xsl”

2) Units in ‘HisUnits.xslt’ When adding additional mappings, this should be done in: “WaterML1\_1\_common\_to\_waterml2.xsl”

## Vocabulary Mappings

### processes/ODM Value Type

|  |  |  |
| --- | --- | --- |
| **Process type** | **OGC Name** | **ODM ValueType** |
| Simulation | [http://www.opengis.net/def/waterml/2.0/processType/Simulation](http://www.opengis.net/def/processType/WaterML/2.0/Simulation) | Model Simulation Result |
| Manual Method | [http://www.opengis.net/def/waterml/2.0/processType/ManualMethod](http://www.opengis.net/def/processType/WaterML/2.0/ManualMethod) | Sample |
| Sensor | [http://www.opengis.net/def/waterml/2.0/processType/Sensor](http://www.opengis.net/def/processType/WaterML/2.0/Sensor) | Field ObservationCalibration Value |
| Algorithm | [http://www.opengis.net/def/waterml/2.0/processType/Algorithm](http://www.opengis.net/def/processType/WaterML/2.0/Algorithm) | Derived Value |
| Unknown | [http://www.opengis.net/def/waterml/2.0/processType/Unknown](http://www.opengis.net/def/processType/WaterML/2.0/Unknown)  | Unknown |
|  |  | Calibration Value |

### Sample Medium

|  |  |  |
| --- | --- | --- |
| **Medium** | **OGC Name** | **ODM Sample Medium CV** |
| Water | [http://www.opengis.net/def/waterml/2.0/medium/Water](http://www.opengis.net/def/medium/WaterML/2.0/Water) |  |
| Ground Water | [http://www.opengis.net/def/waterml/2.0/medium/GroundWater](http://www.opengis.net/def/medium/WaterML/2.0/GroundWater) | Groundwater |
| Surface Water | [http://www.opengis.net/def/waterml/2.0/medium/SurfaceWater](http://www.opengis.net/def/medium/WaterML/2.0/SurfaceWater) | Surface Water |
| Sediment (Water) | [http://www.opengis.net/def/waterml/2.0/medium/SedimentWater](http://www.opengis.net/def/medium/WaterML/2.0/SedimentWater) | Sediment (?) |
| Pore Water | [http://www.opengis.net/def/waterml/2.0/medium/PoreWater](http://www.opengis.net/def/medium/WaterML/2.0/PoreWater) |  |
| Pore Air | [http://www.opengis.net/def/waterml/2.0/medium/PoreAir](http://www.opengis.net/def/medium/WaterML/2.0/PoreAir) |  |
| Soil | [http://www.opengis.net/def/waterml/2.0/medium/Soil](http://www.opengis.net/def/medium/WaterML/2.0/Soil) | Soil |
| Soil Air | [http://www.opengis.net/def/waterml/2.0/medium/SoilAir](http://www.opengis.net/def/medium/WaterML/2.0/SoilAir)  | Soil Air |
| Soil Water | [http://www.opengis.net/def/waterml/2.0/medium/SoilWater](http://www.opengis.net/def/medium/WaterML/2.0/SoilWater)  | Soil Water |
| Atmosphere | [http://www.opengis.net/def/waterml/2.0/medium/Atmosphere](http://www.opengis.net/def/medium/WaterML/2.0/Atmosphere)  | Air |
| Tissue | [http://www.opengis.net/def/waterml/2.0/medium/Tissue](http://www.opengis.net/def/medium/WaterML/2.0/Tissue) | Tissue |
| Ground snow | [http://www.opengis.net/def/waterml/2.0/medium/GroundSnow](http://www.opengis.net/def/medium/WaterML/2.0/GroundSnow) | Snow |
| Unknown | [http://www.opengis.net/def/waterml/2.0/medium/Unknown](http://www.opengis.net/def/medium/WaterML/2.0/Unknown) | Unknown |
|  | For now: http://his.cuahsi.org/wml//sampledMedium/{**Sample Medium}** | OtherFlowback water~~Snow~~Production waterPrecipitationNot RelevantMunicipal waste water |

### Interpolation Type/Data Type

The ODM specifies data is succeeding

|  |  |  |
| --- | --- | --- |
| **Interpolation Type** | **OGC name** | **Odm DataType** |
| Continuous/Instantaneous | <http://www.opengis.net/def/waterml/2.0/interpolationType/Continuous> | Continuous |
| Discontinuous | <http://www.opengis.net/def/waterml/2.0/interpolationType/Discontinuous> | Sporadic |
| Instantaneous total | <http://www.opengis.net/def/waterml/2.0/interpolationType/InstantTotal> | Incremental |
| Average in preceding interval | <http://www.opengis.net/def/waterml/2.0/interpolationType/AveragePrec> |  |
| Maximum in preceding interval | <http://www.opengis.net/def/waterml/2.0/interpolationType/MaxPrec> |  |
| Minimum in preceding interval | <http://www.opengis.net/def/waterml/2.0/interpolationType/MinPrec> |  |
| Preceding total | <http://www.opengis.net/def/waterml/2.0/interpolationType/TotalPrec> |  |
| Average in succeeding interval | <http://www.opengis.net/def/waterml/2.0/interpolationType/AverageSucc> | Average |
| Succeeding total | <http://www.opengis.net/def/waterml/2.0/interpolationType/TotalSucc> | Cumulative |
| Minimum in succeeding interval | <http://www.opengis.net/def/waterml/2.0/interpolationType/MinSucc> | Minimum |
| Maximum in succeeding interval | <http://www.opengis.net/def/waterml/2.0/interpolationType/MaxSucc> | Maximum |
| Constant in preceding interval | <http://www.opengis.net/def/waterml/2.0/interpolationType/ConstPrec> |  |
| Constant in succeeding interval | <http://www.opengis.net/def/waterml/2.0/interpolationType/ConstSucc> | Constant Over Interval Best Easy Systematic Estimator (name in procedure)Variance (name in procedure)StandardDeviation (name in procedure)Mode (name in procedure) |
|  |  |  |
| Categorical TimeSeries | (Specific type of TimeSeries) | Categorical |

.

### Quality categories to ODM Censor Code

|  |  |  |  |
| --- | --- | --- | --- |
| **Quality** | **OGC Name** | **Description** | **ODM Censor Code** |
| Good | <http://www.opengis.net/def/waterml/2.0/quality/good>  | The data has been examined and represents a reliable measurement. | not censorednon-detect |
| Suspect | [http://www.opengis.net/def/waterml/2.0/quality/suspect](http://www.opengis.net/def/waterml/2.0/def/quality/suspect) | The data should be treated as suspect. | present but not quantified |
| Estimate | [http://www.opengis.net/def/waterml/2.0/quality/estimate](http://www.opengis.net/WaterML/2.0/def/quality/estimate) | The data is an estimate only, not a direct measurement.  | less thangreater than |
| Poor | [http://www.opengis.net/def/waterml/2.0/quality/poor](http://www.opengis.net/WaterML/2.0/def/quality/poor)  | The data should be considered as low quality and may have been rejected.  |  |
| Unchecked | [http://www.opengis.net/def/waterml/2.0/quality/unchecked](http://www.opengis.net/WaterML/2.0/def/quality/unchecked) | The data has not been checked by any qualitative method.  |  |
| Missing | [http://www.opengis.net/def/waterml/2.0/quality/missing](http://www.opengis.net/WaterML/2.0/def/quality/missing) | The data is missing.  | (noDataValues will be mapped to this rule) |

# Example WaterML 2 document generated from WaterML 1.1

Examples:

* Basic
* Multiple QC with sample references
* With Offsets

### Basic Example

<wml2:Collection gml:id="generated\_collection\_doc" xmlns:wml2="http://www.opengis.net/waterml/2.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:wml="http://www.cuahsi.org/waterML/1.1/" xmlns:fn="http://www.w3.org/2005/xpath-functions" xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:om="http://www.opengis.net/om/2.0" xmlns:swe="http://www.opengis.net/swe/2.0" xmlns:op="http://schemas.opengis.net/op" xmlns:sf="http://www.opengis.net/sampling/2.0" xmlns:sams="http://www.opengis.net/samplingSpatial/2.0" xmlns:sam="http://www.opengis.net/sampling/2.0" xmlns:wml1\_0="http://www.cuahsi.org/waterML/1.0/" xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco" xmlns:gss="http://www.isotc211.org/2005/gss">
 <wml2:metadata>
 <wml2:DocumentMetadata gml:id="doc\_md">
 <wml2:generationDate>2011-01-01T00:00:00Z</wml2:generationDate>
 <wml2:version xlink:href="http://www.opengis.net/waterml/2.0" xlink:title="WaterML 2.0 RFC" />
 <wml2:generationSystem>XSLT Translation from WaterML1.1 response
 document</wml2:generationSystem>
 </wml2:DocumentMetadata>
 </wml2:metadata>
 <wml2:localDictionary>
 <gml:Dictionary gml:id="phenomena">
 <gml:identifier codeSpace="http://hiscentral.cuahsi.org/waterml2/dictionaries/">phenomena</gml:identifier>
 <gml:dictionaryEntry>
 <gml:Definition gml:id="LBR-USU6">
 <gml:description xlink:href="http://example.com/rest/properties/LBR:USU6" xlink:title="Turbidity" />
 <gml:identifier codeSpace="http://hiscentral.cuahsi.org/wml/localidenfier/">LBR:USU6</gml:identifier>
 <gml:name codeSpace="http://hiscentral.cuahsi.org/ontology/SampleConcept">SampleConcept</gml:name>
 <gml:name codeSpace="http://example.com/rest/properties/LBR:USU6"></gml:name>
 </gml:Definition>
 </gml:dictionaryEntry>
 </gml:Dictionary>
 </wml2:localDictionary>
 <wml2:localDictionary>
 <gml:Dictionary gml:id="quality">
 <gml:identifier codeSpace="http://www.cuahsi.org/waterml2/dictionaries/">quality</gml:identifier>
 <gml:dictionaryEntry>
 <gml:Definition gml:id="qclevel-0">
 <gml:identifier codeSpace="http://hiscentral.cuahsi.org/wml/qualityControlLevelCode">0</gml:identifier>
 <gml:name codeSpace="http://hiscentral.cuahsi.org/wml/qualityControlLevelCode">Raw data</gml:name>
 <gml:remarks>Raw and unprocessed data and data products that have not undergone quality control. Depending on the variable, data type, and data transmission system, raw data may be available within seconds or minutes after the measurements have been made. Examples include real time precipitation, streamflow and water quality measurements.</gml:remarks>
 </gml:Definition>
 </gml:dictionaryEntry>
 </gml:Dictionary>
 </wml2:localDictionary>
 <wml2:localDictionary>
 <gml:Dictionary gml:id="censorCode">
 <!--8.6.4 Data quality. Mapping needed-->
 <gml:identifier codeSpace="http://www.cuahsi.org/waterml2/dictionaries/">censorCode</gml:identifier>
 <gml:dictionaryEntry>
 <gml:Definition gml:id="censorCode-nc">
 <gml:identifier codeSpace="http://hiscentral.cuahsi.org/wml/censored">nc</gml:identifier>
 <gml:name codeSpace="http://hiscentral.cuahsi.org/wml/censored">not censored</gml:name>
 </gml:Definition>
 </gml:dictionaryEntry>
 </gml:Dictionary>
 </wml2:localDictionary>
 <wml2:localDictionary>
 <gml:Dictionary gml:id="method">
 <gml:identifier codeSpace="http://www.cuahsi.org/waterml2/dictionaries/">method</gml:identifier>
 <gml:dictionaryEntry>
 <gml:Definition gml:id="methodCode-2">
 <gml:identifier codeSpace="http://hiscentral.cuahsi.org/wml/method">2</gml:identifier>
 <gml:name codeSpace="http://hiscentral.cuahsi.org/wml/method">Turbidity measured using a Forest Technology Systems DTS-12 turbidity sensor.</gml:name>
 </gml:Definition>
 </gml:dictionaryEntry>
 </gml:Dictionary>
 </wml2:localDictionary>
 <wml2:samplingFeatureMember>
 <wml2:MonitoringPoint gml:id="USU-LBR-Mendon">
 <gml:identifier codeSpace="http://hiscentral.cuahsi.org/network/LBR">USU-LBR-Mendon</gml:identifier>
 <gml:name>Little Bear River at Mendon Road near Mendon, Utah</gml:name>
 <!-- <sam:sampledFeature xlink:href="http://example.com/datasource/0/sampledFeatures/3670" xlink:title="A River"/>
 -->
 <sam:parameter>
 <om:NamedValue>
 <om:name xlink:href="http://hiscentral.cuahsi.org/wml/siteProperty/elevation\_m/" xlink:title="elevation in meters" />
 <om:value xsi:type="xsd:string">1345</om:value>
 </om:NamedValue>
 </sam:parameter>
 <sam:parameter>
 <om:NamedValue>
 <om:name xlink:href="http://hiscentral.cuahsi.org/wml/siteProperty/verticalDatum/" xlink:title="Vertical Datum" />
 <om:value xsi:type="xsd:string">NGVD29</om:value>
 </om:NamedValue>
 </sam:parameter>
 <sam:parameter>
 <om:NamedValue>
 <om:name xlink:href="hhttp://hiscentral.cuahsi.org/wml/siteProperty/County" xlink:title="County" />
 <om:value xsi:type="xsd:string">Cache</om:value>
 </om:NamedValue>
 </sam:parameter>
 <sam:parameter>
 <om:NamedValue>
 <om:name xlink:href="hhttp://hiscentral.cuahsi.org/wml/siteProperty/State" xlink:title="State" />
 <om:value xsi:type="xsd:string">Utah</om:value>
 </om:NamedValue>
 </sam:parameter>
 <sam:parameter>
 <om:NamedValue>
 <om:name xlink:href="hhttp://hiscentral.cuahsi.org/wml/siteProperty/Site Comments" xlink:title="Site Comments" />
 <om:value xsi:type="xsd:string">Located below county road bridge at Mendon Road crossing</om:value>
 </om:NamedValue>
 </sam:parameter>
 <sams:shape>
 <gml:Point gml:id="USU-LBR-Mendon\_pos">
 <gml:pos srsName="EPSG:4269">41.718473 -111.946402</gml:pos>
 </gml:Point>
 </sams:shape>
 </wml2:MonitoringPoint>
 </wml2:samplingFeatureMember>
 <wml2:observationMember>
 <om:OM\_Observation gml:id="observation-1">
 <om:metadata>
 <wml2:ObservationMetadata>
 <gmd:contact>
 <gmd:CI\_ResponsibleParty>
 <gmd:individualName>
 <gmd:LocalisedCharacterString locale="#EN-US">Jeff Horsburgh</gmd:LocalisedCharacterString>
 </gmd:individualName>
 <gmd:organisationName>
 <gmd:LocalisedCharacterString locale="#EN-US">Utah State University Utah Water Research Laboratory</gmd:LocalisedCharacterString>
 </gmd:organisationName>
 <gmd:contactInfo>
 <gmd:CI\_Contact>
 <gmd:phone>
 <gmd:CI\_Telephone>
 <gmd:voice>
 <gco:CharacterString>1-435-797-2946</gco:CharacterString>
 </gmd:voice>
 </gmd:CI\_Telephone>
 </gmd:phone>
 <gmd:address>
 <gmd:CI\_Address>
 <gmd:deliveryPoint>
 <gco:CharacterString>8200 Old Main Hill
,Logan, UT 84322-8200</gco:CharacterString>
 </gmd:deliveryPoint>
 <gmd:electronicMailAddress>
 <gco:CharacterString>jeff.horsburgh@usu.edu</gco:CharacterString>
 </gmd:electronicMailAddress>
 </gmd:CI\_Address>
 </gmd:address>
 <gmd:onlineResource>
 <gmd:CI\_OnlineResource>
 <gmd:linkage>
 <gmd:URL>http://www.bearriverinfo.org</gmd:URL>
 </gmd:linkage>
 </gmd:CI\_OnlineResource>
 </gmd:onlineResource>
 </gmd:CI\_Contact>
 </gmd:contactInfo>
 <gmd:role>
 <gmd:CI\_RoleCode codeList="contactType" codeSpace="http://hiscentral.cuahsi.org/wml/source/" codeListValue="main" />
 </gmd:role>
 </gmd:CI\_ResponsibleParty>
 </gmd:contact>
 <gmd:dateStamp gco:nilReason="inapplicable">
 <gco:DateTime>2006-05-04T18:13:51.0Z</gco:DateTime>
 </gmd:dateStamp>
 <gmd:locale>
 <gmd:PT\_Locale>
 <gmd:languageCode>
 <gmd:LanguageCode codeList="LanguageCode" codeListValue="EN-US">English-United States</gmd:LanguageCode>
 </gmd:languageCode>
 <gmd:characterEncoding>
 <gmd:MD\_CharacterSetCode codeList="MD\_CharacterSetCode" codeListValue="utf8">UTF 8</gmd:MD\_CharacterSetCode>
 </gmd:characterEncoding>
 </gmd:PT\_Locale>
 </gmd:locale>
 <gmd:identificationInfo>
 <gmd:MD\_DataIdentification>
 <gmd:citation>
 <gmd:CI\_Citation>
 <gmd:title>
 <gco:CharacterString>Continuous water quality monitoring by Jeff Horsburgh, David Stevens, Nancy Mesner and others from Utah State University as part of the USDA Conservation Effects Assessment Grant</gco:CharacterString>
 </gmd:title>
 <gmd:date>
 <gmd:CI\_Date>
 <gmd:date>
 <gco:DateTime>2006-05-04T18:13:51.0Z</gco:DateTime>
 </gmd:date>
 <gmd:dateType>
 <gmd:CI\_DateTypeCode codeList="ISO" codeListValue="ISO" codeSpace="ISO" />
 </gmd:dateType>
 </gmd:CI\_Date>
 </gmd:date>
 </gmd:CI\_Citation>
 </gmd:citation>
 <gmd:abstract>
 <gco:CharacterString>Continuous water quality monitoring by Utah State University as part of the USDA CEAP Grant</gco:CharacterString>
 </gmd:abstract>
 <gmd:language>
 <gco:CharacterString>EN-US</gco:CharacterString>
 </gmd:language>
 </gmd:MD\_DataIdentification>
 </gmd:identificationInfo>
 <!--wml2:intendedSamplingInterval-->
 <!-- wml2:status should be a mapping based on QC level... but there is no fixed qcvocab-->
 <wml2:sampledMedium xlink:href="http://www.opengis.net/def/waterml/2.0/medium/SurfaceWater" xlink:title="Surface Water" />
 <!--wml2:maximumGap-->
 </wml2:ObservationMetadata>
 </om:metadata>
 <om:phenomenonTime>
 <gml:TimePeriod gml:id="phen\_time-1">
 <gml:beginPosition>2008-01-01T00:00:00</gml:beginPosition>
 <gml:endPosition>2008-02-01T00:00:00</gml:endPosition>
 </gml:TimePeriod>
 </om:phenomenonTime>
 <om:resultTime>
 <gml:TimeInstant gml:id="eor-1">
 <gml:timePosition>2008-02-01T00:00:00</gml:timePosition>
 </gml:TimeInstant>
 </om:resultTime>
 <om:procedure>
 <wml2:ObservationProcess gml:id="process-1">
 <gml:description>Turbidity measured using a Forest Technology Systems DTS-12 turbidity sensor.</gml:description>
 <gml:identifier codeSpace="urn:cuashi/his/methodCode">2</gml:identifier>
 <wml2:processType xlink:href="http://www.opengis.net/def/waterml/2.0/processType/Sensor" xlink:title="Turbidity measured using a Forest Technology Systems DTS-12 turbidity sensor." />
 <wml2:aggregationPeriod>PT5S</wml2:aggregationPeriod>
 <wml2:processReference xlink:href="http://www.ftsinc.com/" xlink:title="Turbidity measured using a Forest Technology Systems DTS-12 turbidity sensor." />
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="valueType" xlink:href="valueType" />
 <om:value xsi:type="xsd:string">Field Observation</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="noDataValue" xlink:href="noDataValue" />
 <om:value xsi:type="xsd:string">-9999</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="sampleMedium" xlink:href="sampleMedium" />
 <om:value xsi:type="xsd:string">Surface Water</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="speciation" xlink:href="speciation" />
 <om:value xsi:type="xsd:string">Not Applicable</om:value>
 </om:NamedValue>
 </wml2:parameter>
 </wml2:ObservationProcess>
 </om:procedure>
 <om:observedProperty xlink:href="#LBR-USU6" xlink:title="SampleConcept" />
 <om:featureOfInterest xlink:href="#USU-LBR-Mendon" xlink:title="Little Bear River at Mendon Road near Mendon, UtahUSU-LBR-Mendon" />
 <!--9.3.1.5 resultQuality would go here-->
 <om:result>
 <wml2:MeasurementTimeseries gml:id="\_TS-1">
 <!--domainExtent refers to time described
 above-->
 <wml2:temporalExtent xlink:href="#phen\_time-1" />
 <wml2:metadata>
 <wml2:MeasurementTimeseriesMetadata>
 <!--9.11.4 (TimeSeriesMetadata) + 9.14.1 (MeasurementTimeSeriesMetadata)
 basetime
 spacing commentblock startAnchorPoint endAnchorPoint
 cumulative accumulationAnchorTime
 accumulationIntervalLength aggregationDuration -->
 <wml2:cumulative>true</wml2:cumulative>
 <wml2:aggregationDuration>PT5S</wml2:aggregationDuration>
 </wml2:MeasurementTimeseriesMetadata>
 </wml2:metadata>
 <wml2:defaultPointMetadata>
 <wml2:DefaultTVPMeasurementMetadata>
 <wml2:quality xlink:href="http://www.opengis.net/def/waterml/2.0/quality/good" xlink:title="not censored" />
 <wml2:qualifier xlink:href="#methodCode-2" xlink:role="http://www.opengis.net/def/qualifiertype/waterml2/method" />
 <wml2:processing xlink:href="http://hiscentral.cuahsi.org/wml/qualityControl0" xlink:title="Raw data" />
 <!--8.6.3 unitOfMeasure. Mapping. only one or two
 are done presently. The unit of measure is specified
 using the ISO19103 UnitOfMeasure type. -->
 <wml2:uom uom="[NTU]" />
 <!--8.6.5 Data type mapping to
 InterpolationType-->
 <wml2:interpolationType xlink:href="http://www.opengis.net/def/timeseriesType/WaterML/2.0/AverageSucc" xlink:title="Median" />
 </wml2:DefaultTVPMeasurementMetadata>
 </wml2:defaultPointMetadata>
 <wml2:point>
 <wml2:MeasurementTVP>
 <wml2:time>2008-01-01T00:00:00</wml2:time>
 <wml2:value>24.15</wml2:value>
 </wml2:MeasurementTVP>
 </wml2:point>
 <wml2:point>
 <wml2:MeasurementTVP>
 <wml2:time>2008-01-01T00:30:00</wml2:time>
 <wml2:value>22.38</wml2:value>
 </wml2:MeasurementTVP>
 </wml2:point>
 <!-- snip -->
 <wml2:point>
 <wml2:MeasurementTVP>
 <wml2:time>2008-02-01T00:00:00</wml2:time>
 <wml2:value>9.02</wml2:value>
 </wml2:MeasurementTVP>
 </wml2:point>
 </wml2:MeasurementTimeseries>
 </om:result>
 </om:OM\_Observation>
 </wml2:observationMember>
</wml2:Collection>

### Multiple QC with sample references

<?xml version="1.0" encoding="utf-8"?>
<wml2:Collection gml:id="generated\_collection\_doc" xmlns:wml2="http://www.opengis.net/waterml/2.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:wml="http://www.cuahsi.org/waterML/1.1/" xmlns:fn="http://www.w3.org/2005/xpath-functions" xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:om="http://www.opengis.net/om/2.0" xmlns:swe="http://www.opengis.net/swe/2.0" xmlns:op="http://schemas.opengis.net/op" xmlns:sf="http://www.opengis.net/sampling/2.0" xmlns:sams="http://www.opengis.net/samplingSpatial/2.0" xmlns:sam="http://www.opengis.net/sampling/2.0" xmlns:wml1\_0="http://www.cuahsi.org/waterML/1.0/" xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco" xmlns:gss="http://www.isotc211.org/2005/gss">
 <wml2:metadata>
 <wml2:DocumentMetadata gml:id="doc\_md">
 <wml2:generationDate>2011-01-01T00:00:00Z</wml2:generationDate>
 <wml2:version xlink:href="http://www.opengis.net/waterml/2.0" xlink:title="WaterML 2.0 RFC" />
 <wml2:generationSystem>XSLT Translation from WaterML1.1 response
 document</wml2:generationSystem>
 </wml2:DocumentMetadata>
 </wml2:metadata>
 <wml2:localDictionary>
 <gml:Dictionary gml:id="phenomena">
 <gml:identifier codeSpace="http://hiscentral.cuahsi.org/waterml2/dictionaries/">phenomena</gml:identifier>
 <gml:dictionaryEntry>
 <gml:Definition gml:id="LBR-USU41">
 <gml:description xlink:href="http://example.com/rest/properties/LBR:USU41" xlink:title="Solids, total Suspended" />
 <gml:identifier codeSpace="http://hiscentral.cuahsi.org/wml/localidenfier/">LBR:USU41</gml:identifier>
 <gml:name codeSpace="http://hiscentral.cuahsi.org/ontology/SampleConcept">SampleConcept</gml:name>
 <gml:name codeSpace="http://example.com/rest/properties/LBR:USU41"></gml:name>
 </gml:Definition>
 </gml:dictionaryEntry>
 </gml:Dictionary>
 </wml2:localDictionary>
 <wml2:localDictionary>
 <gml:Dictionary gml:id="quality">
 <gml:identifier codeSpace="http://www.cuahsi.org/waterml2/dictionaries/">quality</gml:identifier>
 <gml:dictionaryEntry>
 <gml:Definition gml:id="qclevel-0">
 <gml:identifier codeSpace="http://hiscentral.cuahsi.org/wml/qualityControlLevelCode">0</gml:identifier>
 <gml:name codeSpace="http://hiscentral.cuahsi.org/wml/qualityControlLevelCode">Raw Data</gml:name>
 <gml:remarks></gml:remarks>
 </gml:Definition>
 </gml:dictionaryEntry>
 <gml:dictionaryEntry>
 <gml:Definition gml:id="qclevel-1">
 <gml:identifier codeSpace="http://hiscentral.cuahsi.org/wml/qualityControlLevelCode">1</gml:identifier>
 <gml:name codeSpace="http://hiscentral.cuahsi.org/wml/qualityControlLevelCode">Quality controlled data</gml:name>
 <gml:remarks>Quality controlled data that have passed quality assurance procedures such as routine estimation of timing and sensor calibration or visual inspection and removal of obvious errors. An example is USGS published streamflow records following parsing through USGS quality control procedures.</gml:remarks>
 </gml:Definition>
 </gml:dictionaryEntry>
 </gml:Dictionary>
 </wml2:localDictionary>
 <wml2:localDictionary>
 <gml:Dictionary gml:id="censorCode">
 <!--8.6.4 Data quality. Mapping needed-->
 <gml:identifier codeSpace="http://www.cuahsi.org/waterml2/dictionaries/">censorCode</gml:identifier>
 <gml:dictionaryEntry>
 <gml:Definition gml:id="censorCode-nc">
 <gml:identifier codeSpace="http://hiscentral.cuahsi.org/wml/censored">nc</gml:identifier>
 <gml:name codeSpace="http://hiscentral.cuahsi.org/wml/censored">not censored</gml:name>
 </gml:Definition>
 </gml:dictionaryEntry>
 </gml:Dictionary>
 </wml2:localDictionary>
 <wml2:localDictionary>
 <gml:Dictionary gml:id="method">
 <gml:identifier codeSpace="http://www.cuahsi.org/waterml2/dictionaries/">method</gml:identifier>
 <gml:dictionaryEntry>
 <gml:Definition gml:id="methodCode-25">
 <gml:identifier codeSpace="http://hiscentral.cuahsi.org/wml/method">25</gml:identifier>
 <gml:name codeSpace="http://hiscentral.cuahsi.org/wml/method">Water chemistry grab sample collected by technicians in the field.</gml:name>
 </gml:Definition>
 </gml:dictionaryEntry>
 </gml:Dictionary>
 </wml2:localDictionary>
 <wml2:samplingFeatureMember>
 <wml2:MonitoringPoint gml:id="USU-LBR-Wellsville">
 <gml:identifier codeSpace="http://hiscentral.cuahsi.org/network/LBR">USU-LBR-Wellsville</gml:identifier>
 <gml:name>Little Bear River near Wellsville, Utah</gml:name>
 <!-- <sam:sampledFeature xlink:href="http://example.com/datasource/0/sampledFeatures/3670" xlink:title="A River"/>
 -->
 <sam:parameter>
 <om:NamedValue>
 <om:name xlink:href="http://hiscentral.cuahsi.org/wml/siteProperty/elevation\_m/" xlink:title="elevation in meters" />
 <om:value xsi:type="xsd:string">1365</om:value>
 </om:NamedValue>
 </sam:parameter>
 <sam:parameter>
 <om:NamedValue>
 <om:name xlink:href="http://hiscentral.cuahsi.org/wml/siteProperty/verticalDatum/" xlink:title="Vertical Datum" />
 <om:value xsi:type="xsd:string">NGVD29</om:value>
 </om:NamedValue>
 </sam:parameter>
 <sam:parameter>
 <om:NamedValue>
 <om:name xlink:href="hhttp://hiscentral.cuahsi.org/wml/siteProperty/County" xlink:title="County" />
 <om:value xsi:type="xsd:string">Cache</om:value>
 </om:NamedValue>
 </sam:parameter>
 <sam:parameter>
 <om:NamedValue>
 <om:name xlink:href="hhttp://hiscentral.cuahsi.org/wml/siteProperty/State" xlink:title="State" />
 <om:value xsi:type="xsd:string">Utah</om:value>
 </om:NamedValue>
 </sam:parameter>
 <sam:parameter>
 <om:NamedValue>
 <om:name xlink:href="hhttp://hiscentral.cuahsi.org/wml/siteProperty/Site Comments" xlink:title="Site Comments" />
 <om:value xsi:type="xsd:string">Located on the upstream side of State Highway 101 bridge.</om:value>
 </om:NamedValue>
 </sam:parameter>
 <sams:shape>
 <gml:Point gml:id="USU-LBR-Wellsville\_pos">
 <gml:pos srsName="EPSG:4269">41.643457 -111.917649</gml:pos>
 </gml:Point>
 </sams:shape>
 </wml2:MonitoringPoint>
 </wml2:samplingFeatureMember>
 <wml2:observationMember>
 <om:OM\_Observation gml:id="observation-1">
 <om:metadata>
 <wml2:ObservationMetadata>
 <!-- snip See basic for metadata example-->
 <wml2:sampledMedium xlink:href="http://www.opengis.net/def/waterml/2.0/medium/SurfaceWater" xlink:title="Surface Water" />
 </wml2:ObservationMetadata>
 </om:metadata>
 <om:phenomenonTime>
 <gml:TimePeriod gml:id="phen\_time-1">
 <gml:beginPosition>2007-11-07T13:00:00</gml:beginPosition>
 <gml:endPosition>2007-12-20T14:05:00</gml:endPosition>
 </gml:TimePeriod>
 </om:phenomenonTime>
 <om:resultTime>
 <gml:TimeInstant gml:id="eor-1">
 <gml:timePosition>2007-12-20T14:05:00</gml:timePosition>
 </gml:TimeInstant>
 </om:resultTime>
 <om:procedure>
 <wml2:ObservationProcess gml:id="process-1">
 <gml:description>Water chemistry grab sample collected by technicians in the field.</gml:description>
 <gml:identifier codeSpace="urn:cuashi/his/methodCode">25</gml:identifier>
 <wml2:processType xlink:href="http://www.opengis.net/def/waterml/2.0/processType/ManualMethod" xlink:title="Water chemistry grab sample collected by technicians in the field." />
 <wml2:processReference xlink:href="http://hiscentral.cuahsi.org/wml/method/25" xlink:title="Water chemistry grab sample collected by technicians in the field." />
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="valueType" xlink:href="valueType" />
 <om:value xsi:type="xsd:string">Sample</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="noDataValue" xlink:href="noDataValue" />
 <om:value xsi:type="xsd:string">-9999</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="sampleMedium" xlink:href="sampleMedium" />
 <om:value xsi:type="xsd:string">Surface Water</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="speciation" xlink:href="speciation" />
 <om:value xsi:type="xsd:string">Not Applicable</om:value>
 </om:NamedValue>
 </wml2:parameter>
 </wml2:ObservationProcess>
 </om:procedure>
 <om:observedProperty xlink:href="#LBR-USU41" xlink:title="SampleConcept" />
 <om:featureOfInterest xlink:href="#USU-LBR-Wellsville" xlink:title="Little Bear River near Wellsville, UtahUSU-LBR-Wellsville" />
 <om:result>
 <wml2:MeasurementTimeseries gml:id="\_TS-1">
 <!--domainExtent refers to time described
 above-->
 <wml2:temporalExtent xlink:href="#phen\_time-1" />
 <wml2:metadata>
 <wml2:MeasurementTimeseriesMetadata>
 <wml2:cumulative>false</wml2:cumulative>
 </wml2:MeasurementTimeseriesMetadata>
 </wml2:metadata>
 <wml2:defaultPointMetadata>
 <wml2:DefaultTVPMeasurementMetadata>
 <wml2:quality xlink:href="http://www.opengis.net/def/waterml/2.0/quality/good" xlink:title="not censored" />
 <wml2:qualifier xlink:href="#methodCode-25" xlink:role="http://www.opengis.net/def/qualifiertype/waterml2/method" />
 <wml2:processing xlink:href="http://hiscentral.cuahsi.org/wml/qualityControl0" xlink:title="Raw Data" />
 <wml2:uom uom="mg/L" />
 <wml2:interpolationType xlink:href="http://www.opengis.net/def/timeseriesType/WaterML/2.0/Sporadic" xlink:title="Sporadic" />
 </wml2:DefaultTVPMeasurementMetadata>
 </wml2:defaultPointMetadata>
 <wml2:point>
 <wml2:MeasurementTVP>
 <wml2:time>2007-11-07T13:00:00</wml2:time>
 <wml2:value>10.5</wml2:value>
 <wml2:metadata>
 <wml2:TVPMeasurementMetadata>
 <!--link not functional.
 relatedObservation for sample 9188-->
 <wml2:relatedObservation>
 <om:ObservationContext>
 <om:role xlink:href="http://www.opengis.net/def/relatedObservation/WaterML/2.0/analyticalSample" xlink:title="Analytical Sample Observation" />
 <om:relatedObservation xlink:href="http://example.com/wqx/9188" xlink:title="LabCode:9188" />
 </om:ObservationContext>
 </wml2:relatedObservation>
 <wml2:processing xlink:href="#qclevel-0" />
 </wml2:TVPMeasurementMetadata>
 </wml2:metadata>
 </wml2:MeasurementTVP>
 </wml2:point>
<!-- snip -->
 <wml2:point>
 <wml2:MeasurementTVP>
 <wml2:time>2007-12-20T14:05:00</wml2:time>
 <wml2:value>2.5</wml2:value>
 <wml2:metadata>
 <wml2:TVPMeasurementMetadata>
 <!--link not functional.
 relatedObservation for sample G122007-WELL-TSS-->
 <wml2:relatedObservation>
 <om:ObservationContext>
 <om:role xlink:href="http://www.opengis.net/def/relatedObservation/WaterML/2.0/analyticalSample" xlink:title="Analytical Sample Observation" />
 <om:relatedObservation xlink:href="http://example.com/wqx/G122007-WELL-TSS" xlink:title="LabCode:G122007-WELL-TSS" />
 </om:ObservationContext>
 </wml2:relatedObservation>
 <wml2:processing xlink:href="#qclevel-1" />
 </wml2:TVPMeasurementMetadata>
 </wml2:metadata>
 </wml2:MeasurementTVP>
 </wml2:point>
 </wml2:MeasurementTimeseries>
 </om:result>
 </om:OM\_Observation>
 </wml2:observationMember>
</wml2:Collection>

### With Offset

<?xml version="1.0" encoding="utf-8"?>
<wml2:Collection gml:id="generated\_collection\_doc" xmlns:wml2="http://www.opengis.net/waterml/2.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:wml="http://www.cuahsi.org/waterML/1.1/" xmlns:fn="http://www.w3.org/2005/xpath-functions" xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:om="http://www.opengis.net/om/2.0" xmlns:swe="http://www.opengis.net/swe/2.0" xmlns:op="http://schemas.opengis.net/op" xmlns:sf="http://www.opengis.net/sampling/2.0" xmlns:sams="http://www.opengis.net/samplingSpatial/2.0" xmlns:sam="http://www.opengis.net/sampling/2.0" xmlns:wml1\_0="http://www.cuahsi.org/waterML/1.0/" xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco" xmlns:gss="http://www.isotc211.org/2005/gss">
 <wml2:metadata>
 <wml2:DocumentMetadata gml:id="doc\_md">
 <wml2:generationDate>2011-01-01T00:00:00Z</wml2:generationDate>
 <wml2:version xlink:href="http://www.opengis.net/waterml/2.0" xlink:title="WaterML 2.0 RFC" />
 <wml2:generationSystem>XSLT Translation from WaterML1.1 response
 document</wml2:generationSystem>
 </wml2:DocumentMetadata>
 </wml2:metadata>
 <wml2:localDictionary>
 <gml:Dictionary gml:id="phenomena">
 <gml:identifier codeSpace="http://hiscentral.cuahsi.org/waterml2/dictionaries/">phenomena</gml:identifier>
 <gml:dictionaryEntry>
 <gml:Definition gml:id="LBR-USU20">
 <gml:description xlink:href="http://example.com/rest/properties/LBR:USU20" xlink:title="Wind direction" />
 <gml:identifier codeSpace="http://hiscentral.cuahsi.org/wml/localidenfier/">LBR:USU20</gml:identifier>
 <gml:name codeSpace="http://hiscentral.cuahsi.org/ontology/SampleConcept">SampleConcept</gml:name>
 <gml:name codeSpace="http://example.com/rest/properties/LBR:USU20"></gml:name>
 </gml:Definition>
 </gml:dictionaryEntry>
 </gml:Dictionary>
 </wml2:localDictionary>
 <wml2:localDictionary>
 <gml:Dictionary gml:id="quality">
 <gml:identifier codeSpace="http://www.cuahsi.org/waterml2/dictionaries/">quality</gml:identifier>
 <gml:dictionaryEntry>
 <gml:Definition gml:id="qclevel-0">
 <gml:identifier codeSpace="http://hiscentral.cuahsi.org/wml/qualityControlLevelCode">0</gml:identifier>
 <gml:name codeSpace="http://hiscentral.cuahsi.org/wml/qualityControlLevelCode">Raw data</gml:name>
 <gml:remarks>Raw and unprocessed data and data products that have not undergone quality control. Depending on the variable, data type, and data transmission system, raw data may be available within seconds or minutes after the measurements have been made. Examples include real time precipitation, streamflow and water quality measurements.</gml:remarks>
 </gml:Definition>
 </gml:dictionaryEntry>
 </gml:Dictionary>
 </wml2:localDictionary>
 <wml2:localDictionary>
 <gml:Dictionary gml:id="censorCode">
 <!--8.6.4 Data quality. Mapping needed-->
 <gml:identifier codeSpace="http://www.cuahsi.org/waterml2/dictionaries/">censorCode</gml:identifier>
 <gml:dictionaryEntry>
 <gml:Definition gml:id="censorCode-nc">
 <gml:identifier codeSpace="http://hiscentral.cuahsi.org/wml/censored">nc</gml:identifier>
 <gml:name codeSpace="http://hiscentral.cuahsi.org/wml/censored">not censored</gml:name>
 </gml:Definition>
 </gml:dictionaryEntry>
 </gml:Dictionary>
 </wml2:localDictionary>
 <wml2:localDictionary>
 <gml:Dictionary gml:id="method">
 <gml:identifier codeSpace="http://www.cuahsi.org/waterml2/dictionaries/">method</gml:identifier>
 <gml:dictionaryEntry>
 <gml:Definition gml:id="methodCode-9">
 <gml:identifier codeSpace="http://hiscentral.cuahsi.org/wml/method">9</gml:identifier>
 <gml:name codeSpace="http://hiscentral.cuahsi.org/wml/method">Wind direction measured using a 03001 R.M. Young Wind Sentry Set (anemometer and vane).</gml:name>
 </gml:Definition>
 </gml:dictionaryEntry>
 </gml:Dictionary>
 </wml2:localDictionary>
 <wml2:localDictionary>
 <gml:Dictionary gml:id="offset">
 <gml:identifier codeSpace="http://www.cuahsi.org/waterml2/dictionaries/">censorCode</gml:identifier>
 <gml:dictionaryEntry>
 <gml:DefinitionCollection aggregationType="set" gml:id="offsetType-1">
 <gml:dictionaryEntry>
 <gml:Definition gml:id="offsetTypeDescripton-1">
 <gml:identifier codeSpace="http://hiscentral.cuahsi.org/wml/offset">1</gml:identifier>
 <gml:name codeSpace="http://hiscentral.cuahsi.org/wml/offset">Distance above ground level</gml:name>
 </gml:Definition>
 </gml:dictionaryEntry>
 <gml:dictionaryEntry>
 <gml:UnitDefinition gml:id="offsetTypeUnits-1">
 <gml:identifier codeSpace="http://www.opengis.net/def/uom/UCUM/0" />
 <gml:name codeSpace="http://hiscentral.cuahsi.org/wml/units">m</gml:name>
 </gml:UnitDefinition>
 </gml:dictionaryEntry>
 </gml:DefinitionCollection>
 </gml:dictionaryEntry>
 </gml:Dictionary>
 </wml2:localDictionary>
 <wml2:samplingFeatureMember>
 <wml2:MonitoringPoint gml:id="USU-LBR-ExpFarm">
 <gml:identifier codeSpace="http://hiscentral.cuahsi.org/network/LBR">USU-LBR-ExpFarm</gml:identifier>
 <gml:name>Utah State University Experimental Farm near Wellsville, Utah</gml:name>
 <!-- <sam:sampledFeature xlink:href="http://example.com/datasource/0/sampledFeatures/3670" xlink:title="A River"/>
 -->
 <sam:parameter>
 <om:NamedValue>
 <om:name xlink:href="http://hiscentral.cuahsi.org/wml/siteProperty/elevation\_m/" xlink:title="elevation in meters" />
 <om:value xsi:type="xsd:string">1369</om:value>
 </om:NamedValue>
 </sam:parameter>
 <sam:parameter>
 <om:NamedValue>
 <om:name xlink:href="http://hiscentral.cuahsi.org/wml/siteProperty/verticalDatum/" xlink:title="Vertical Datum" />
 <om:value xsi:type="xsd:string">NGVD29</om:value>
 </om:NamedValue>
 </sam:parameter>
 <sam:parameter>
 <om:NamedValue>
 <om:name xlink:href="hhttp://hiscentral.cuahsi.org/wml/siteProperty/County" xlink:title="County" />
 <om:value xsi:type="xsd:string">Cache</om:value>
 </om:NamedValue>
 </sam:parameter>
 <sam:parameter>
 <om:NamedValue>
 <om:name xlink:href="hhttp://hiscentral.cuahsi.org/wml/siteProperty/State" xlink:title="State" />
 <om:value xsi:type="xsd:string">Utah</om:value>
 </om:NamedValue>
 </sam:parameter>
 <sam:parameter>
 <om:NamedValue>
 <om:name xlink:href="hhttp://hiscentral.cuahsi.org/wml/siteProperty/Site Comments" xlink:title="Site Comments" />
 <om:value xsi:type="xsd:string">This is a continuous weather station.</om:value>
 </om:NamedValue>
 </sam:parameter>
 <sams:shape>
 <gml:Point gml:id="USU-LBR-ExpFarm\_pos">
 <gml:pos srsName="EPSG:4269">41.666993 -111.890567</gml:pos>
 </gml:Point>
 </sams:shape>
 </wml2:MonitoringPoint>
 </wml2:samplingFeatureMember>
 <wml2:observationMember>
 <om:OM\_Observation gml:id="observation-1">
 <om:metadata>
 <wml2:ObservationMetadata>
<!-- snip see basic -->
 <wml2:sampledMedium xlink:href="http://hiscentral.cuahsi.org/wml/sampledMedium" xlink:title="Air" />

 </wml2:ObservationMetadata>
 </om:metadata>
 <om:phenomenonTime>
 <gml:TimePeriod gml:id="phen\_time-1">
 <gml:beginPosition>2008-01-01T00:00:00</gml:beginPosition>
 <gml:endPosition>2008-02-01T00:00:00</gml:endPosition>
 </gml:TimePeriod>
 </om:phenomenonTime>
 <om:resultTime>
 <gml:TimeInstant gml:id="eor-1">
 <gml:timePosition>2008-02-01T00:00:00</gml:timePosition>
 </gml:TimeInstant>
 </om:resultTime>
 <om:procedure>
 <wml2:ObservationProcess gml:id="process-1">
 <gml:description>Wind direction measured using a 03001 R.M. Young Wind Sentry Set (anemometer and vane).</gml:description>
 <gml:identifier codeSpace="urn:cuashi/his/methodCode">9</gml:identifier>
 <wml2:processType xlink:href="http://www.opengis.net/def/waterml/2.0/processType/Sensor" xlink:title="Wind direction measured using a 03001 R.M. Young Wind Sentry Set (anemometer and vane)." />
 <wml2:aggregationPeriod>PT1H</wml2:aggregationPeriod>
 <wml2:processReference xlink:href="http://www.campbellsci.com/03001-wind-sentry" xlink:title="Wind direction measured using a 03001 R.M. Young Wind Sentry Set (anemometer and vane)." />
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="valueType" xlink:href="valueType" />
 <om:value xsi:type="xsd:string">Field Observation</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="noDataValue" xlink:href="noDataValue" />
 <om:value xsi:type="xsd:string">-9999</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="sampleMedium" xlink:href="sampleMedium" />
 <om:value xsi:type="xsd:string">Air</om:value>
 </om:NamedValue>
 </wml2:parameter>
 <wml2:parameter>
 <om:NamedValue>
 <om:name xlink:title="speciation" xlink:href="speciation" />
 <om:value xsi:type="xsd:string">Not Applicable</om:value>
 </om:NamedValue>
 </wml2:parameter>
 </wml2:ObservationProcess>
 </om:procedure>
 <om:observedProperty xlink:href="#LBR-USU20" xlink:title="SampleConcept" />
 <om:featureOfInterest xlink:href="#USU-LBR-ExpFarm" xlink:title="Utah State University Experimental Farm near Wellsville, UtahUSU-LBR-ExpFarm" />

 <om:result>
 <wml2:MeasurementTimeseries gml:id="\_TS-1">
 <!--domainExtent refers to time described
 above-->
 <wml2:temporalExtent xlink:href="#phen\_time-1" />
 <wml2:metadata>
 <wml2:MeasurementTimeseriesMetadata>

 <wml2:cumulative>true</wml2:cumulative>
 <wml2:aggregationDuration>PT1H</wml2:aggregationDuration>
 </wml2:MeasurementTimeseriesMetadata>
 </wml2:metadata>
 <wml2:defaultPointMetadata>
 <wml2:DefaultTVPMeasurementMetadata>
 <wml2:quality xlink:href="http://www.opengis.net/def/waterml/2.0/quality/good" xlink:title="not censored" />
 <wml2:qualifier xlink:href="#methodCode-9" xlink:role="http://www.opengis.net/def/qualifiertype/waterml2/method" />
 <wml2:processing xlink:href="http://hiscentral.cuahsi.org/wml/qualityControl0" xlink:title="Raw data" />

 <wml2:uom uom="deg" />
 <!--8.6.5 Data type mapping to
 InterpolationType-->
 <wml2:interpolationType xlink:href="http://www.opengis.net/def/timeseriesType/WaterML/2.0/ConstSucc" xlink:title=" Constant in succeeding interval (StandardDeviation) " />
 </wml2:DefaultTVPMeasurementMetadata>
 </wml2:defaultPointMetadata>
 <wml2:point>
 <wml2:MeasurementTVP>
 <wml2:time>2008-01-01T00:00:00</wml2:time>
 <wml2:value>16.47688</wml2:value>
 <wml2:metadata>
 <wml2:TVPMeasurementMetadata>
 <wml2:qualifier>
 <swe:Quantity definition="http://hiscentral.cuahsi.org/wml/offsetValue" identifier="#offsetTypeCode-1">
 <swe:uom code="m" />
 <swe:value>2.44</swe:value>
 </swe:Quantity>
 </wml2:qualifier>
 </wml2:TVPMeasurementMetadata>
 </wml2:metadata>
 </wml2:MeasurementTVP>
 </wml2:point>
<!-- snip -->
 <wml2:point>
 <wml2:MeasurementTVP>
 <wml2:time>2008-02-01T00:00:00</wml2:time>
 <wml2:value>76.24384</wml2:value>
 <wml2:metadata>
 <wml2:TVPMeasurementMetadata>
 <wml2:qualifier>
 <swe:Quantity definition="http://hiscentral.cuahsi.org/wml/offsetValue" identifier="#offsetTypeCode-1">
 <swe:uom code="m" />
 <swe:value>2.44</swe:value>
 </swe:Quantity>
 </wml2:qualifier>
 </wml2:TVPMeasurementMetadata>
 </wml2:metadata>
 </wml2:MeasurementTVP>
 </wml2:point>
 </wml2:MeasurementTimeseries>
 </om:result>
 </om:OM\_Observation>
 </wml2:observationMember>
</wml2:Collection>

NOTES and TODOs:

* TODO/Best Practice: samplingFeature Collection example (wml2:collection/wml2:samplingFeature/sams:SamplingFeatureCollection)
* WML 2 issue: Daylight savings time zone flag if it is utilized at a station
* WML2 issue: MonitoringPoint/monitoringType cardinality is incorrect. Should be 0\_unbounded (corrected in svn).
* WML2. Add dictionary entries for, SWE Quality, so that they can be referred to.
* How to handle original UNIT descriptions (aka information preservation)
* TODO/Best Practice: handling local locations, especially just relative offsets to a local project system.
* TODO/Best Practice: CensoredReason? (need example with censored reason in the examples)
* ValueType “Calibration” Value maps to: ???
* Add endpoint to Generic Web Services to return specific sample (as wqx?)
* URL Endpoints to add to HIS central
	+ Method
	+ Network
	+ sites