# Implementing an Enterprise Wide Geospatial Solution

Are you:

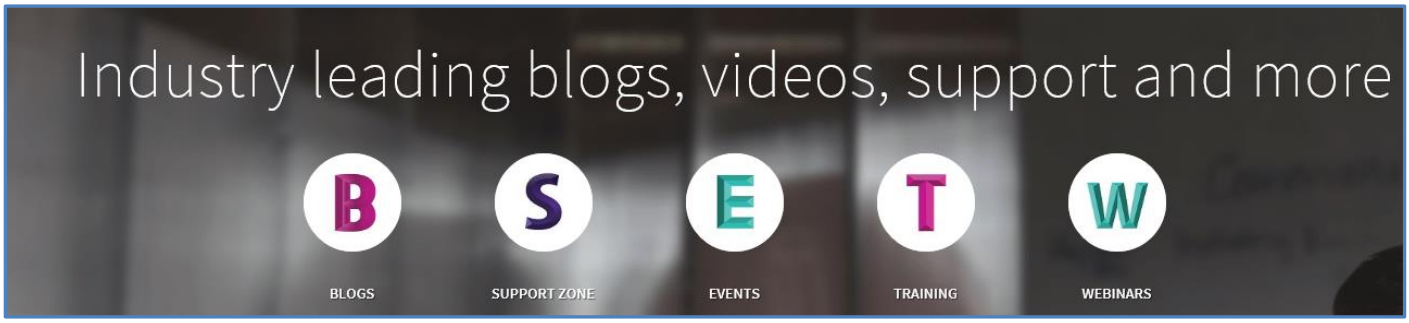
- tasked with reviewing your current geospatial applications?
- coming to the end of long-term contracts with expensive proprietary GIS vendors?
- or just eager to explore implementing **Open Source GIS**?

Here is some good news!

- don't worry it's been done before – by lots of organisations!
- you will still get professional support and expert training
- the tools available are just as good, if not far exceed the capabilities of their proprietary counterparts
- and there is 'a lot' of free support and advice online

Therein lies the reason I wanted to write this blog 😊.

Cadline has a free to use, public facing support portal called Cadline Community which gets over 3 Million hits per year. It's great! It has lots of videos, faq's, blogs, white papers and other resources for you to use, providing support for all **Autodesk products** as well as Open Source GIS solutions, including **QGIS**, **PostGIS** and **GeoServer**.




As an **Application Engineer** in the Cadline **DynamicMaps** team I regularly produce content for Cadline Community and I really enjoy doing it!

As an **Open Source GIS Evangelist** as well as a '*Geographer in a CAD World*!', I also promote this material on my personal **LinkedIn** pages so that I can share my experiences and knowledge with the wider community.


I haven't counted, but I would estimate I have created **over 100 articles** for Cadline Community! I see it as a great way to undertake my own RnD (learning new tools and streamlining work processes) and then have a perfect location to store this knowledge, so that other users and myself can access that information whenever I may need to in the future.

In my role supporting Cadline's clients, I also provide training, support and data migration services for all of our **DynamicMaps solutions**, which include a webGIS, GML translator tool, llpg and incident reporting tool.

DynamicMaps **WebGIS** | DynamicMaps **Address & Street Manager** | DynamicMaps **GML Translator** | DynamicMaps **ReportIt** | DynamicMaps **INSPIRE** | DynamicMaps **Street Naming & Numbering**

In addition, Cadline also provides Training and Support Services for a number of Open Source Geospatial applications. Delivering both public and private **AGI accredited training** courses in QGIS, GeoServer and PostGIS.

PostGIS Spatial PostgreSQL

OpenLayers 3.0

agi CPD ACCREDITED

This means that Cadline has a wealth of online resources which are regularly kept up to date and, if used correctly, can help you implement your own **enterprise wide GIS solution**.

Now, you could simply access our Cadline Community website and search for GIS …


and just like after running a **google search** you may not know where to start when faced with a large list of results!



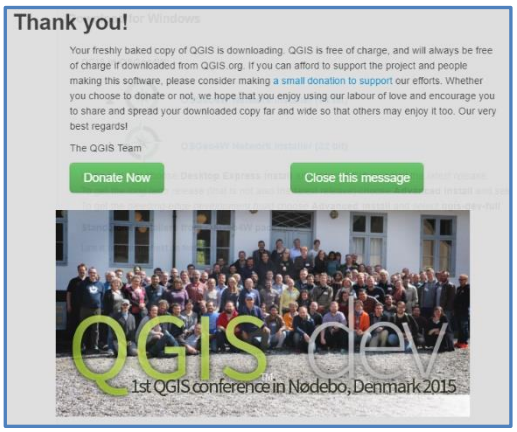
Well in this blog I aim to provide an overview of how you could successfully implement your own enterprise GIS, identifying the **best Cadline Community** resources which provide expert support and advice on the following core components:

- *Installing Open Source Applications on a Server*
- *Data Sources and Data Processing*
- *Managing Basemaps*
- *Utilising Web Map Publishing Services*
- *Data Maintenance*
- *Maximising your Desktop GIS*
- *Publishing Web Mapping Applications*
- *Integrating CAD and GIS Teams*

## 1 - Installing Open Source Applications on a Server:

I won't pretend to be a Database Administrator, Network Engineer or IT guru,.. but from my experience installing QGIS as a desktop GIS within an enterprise environment, e.g. via Citrix, is simple and straight forward. The hardest decision is whether or not to provide a **donation** when you download the latest Long-Term Release.

https://qgis.org/en/site/forusers/download.html




Now we have a desktop GIS installed (more on this later) you will likely want a central location to store your spatial assets, and possibly a way to more easily publish that data as Web Map Services. Cadline fully supports the implementation of both **GeoServer** and **PostGIS** and has a number of years' experience installing these within an enterprise architecture.


Here is a Cadline Community link which details how to download, install and then **configure a GeoServer and PostGIS instance on an application/database server.**

https://www.cadlinecommunity.co.uk/hc/en-us/articles/115004550969-GeoServer-and-PostGIS-Server-Installation

This blog is a great starting point when looking to install these applications on a server and provide specific advice on:

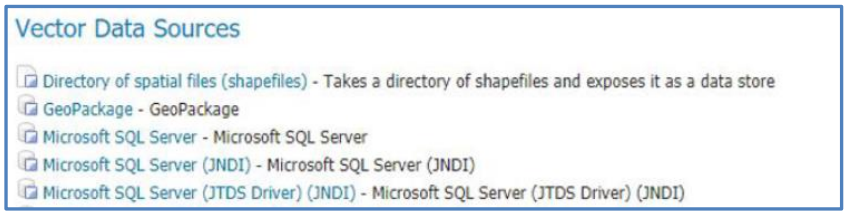
- Setting up GeoServer as a Service
- Setting GeoServer Access Rules
- Configuring Remote Access to allow connections via the correct Ports
- Updating the Postgres PG_HBA config file to allow remote connections to your PostGIS Database

In addition to using PostGIS to store your spatial assets, you may also have some datasets in a **SQL Database** Instance. While GeoServer is happy to connect directly to PostGIS databases (out of the box), it requires an extension to connect with SQL.

Here is a Cadline Community link which outlines how to download, install and then configure the **SQL Server Extension for GeoServer:**

https://www.cadlinecommunity.co.uk/hc/en-us/articles/115005802929-GeoServer-SQL-Server-Extension-Installation

Once the SQL Server extension has been installed, you can now connect your GeoServer instance to any extra datasets stored in your existing SQL database.




## 2 - Data Sources and Data Processing:

Data, be it spatial or attribute data, is key to any enterprise GIS solution. At the outset of your implementation you may be looking for advice on sourcing specific datasets, especially looking for any **openly available** data.

Here is a Cadline Community link providing advice on accessing a number of **Open Source datasets:**

https://www.cadlinecommunity.co.uk/hc/en-us/articles/208320689-Exploring-Open-Data

Having now implemented your chosen GeoStore database (e.g. PostGIS) and downloaded the datasets that you wish to visualise, your next step is to translate that data and migrate it successfully into your GeoStore. This isn't as easy as it seems as you may have datasets in a number of different GIS formats e.g. ESRI Shapefile, MapInfo TAB, AutoCAD DXF, GML, GeoJSON etc…

You could opt to purchase expensive data translation software, which definitely has its advantages as it often undertakes complex processing tasks during the data migration. However, as a starting point why not utilise the Open Source **Geospatial Data Abstraction Libraries (GDAL)** which use a command line **Ogr2Ogr** application allowing you to translate between many of these common geospatial formats.

Cadline Community has two **Ogr2Ogr blogs**, the first introducing the tool and the second concentrating on migrating data into a PostGIS database:

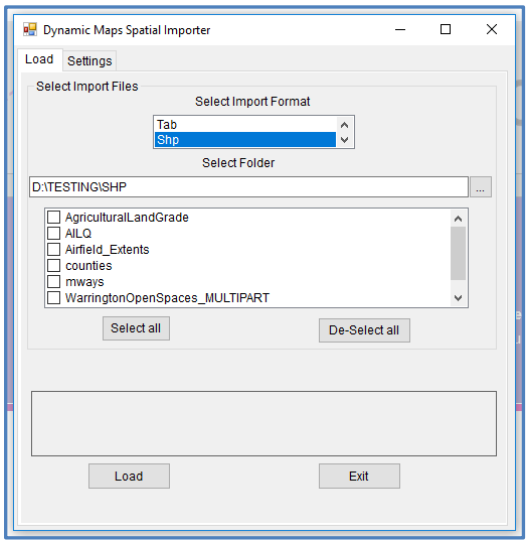
https://www.cadlinecommunity.co.uk/hc/en-us/articles/115003496349-Utilising-Ogr2Ogr-Part-One

https://www.cadlinecommunity.co.uk/hc/en-us/articles/115003798085-Utilising-Ogr2Ogr-Part-Two-PostGIS-

Theses blogs are a great introduction to Ogr2Ogr covering topics including:

- Accessing Ogr2Ogr
- Reprojecting data
- Identify spatial information e.g. record counts
- Importing between flat GIS files
- Importing between SQL, Oracle and PostGIS Databases
- Manage Database Tables Schema

If you are 'code' adverse… Cadline has utilised the Ogr2Ogr toolset to create our very own **DynamicMaps Spatial Importer tool**. This provides a simple to use interface allowing our clients to undertake bulk translations between many common data formats and databases without needing to write complex command line code:




Using these spatial import tools you can easily upload, reproject and index your spatial datasets within yoiur chosen spatial database. So, its  now time to consider what basemapping should I use?

## 3 - Basemapping:

Gone are the days when all background mapping data came at a price and from only a small number of vendors. Now, in these halcyon 'Open Source' days, we have a plentiful supply of basemapping to suits all applications, all users' needs and all aesthetic tastes!

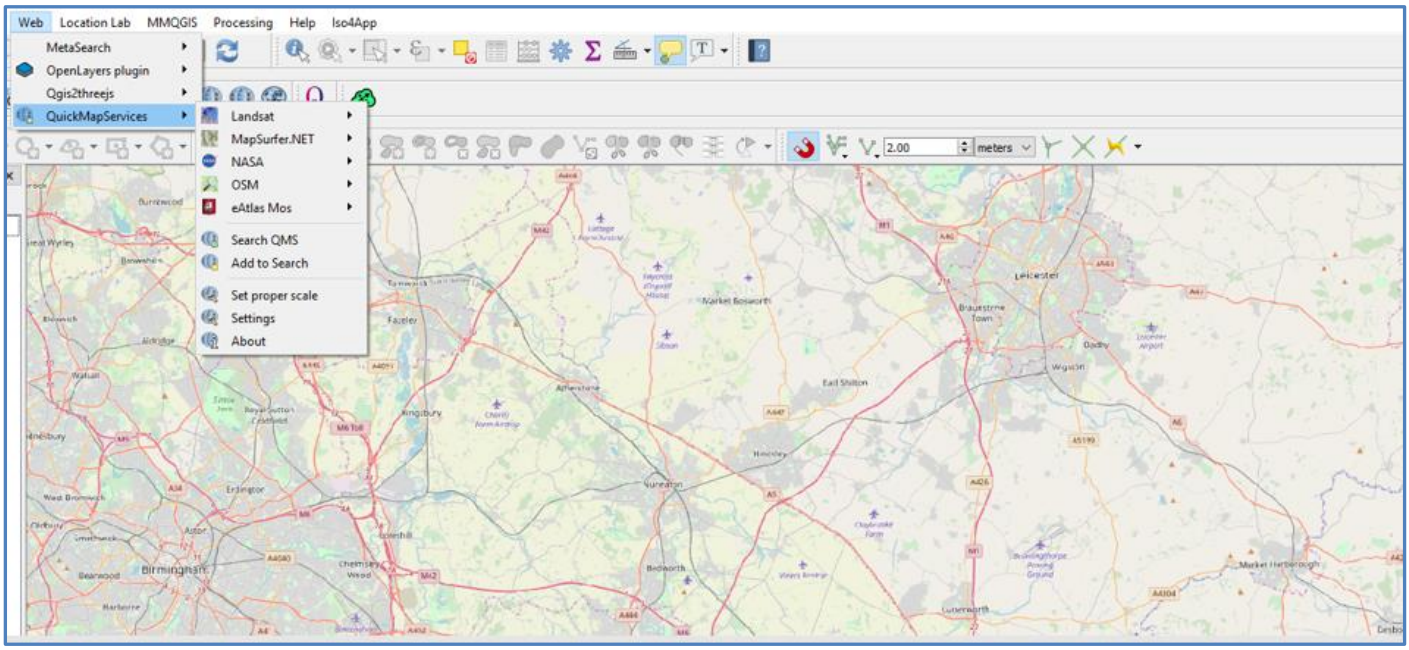
The only real question you have is whether you go direct to the expert surveyors e.g. the **Ordnance Survey** (and others) or are you happy to rely on freely available **crowd-sourced datasets** collected by 'Geo-Geeks' like myself on a Mobile App at the weekend? Maybe this is an over simplification, but we are definitely in a world where data is king and there are currently a lot of choices that you can make.

All of which means we have a lot of resources in Cadline Community with tips and tricks on how to access, process and style these basemaps. So, I have broken this section down into:

- external basemaps
- PSMA and Ordnance Survey basemapping
- managing your own Web Map Tile Service

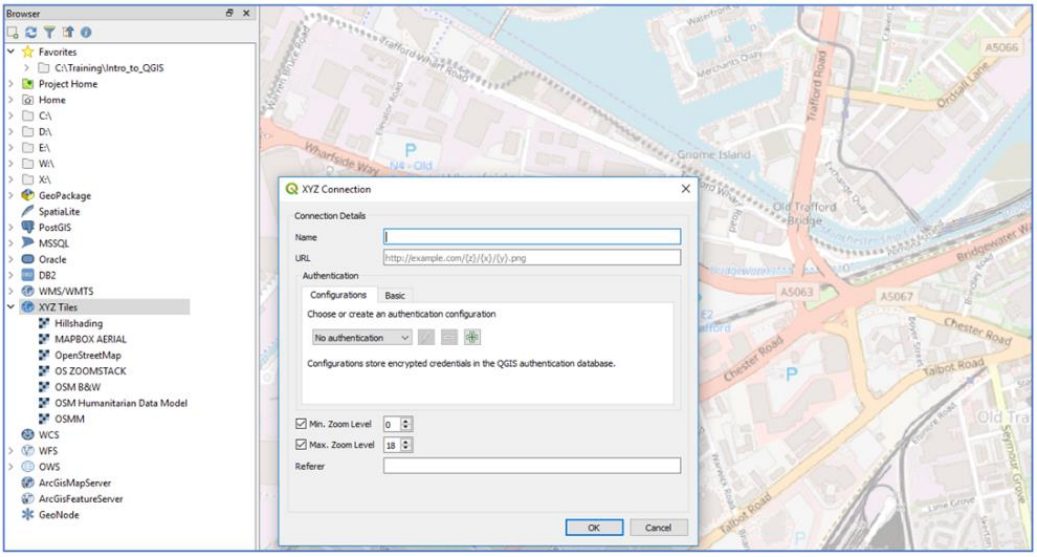
### 3.1 External Basemapping:

QGIS desktop GIS can connect directly to any compliant **Web Map Tile Service** and has a free to use plugin (**QuickMapServices**) to make this easy:




However, if you know the URL of your WMTS compliant resource here is an FAQ on how to **set up your WMTS within QGIS**:

https://www.cadlinecommunity.co.uk/hc/en-us/articles/115004388965-QGIS-Adding-WMTS-Tile-Layers



### 3.2 PSMA and Ordnance Survey Basemapping:

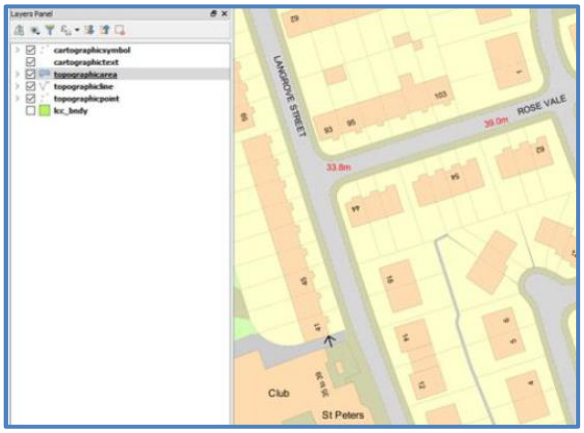
Maybe you are a UK Local Authority and part of the **Public Sector Mapping Agreement**? If so you can consume any of this information within your Open Source GIS applications. If you don't want the overheads of managing these datasets here is an FAQ detailing how to access a WMTS which serves up **Ordnance Survey Streetview** directly into QGIS:

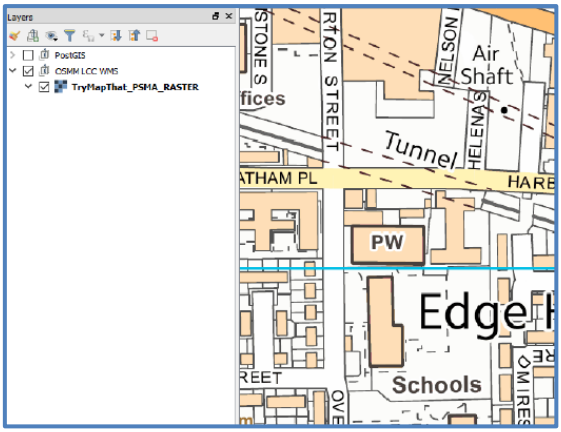
https://www.cadlinecommunity.co.uk/hc/en-us/articles/360001292197-MapThat-OS-StreetView


or if you are eager to put your QGIS, GeoServer and PostGIS skills to use, then this blog details how you can maximise your access to **PSMA datasets in CAD and GIS**:

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360000415117-Publishing-PSMA-Datasets

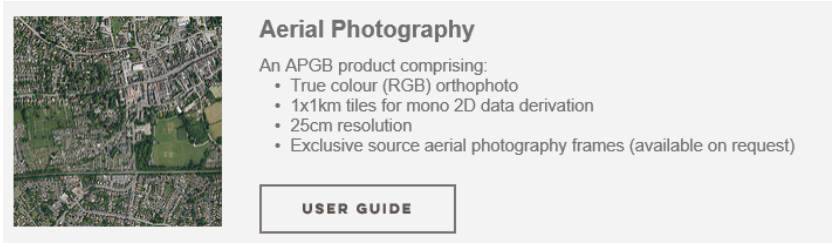
- using GeoServer to publish Large Scale Raster basemapping
- accessing PSMA basemaps via GeoServer as a WMS feed
- publishing and consuming OS Mastermap





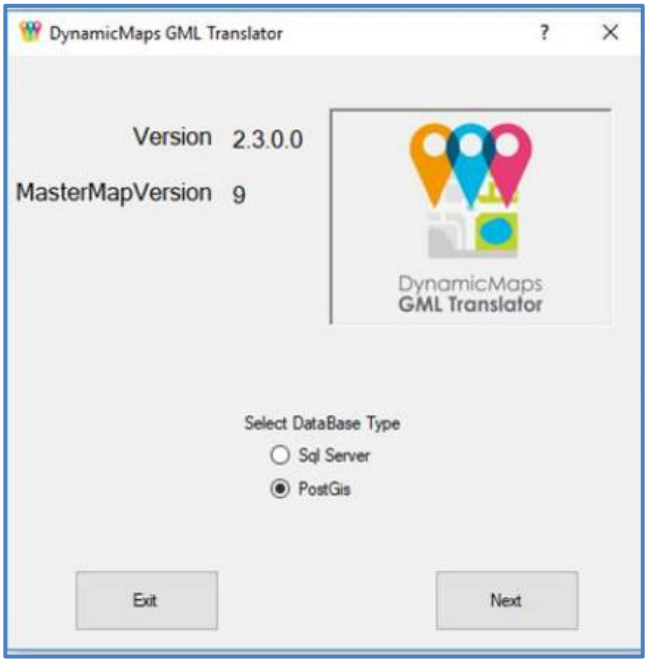
Recently, when onsite at one of our DynamicMaps clients, I heard about the **Aerial Photography for Great Britain (APGB)** initiative which provides aerial imagery as a Web Map Service. This is a great project, as it provides non-GIS experts access to an up to date source of aerial imagery without any complex processing or data storage requirements.

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360001089957-MapThat-Aerial-Imagery




Being part of the PSMA also allows you to work with the **OS Mastermap Topography** layer. Firstly, you will need tools to **process OSMM** into your preferred spatial format. Cadline's DynamicMaps **GML Translator tool** allows you to translate OSMM into either SQL Server or PostGIS.

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360001494037-DynamicMaps-GML-Translator-Now-Uploads-OS-Mastermap-into-PostGIS-

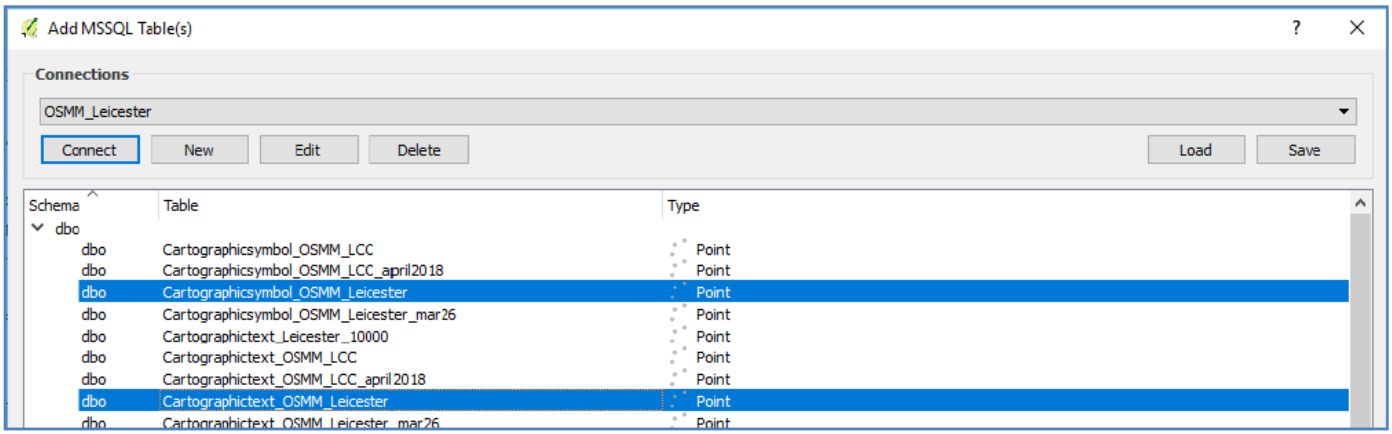


Having now translated your OSMM holding into a spatial database, you will need to allow your users to consume this basemapping and QGIS is a great place to start!

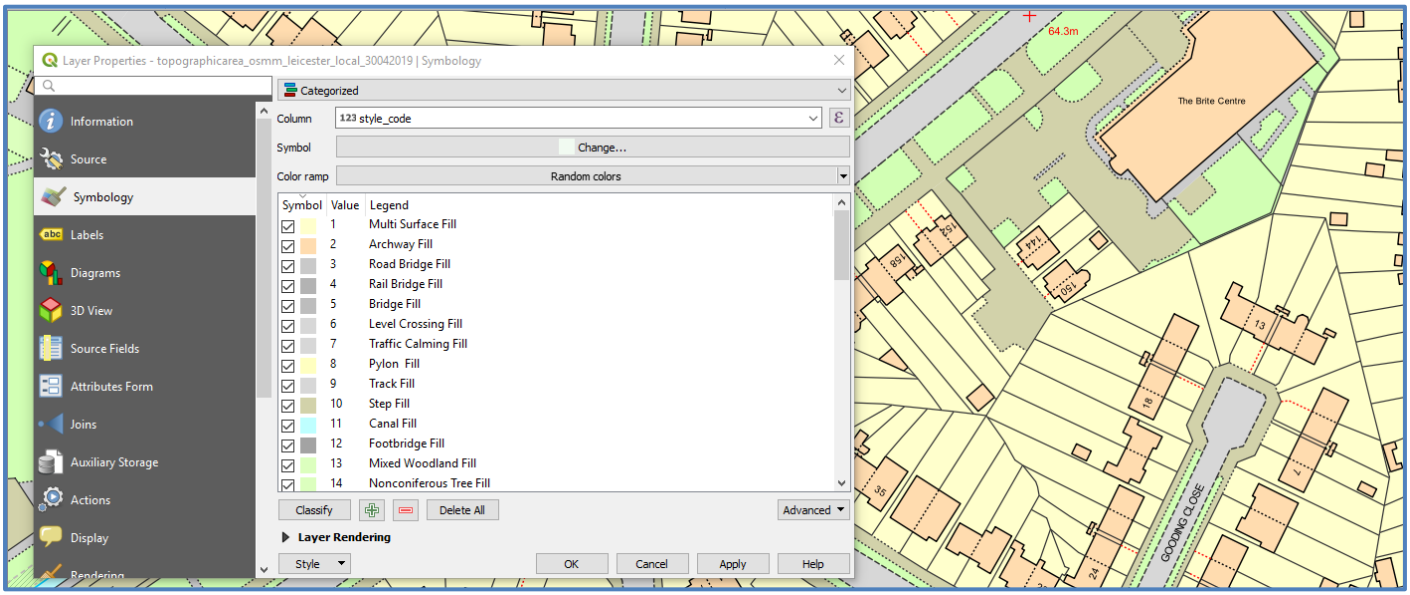
Here is a blog detailing how to **style OSMM spatial geometry from a SQL database** within QGIS:

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360000021738-Styling-SQL-Server-OS-MasterMap-Layers-in-QGIS-Part-2

providing **Data Connection** details:




And **styling options** using the Ordnance Survey **QML Style files**:



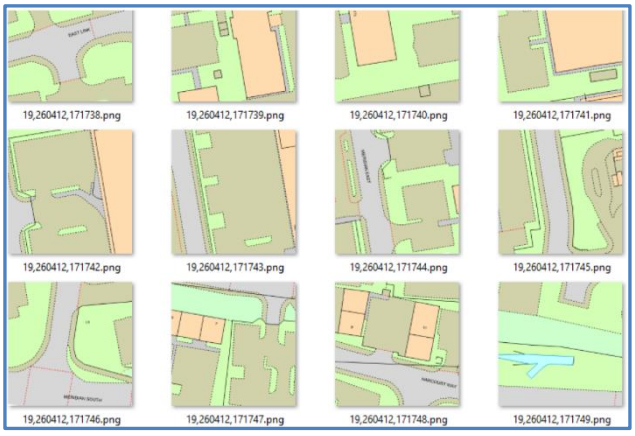
With some additional advice on ensuring the complex polygon **Custom Symbol** styles are also correctly handled:

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360000351118-QGIS-How-do-you-configure-the-OSMM-Symbols-in-QGIS-


### 3.3 Managing your own Web Map Tile Services:

Have you created a series of **Web Map Tiles Service (WMTS)** images? And do you want to open those in your desktop GIS? Well here is a blog for you as it details how to add ZXY (Google) Tiles as a Tile Map Layer:

https://www.cadlinecommunity.co.uk/hc/en-us/articles/115004388965-QGIS-Adding-WMTS-Tile-Layers

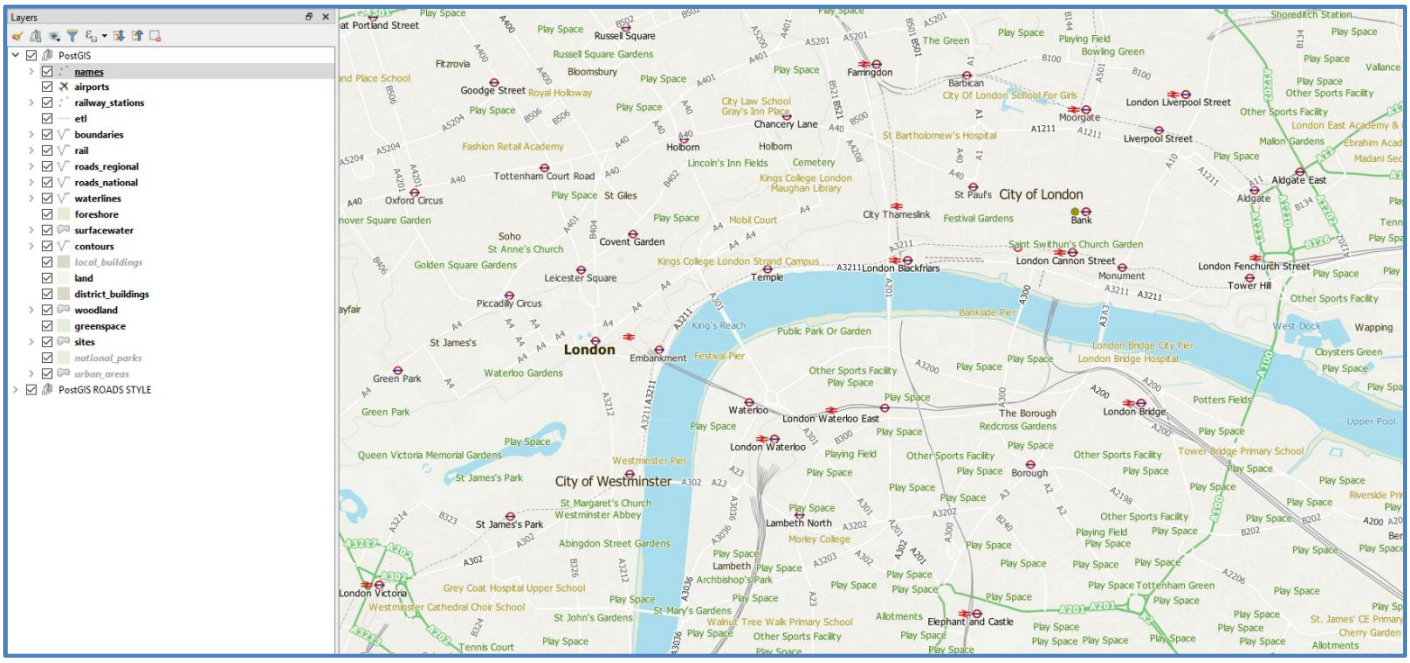


Alternately you may wish to utilise the Ordnance Surveys new Zoomstack basemapping. If so we have 3 blogs detailing how to access, download and store **OS Zoomstack** in 3 separate formats:

**Part 1: Vector Tiles**
https://www.cadlinecommunity.co.uk/hc/en-us/articles/360000747077-Exploring-OS-Zoomstack-Part-1-Vector-Tiles

**Part 2: PostGIS**
https://www.cadlinecommunity.co.uk/hc/en-us/articles/360000767357-Exploring-OS-Zoomstack-Part-2-PostGIS-and-GeoServer

**Part 3: GeoPackage**
https://www.cadlinecommunity.co.uk/hc/en-us/articles/360000782437-Exploring-OS-Zoomstack-Part-3-GeoPackage




With advice on how you can then **access OS Zoomstack from within your desktop and webGIS**:

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360000918518-OS-ZoomStack-Access-via-Desktop-and-webGIS-

Instead of storing these datasets locally on your own servers, you may wish to utilise dedicated Map Servers to publish your basemapping with optimum speeds and styling. This is where a supplier like **MapBox** are perfect!

Firstly, you will need to **setup a MapBox Account**:

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360000603618-MapThat-Create-your-own-MapBox-Access-Tokens

and then you can upload your basemapping files e.g. OS Zoomstack into your MapBox Account to then publish as your very own **Web Map Tile Service**:

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360001229078-OS-Zoomstack-WMTS-Feeds-for-MapThat

Which can then be consumed by both desktop and webGIS.


## 4 – Using GeoServer to Style Data and Publish a WMS:

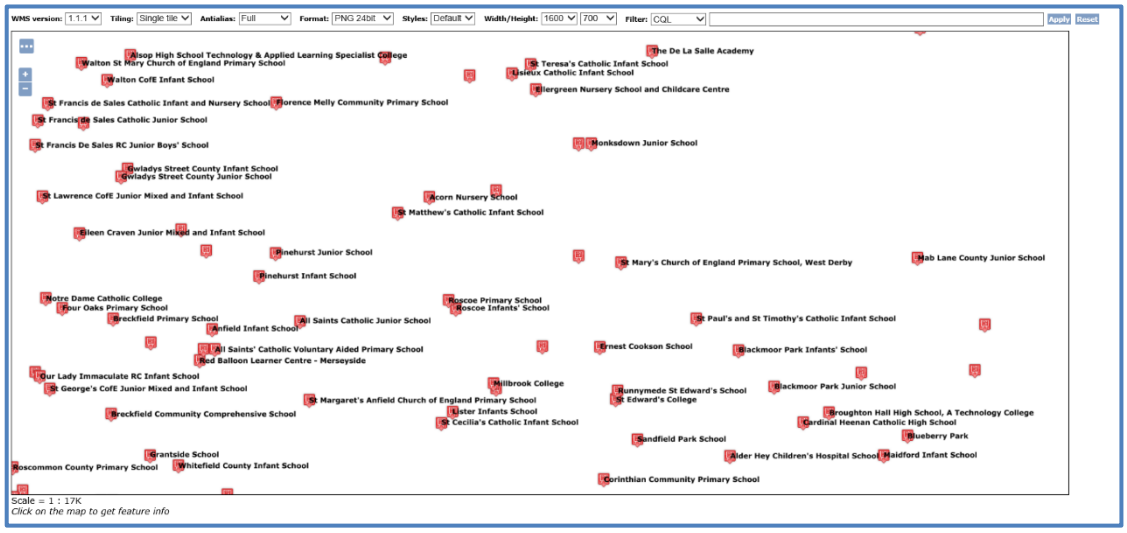
Remember when you received geospatial files on floppy discs? Then it was CD's and then DVD's..? if you don't and maybe you became a professional in this new 'digital age', then you are likely very used to receiving your spatial data and basemapping updates in **digital format**, either as a download or a live **Web Map Service (WMS).** As well as your external suppliers adopting these supply formats, Cadline fully recommends that you utilise Web Map Publishing software such as **GeoServer** to publish your assets.

It has a number of advantages, including:

- Professional styling options
- Publishing of heavy spatial assets in a light weight URL
- Management of basemapping, including OSMM, into disparate client applications

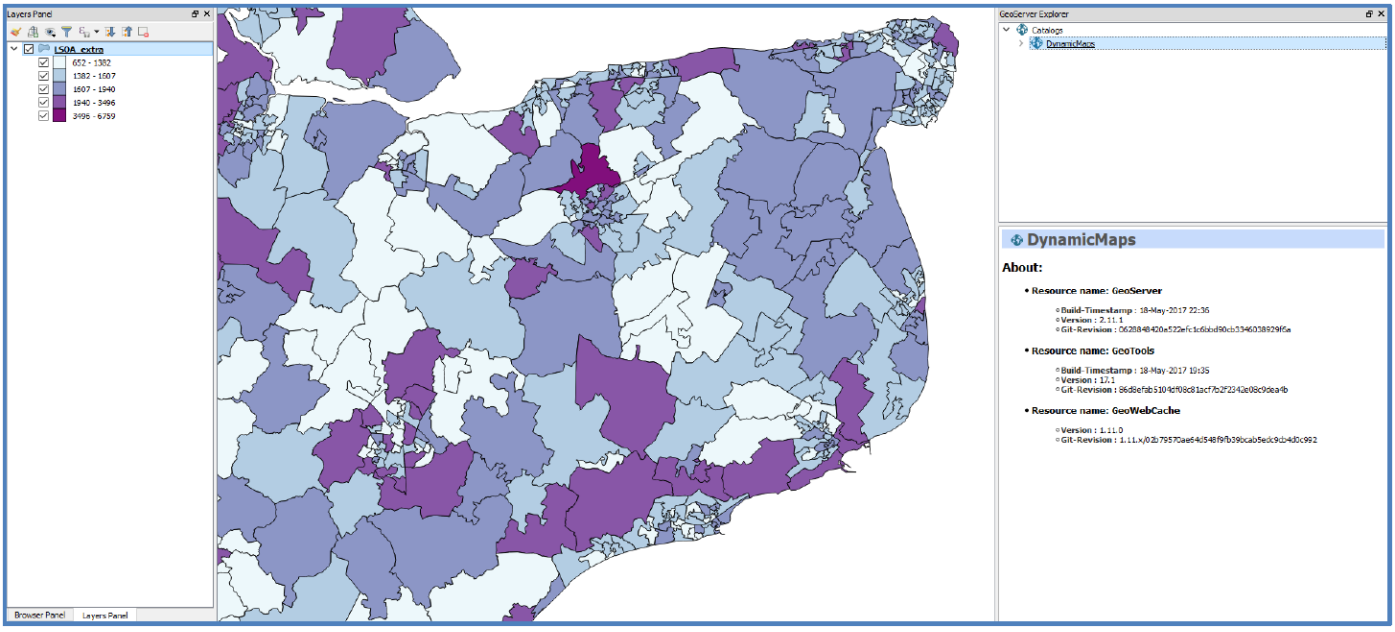
Once your GeoServer instance is deployed why not use this Cadline Community Blog on applying **SLD styling options** such as Labels, Thematic Ranges and Scale dependent visibility:

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360000018098-GeoServer-Creating-MapThat-Label-Layers




If you find creating SLD style files complicated, then why not use the **GeoServer Plugin for QGIS**, where you can style your layers within the QGIS project and auto generate complicated styling options to then save to your GeoServer Instance.

https://www.cadlinecommunity.co.uk/hc/en-us/articles/115004680145

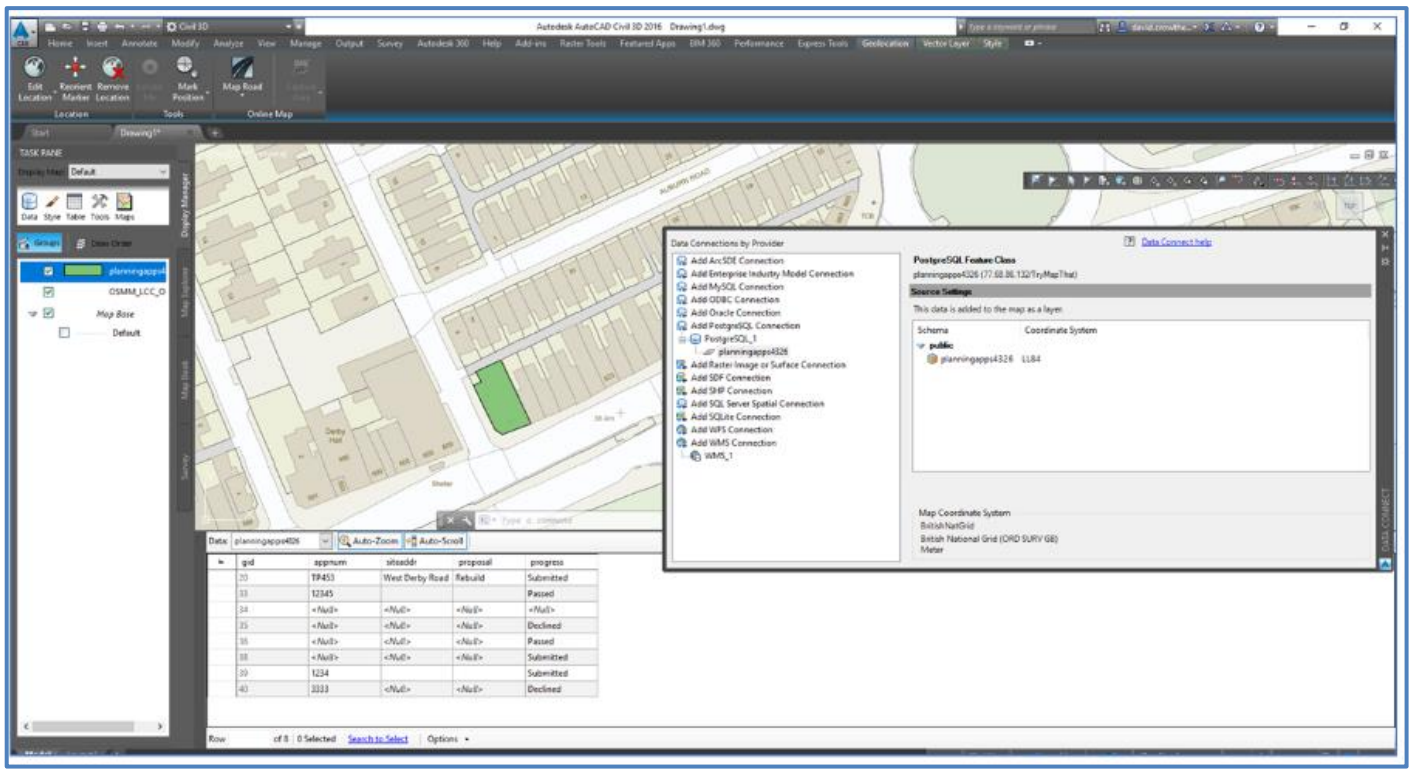


The 'Nirvana' (as I like to call it) is when you can publish your **OSMM** holding from a spatial database (e.g. PostGIS) as a **Web Map Service (WMS).** The reason this is so powerful, is that not only does it provide a light weight source for OSMM, which is pre-styled ready for the client to consume, but because it is using the WMS standard, the service can then be consumed by multiple applications such as desktop GIS, webGIS and **Autodesk products**.

Here is a Cadline Community blog detailing how you can use **GeoServer** and the **OS SLD style files** to publish your **OSMM holding** as a WMS:

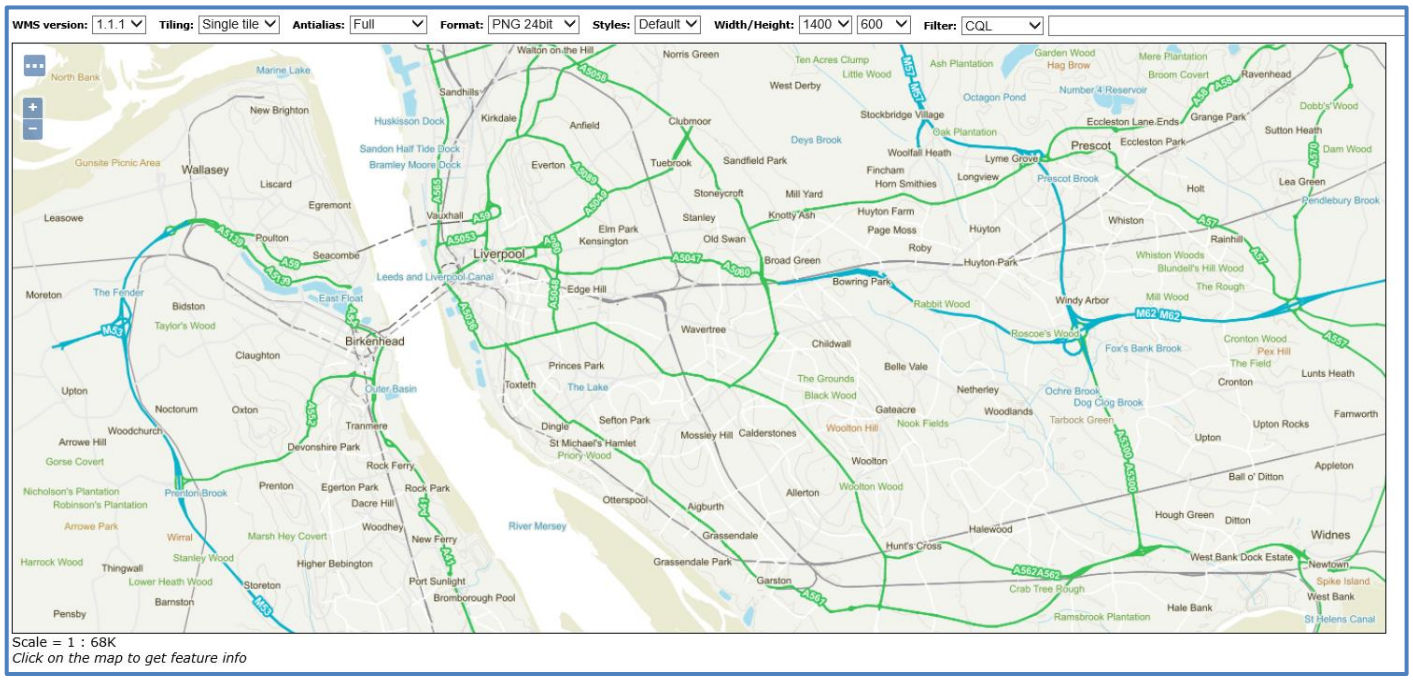
https://www.cadlinecommunity.co.uk/hc/en-us/articles/115003309789-Publishing-OS-MasterMap-WMS-Layers

Once published here is the WMS service being consumed within **Autodesk Map3D**.

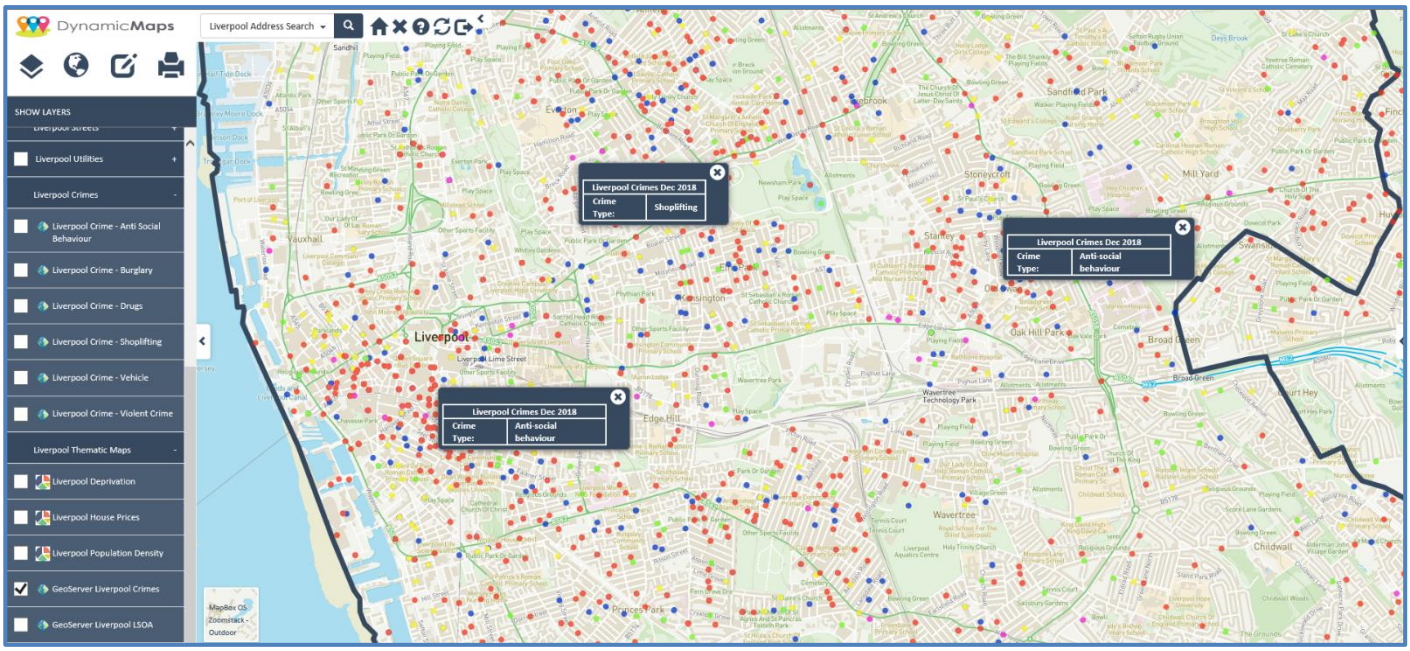


Continuing this theme, you can also use GeoServer to publish your **OS Zoomstack** holding as a WMS service, again making the basemapping then accessible by multiple applications.

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360001225197-OS-ZoomStack-New-GeoServer-WMS-SLD-Styles




The DynamicMaps team utilise GeoServer within our **webGIS**, both for **basemap publishing** and **spatial layer** creation. Using SLD Style options we can very easily make high impact map layers e.g. Crime Incident mapping.



## 5 – Data Maintenance


You have now installed, configured and populated your geospatial applications ready to provide your end users with the tools to do their jobs. This is probably a good point to take stock and think about the next steps, especially with regards to long term **data maintenance**.

- Who will update these datasets?
- How can I control what values are entered and by whom?
- How do I maintain data integrity such as primary unique keys?
- Can I automate any data updates to make life easier?

Our Cadline Community web forum has a number of useful blogs, tips & tricks and faq's detailing ways to implement **data maintenance procedures** within both your desktop GIS and spatial database.

### 5.1 Users and Permissions:

To start with here is a two-part blog on implementing good practice for controlling **PostGIS Users and Permissions**:

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360001032998-PostGIS-Users-and-Permissions-Part-1

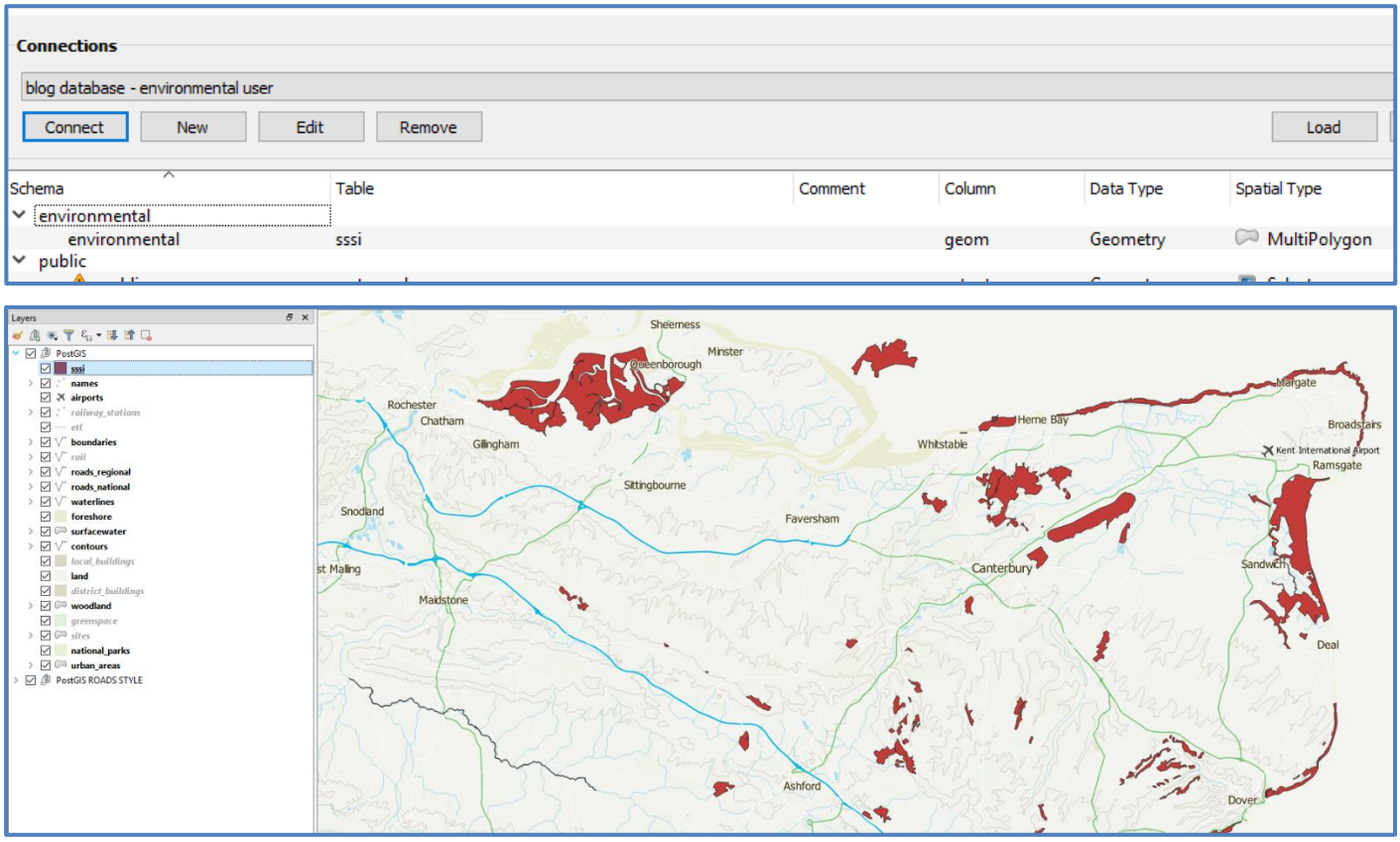
https://www.cadlinecommunity.co.uk/hc/en-us/articles/360001020317-PostGIS-Users-and-Permissions-Part-2


Including options for:

- Creating Super Users
- Granting Access to Schemas
- Managing Roles, Privileges and Table Owners

Once the correct **access controls** have been implemented, you can be sure that users connecting via a client application such as **QGIS** can only **View** and **Edit** the tables that you want them to.

For example, the Environmental Team can only access the tables in their specific database Schema (Environmental):




## 5.2 Database Triggers – Update Values

But don't stop there! Ensure that you implement steps to maintain the integrity of those datasets. For example, you could implement **Database Triggers** which auto populate values instead of leaving this in the hands of your users. Database Triggers are an effective way to reduce overheads spent on time consuming data entry, while also ensuring you minimise mistakes due to human error.

In this Cadline Community FAQ we explore using **Database Triggers** to auto **update an AREA field** within a Planning Applications table:

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360001333097-PostGIS-Update-Area-Trigger

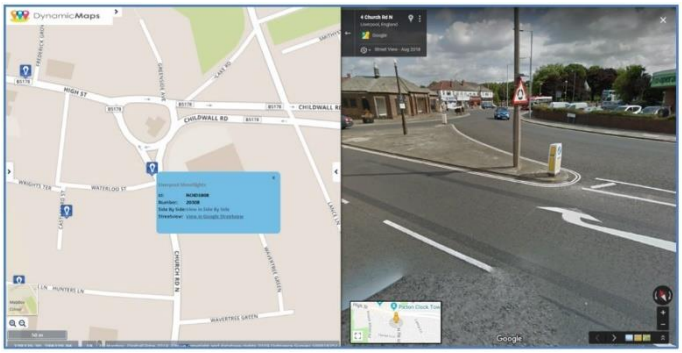
Once the user creates a new feature into the spatial table using either QGIS, webGIS or Autodesk Map products, the database then activates a trigger to **auto populate the Area field.**

```
CREATE OR REPLACE FUNCTION calc_area()
RETURNS trigger AS
$BODY$
BEGIN
NEW.area := ROUND((st_area(NEW.geom::geography))::numeric,2);
RETURN NEW;
END;
$BODY$
LANGUAGE plpgsql;
```

| | | | | |
|---|---|---|---|---|
| 11 | 43 | 010300002... | 290.87 | Passed |
| 12 | 44 | 010300002... | 220.82 | Declined |
| 13 | 45 | 010300002... | 433.42 | Declined |
| 14 | 46 | 010300002... | 122.46 | Passed |
| 15 | 56 | 010300002... | 214.3 | Submitted |
| 16 | 59 | 010300002... | 176.49 | Submitted |

If using a **SQL database** you can also utilise database triggers to maintain your data. In this blog we demonstrate how the back-end database can run a number of update routines to extract information and populate extra fields. Ultimately creating a link to Google StreetView each time the user moves or creates a new Streetlamp feature.

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360001505997-MapThat-Linking-to-Google-StreetView-and-Database-Triggers

Ultimately we have taken that complex data maintenance task away from the user and allowed the database to ensure that as our table changes, its integrity is still maintained.

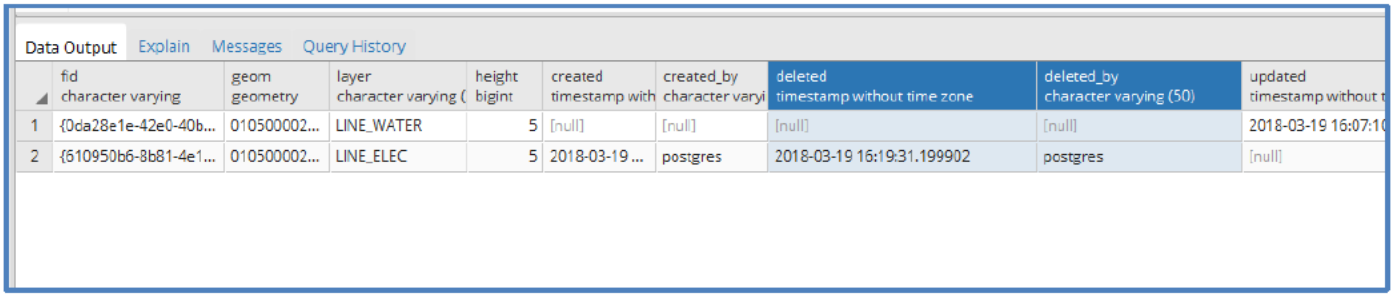
## 5.3 Database Triggers – Auditing History

You can also utilise database triggers to record changes made to any table in your spatial geostore, essentially creating an **audit log**. These can be very useful if you have a mandatory requirement to log all changes, or if you wish to monitor the changes being made by your user base.

In this Cadline Community blog we introduce **creating database triggers** in a **PostGIS database**, tracking the changes being made to a Utility network and updating an **audit table**:

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360000575049-PostGIS-Implementing-Database-Triggers-for-Data-Auditing

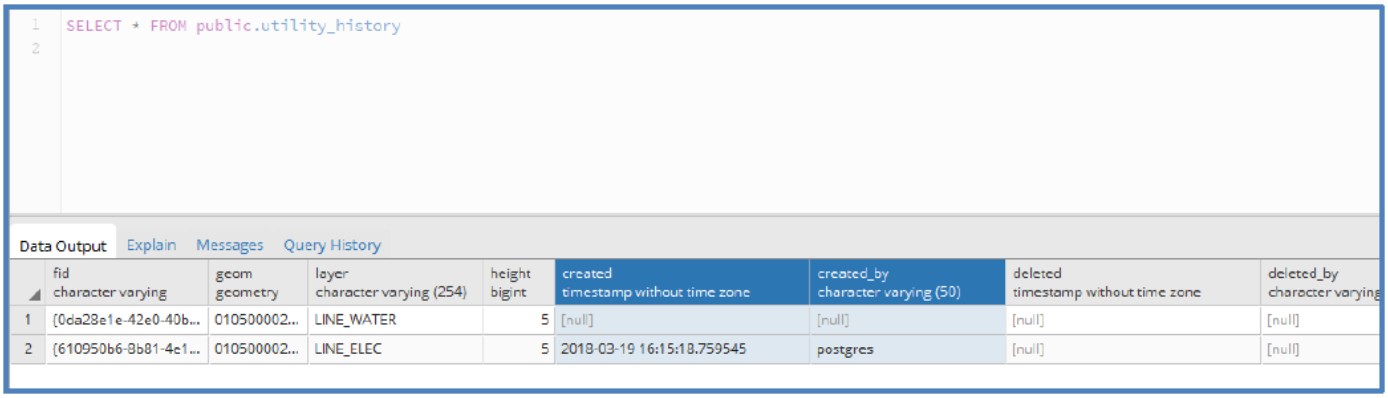
detailing which records have been **deleted**:



Data Output | Explain | Messages | Query History

| | fid character varying | geom geometry | layer character varying ( | height bigint | created timestamp with | created_by character varyi | deleted timestamp without time zone | deleted_by character varying (50) | updated timestamp without t |
|---|---|---|---|---|---|---|---|---|---|
| 1 | {0da28e1e-42e0-40b... | 010500002... | LINE_WATER | 5 | [null] | [null] | [null] | [null] | 2018-03-19 16:07:1( |
| 2 | {610950b6-8b81-4e1... | 010500002... | LINE_ELEC | 5 | 2018-03-19 ... | postgres | 2018-03-19 16:19:31.199902 | postgres | [null] |

and which have been **created**:



```
SELECT * FROM public.utility_history
```

Data Output | Explain | Messages | Query History

| | fid character varying | geom geometry | layer character varying (254) | height bigint | created timestamp without time zone | created_by character varying (50) | deleted timestamp without time zone | deleted_by character varying |
|---|---|---|---|---|---|---|---|---|
| 1 | {0da28e1e-42e0-40b... | 010500002... | LINE_WATER | 5 | [null] | [null] | [null] | [null] |
| 2 | {610950b6-8b81-4e1... | 010500002... | LINE_ELEC | 5 | 2018-03-19 16:15:18.759545 | postgres | [null] | [null] |

## 5.4 QGIS Widgets:

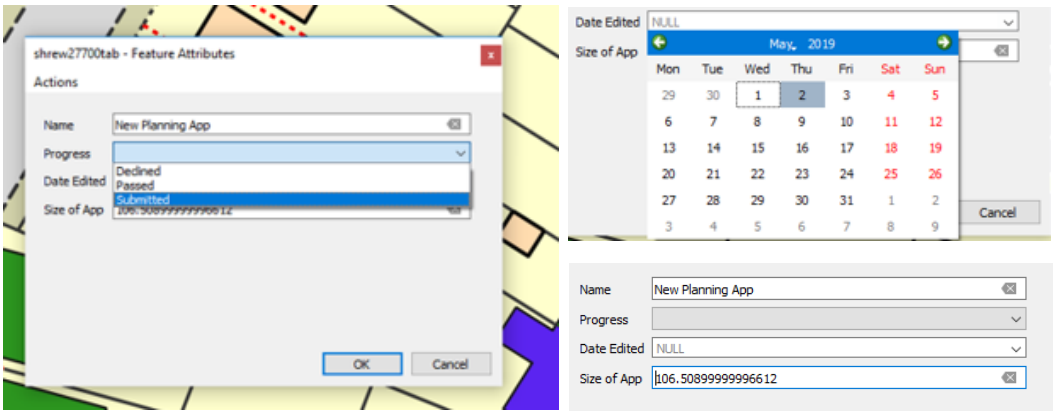
There may, however, be occasions when you also wish to manage data entry tasks from within your client desktop GIS applications. QGIS is perfect for this task as it uses a series of **Widgets** allowing you to manage attribute editing, providing different attribute settings for each individual layer.

To introduce yourself to **working with Widgets** try this Cadline Community How To guide:

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360000225998-Working-with-Widgets-in-QGIS-Part-1

where we cover options for:

- managing **unique** values
- creating **default** values
- implementing **value maps** to provide list boxes
- using **data pickers**
- auto **calculating** area values




The most important attribute within your spatial data is creation of its **unique value**. Leaving this as a flexible option that users can create and edit from within any mapping application is poor practice. So why not follow these two FAQ links to understand how to **implement unique values** in both a **SQL** and **PostGIS** database:

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360000263377-QGIS-Widgets-Using-Unique-ID-s-with-SQL-Server-Tables

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360000030557-QGIS-Widgets-Auto-Add-Unique-ID

## 6 – QGIS Tips and Tricks!

You are now at the stage where your users can start to access your geospatial assets.

*So, are Open Source geospatial applications as good as proprietary software when it comes to levels of functionality?*

Having spent my early GIS Professional years using **COTS** GIS tools, it's no wonder that I like to evangelise about the Open Source alternatives we are now so lucky to have. If you used GIS products in the early 2000's then you will definitely recall asking these questions:

- How can I **find a location**? – sorry you will need to purchase some postcode data!
- Is it possible to **calculate the shortest route** between two places? – sorry we can't do that, you will need to purchase this extension!

## Well QGIS does this and more!


To get started here is a link to the **QGIS help** topics in Cadline Community for QGIS

If you want to learn about my favourite **free to use plugins** then click this link – Top 5 QGIS plugins

And if you don't want to 'Pay the Man' and exhaust your already tight budgets here are some great new links for:

**Finding Postcodes:**

https://www.cadlinecommunity.co.uk/hc/en-us/articles/210408325-Top-5-QGIS-Plugins

**Searching for Addresses:**

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360001288098-QGIS-Search-Addresses

**Undertaking Routing Analysis:**

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360001288098-QGIS-Search-Addresses

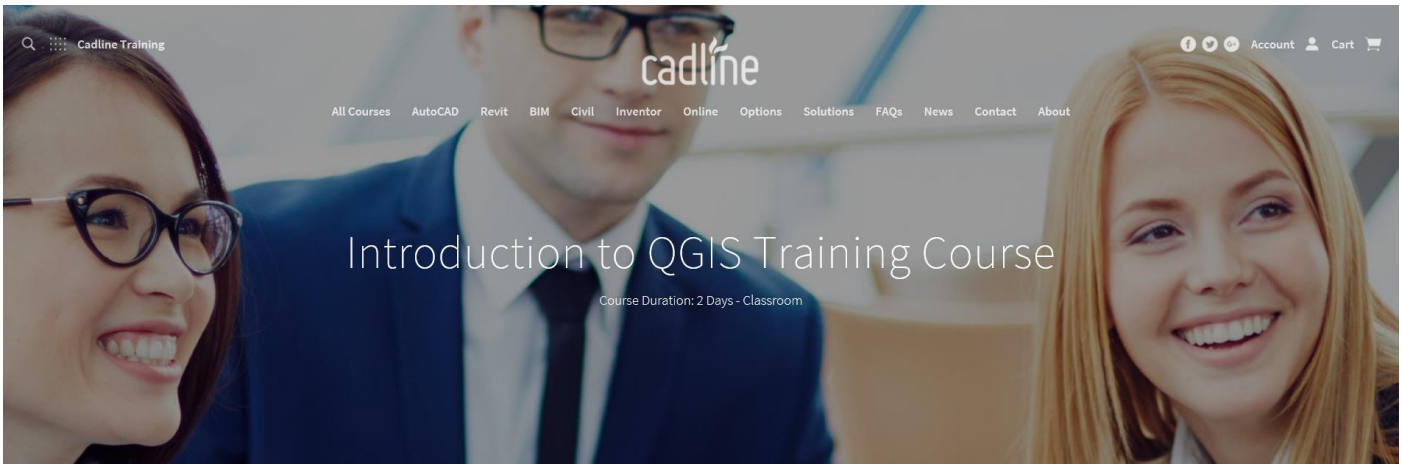
## 7 – Utilise WebMaps:

Having implemented an Open Source GIS such as QGIS, providing a cost effective yet highly functional GIS application, don't fall into the trap of automatically giving everyone in your organisation access to it! 😊

There will be time/resourcing overheads associated to its implementation and roll out across a large organisation, as well as training issues where many users won't be in a position to operate the application without attending a training course.

While Cadline do offer an **AGI accredited QGIS** course:

https://training.cadline.co.uk/products/qgis-introduction-training-course



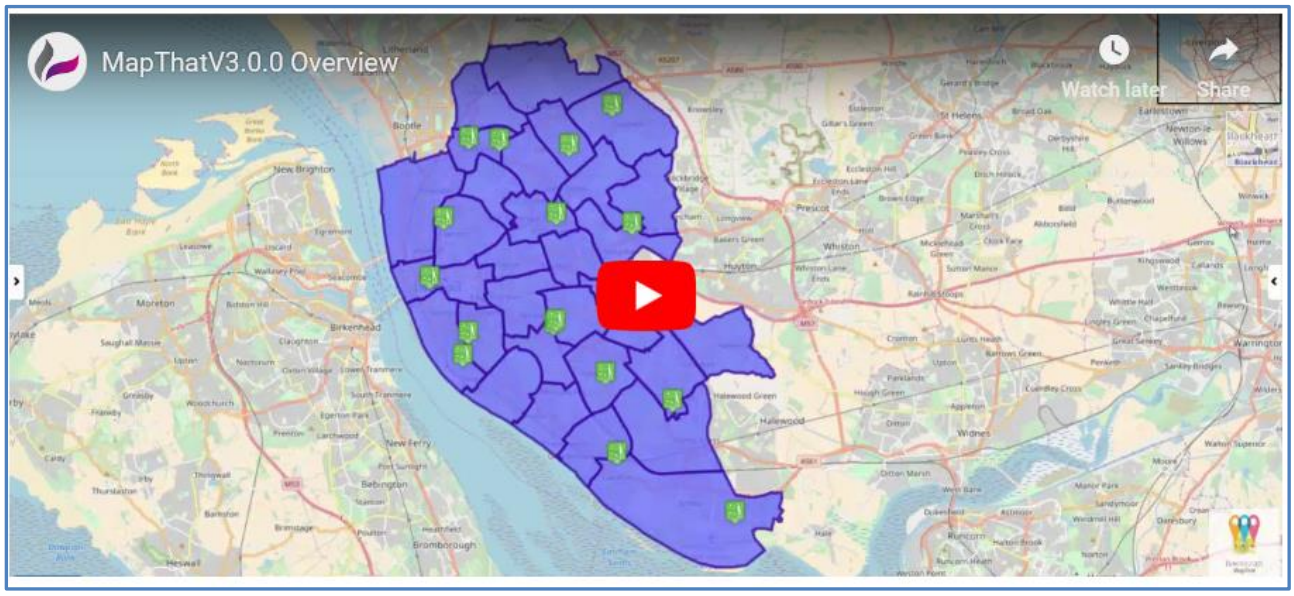

We would always recommend rolling QGIS out to your **Data Managers** and general **GIS users**, who may wish to undertake complex spatial analysis and geoprocessing task. But for all other users, you should consider implementing a **web mapping application,** as these will provide access to the same basemapping and spatial layers, in a more user-friendly interface.

But you have to get the balance right! You don't want users to only have a basic web viewer where they can only undertake simple map interogation and can't generate scale prints, as this ultimately leads to a demand to access desktop GIS tools that often users aren't able to fully utilise.

As a result, Cadline's DynamicMaps team has developed an Open Source web mapping application to provide non-GIS users with an interface to undertake GIS tasks in a familiar interface.

Follow this link to view an overview of the functionality available within **MapThat**:

https://www.cadlinecommunity.co.uk/hc/en-us/articles/115005834185-Try-MapThat



MapThat webGIS provides our user base with a friendly web map interface with additional **Role dependent tools** such as a suite of **Drawing Tools**:

https://www.cadlinecommunity.co.uk/hc/en-us/articles/115005286445-MapThat-V3-Drawing-Tools

which now include **Snapping options**:

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360000030397-MapThat-Drawing-Tools-Snapping

as well as options for **panning and zooming** the map as you digitise:

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360000908597-MapThat-Updated-Drawing-Tools-

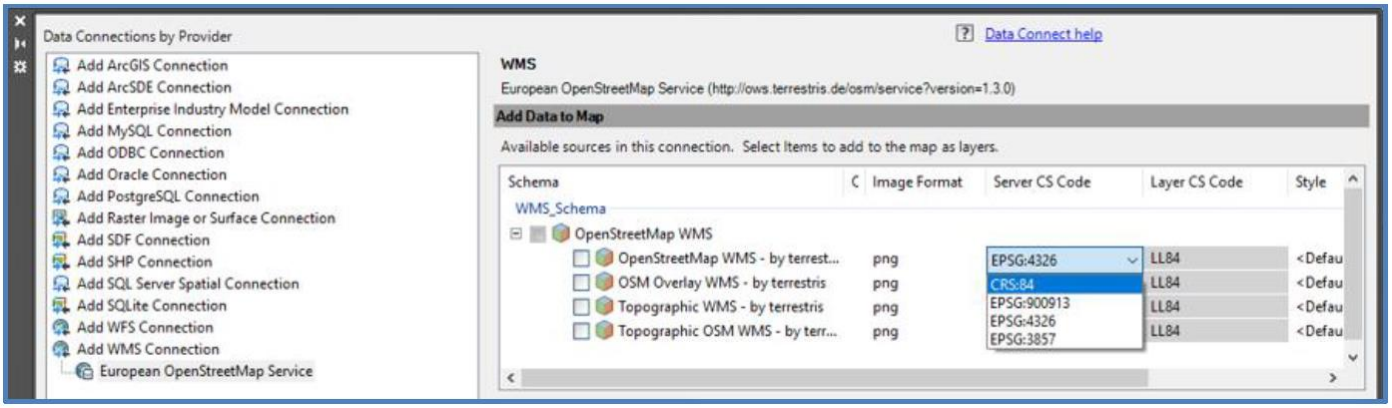

A combination of **database triggers** and good **spatial storage** practices now ensure that you can successfully implement an enterprise wide GIS. Users will ultimately have access to software that provides the correct level of functionality to them, and both spatial and base mapping datasets are published from a central repository which can be consumed by all your client applications.

## 8 – Better Integrate CAD and GIS:

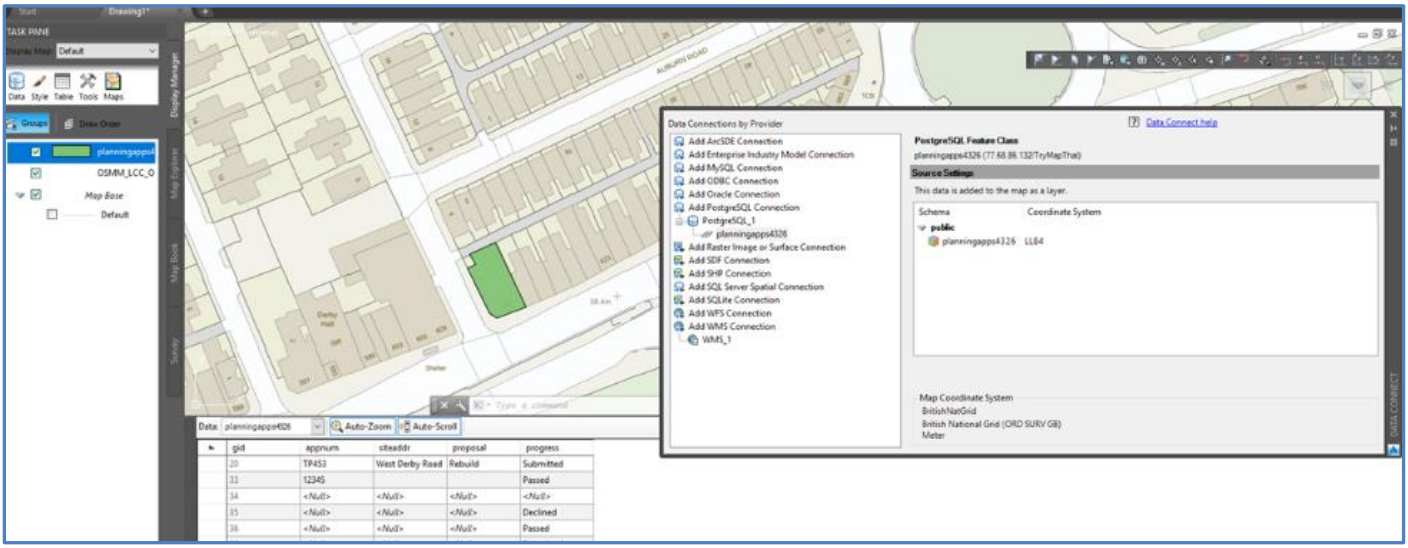
This approach can then be extended to help you better integrate your CAD and GIS users. By utilising Open Source geospatial products such as PostGIS and GeoServer you are now well placed to **integrate your CAD team into your geospatial world**!

Autodesk applications such as Map 3D, Civil 3D and InfraWorks all benefit from Web Map Service (**WMS**) capabilities which mean that the **GeoServer** PSMA web maps we published earlier are accessible, as well as other external **Web Map Tile Services**, such as **OpenStreetMap**:

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360000418625




And with your spatial assets now stored within a database (e.g. **PostGIS)** your CAD users can also access that information, make edits, update your **single source of truth** and share their changes with the GIS team.



Here is a Cadline Community **4 Part Video Blog** on how you can use Open Source GIS tools to **better integrate your CAD and GIS teams**:

https://www.cadlinecommunity.co.uk/hc/en-us/articles/360001096598-Integrated-CAD-and-GIS