

OGC API – Maps

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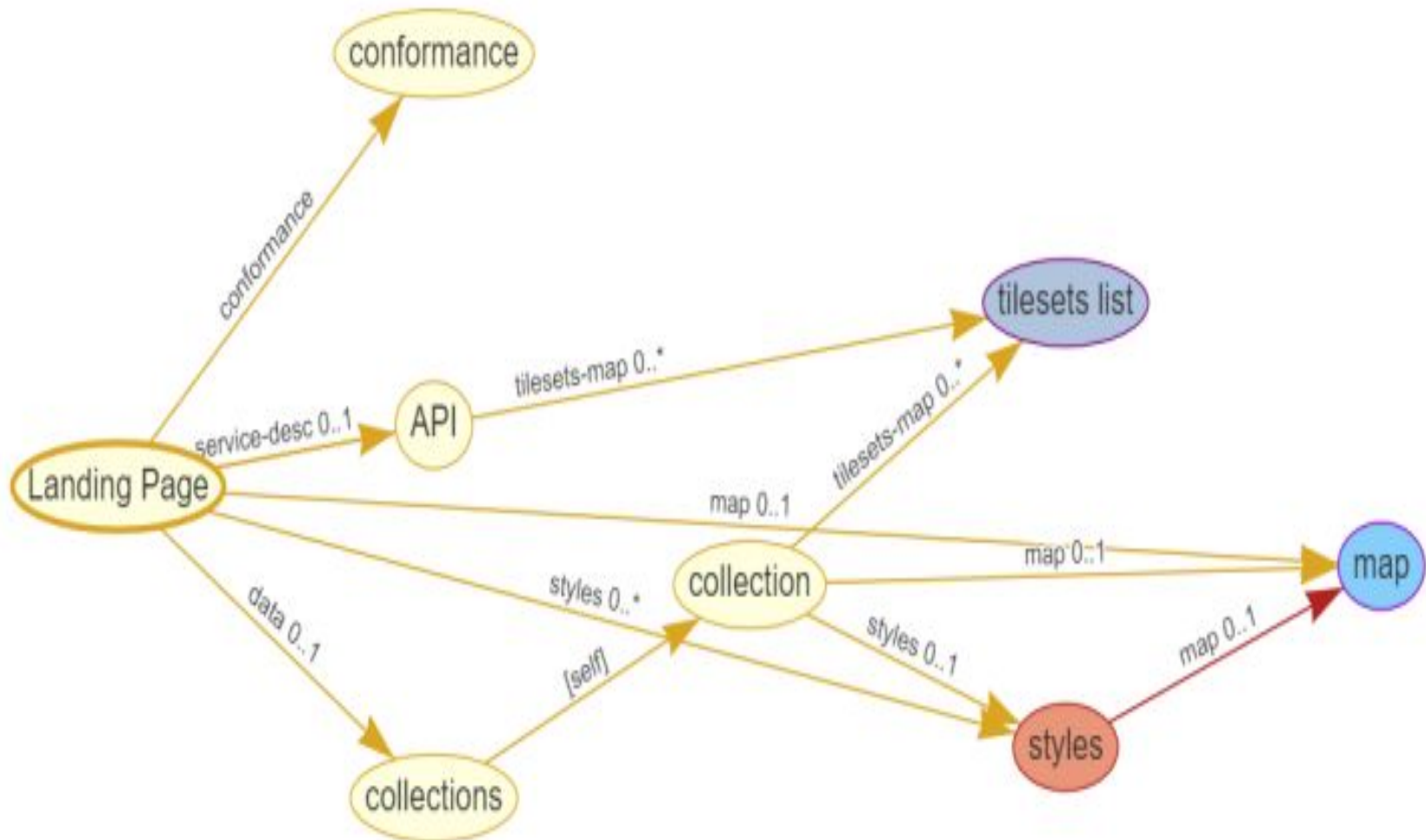
OGC API - Maps

- **Publication Date:** 2022-06-06
- **Submitter:** Dr. Joan Maso: University Autonomia the Barcelona (UAB-CREAF) and others
- Web API for **requesting map images** over the Internet
- client to request images: changing **parameters** (size, CRS)
- **Information:** what types of maps, producing a map and answering queries
- does **not make OGC API - Common mandatory**

Introduction

- Building blocks which can be used in a Web API to **retrieve geospatial data as maps** that as visual portrayals of the data created by applying a style to the data
- support is **not required for any specific CRS**
- **geospatial data resources** replace the concept of layer
- layers in WMS and WMTS were not defined by other OGC APIs and **did not support other functionalities.**

Introduction



Operations

- **Discovery operations:** API definition, metadata, CRS
- **Retrieval operations:** get a map from the API
- **Query operations:** retrieve data

Requirements classes defining resources

The Core specifies requirements that all Web APIs have to implement if they are claiming to support maps from a geospatial resource following this OGC API – Maps

Resource name	Common path
Map	<code>.../map</code>
Tilesets list	<code>.../map/tiles</code>
Tileset	<code>.../map/tiles/{tileMatrixSetId}</code>
Tile	<code>... /map/tiles/{tileMatrixSetId}/{tileMatrix}/{tileRow}/{tileCol}</code>
Map	<code>/map?collections={collectionId},{collectionId},...</code>

Requirements classes defining parameters

Resource name	Example of possible paths
Map	<code>/map?bgcolor={bgcolor}&transparent={transparent},...</code>
Map	<code>/map?map-title=topCenter&map-legend=middleRight&scale-bar=bottomCenter&map-compass=topLeft&situation-map=bottomLeft&grid-crs=CRS:84, EPSG:32831&map-attribution=bottomRight</code>
Scaling	<code>`/map?width={width}&height={height}&transparent={true</code>
BBox	<code>`/map?bbox={bbox}</code>
Subsetting	<code>`/map?subset={subset}</code>
BBox	<code>`/map?bbox={bbox}&bbox-crs={bbox-crs}</code>
CRS	<code>`/map?crs={crs}</code>
time	<code>`/map?time={time}</code>
Subsetting	<code>`/map?subset={subset}</code>

Requirements classes defining origins

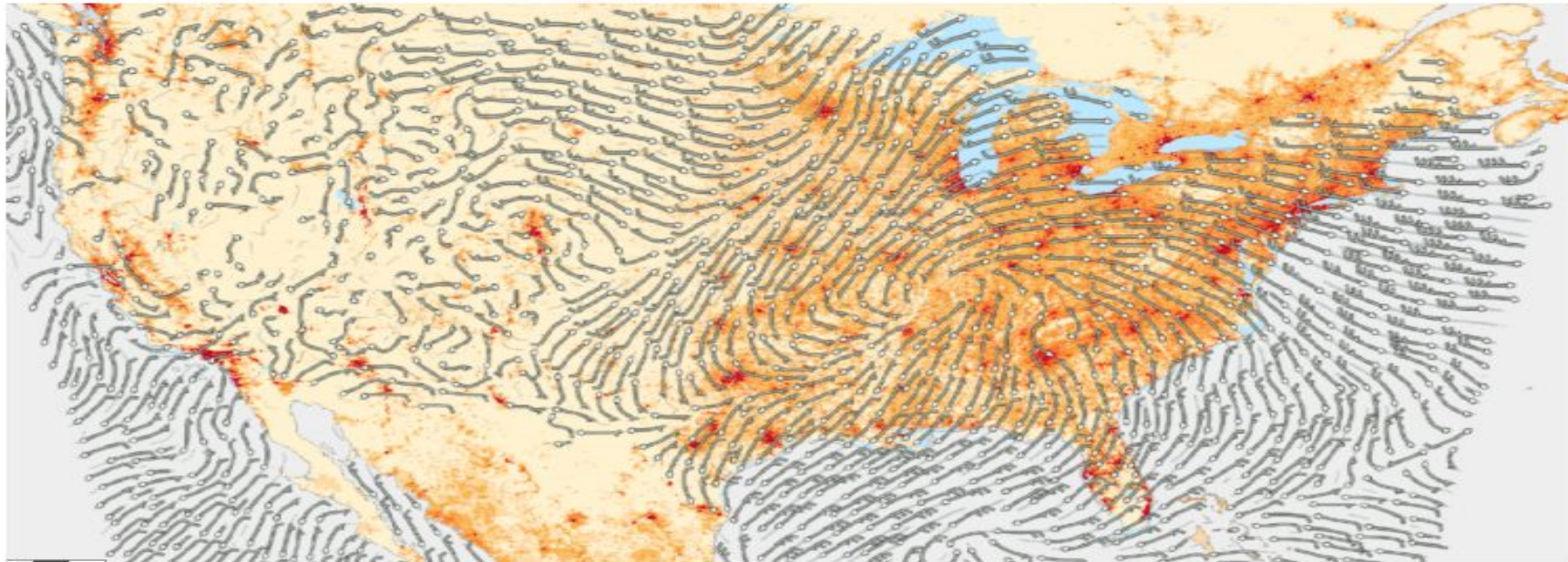
- Map format: **flexible**
- Common Map format:
 - PNG (<http://www.opengis.net/spec/ogcapi-maps-1/1.0/req/png>)
 - JPEG (<http://www.opengis.net/spec/ogcapi-maps-1/1.0/req/jpeg>)
 - TIFF (<http://www.opengis.net/spec/ogcapi-maps-1/1.0/req/tiff>)
 - SVG (<http://www.opengis.net/spec/ogcapi-maps-1/1.0/req/svg>)
 - HTML (<http://www.opengis.net/spec/ogcapi-maps-1/1.0/req/html>)

Requirements classes defining representations

Resource name	Common path
Dataset	/styles/{styleId}/map
GeoData	collections/{collectionId}/styles/{styleId}/map
Map	/map/
Styled Map	/styles/{styleId}/map
Map	/collections/{collectionId}/map
Styled Map	/collections/{collectionId}/styles/{styleId}/map

Map interoperability

Define a common way to generate maps on the web that can be **combined together in a single view**



Correspondence between WMS map metadata and OGC APIs

Name in <Service> WMS 1.3	Where in the API	property	Specified in
Title	service metadata	title	OGC API Common - part 1
Name fixed to "WMS"	N/A		
Abstract	service metadata	description	OGC API Common - part 1
OnlineResource	landing page	links	OGC API Common - part 1
Keywords	N/A		
LayerLimit	service metadata	limits	This standard
MaxWidth MaxHeight	service metadata	x-OGC-limits.maps.maxWidth x-OGC-limits.maps.maxHeight x-OGC-limits.maps.maxPixels	This standard Requirement Class "Scaling"
Fees	N/A		
AccessConstraints	N/A		

Correspondence between WMS map metadata and OGC APIs

Name in <Layer> WMS 1.3	Where in the API	property	Specified in
Title	collections response	title	OGC API Common - part 2
Name	collections response	id	OGC API Common - part 2
Abstract	collections response	description	OGC API Common - part 2
Keywords	N/A		

Style	style response	id	OGC API Styles - part 1
EX_GeographicBoundingBox	collections response	extent	OGC API Common - part 2
CRS	collections response	storageCRS	OGC API Features - part 2
BoundingBox	N/A		
minScaleDenominator	collections response	minScaleDenominator	Possibly in OGC API Features - part 2
maxScaleDenominator		maxScaleDenominator	
Sample Dimensions	OpenAPI extra parameters definition		
MetadataURL	collections response	link with rel describedBy	OGC API Common - part 2
Attribution	collections response	attribution	OGC API Common - part 2
Identifier	N/A		
AuthorityURL			
FeatureListURL	items response		OGC API features provides this capability
DataURL			OGC API features, coverage and EDR provide download capabilities
queryable			OGC API features, coverage and EDR provide query capabilities

Relationship to other OGC API standards

- **OGC API - Tiles** specifies the link relation types to **access map tile sets** from a dataset or collection.
- **OGC API - Styles** defines **paths to list available styles** from which maps can also be accessed.
- **OGC API - Processes - Part 3: Workflows and Chaining** provides a mechanism to **trigger localized processing** workflows as a result of retrieving maps (for a specific area and resolution of interest)

Client side maps

- **OGC API - Maps** use cases will focus more on **static maps** as well as print cartography
- **OGC API - Tiles** with raw data (e.g., Vector and Coverage Tiles) will be better suited for **dynamic maps**

Requirement Class "Map Core"

Resource Path	Description
/map	A map representing dataset behind the API in the default style
/styles/{styleId}/map	A map representing dataset behind the API in the <code>styleId</code> style.
/collections/{collectionId}/map	A map representing <code>collectionId</code> in the default style
/collections/{collectionId}/styles/{styleId}/map	A map representing <code>collectionId</code> in the <code>styleId</code> style

Requirement Class "Map Core": Operations

Requirement 1	/req/core/map-op
A	Every map SHALL be available as a HTTP GET request to a URI that will be composed by three parts: the first part is the URI of a resource that can be represented as a map (with or without a style path parameter), the second part follows the pattern /map and the third part completing the retrieval parameters as needed
B	Only the resources (e.g. a collection id) that advertise the following the pattern .../map... can be retrieved as maps

Requirement Class "Map Core": Response

Requirement 2	/req/core/map-response
A	A successful execution of a map operation SHALL be a response with a HTTP status code 200.
B	The map response SHALL be in the storage CRS specified in the collection description, or http://www.opengis.net/def/crs/OGC/1.3/CRS84 if none is specified, unless overridden by a specific query parameter (see Requirement Class "Maps CRS").
C	The headers SHALL include the "Content-Crs" header with the URI of the CRS used to render the map except if the content is in the http://www.opengis.net/def/crs/OGC/1.3/CRS84 CRS.
D	The headers of the response SHALL include a "Content-Bbox" header with the actual geospatial boundary of the rendered map.

Requirement Class "Map Background"

```
bgcolor:  
  name: bgcolor  
  in: query  
  description:  
    Hexadecimal red-green-blue[-alpha] color value for  
    the background color (default=0xFFFFFFFF). The first and  
    second characters specify a the intensity of red, the  
    third and forth characters specify a the intensity of  
    green, and the fifth and sixth two characters specify a  
    the intensity of blue. Optionally the seventh and eighth  
    characters specify the level of opacity (alpha channel)  
    where 00 is completely transparent and FF is completely  
    opaque.  
  required: false  
  style: form  
  explode: false  
  schema:  
    type: string  
    default: 0xFFFFFFFF
```


Requirement Classes for a "Map Cartographic Layout"

```
name: map-title
in: query
required: false
description: a title into the map
style: form
schema:
  type: string
  enum:
    - none
    - topLeft
    - topCenter
    - topRight
    - middleLeft
    - middleRight
    - bottomLeft
    - bottomCenter
    - bottomRight
  default: none
```

Requirement Class "Map Tiles"

```
{
  "links": [
    ...
    {
      "href": "http://data.example.com/collections/buildings/map/tiles",
      "rel": "http://www.opengis.net/def/rel/ogc/1.0/tileset",
      "type": "application/json"
    }
  ]
}
```

Requirement Class "Map Geo Data Resource Selection"

- /req/collections-selection/query-collections

```
name: collections
in: query
required: false
style: form
explode: false
schema:
  type: array
  items:
    type: string
```

Requirement Class "DateTime"

This requirements class defines the way date and time can be used as a parameter to filter the content in the map resource.

Requirement 36	/req/collections/rc-datetime-definition
----------------	---

```
name: datetime
in: query
required: false
schema:
  type: string
style: form
explode: false
```


Requirement Class "Geospatial Data Map"

This requirements class specifies how to get maps from particular resources that contains geodata. Common resources that can contain geodata are the ones at the endpoint `/collections/{collectionId}`

Requirement 48	<code>/req/geodata/desc-links</code>
A	If the API has a mechanism for their geospatial data resources or modified geospatial resources to expose links to related aspects (e.g. feature items, metadata...), the API SHALL include a link with and with rel: http://www.opengis.net/def/rel/ogc/1.0/map and the href pointing to a the map resource that presents this geospatial data resource.

Requirement Class "Geospatial Data Map"

```
"id": "buildings",
"title": "Buildings in the city of Bonn",
"description": "This collection contains buildings",
"attribution": "OpenStreetMap",
"extent": {
  ...
},
"crs": ["[EPSG:32631]", "[EPSG:23031]", "[EPSG:4326]"],
"storageCrs": "[EPSG:32631]",
"storageCrsExtent": {
  "spatial" : {
    "bbox" : [ [ 47736, 4421022, 797736, 4734022 ] ]
  }
},
"storageCrsCoordinateEpoch": 2022.3,
"links": [
  ...
  {
    "href": "http://data.example.com/collections/buildings/map",
    "rel": "http://www.opengis.net/def/rel/ogc/1.0/map",
    "type": "image/png",
  }
]
}
```

Other Requirement Classes

- Requirement Class "Scaling"
- Requirement Class "Maps spatial subsetting by coordinate intervals"
- Requirement Class "Maps spatial subsetting by center point"
- Requirement Class "Maps CRS"
- Requirement Class "Styled Maps"
- Requirement Class "Dataset Maps"

Hands-on: Create Project

QGIS

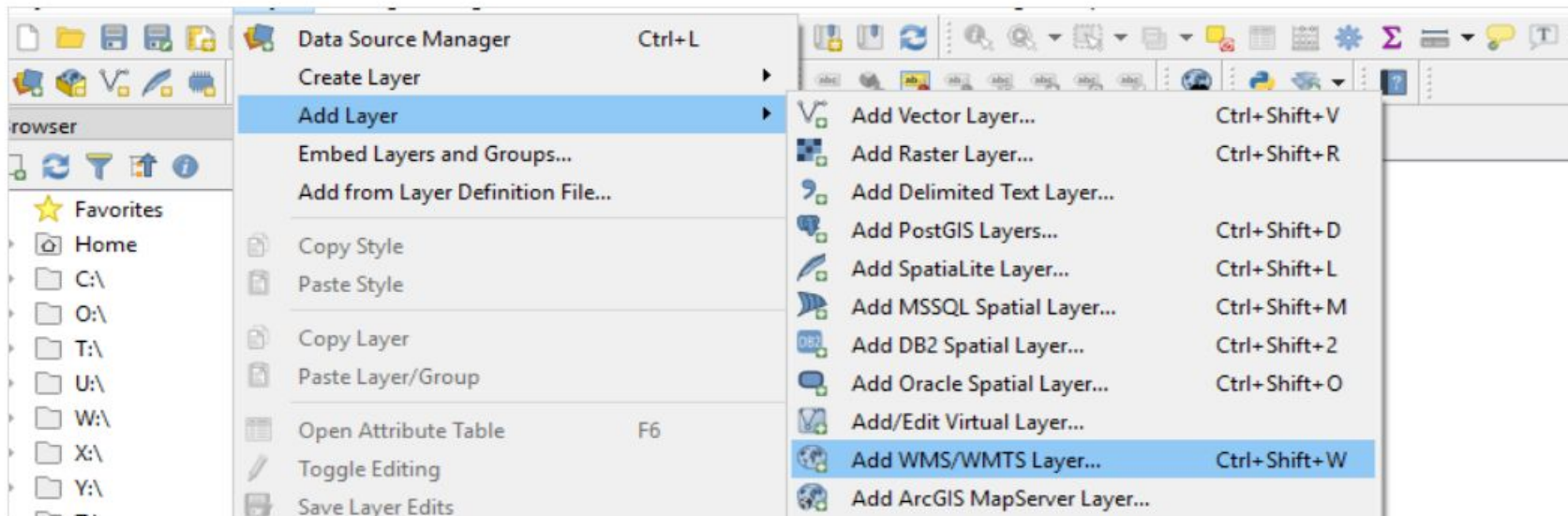
QGIS is an open GIS desktop application that allows you to display, interrogate, visualise and create geospatial information. It is also capable of interacting with geo-centric APIs (for example, a WMTS).

The instructions that follow demonstrate how to integrate the OS Maps API in order to produce a background map in QGIS.

For the purposes of this guide the version of QGIS used is 3.4.

Integrating OS Maps API in QGIS

1. Open a blank document in QGIS.
2. Navigate to Layer → Add Layer → Add WMS/WMTS Layer...



Hands-on: Create Project

The screenshot displays the 'Data Source Manager | WMS/WMTS' window. On the left is a sidebar with a tree view of data source categories: Browser, Vector, Raster, Mesh, Delimited Text, GeoPackage, SpatialLite, PostgreSQL, MSSQL, Oracle, DB2, Virtual Layer, WMS/WMTS (selected), WCS, WFS, and ArcGIS Map Server. The main panel is titled 'Layers' and shows a dropdown menu for 'Datahub Maps API'. Below the dropdown are buttons for 'Connect', 'New', 'Edit', 'Remove', 'Load', 'Save', and 'Id Default Server'. A table with columns 'ID', 'Name', 'Title', and 'Abstract' is currently empty. Below the table are sections for 'Image Encoding' and 'Options'. The 'Options' section includes input fields for 'Tile size', 'Request step size', and 'Feature limit for GetFeatureInfo' (set to 10), a 'WGS 84' checkbox, and a 'Change...' button. At the bottom, there is a 'Layer name' input field, the status 'Ready', and 'Close', 'Add', and 'Help' buttons.

ID	Name	Title	Abstract
----	------	-------	----------

Options

Tile size:

Request step size:

Feature limit for GetFeatureInfo:

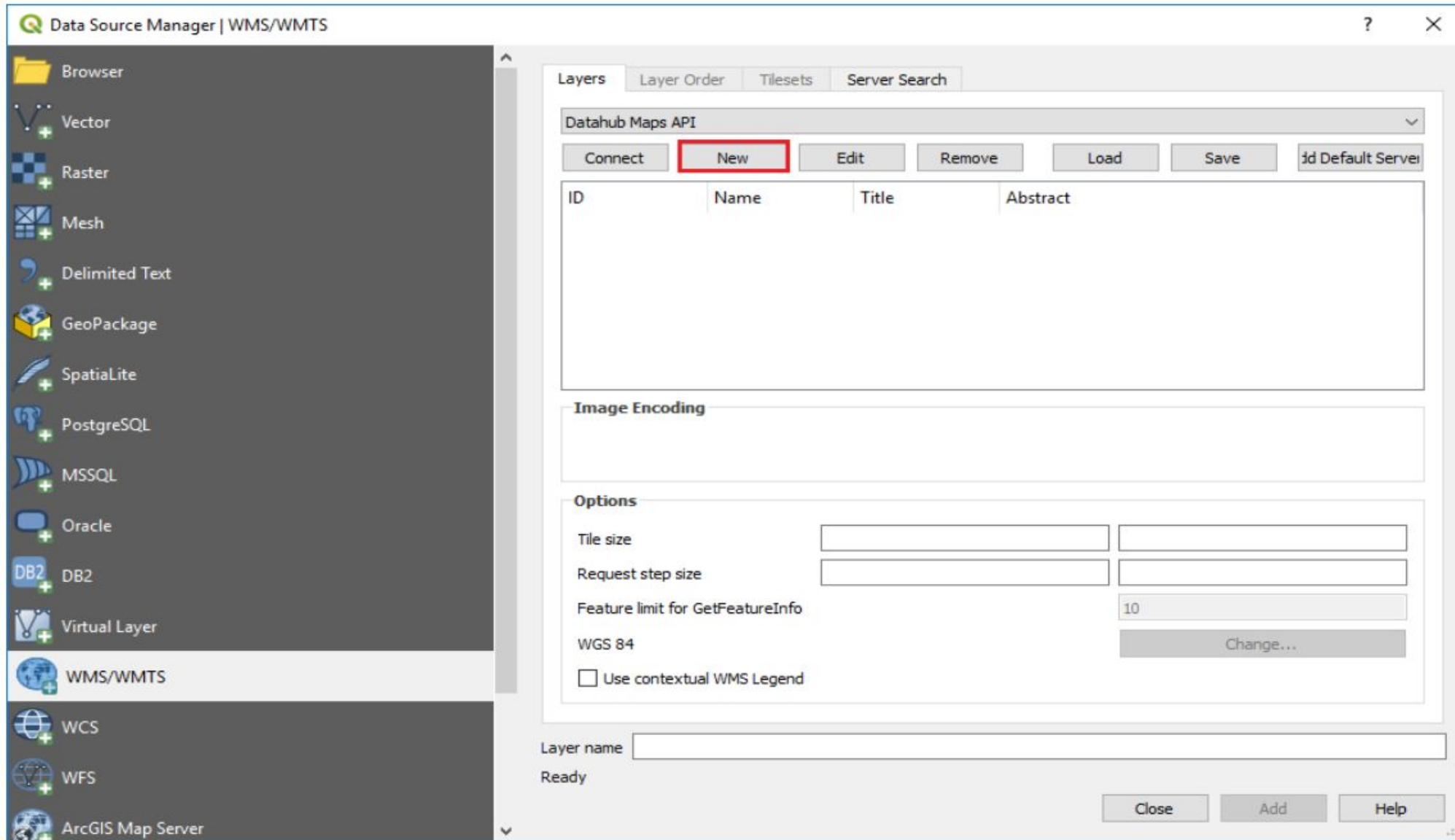
WGS 84:

Use contextual WMS Legend:

Layer name:

Ready

Hands-on: Create Project



Hands-on: Create Project

Create a New WMS/WMTS Connection

Connection Details

Name

URL

Authentication

Configurations **Basic**

Choose or create an authentication configuration

No authentication

Configurations store encrypted credentials in the QGIS authentication database.

WMS/WMTS Options

Referer

DPI-Mode

Ignore GetMap/GetTile URI reported in capabilities

Ignore GetFeatureInfo URI reported in capabilities

Ignore axis orientation (WMS 1.3/WMTS)

Invert axis orientation

Smooth pixmap transform

Hands-on: Create Project

Create a New WMS/WMTS Connection

Connection Details

Name: OS DataHub WMTS 2

URL: https://api.os.uk/maps/raster/v1/wmts?key= [REDACTED]

Authentication

Configurations Basic

Choose or create an authentication configuration

No authentication [edit] [delete] [add]

Configurations store encrypted credentials in the QGIS authentication database.

WMS/WMTS Options

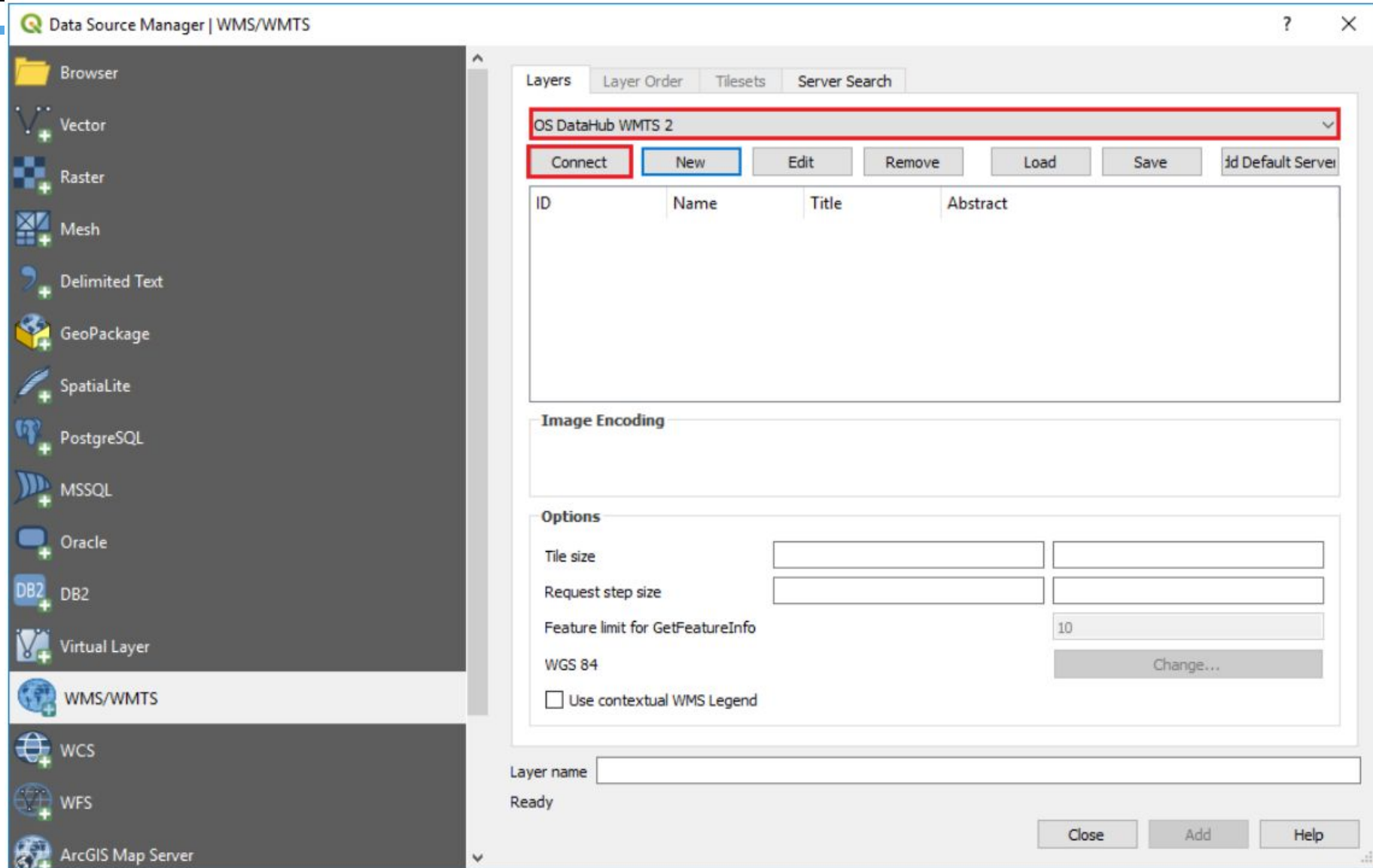
Referer: [empty]

DPI-Mode: all

- Ignore GetMap/GetTile URI reported in capabilities
- Ignore GetFeatureInfo URI reported in capabilities
- Ignore axis orientation (WMS 1.3/WMTS)
- Invert axis orientation
- Smooth pixmap transform

OK Cancel Help

Hands-on: Create Project



Hands-on - Create Project

Data Source Manager | WMS/WMTS

Browser

- Vector
- Raster
- Mesh
- Delimited Text
- GeoPackage
- SpatialLite
- PostgreSQL
- MSSQL
- Oracle
- DB2
- Virtual Layer
- WMS/WMTS**
- WCS
- WFS
- ArcGIS Map Server

Layers | Layer Order | Tilesets | Server Search

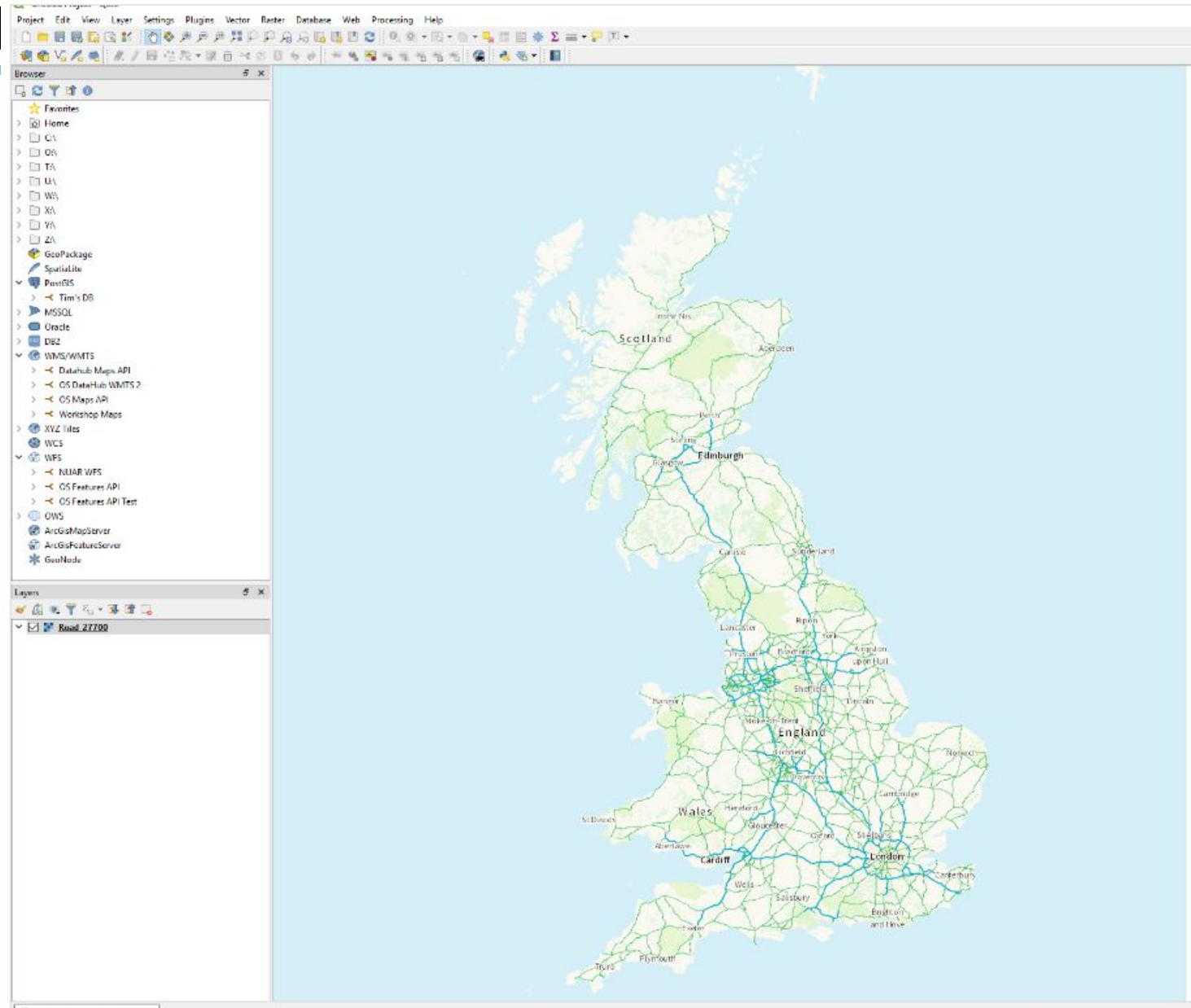
Layer	Format	Title	Style	Tileset	CRS
Leisure_27700	image/png	Leisure_27700	Default Style	EPSG:27700	EPSG:27700
Light_27700	image/png	Light_27700	Default Style	EPSG:27700	EPSG:27700
Light_3857	image/png	Light_3857	Default Style	EPSG:3857	EPSG:3857
Outdoor_27700	image/png	Outdoor_27700	Default Style	EPSG:27700	EPSG:27700
Outdoor_3857	image/png	Outdoor_3857	Default Style	EPSG:3857	EPSG:3857
Road_27700	image/png	Road_27700	Default Style	EPSG:27700	EPSG:27700
Road_3857	image/png	Road_3857	Default Style	EPSG:3857	EPSG:3857

Layer name: Road_27700

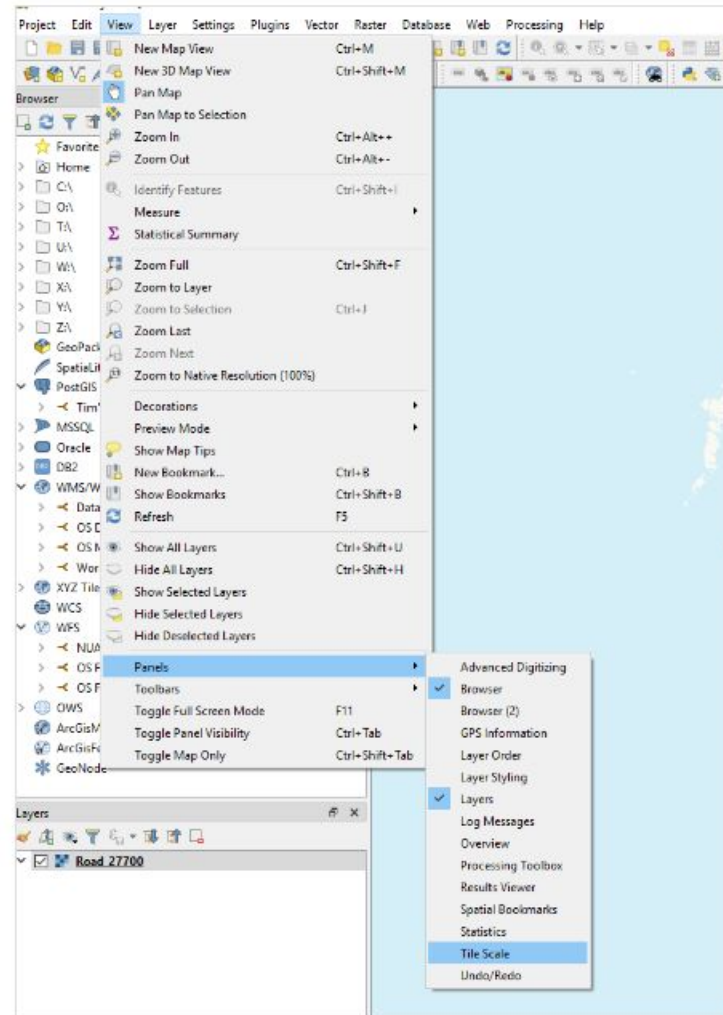
Tileset selected:

Close Add Help

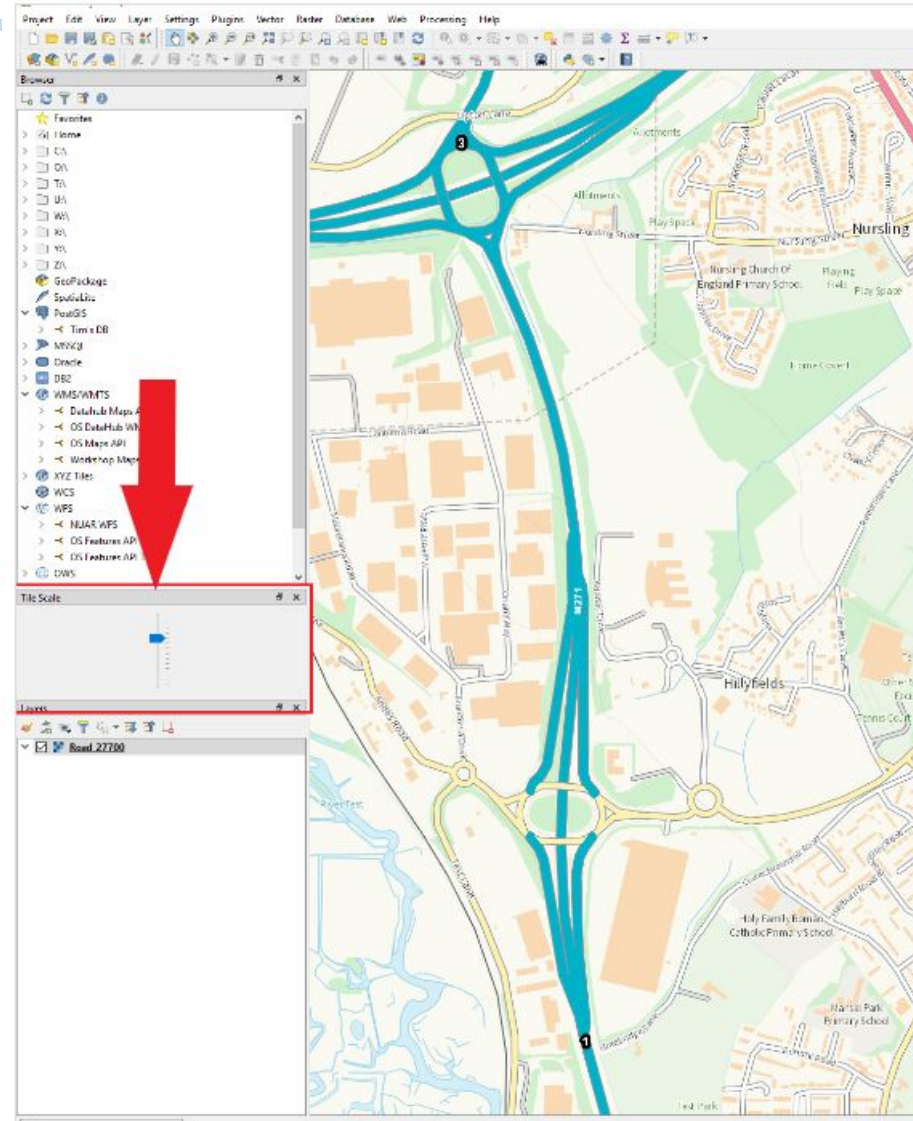
Hands-on: (



Hands-on: Create Project



Hands-on: Create Project



Hands-on: Exercise

Q 1. Create API for Features using OS Data

Q 2. Create a website and add API for maps, features

THANK YOU!

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#OGCAPI