



Instituto Geográfico Nacional
CENTRO NACIONAL DE INFORMACIÓN GEOGRÁFICA

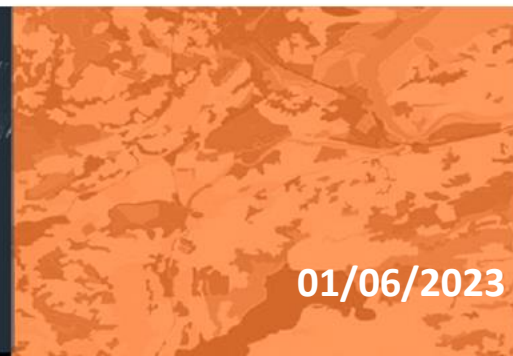


Hydrographic feature types and publication by web services



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www.ign.es



01/06/2023





TABLE OF CONTENTS

- 
- 
1. GRI Hydrography Project and Data Model – INSPIRE extension
 2. Problems with Data Model Implementation
 3. INSPIRE Views from Production Data Base
 4. Improving INSPIRE Implementation
 5. WMS
 6. WFS
 7. ATOM
 8. OGC API Features



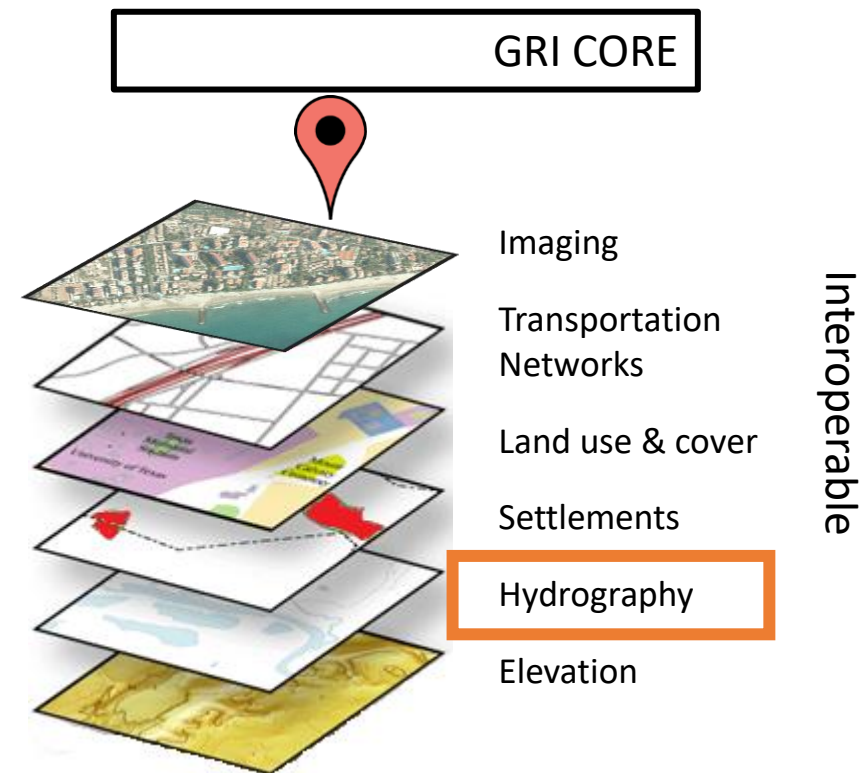
GRI Hydrography Project and Data Model

https://www.ign.es/resources/IGR/Hidrografia/IGN_especificaciones_IGR-HI.pdf

GRI: official geographical information with which any user and application could refer their data uniquely

Characteristics:

- ✓ Provides *precise location* without ambiguities
- ✓ Allows *data combination*
- ✓ Must be *maintained* over time
- ✓ Provided by a *competent source* with legal requirement



LEGAL REQUIREMENTS

INTEROPERABILITY



INSPIRE



WFD



USUARIOS

DGA +
Confederaciones

Cartografía básica
del estado

Cartografía de
CC.AA.

Ensure consistency between data reported in Inspire and in WFD Article 8.7.44 of EU 1089/2010 Regulation for the development of Inspire

OBJECTIVITY

QUALITY

USEFULNESS

UPDATED

Physical Waters



Network



Water Bodies

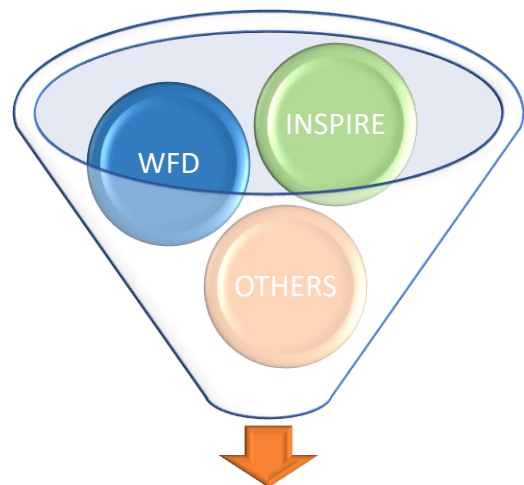


PRODUCTION FROM LiDAR

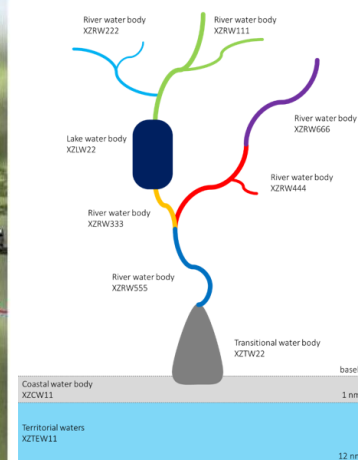
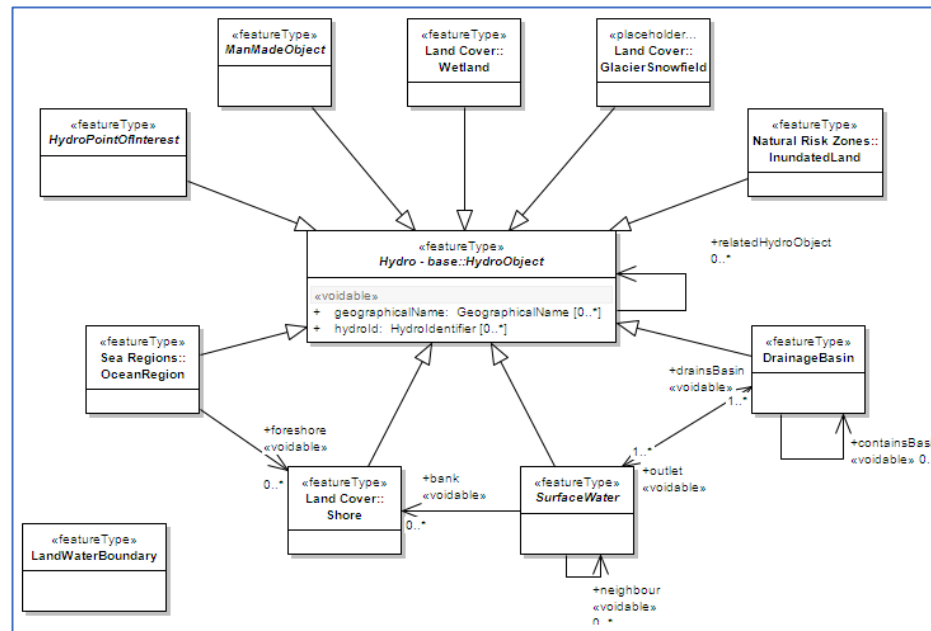
Network

→ Trimming the network by attributes

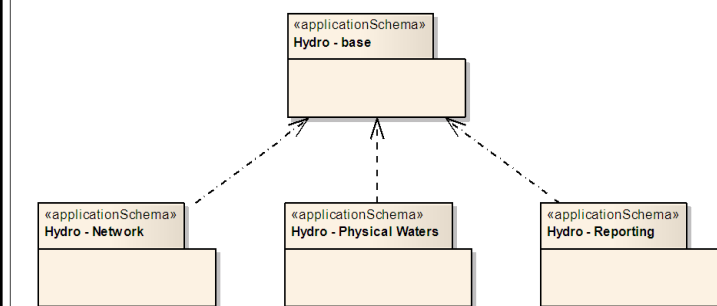
Data Model



DATA MODEL



pkg Hydrography package structure



hi_tramocurso_les120

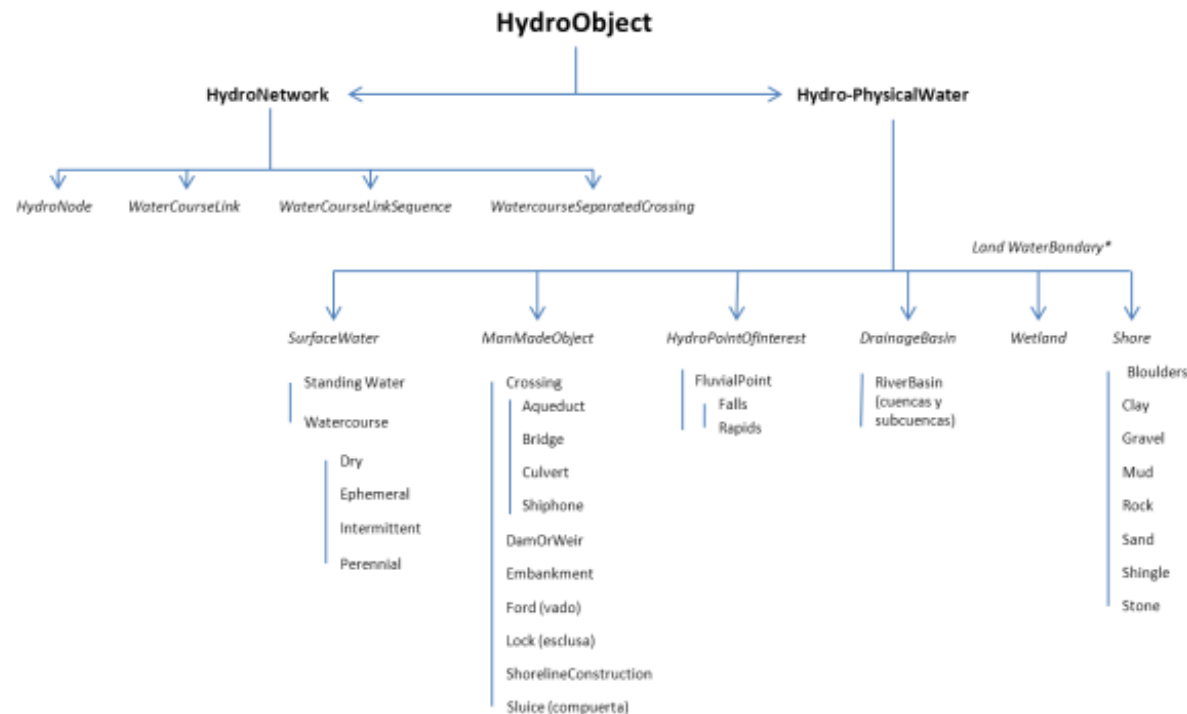
Columnas (40)

objectid
gid
fecha
version
fechabaja
feharef
coddemarc
nombre
idcurso
codrio
idtramodma
codmasa
continua
dma
tipocurso
idtramored
jerarquia
persistencia
posicion
condicion
orden
ordenesq
ordenamb
marea
delineado
anchomax
anchomin
longitud
situacion
tipored
resolucion
fuelle
origenxy
origenz
estado
modificado
revisor
observaciones
origen
geom

GRI HI
BACKBONE

CODIIGE* Technical Group: Guide for Hydrography Data Specification

Help Guide for creating the necessary coverages for INSPIRE Hydrography theme



* Posible cambio en la revisión de técnicos para la coordinación del tema 16 del anexo III de shoreline.

*Board of Directors of the Geographic Information Infrastructure of Spain

https://www.idee.es/resources/documentos/20170425_GuiaTransformacionCODIIGE-HY.pdf

Data Model - INSPIRE EXTENSION

Hydro Physical Waters::Surface Water

Attribute localType:

Is defined by INSPIRE as a localisedCharacterString.

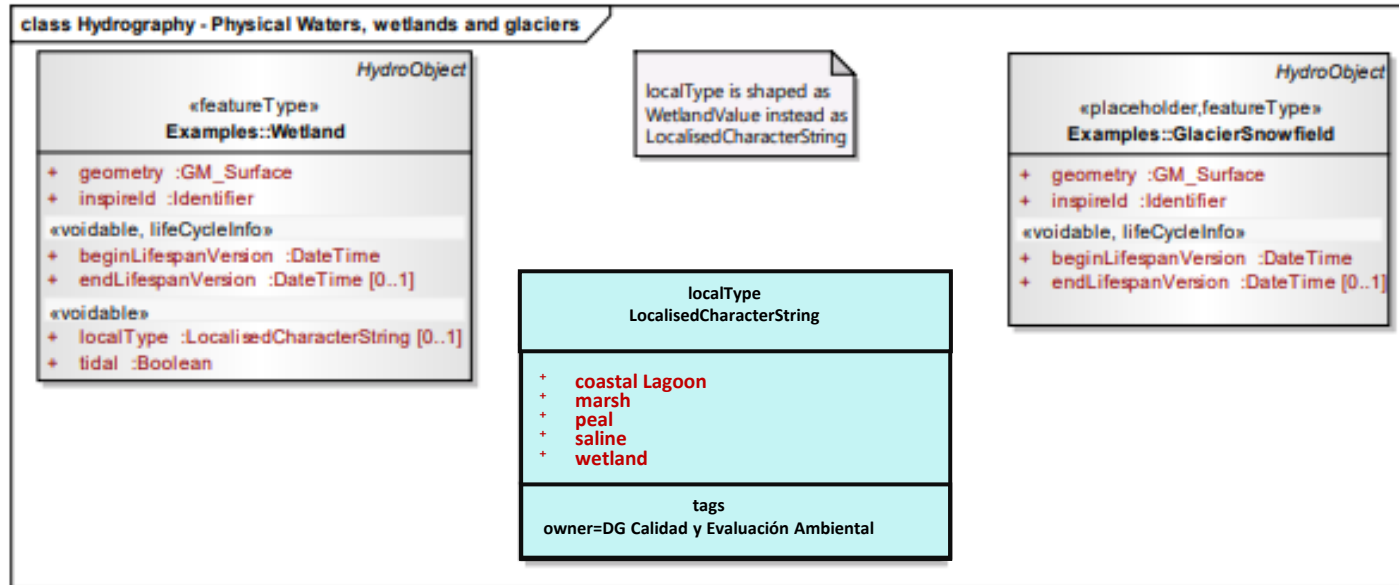
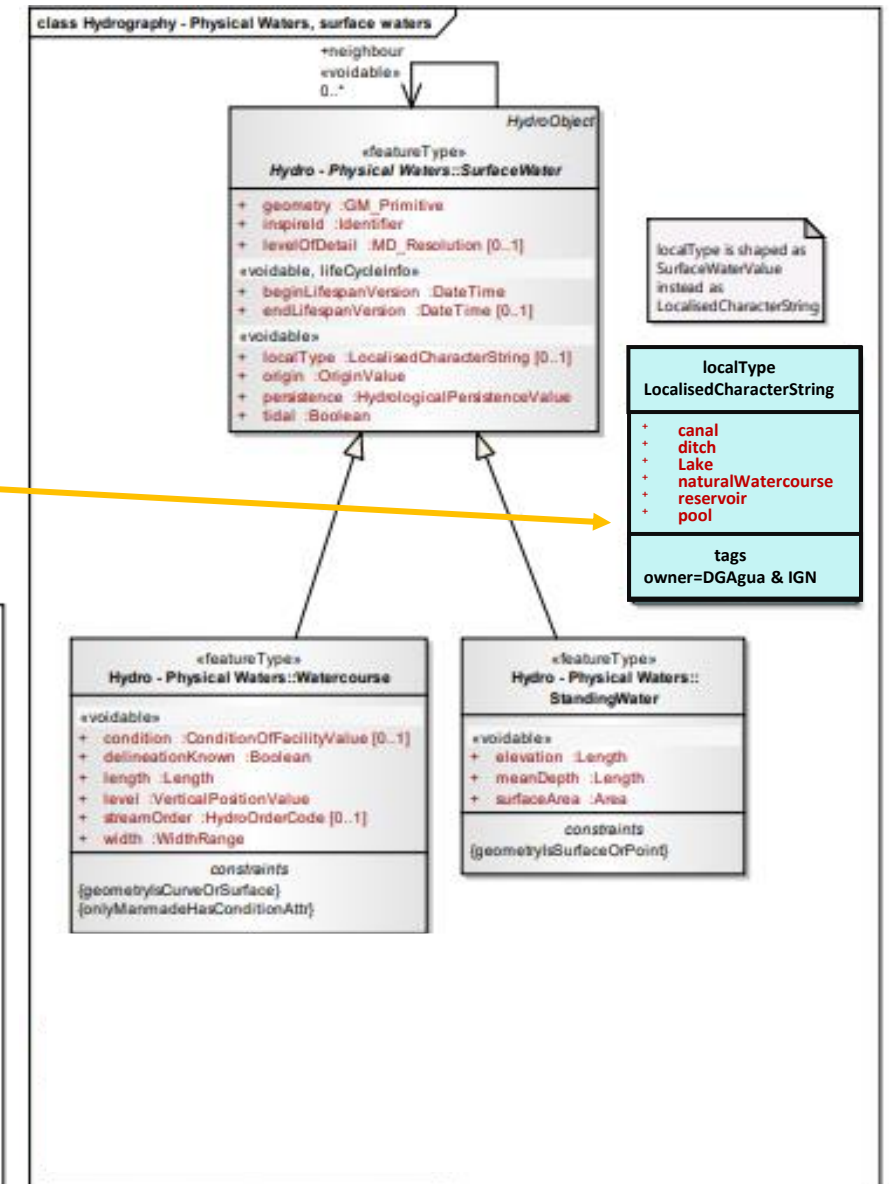
CODIIGE Technical Group defined a concrete list of possible strings for this attribute:

Watercourse

- Canal
- Ditch
- NaturalWatercourse

StandingWaters

- Lake
- Reservoir
- Pool



Data Model - INSPIRE EXTENSION

Hydro Physical Waters::Wetland

Attribute localType:

Is defined by INSPIRE as a localisedCharacterString.

CODIIGE Technical Group defined a concrete list of possible strings for this attribute:

CoastalLagoon

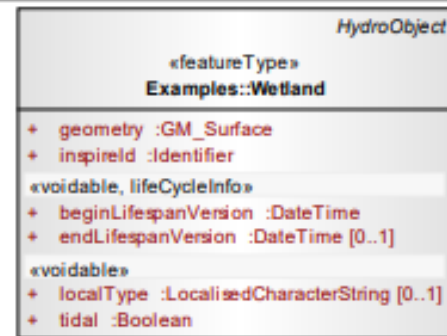
Marsh

Peal

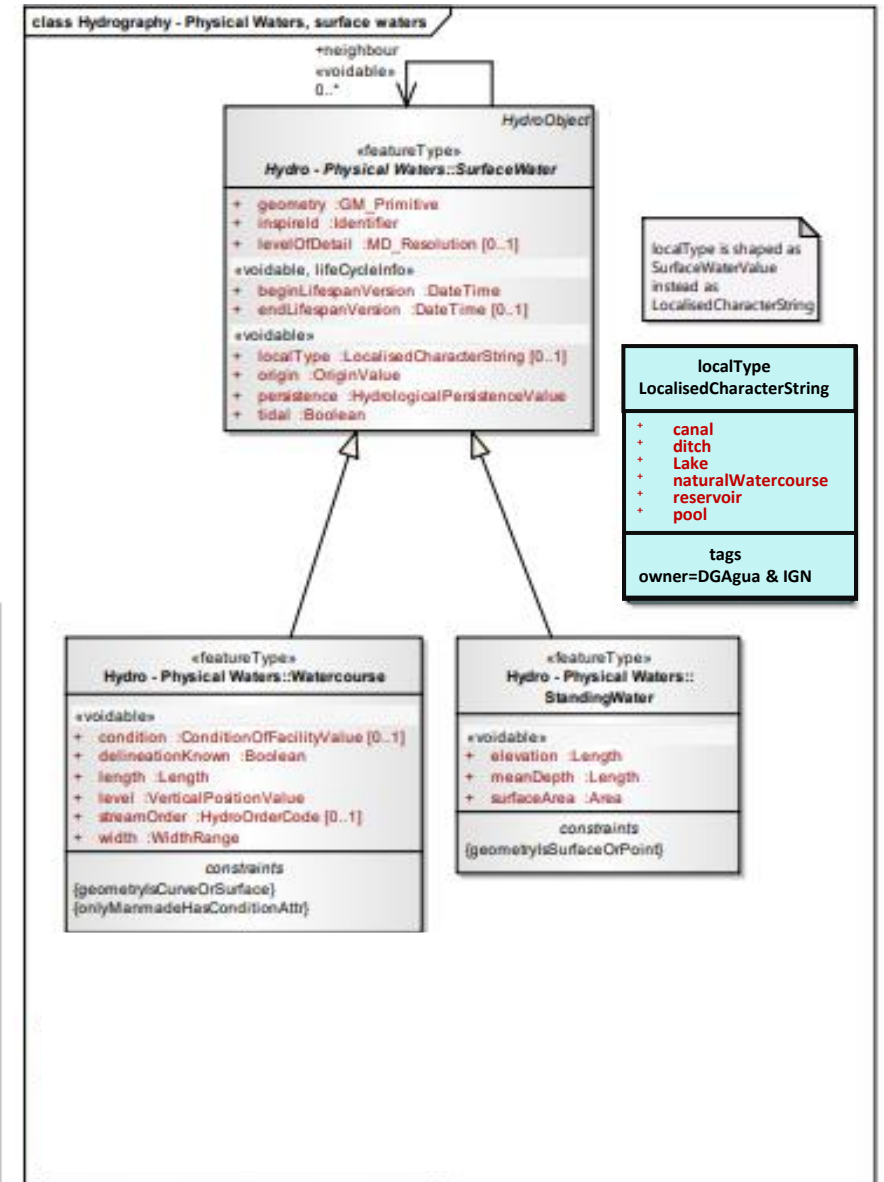
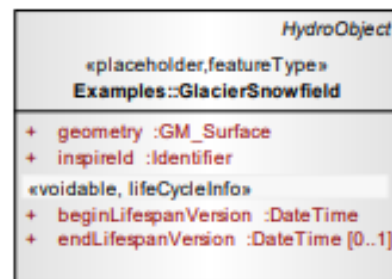
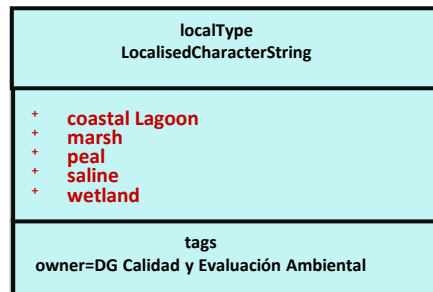
Saline

Wetland

class Hydrography - Physical Waters, wetlands and glaciers

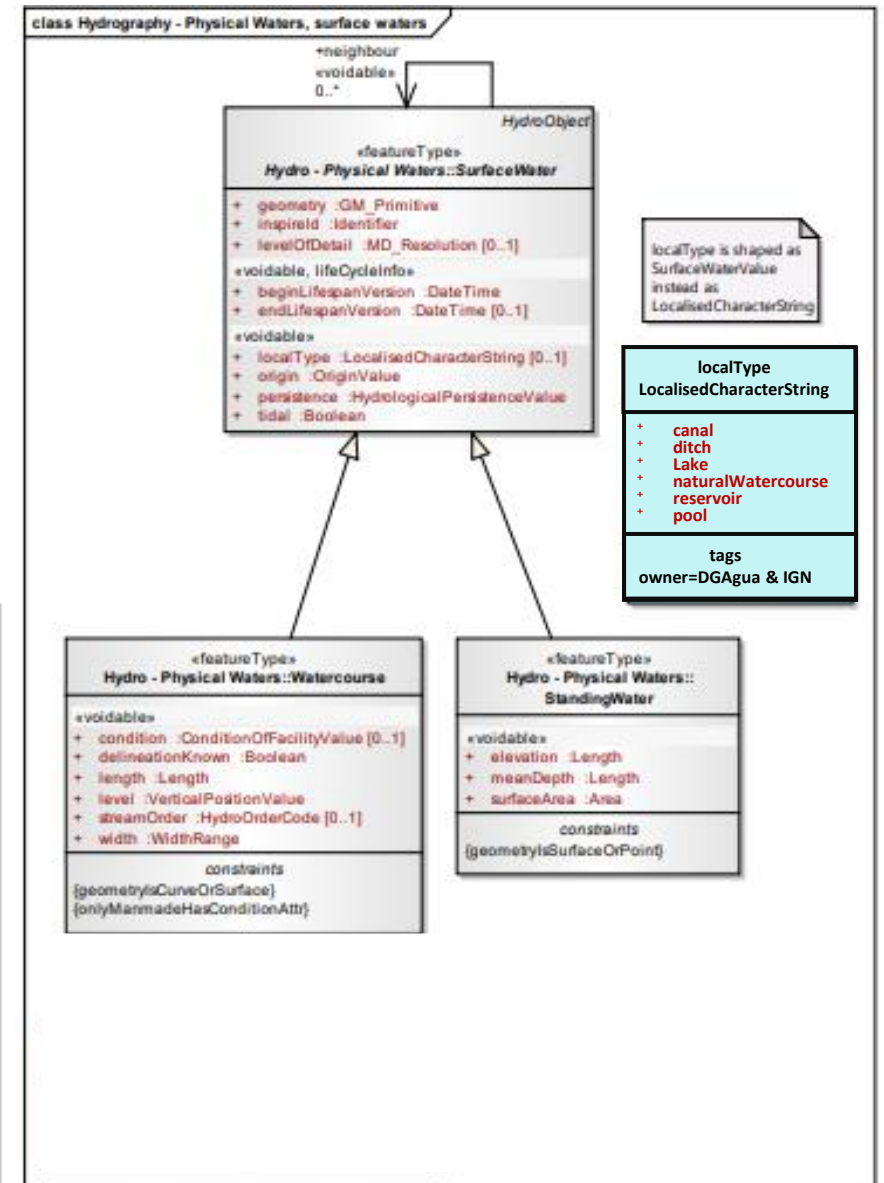
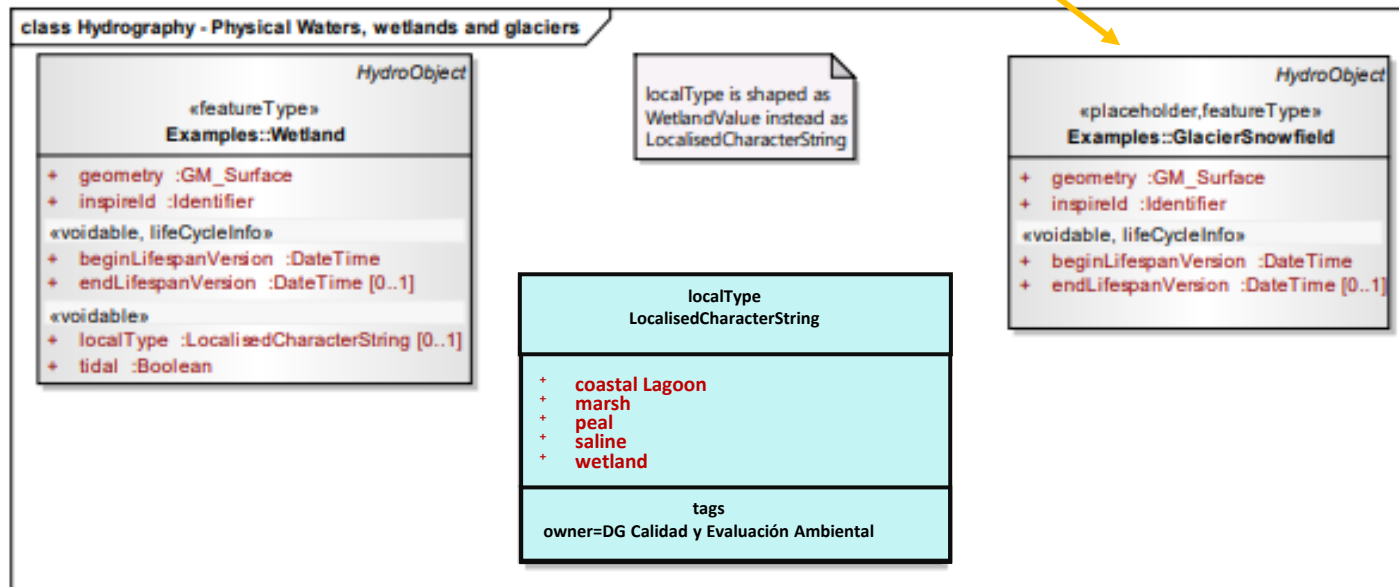


localType is shaped as
WetlandValue instead as
LocalisedCharacterString



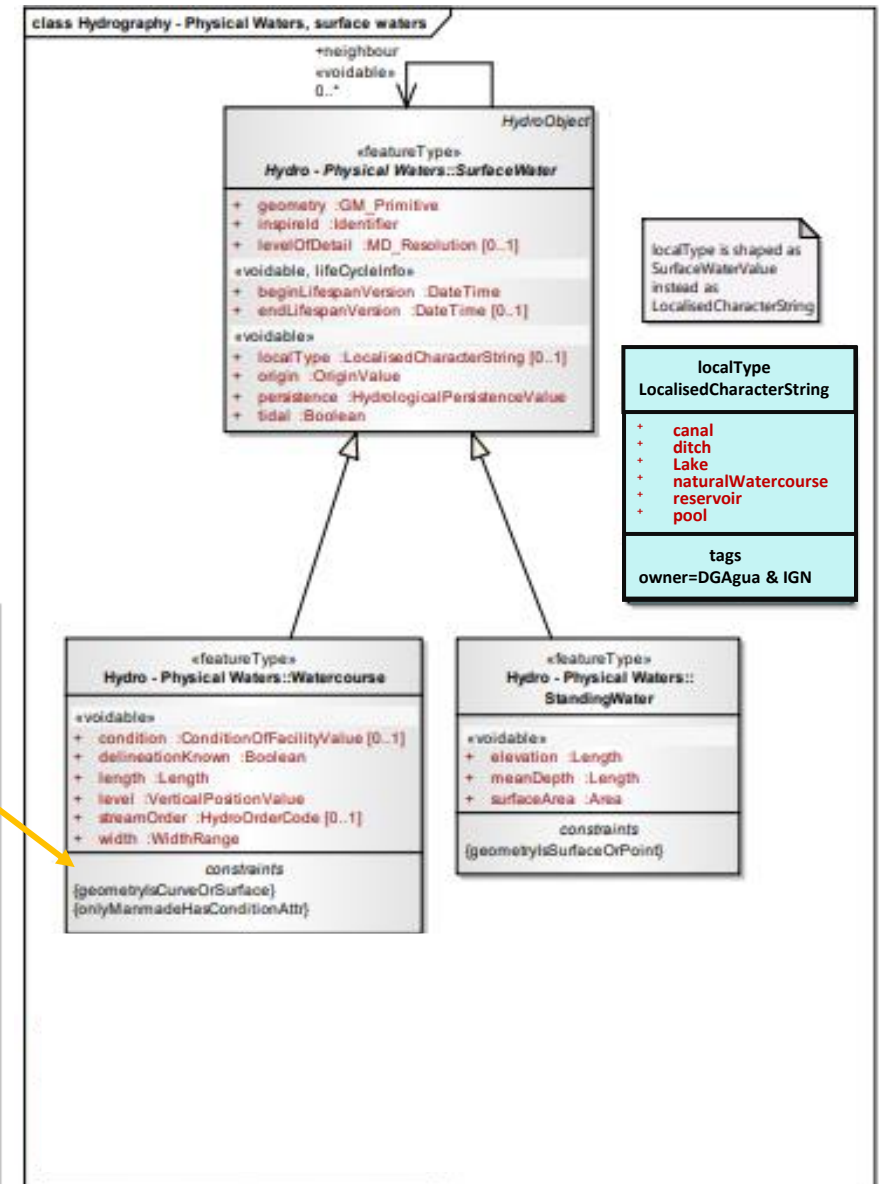
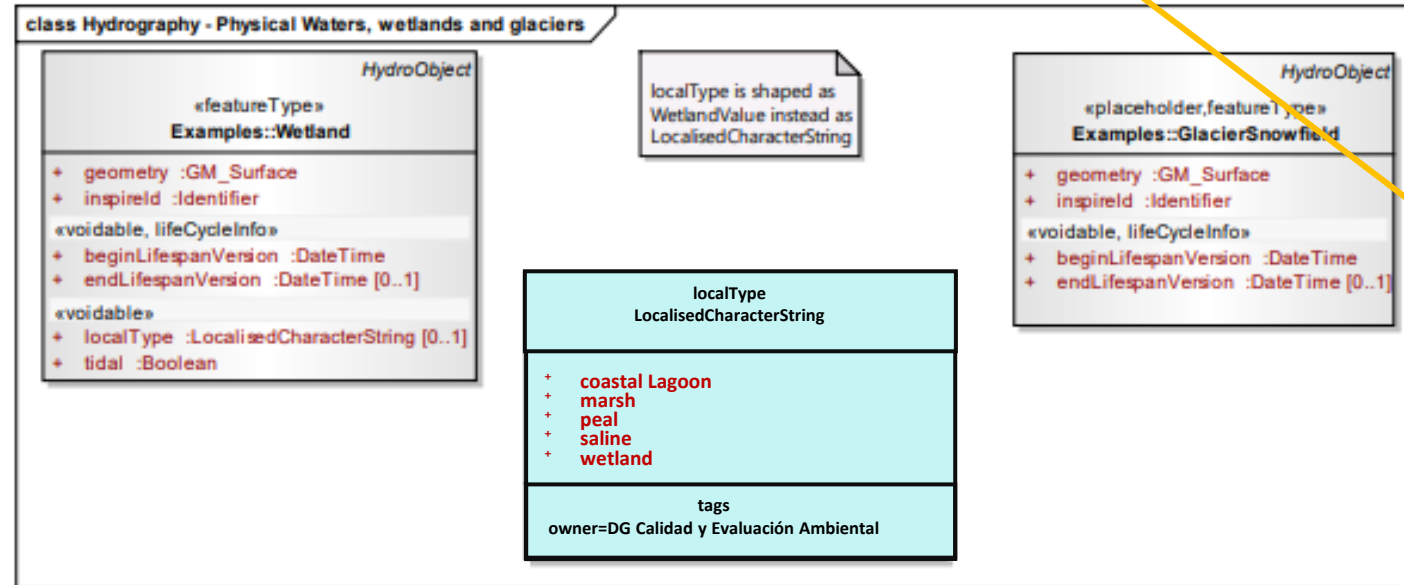
Data Model - INSPIRE EXTENSION

GlacierSnowfiled
Spanish Land Cover specification has not defined a feature type for glaciers, so it has been proposed to use the place holder in the hydrography specification



Data Model - INSPIRE EXTENSION

Further Constrains for PhysicalWaters::Watercourse
geometryIsCurveOrSurface
onlyManmadeHasConditionAttribute





Problems with Data Model Implementation

Problems with Data Model Implementation

There is no element found for some hydro objects

Solution: HydroObject is created but it is empty

- GlaciersandSnowfield
- ManMadeObject::Sluice

LandWaterBoundary: too many different lines.

Which one should we choose?

5.5.2.1.9. LandWaterBoundary

LandWaterBoundary

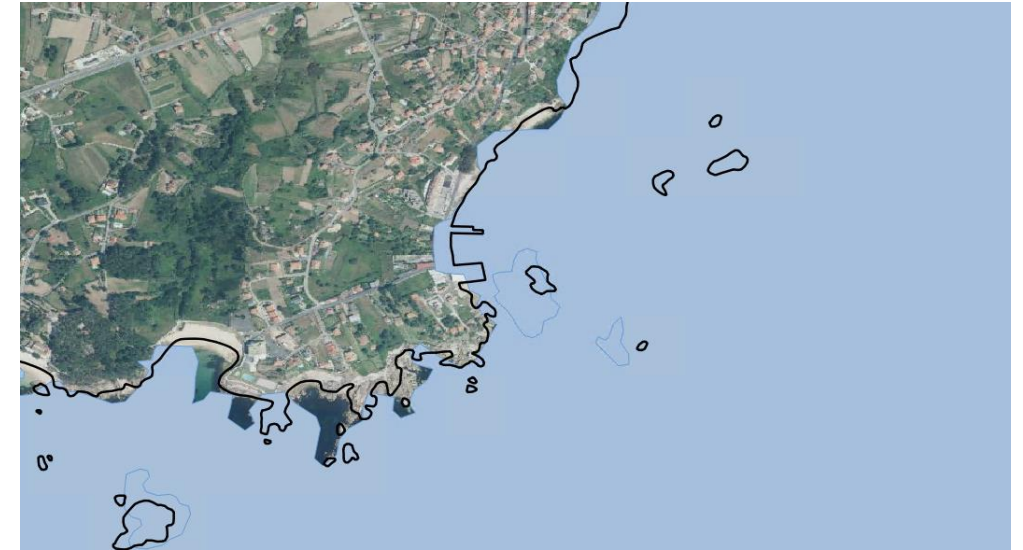
Definition: The line where a land mass is in contact with a body of water.

Description: SOURCE [DFDD].

NOTE The plane of reference for the land-water boundary should be a high water datum, such as 'Mean High Water Springs', 'High Water' or 'Mean Higher High Water'. Where there is little appreciable change in waterlevels / tide at the adjacent shore, then 'Mean Sea Level' or 'Local Datum' may be used.

Stereotypes: «featureType»

Inconsistency between LandWaterBoundary and SeaRegion



Solution: We have taken the information of the IHM with a double line:

- Low tide will be shoreline as is the hydrographical zero (value is mean level)
- High tide will be LandWaterBoundary as is the maximum máximo avance of tides towards land (mean level)

However, other objects like waterCourse, are not consistent with it as they must be consistent with cartographical zero

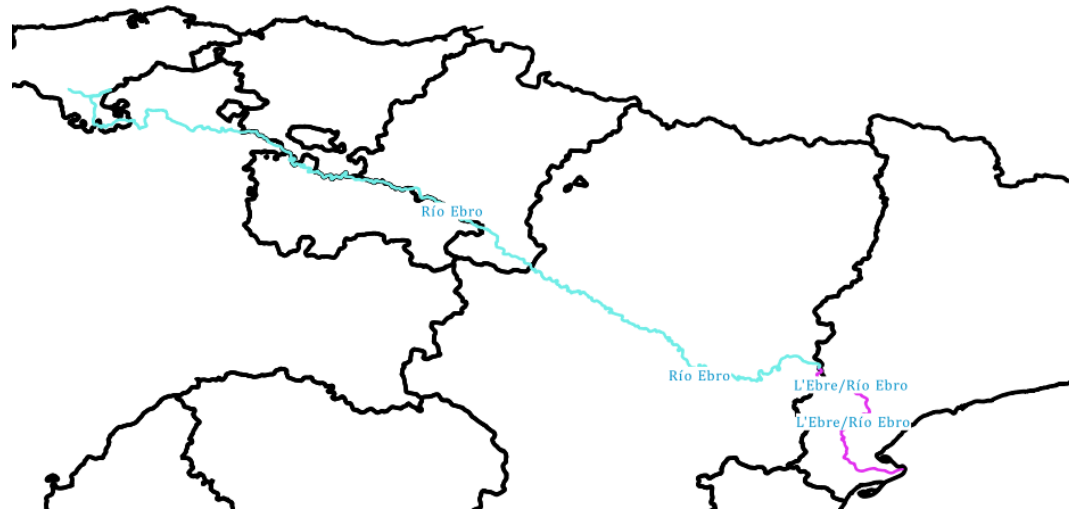
Problems with Data Model Implementation

Language for geographical names: 6 different languages can be used

Solution: Name and language is given by the official gazetteer

Thus, for example, the same river has different names depending the region

But its identified by the same id and pfafstetter code



StandingWater::localType

Difficulties for differencing between some reservoirs and rafts
or between lagoons and ponds

Solution: We have taken the differentiation done
by competent organizations.

ISO 639-2

CODE	LANGUAGE
es	Spanish; Castilian
ca	Catalan; Valencian
eu	Basque
gl	Galician
an	Aragonese
ast	Asturian; Bable ...

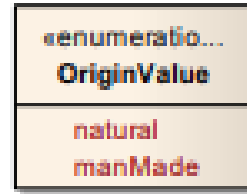


Classified as lagoon but seems to be pond or raft

Problems with Data Model Implementation

Hydro Physical Waters::Surface Waters Attribute Origin:

Many ditches created for irrigation purposes along a natural river
Solution: We have considered them as natural Origin



Attribute: origin

Value type:

OriginValue

Definition:

Origin of the surface water.

Description:

SOURCE [Based on EuroRegionalMap].

EXAMPLE

Natural,

man-made,

etc.

NOTE 1 Natural surface waters are natural watercourses (e.g. rivers, streams) and standing waters (e.g. pools, lakes) naturally preserved and that have been canalised and / or dammed either for navigation or for preventing flood disaster.

NOTE 2 A man-made surface water is a surface water entirely created by man for drainage, storage or transportation purpose, this includes canals, ditches and reservoirs.

Multiplicity:

1

Stereotypes:

«voidable»

Hydro - Network Generation

It has been generated from PhysicalWaters::waterCourse Feature

We two main Problems:

Connectivity – Watercourse was not always continuous

Flow Direction – It was not always well captured downwards





INSPIRE Views from Production Data Base

INSPIRE Views from Production Data Base

PRODUCTION DATA BASE

hi_tramocurso_l	hi_glaciar_s
hi_aguaestancada_s	hi_laminaartificial_s
ge_filtracion_p	hi_lineacosta_ign
ge_pozo_p	hi_lineacosta_ihm
ge_surgencia_p	hi_murocont_l
hi_cascada_p	hi_presa_s
hi_compuerta_p	hi_rednodo_p
hi_cruce_l	hi_redsecuencia_l
hi_cuenca_s	hi_redtramo_l
hi_deposito_p	hi_subcuenca_s
hi_esclusa_p	hi_vado_l
hi_estructuracostera_l	hi_zhumbeda_s
	re_dermarcacion_s
	rm_regionmar_s

materialized views

INSPIRE VIEWS

GE.SpringOrSeep
GE.ActiveWell
GE.SwallowHole
HY.Network.HydroNode
HY.Network.WatercourseSequence
HY.Network.WatercourseLink
HY.PhysicalWaters.ShorelineConstruction
HY.PhysicalWaters.Crossing
HY.PhysicalWaters.DamOrWeir
HY.PhysicalWaters.DrainageBasin
HY.PhysicalWaters.Falls
HY.PhysicalWaters.Ford
HY.PhysicalWaters.LandWaterBoundary
HY.PhysicalWaters.Lock
HY.PhysicalWaters.RiverBasin
HY.PhysicalWaters.StandingWater
HY.PhysicalWaters.Watercourse
HY.PhysicalWaters.Wetland
SR.SeaRegion.SeaArea

INSPIRE Views from Production Data Base

For Example:

materialized
views

hi_aguaestancada_s_etr89

Columnas (19)

gid
fecha
version
id_aest
nombre
tipo_aest
origen
id_demarc
drainsbasin
marea
elevacion
persist
nivel_agua
area
resolution
fuelle
origen_z
geom
inspireid_localid

HY.PhysicalWaters.StandingWater_epsg4258

Columnas (13)

inspireid_localid
beginlifespanversion
hydroid_localid
geographicalname
localtype
origin
persistence
tidal
meandepth
elevation
levelofdetail
surfacearea
geom

```
SELECT agua.inspireid_localid,
       agua.fecha AS beginlifespanversion,
       ( SELECT concat(agua.id_demarc, 'HYFLSP', lpad(agua.id_aest::text, 13, '0'::text)) AS concat) AS hydroid_localid,
       agua.nombre AS geographicalname,
       ( SELECT leyenda.inspirevalue AS localtype
         FROM metadatos.igr_hi_fc_listed_value leyenda
         WHERE agua.tipo_aest = leyenda.id) AS localtype,
       ( SELECT leyenda2.inspirevalue AS origin
         FROM metadatos.md_igr_fc_listed_value leyenda2
         WHERE agua.origen = leyenda2.id) AS origin,
       ( SELECT leyenda.inspirevalue AS persistence
         FROM metadatos.igr_hi_fc_listed_value leyenda
         WHERE agua.persist = leyenda.id) AS persistence,
       agua.marea AS tidal,
       agua.nivel_agua AS meandepth,
       agua.elevacion AS elevation,
       agua.resolution AS levelofdetail,
       agua.area AS surfacearea,
       agua.geom
FROM hidro0.hi_aguaestancada_s agua
WHERE st_intersects(st_setsrid(agua.geom, 4258), st_geomfromtext('POLYGON((-10 45,6 45,6 34, -10 34,-10 45))'::text, 4258));
```



Improving INSPIRE Implementation

Improving INSPIRE Implementation

VERSION	SOURCE FOR PRODUCTION	PUBLISHED	QUALITY CONTROL
IGR-HI V0	BTN	YES	NO
IGR-HI V1	LiDAR	NO – On Going	YES

LEGAL REQUIREMENTS

INTEROPERABILITY

OBJECTIVITY

QUALITY

USEFULNESS

UPDATED

Quality Control

Geometry:

Continuity
Orientation
Self-Intersection ..

Topological:

Segmentation
Overlap
Gaps ...

Semantic on attributes

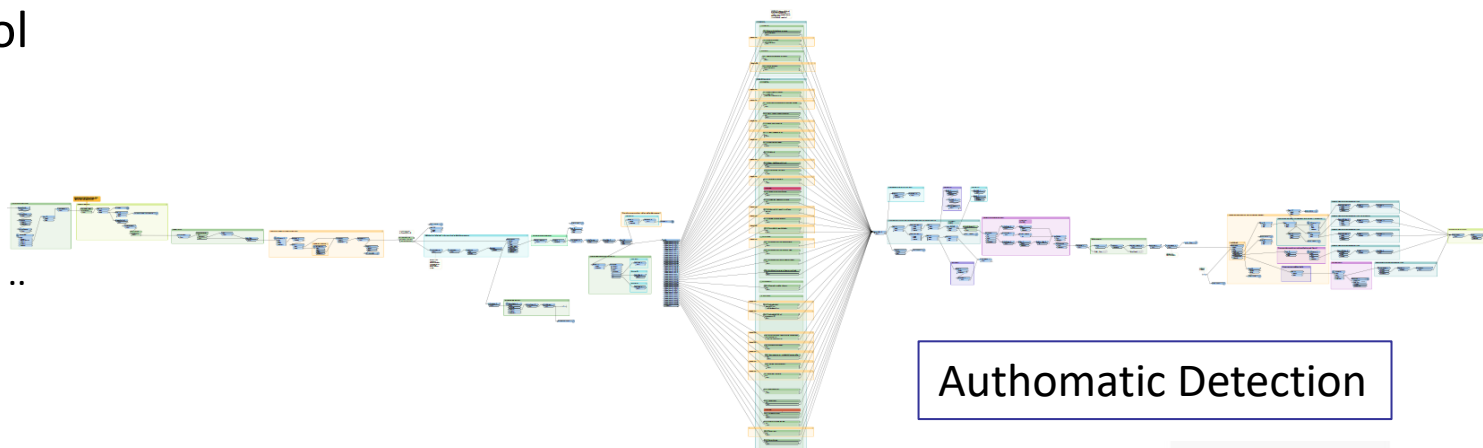
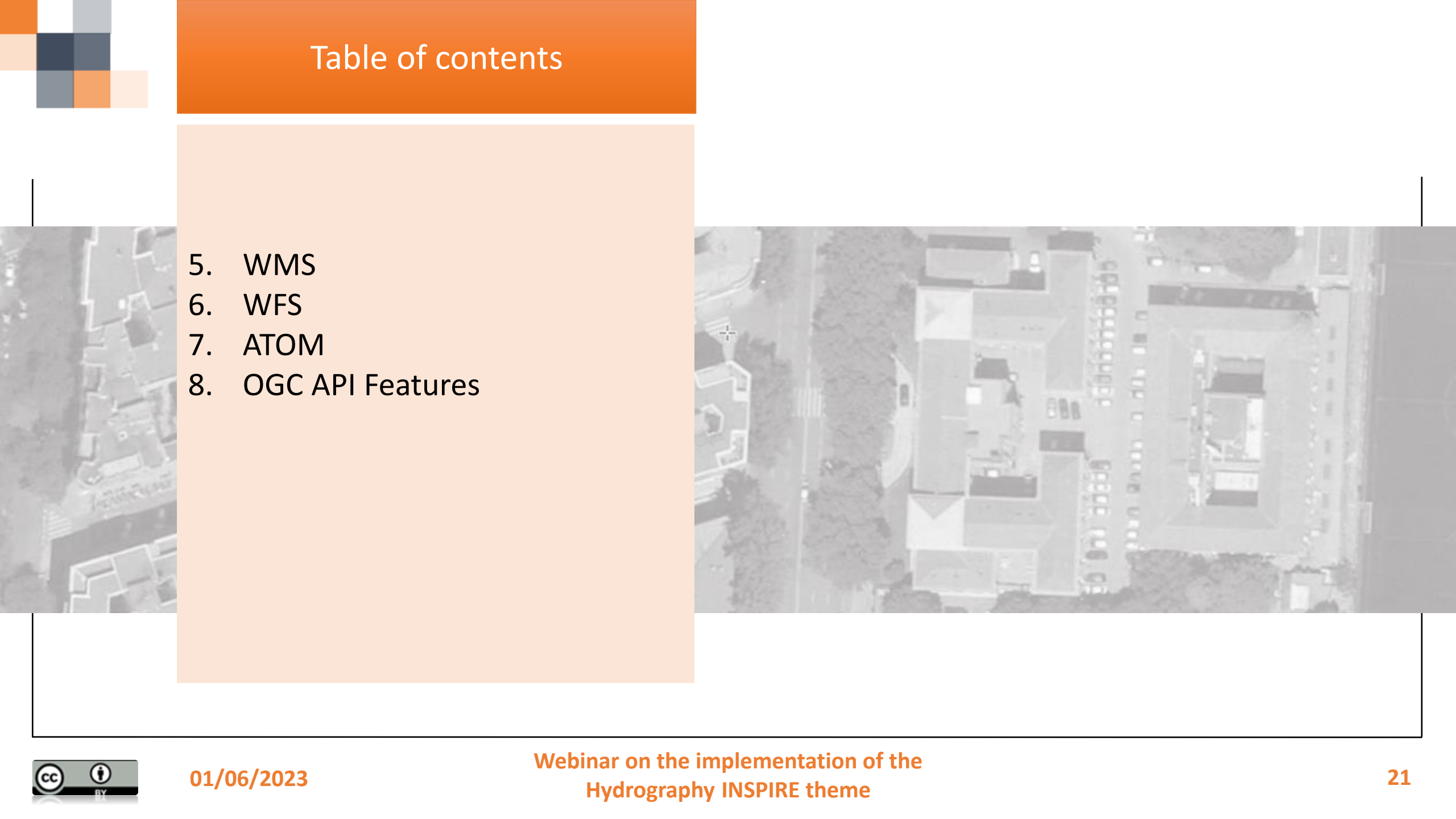




Table of contents

- 
5. WMS
 6. WFS
 7. ATOM
 8. OGC API Features

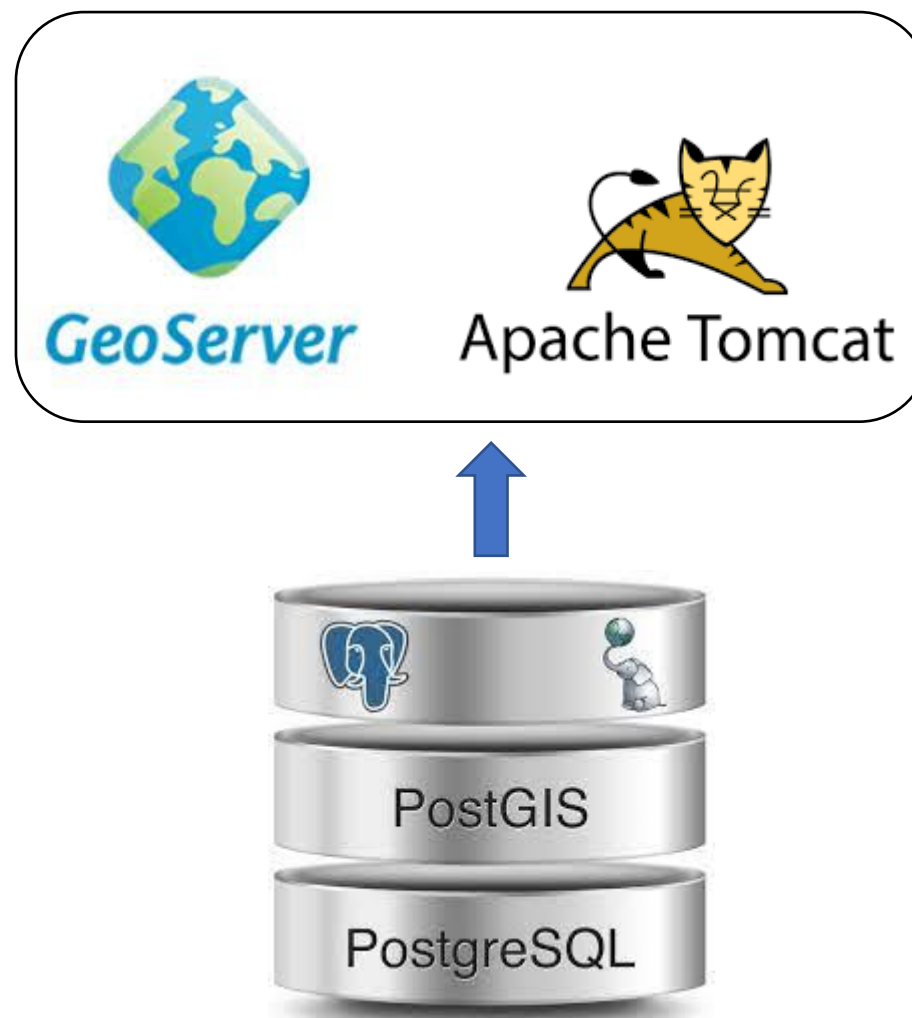


WMS

<https://servicios.idee.es/wms-inspire/hidrografia>

- Published in January 2018
- Hydrography v.0
- PostgreSQL DB+ PostGIS
 - DB Clúster with 3 replicated DB
 - WFS, Atom and OGC API Features
- GeoServer 2.15.2 (two virtual machines)
- <https://servicios.idee.es/wms-inspire/hidrografia>
 - 7 layers
 - 2 styles

WMS



OGC WMS (Web Map Service)

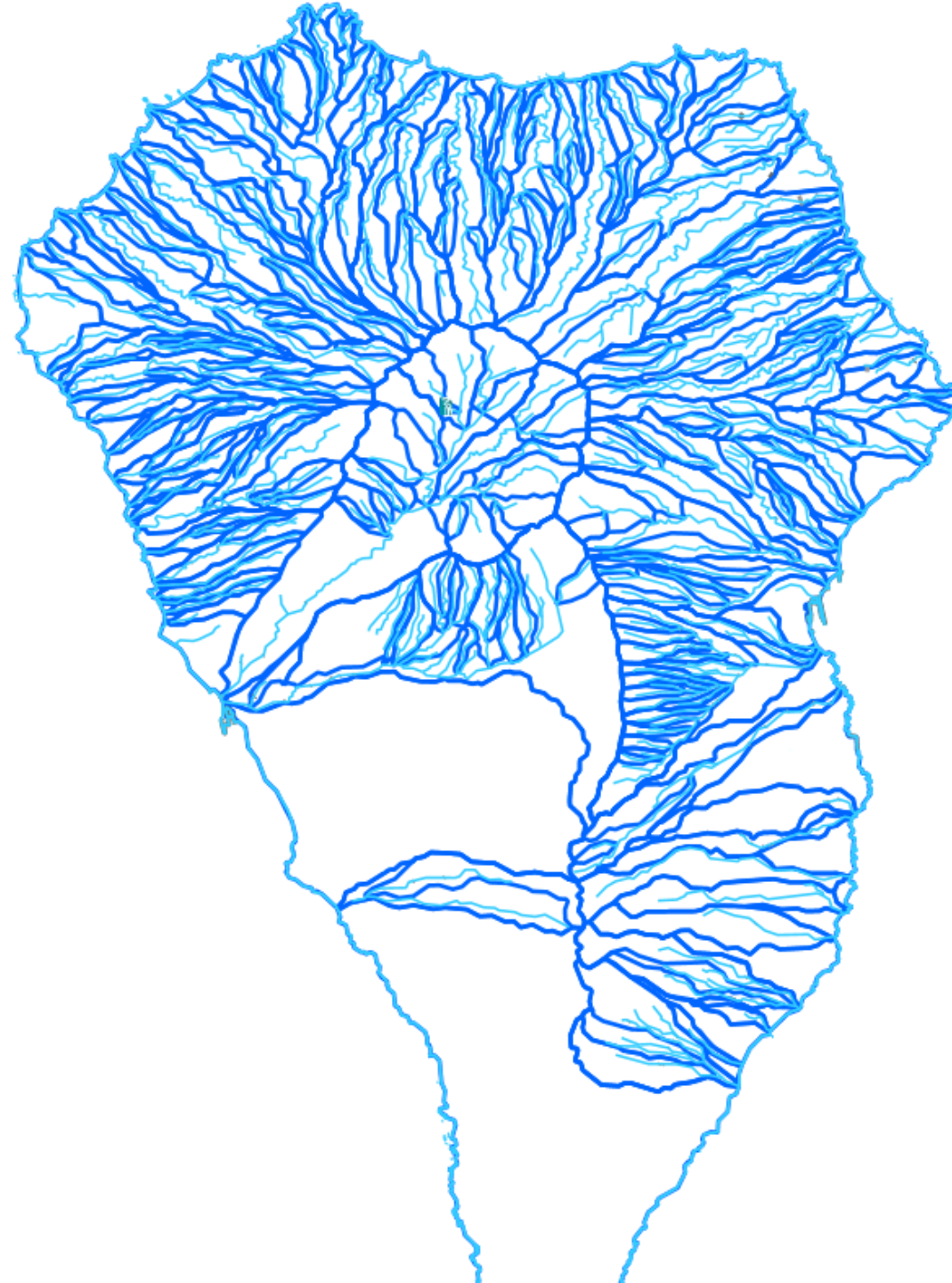
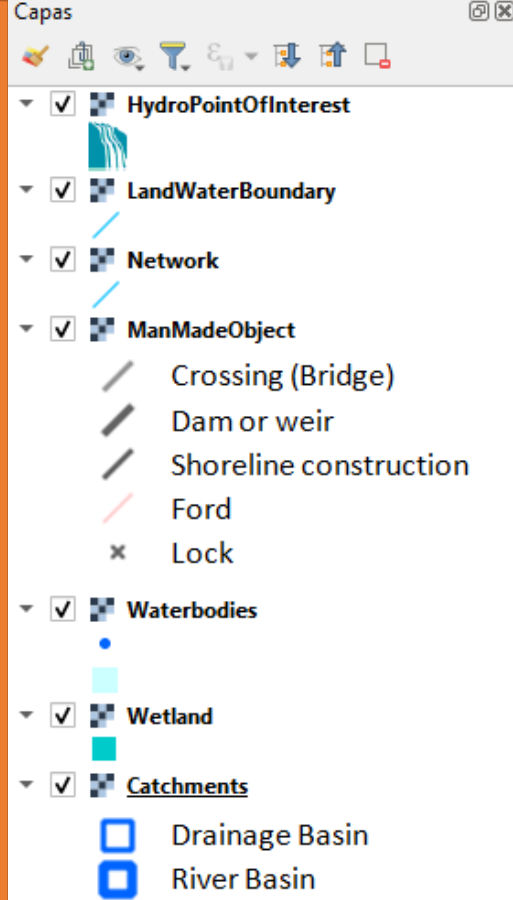
- INSPIRE Data Specification on Hydrography – Technical Guidelines

11.1 Layers to be provided by INSPIRE view services

	Layer Name	Layer Title	Spatial object type(s)	Keywords
✓	HY.PhysicalWaters.Waterbodies	Waterbody	Watercourse, StandingWater	Watercourse, River, Stream, Lake, Reservoir
✓	HY.PhysicalWaters.LandWaterBoundary	Land water boundary	LandWaterBoundary	Coastline, Shoreline
✓	HY.PhysicalWaters.Catchments	Catchment	DrainageBasin, RiverBasin	Basin, Catchment area, Drainage basin
✓	HY.Network	Hydrographic network	HydroNode, WatercourseLink	Hydrographic network,
✓	HY.PhysicalWaters.HydroPointOfInterest	Hydro Point of Interest	Rapids, Falls	Rapids, Falls, Cascade
✓	HY.PhysicalWaters.ManMadeObject	Man-made Object	Crossing, DamOrWeir, Embankment, Sluice, Lock, Ford, ShorelineConstruction	Bridge, Aqueduct, Dam, Weir, Lock, Ford, Dick
✓	HY.PhysicalWaters.Wetland	Wetlands	Wetland	
✗	HY.PhysicalWaters.Shore	Shores	Shore	

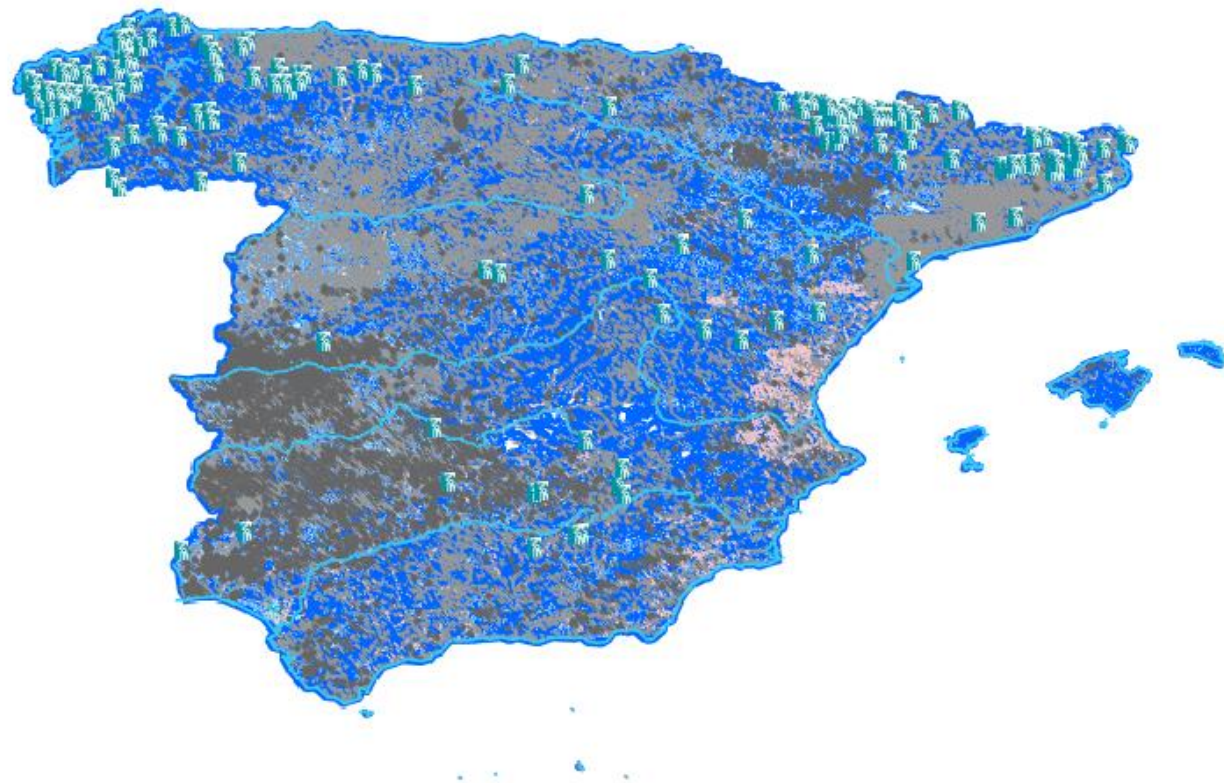
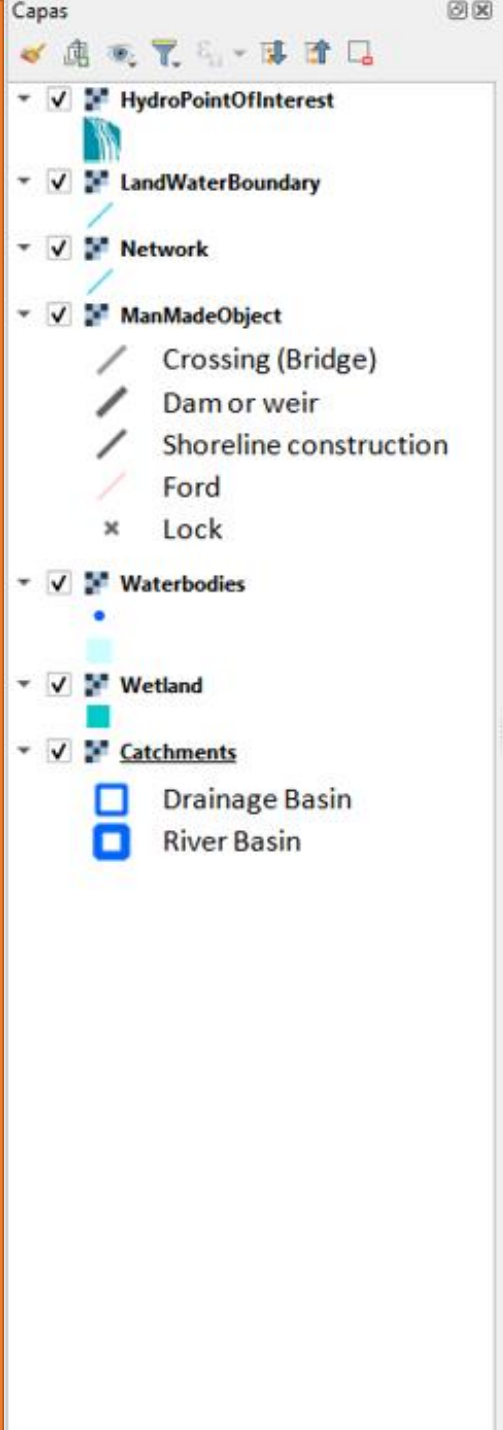


INSPIRE style





INSPIRE
style

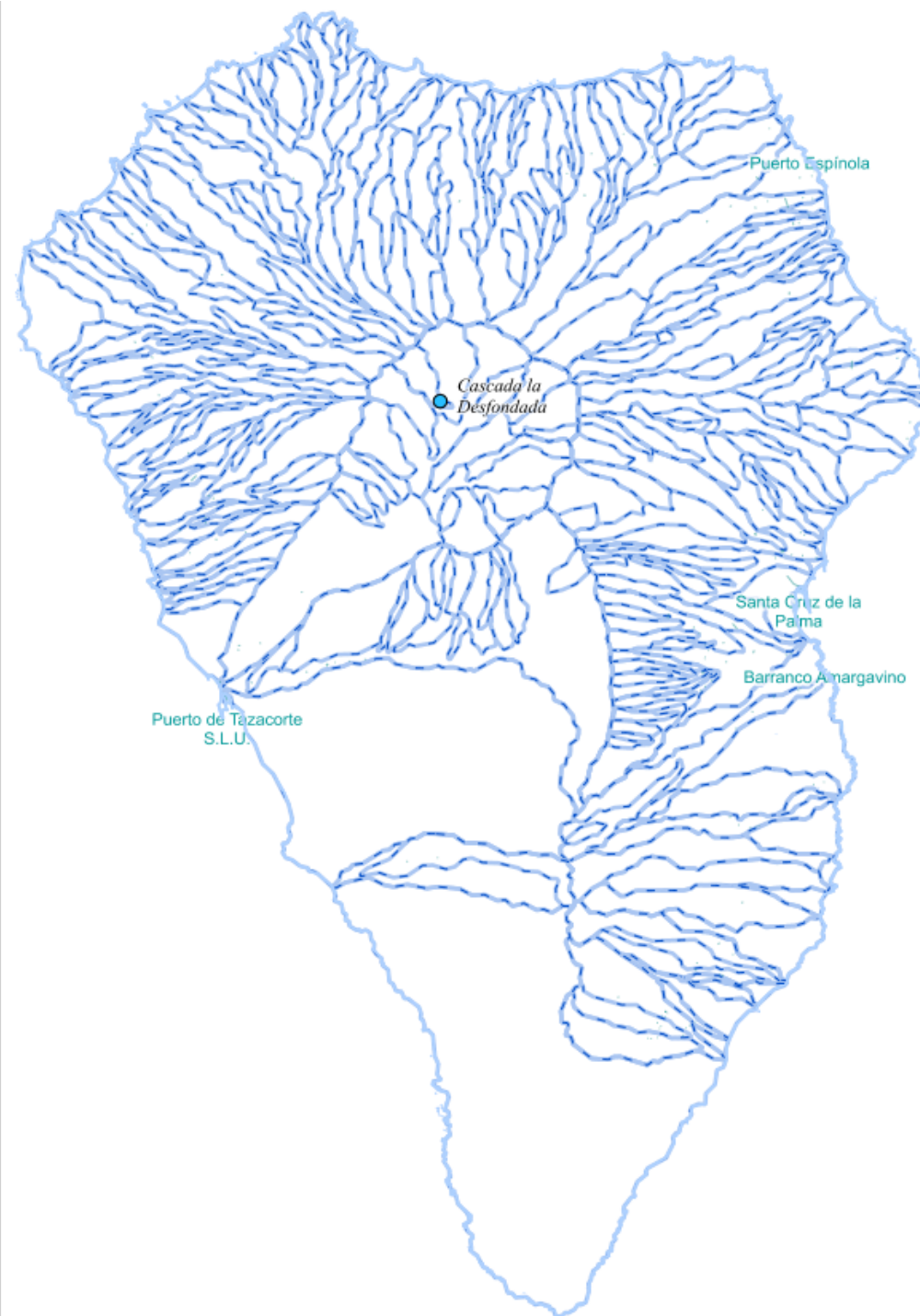




Customized style

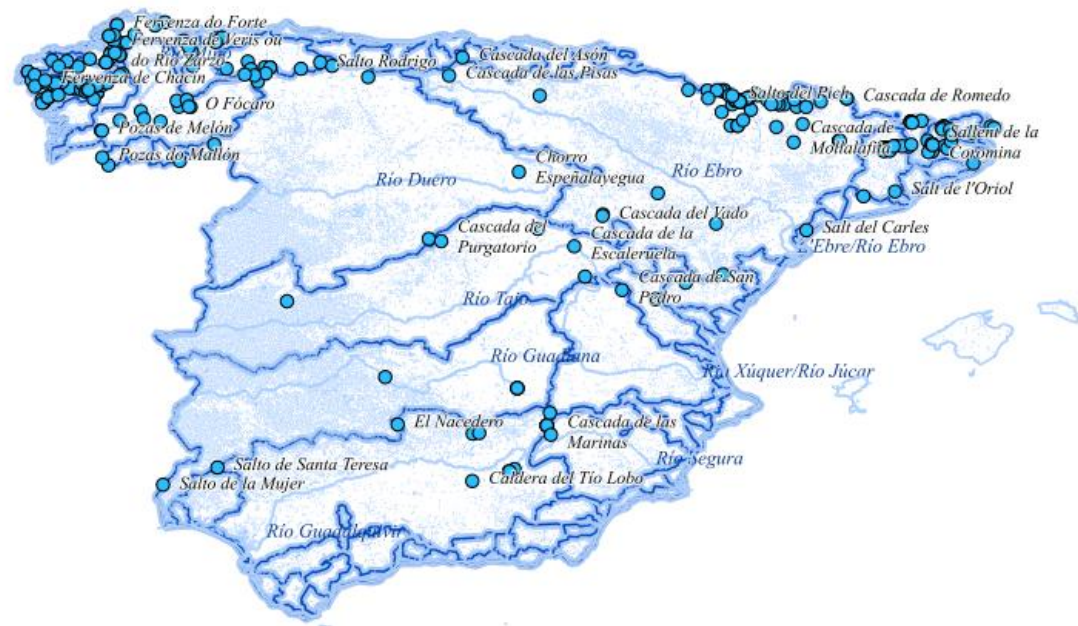
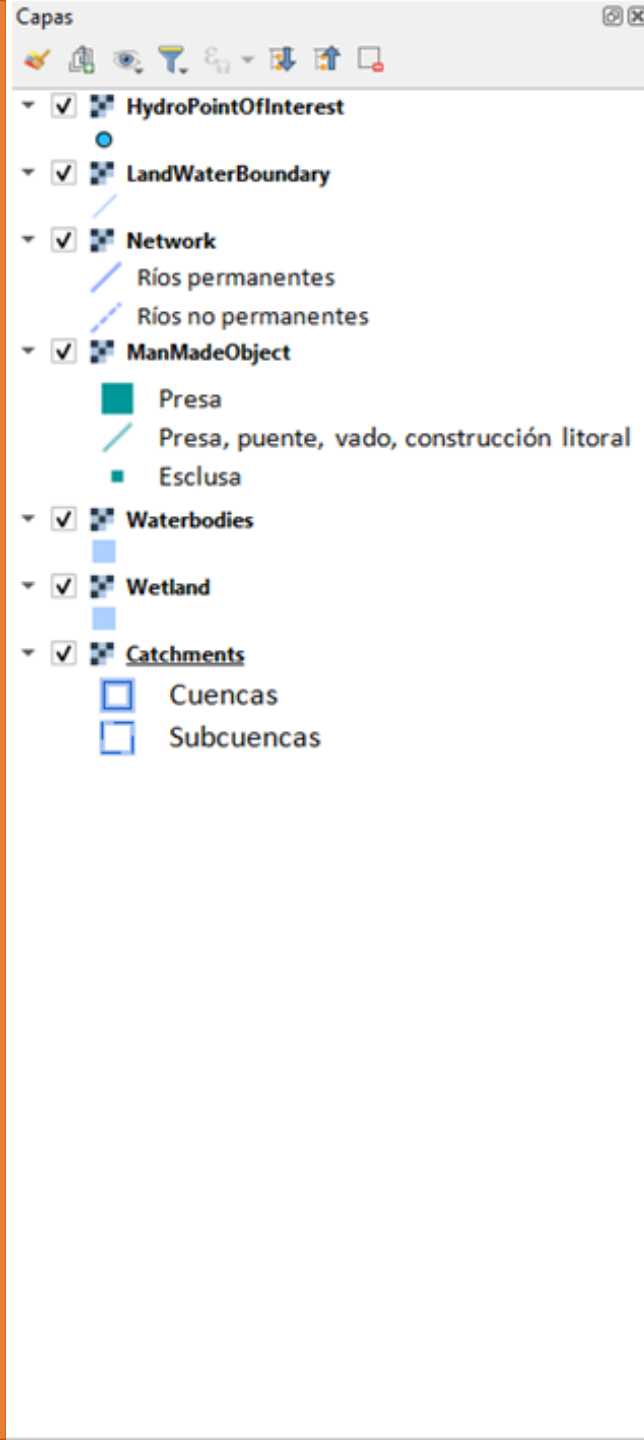
Capas

- ☒ ☒ **HydroPointOfInterest**
 - Cascada la Desfondada*
- ☒ ☒ **LandWaterBoundary**
 -
- ☒ ☒ **Network**
 - Ríos permanentes
 - Ríos no permanentes
- ☒ ☒ **ManMadeObject**
 - Presa
 - Presa, puente, vado, construcción litoral
 - Esclusa
- ☒ ☒ **Waterbodies**
 -
- ☒ ☒ **Wetland**
 -
- ☒ ☒ **Catchments**
 - Cuencas
 - Subcuencas





Customized
style



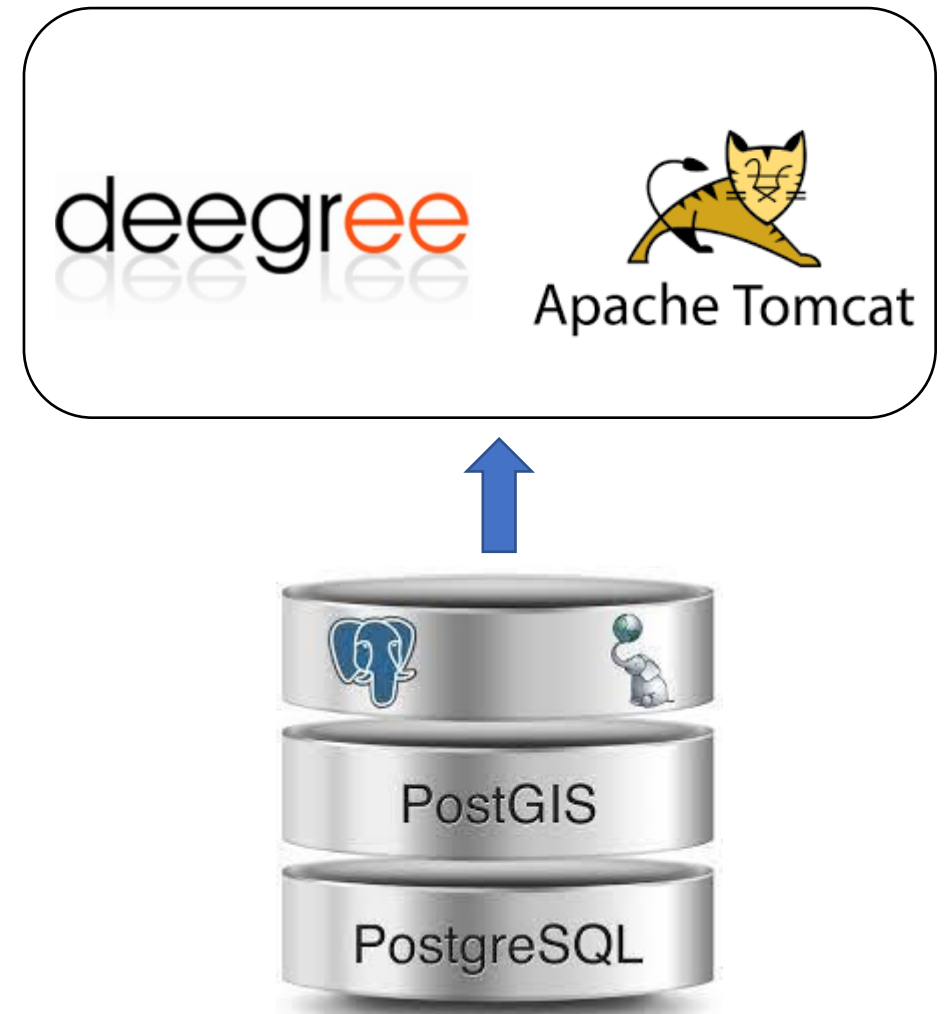


WFS

<https://servicios.idee.es/wfs-inspire/hidrografia>

- Published in February 2019
- PostgreSQL DB+ PostGIS
 - DB Clúster with 3 replicated DB
 - WFS, Atom and OGC API Features
- Deegree 3.4.3 (two virtual machines)
- INSPIRE Validation:
 - GML data set: identifiers, attribute values, and geometry.
 - WFS: errors due to the data set. Next steps: validate HY v.1.
- <https://servicios.idee.es/wfs-inspire/hidrografia>
 - 3 feature types of HydroNetwork. Problems with WaterCourse
 - 12 feature types of Hydro-PhysicalWaters.

WFS



HydroObject

HydroNetwork

Hydro-PhysicalWater

HydroNode

WaterCourseLink

WaterCourseLinkSequence

WatercourseSeparatedCrossing

Land WaterBondary*

SurfaceWater

ManMadeObject

HydroPointOfInterest

DrainageBasin

Wetland

Shore

Standing Water

Watercourse

Dry

Ephemeral

Intermittent

Perennial

Crossing

Aqueduct

Bridge

Culvert

Shiphone

DamOrWeir

Embankment

Ford (vado)

Lock (esclusa)

ShorelineConstruction

Sluice (compuerta)

FluvialPoint

Falls

Rapids

RiverBasin

(cuencas y subcuencas)

Bloulders

Clay

Gravel

Mud

Rock

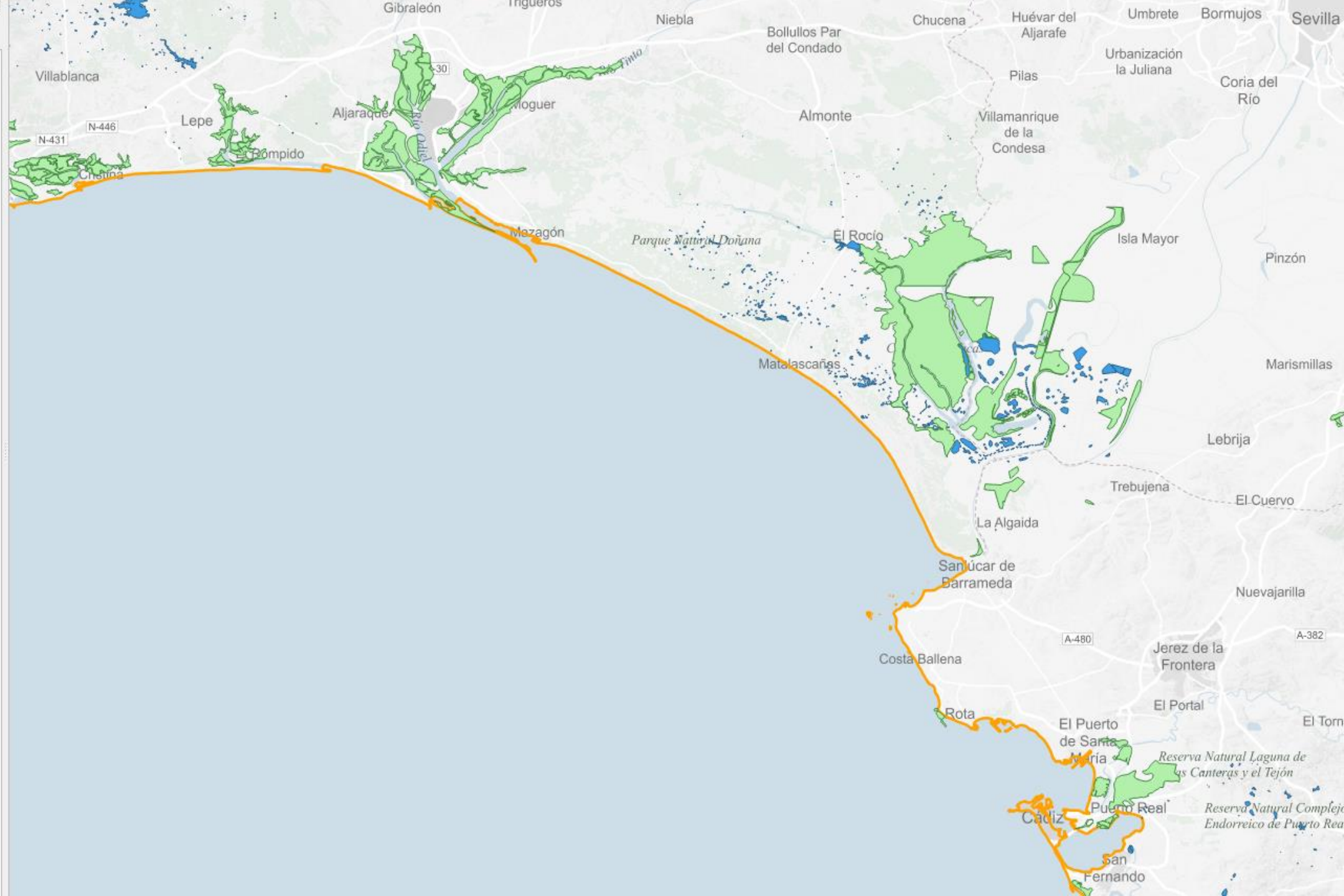
Sand

Shingle

Stone



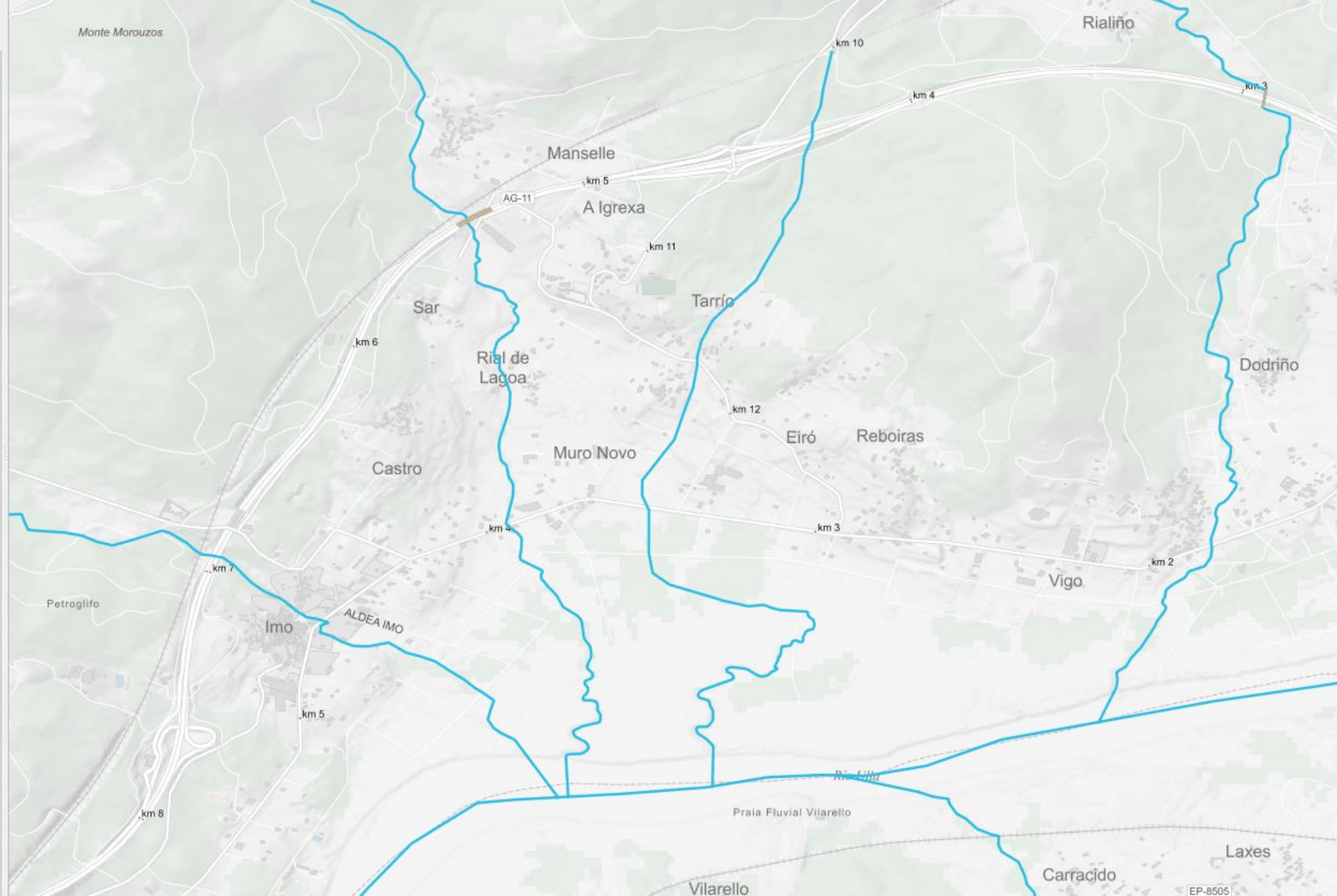
- ☐ DrainageBasin
- ☐ RiverBasin
- ☒ Wetland
- ☒ StandingWater
- ☒ LandWaterBoundary
- ☐ Crossing
- ☐ Watercourse
- ☐ Falls
- ☐ ShorelineConstruction
- ☒ IGN Base Map



Capas

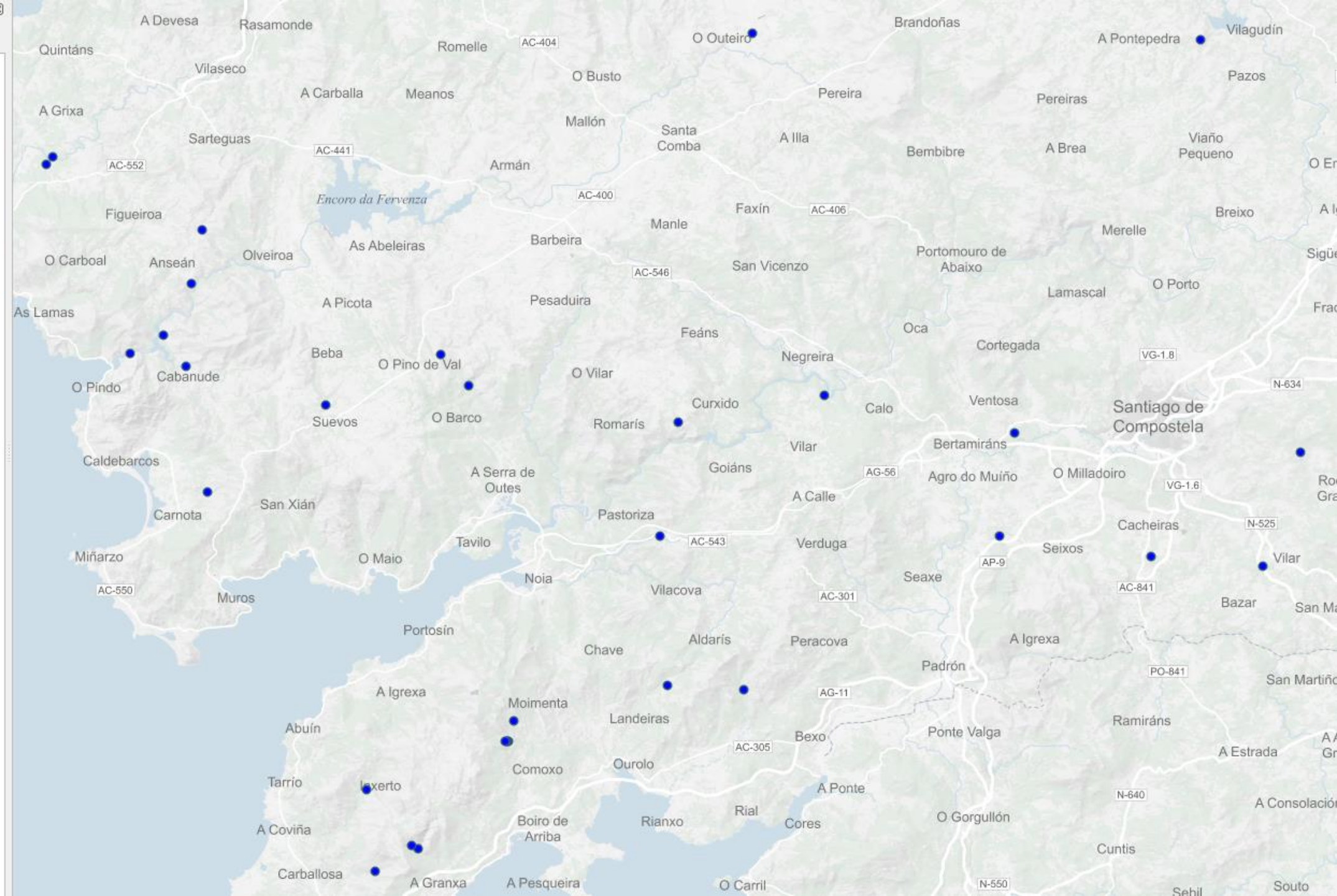
- ☐  DrainageBasin
- ☐  RiverBasin
- ☐  Wetland
- ☐  StandingWater
- ☐  LandWaterBoundary
- ☒  Crossing
- ☒  Watercourse
- ☐  Falls
- ☐  ShorelineConstruction
- ☒  IGN Base Map

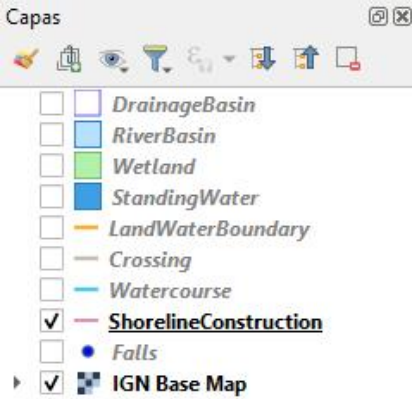


Capas



- ☐ DrainageBasin
- ☐ RiverBasin
- ☐ Wetland
- ☐ StandingWater
- ☐ LandWaterBoundary
- ☐ Crossing
- ☐ Watercourse
- ☒ Falls
- ☐ ShorelineConstruction
- ☒ IGN Base Map







Atom

ATOM Feed <https://www.ign.es/atom/ds.es.xml>

Hydrography Feed https://www.ign.es/atom/dataset_feeds/hidro_igr.es.xml

- Published in November 2020
- ATOM Feed <https://www.ign.es/atom/ds.es.xml>
 - XML files made with text editor (two virtual machines)
- Hydrography Feed https://www.ign.es/atom/dataset_feeds/hidro_igr.es.xml
 - GML files → from WFS with an automatic process.
 - Grouped by Feature Types
 - 57 files
 - No GML WaterCourse due WFS errors



- Atom Data https://centrodedescargas.cnig.es/CentroDescargas/documentos/atom/hy/hidro_igr_gml.zip

 hy-p_Crossing0.gml
 hy-p_Crossing10000.gml
 hy-p_Crossing20000.gml
 hy-p_Crossing30000.gml
 hy-p_Crossing40000.gml
 hy-p_Crossing50000.gml
 hy-p_Crossing60000.gml
 hy-p_Crossing70000.gml
 hy-p_Crossing80000.gml
 hy-p_Crossing90000.gml
 hy-p_Crossing100000.gml
 hy-p_Crossing110000.gml
 hy-p_Crossing120000.gml
 hy-p_Crossing130000.gml
 hy-p_DamOrWeir0.gml
 hy-p_DamOrWeir10000.gml
 hy-p_DamOrWeir20000.gml
 hy-p_DrainageBasin0.gml
 hy-p_DrainageBasin10000.gml

 hy-p_DrainageBasin20000.gml
 hy-p_DrainageBasin30000.gml
 hy-p_DrainageBasin40000.gml
 hy-p_DrainageBasin50000.gml
 hy-p_DrainageBasin60000.gml
 hy-p_DrainageBasin70000.gml
 hy-p_DrainageBasin80000.gml
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 hy-p_DrainageBasin130000.gml
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 hy-p_DrainageBasin150000.gml
 hy-p_DrainageBasin160000.gml
 hy-p_DrainageBasin170000.gml
 hy-p_Falls0.gml
 hy-p_Ford0.gml
 hy-p_LandWaterBoundary0.gml

 hy-p_LandWaterBoundary10000.gml
 hy-p_Lock0.gml
 hy-p_RiverBasin0.gml
 hy-p_ShorelineConstruction0.gml
 hy-p_StandingWater0.gml
 hy-p_StandingWater10000.gml
 hy-p_StandingWater20000.gml
 hy-p_StandingWater30000.gml
 hy-p_StandingWater40000.gml
 hy-p_StandingWater50000.gml
 hy-p_StandingWater60000.gml
 hy-p_StandingWater70000.gml
 hy-p_StandingWater80000.gml
 hy-p_StandingWater90000.gml
 hy-p_StandingWater100000.gml
 hy-p_StandingWater110000.gml
 hy-p_StandingWater120000.gml
 hy-p_StandingWater130000.gml
 hy-p_Wetland0.gml



OGC API Features

<https://api-features.idee.es/?lang=en>

- Published in April 2023
- PostgreSQL DB+ PostGIS
 - DB Clúster with 3 replicated DB
 - WFS, Atom and OGC API Features
- Pygeoapi 0.15 in a Docker (three virtual machines)
- <https://api-features.idee.es/?lang=en>
 - 15 collections (Feature Types)
 - No INSPIRE Scheme

OGC API Features



API for downloading geographic objects (API-Features) of the National Cartographic System of Spain

API for downloading geographic objects from the National Cartographic System from Hydrography, Transport Networks, CartoCiudad postal addresses and the Information System on Land Occupation of Spain 2014 (SIOSE). The service is based on the OGC API-Features standard.

geospatial data api

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Collections

[View the collections in this service](#)

API Definition

Documentation: [Swagger UI](#) [ReDoc](#)

[OpenAPI Document](#)

Conformance

Provider

Infraestructura de Datos Espaciales de España
<https://www.idee.es/>

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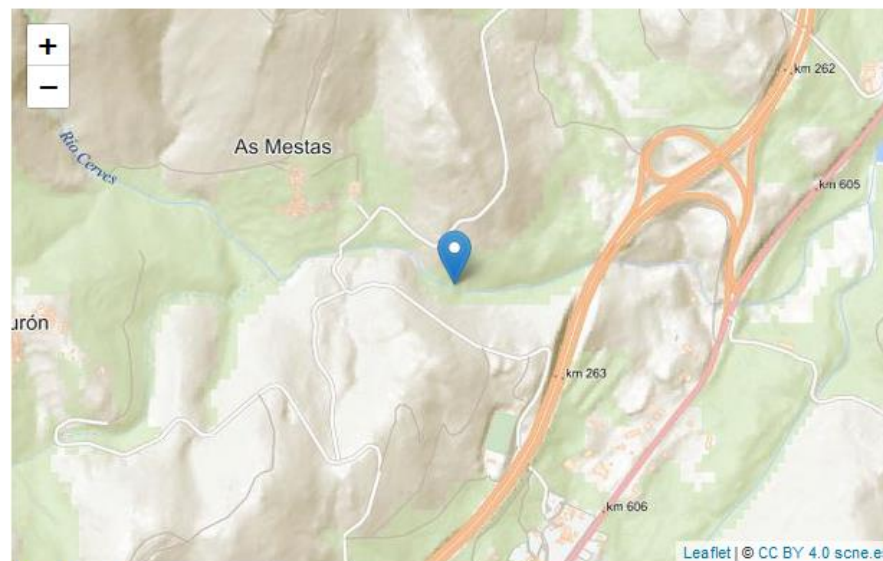
Fax

[+34 91 597 97 64](tel:+34915979764)

Collections in this service

Name	Type	Description
Crossing	feature	A man-made object allowing the passage of water above or below an obstacle.
Dam or weir	feature	A permanent barrier across a watercourse used to impound water or to control its flow.
Drainage basin	feature	Area having a common outlet for its surface runoff.
Falls	feature	A vertically descending part of a watercourse where it falls from a height.
Ford	feature	A shallow part of a watercourse used as a road crossing.
Land water boundary	feature	The line where a land mass is in contact with a body of water.
Lock	feature	An enclosure with a pair or series of gates used for raising or lowering vessels as they pass from one water level to another.
River basin	feature	The area of land from which all surface run-off flows through a sequence of streams, rivers and, possibly, lakes into the sea at a single river mouth, estuary or delta.
Shoreline construction	feature	An artificial structure attached to land bordering a body of water and fixed in position.
Standing water	feature	A body of water that is entirely surrounded by land.
Watercourse	feature	A natural or man-made flowing watercourse or stream.
Wetland	feature	A poorly drained or periodically flooded area where the soil is saturated with water, and vegetation is supported.
Hydro node	feature	A node within the hydrographic network.
Watercourse link	feature	A segment of a watercourse within a hydrographic network.
Watercourse link sequence	feature	A sequence of watercourse links representing a non-branching path through a hydrographic network.

Item


[Prev](#) [Next](#)

Property	Value
id	ES010HYFLSP0000001528577
nombre	Pozas de Melón
persist	http://inspire.ec.europa.eu/codelist/WaterPersistenceValue/seasonal
nil_varios	True
id_demarc	ES010
persistd	Estacional
nativeness	None
id_demarc_d	Miño-Sil
resolucion	5
hydroid_localid	ES010HYFLSP00000000000216
fecha_alta	2019-02-27
fuelle	5001
script	Latn
fueded	Instituto Geográfico Nacional
nilreason_nombre	None
descr	None

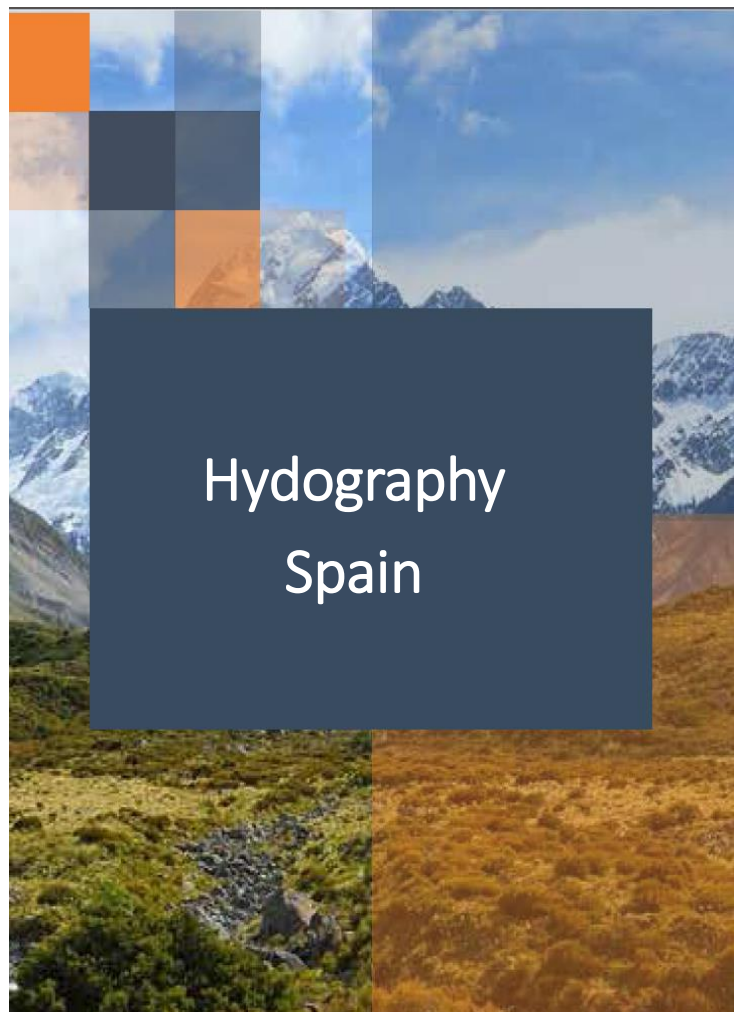
<https://api-features.idee.es/collections/hidrografia/Falls/items/ES010HYFLSP0000001528577?lang=en>



Conclusions

Hydrography Theme in Spain

Conclusions



Hydrography data set v.1.

- Effort to generate a hydrography data set in a coordinated way among the Spanish entities with competences in this subject.
- Effort to create data in accordance with INSPIRE and other regulations.
- The aim is to publish version 1 in 2023.

Web services

- Publication of hydrography data set by several web services standards.
- Working with the new OGC API standards.
- HY version 1: datasets and services will be re-validated according to INSPIRE.

www.ign.es

THANK YOU
FOR YOUR ATTENTION

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