O'Riogain Spatial Analytics Ltd.

Review of the Residential Housing Market in Celbridge, Leixlip & Maynooth

December 2017

Introduction

Client Requirements

Our clients are a young, Irish couple who have been living in rented accommodation in London, UK, for the past three years and are planning to return to Ireland in June 2018.

As part of this move, they intend to buy their first home, for which they have specified the following constraints (in no particular order):

1. **Location**: In Celbridge, Leixlip or Maynooth, County Kildare, where they have family connections.
2. **General Amenities**: It must be located within a 20-minute walk of the relevant town centre (main street), having become accustomed to living close to their borough's high street in London.
3. **Public Transport**: There must be a public transport stop nearby from which they can commute to Dublin city centre, where they already have offers of employment.
    - They do not intend to use any of their limited financial assets (see the next requirement) to purchase their own private means of transportation.
4. **Price**: In the €200,000-€400,000 range, with that strict upper limit.
5. **Value**: The target property must be in a neighbourhood/development that has a proven history of positive price performance/value retention, having seen how their own parents' homes were impacted by negative equity during the previous recession.
6. **Type**: Because of their tight budget, they are prepared to consider any type of property, be it apartment or house (semi-detached or detached) etc.

Objectives

As they are out of touch with the target housing market, our clients have commissioned us in O'Riogain Spatial Analytics Ltd. to undertake a study of the target property market with objective of determining the probability of finding a property which will meet all of the requirements specified above.

Approach

The following approach was adopted for this study:

1. Select a suitable areal unit that will provide the level of spatial granularity needed for this study.
2. Identify the data sources needed to support the study's objectives.
3. Acquire the relevant subset of that data and load it into PostgreSQL database tables.
4. Use PGAdmin to develop SQL code to create and populate any additional data elements needed in those database tables.
5. Use PGAdmin to develop SQL code to create any additional views required over those database tables.
6. Use PostGIS to enable access to the database objects referred to above during the following steps.
7. Use QGIS to visualise and analyse the data that was acquired, stored, enriched, and made available during the previous steps.
8. Use QGIS to export key elements of the previous step in GeoJSON format
9. Use HTML, Leaflet, Bootstrap, JQuery and Javascript technologies to visualise the output of the previous step in web map format, thereby providing our clients with easy, interactive access to key insights of this study.
10. Summarise the conclusions of the study.

Study Details

Areal Unit Selection

This section covers stage 1 of this study's approach, as outlined previously in this document.

Ordinance Survey Ireland's Small Area Boundaries (commonly known as Small Areas) was selected as the most suitable areal unit for this study. As they were designed to encompass with minimum of 65 – approx. average of around 90 - residential address points, they were found to provide a very good map overlay for the residential neighbourhoods/developments in the 3 townships targeted by this study.

Small Area data is available for download (in a variety of formats, including ESRI Shapefile) from the following web page:

- https://data.gov.ie/dataset/small-areas-ungeneralised-osi-national-statistical-boundaries-2015.

Open Street Map's Standard map was selected as the most suitable background mapping layer on which to overlay the Small Areas.

Data Source Selection

This section covers stage 2 of this study's approach, as outlined previously in this document.

The Residential Property Price Register is produced by the Property Services Regulatory Authority (PSRA) pursuant to section 86 of the Property Services (Regulation) Act 2011. It includes Date of Sale, Price and Address of all residential properties purchased in Ireland since the 1st January 2010, as declared to the Revenue Commissioners for stamp duty purposes.

The entire register can be downloaded (in CSV format) using the following link:

- https://www.propertypriceregister.ie/website/npsra/ppr/npsra-ppr.nsf/Downloads/PPR-ALL.zip/$FILE/PPR-ALL.zip.

However, as it did not contain any geometric data (e.g. latitude and longitude) for its properties, it would be of no immediate use to this study.

Fortunately, a copy of the register (also in CSV format), covering all property sales in the Republic of Ireland during the period 2012-2017, and which has been geocoded for small areas, is available for download from the following website:

- https://www.shanelynn.ie/the-irish-property-price-register-geocoded-to-small-areas/ using the following link:
- https://s3-eu-west-1.amazonaws.com/shanebucket/downloads/ppr-geocoding/ppr_data_encoded.csv.zip.

To ensure consistency, the Small Area data (in ESRI Shapefile format) were also downloaded from this website using the following link:

- https://s3-eu-west-1.amazonaws.com/shanebucket/downloads/ppr-geocoding/small-areas-gps-projection.zip.

Those selected datasets are used to address requirements 1, 2, 4, 5 and 6 of this study.

To deal with requirement 3, data for all bus stops in the Republic of Ireland (in ESRI Shapefile format) was downloaded from the following Transport for Ireland web page:

- https://www.transportforireland.ie/transitData/PT_Data.html using the following link:
- https://www.transportforireland.ie/transitData/NaPTAN_Shapefiles.zip.

The use of actual purchase price (rather than the asking prices of properties that are currently on the market in the target areas) has the following advantages for this study:

1. Using data for the most recent year (2017), they can provide a better indication of what our clients are likely to have to pay for their home (in accordance with requirement 4).
2. They can be used to measure the price performance (pursuant to requirement 5) over a period of up to 6 years (2012-2017).

QGIS Map Layer Creation

This section covers stages 3, 4, 5, 6 and 7 of this study's approach, as outlined previously in this document.

Please note that, unless otherwise stated, all layers created in QGIS for this study were created in **EPSG 32629**.

Background Layer

We firstly created a new project in QGIS and used its Web>QuickMapServices>OSM>OSM Standard facility to create the background map for this study – see the resultant screenshot in Appendix A1.

Small Areas (Layer Creation)

The selected Small Areas Shapefile (**small_areas_gps.shp**) was then imported into QGIS (Database>DB Manager>Import Layer/File) to create the database table called **small_areas_gps** in PostgreSQL (courtesy of PostGIS). A layer of the same name was created in our QGIS project by right-clicking on the table name and selecting the 'Add to Canvas' option.

Using a combination of the Select Features by Polygon, followed by Select Feature(s) with Ctrl+Select, the subset of Small Areas that were within the required distance of the centres of Celbridge, Leixlip and Maynooth were chosen, in accordance with requirements 1 & 2 – see the resultant screenshot in Appendix A2. The selected Small Areas were then exported as a Shapefile called **small_areas_clm** (by right clicking on the **small_areas_gps** layer and selecting Export>Save Selected Features As).

The resultant **small_areas_clm.shp** Shapefile was then imported into QGIS (Database>DB Manager>Import Layer/File) to create a database table, also called **small_areas_clm**, in PostgreSQL (courtesy of PostGIS). A polygon (choropleth) layer of the same name was created in our QGIS project by right-clicking on the table name and selecting the 'Add to Canvas' option, after which the **small_areas_gps** layer was removed from the study's QGIS project.

Refer to the subsection entitled **Small Areas (Layer Graduation & Labelling)** below for an overview of how the **small_areas_clm** layer, that we had just created, was graduated to reflect house price performance (pursuant of requirement 5), together with a pointer to the screenshot of the results of that exercise.

House Prices

Instead of loading all of the geocoded Residential Property Price Register data (in **ppr_data_encoded.csv**), we opened it in Microsoft Excel to filter its contents using the County column and to then extract only those records which pertained to property sales in County Kildare into a file named **house_prices_kildare.csv**. We then used QGIS (Layer>Add Layer>Add Delimited Text Layer) to create an overlay point layer and database table, both called **house_prices_kildare**, for it – see the resultant screenshot in Appendix A3.

Using PostgreSQL's PGAdmin Query tool, we then developed a view, called **house_prices_clm**, over the **house_prices_kildare** table, which provided a subset of the price register data pertaining to properties that were located

in the Small Areas that had been selected for the 3 townships targeted by this study. The relevant SQL code (and all other SQL code developed during this study) is provided in the file named **CS621 – Project – Sean O'Riogain – v2.sql**, which accompanies this document.

To enable us to satisfy requirement 4 (price range), QGIS was again used (Layer>Add Layer>Add PostGIS Layers) to use the **house_prices_clm** view to create an overlay point layer of the same name, graduating it using suitable custom intervals – see the resultant screenshot in Appendix A4.

We then used the same technique to create a view-layer pair, both called **house_prices_clm_2017**, which focused only on those house purchase transactions that occurred in the most recent year – see the resultant screenshot in Appendix A5. This layer would prove useful when assessing the probability of locating a suitable property in the value-retaining neighbourhood (see requirement 5) within our client's price range (see requirement 4).

Bus Stops

The relevant, sourced Shapefile (**NaPTAN_StopPoints.shp**) was then imported into QGIS (Database>DB Manager>Import Layer/File) to create the database table called **stop_points** in PostgreSQL (courtesy of PostGIS). A layer of the same name was created in our QGIS project by right-clicking on the table name and selecting the 'Add to Canvas' option.

Using PostgreSQL's PGAdmin Query tool, we then developed a view, called **stop_points_clm**, over the **stop_points** table, which provided a subset of the price register data pertaining to properties that were located in the Small Areas that had been selected for the study's 3 townships. The relevant SQL code (and all other SQL code developed during this study) is provided in the file named **CS621 – Project – Sean O'Riogain – v2.sql**, which accompanies this document.

To enable us to satisfy requirement 3 (proximity to bus stops), QGIS was again used (Layer>Add Layer>Add PostGIS Layers) to use the **stop_points_clm** view to create an overlay point layer of the same name – see the resultant screenshot in Appendix A6.

Small Areas (Layer Graduation & Labelling)

To enable us to satisfy requirement 5, we needed to classify each of the Small Area within the scope of this study by its house price performance. To achieve that, we had to firstly use PGAdmin's Query Tool to create a new attribute (column) in **small_areas_clm** table in PostgreSQL, which we called **avg_pct_price_rise_pa**, in which to store a price performance 'density' value which would indicate the average annual percentage house price increase in each of those Small Areas between 2012 and 2017.

During its creation, that column was initialised using a default value of zero. It was then populated using a 'tricky' piece of SQL code, which implemented the following calculations for each of the Small Areas within the scope of this study:

1. Compute the average house price achieved during the most recent year for which data is available for it
2. Subtract the average house price achieved during the earliest year for which data is available for it from the result of the previous step.
3. Divide the result of the previous step by the earliest average house price figure.
4. Multiply the result of the previous step by 100 to derive the percentage house price rise achieved within each Small Area during the time interval for which house price data is available for it.
5. Divide the result of the previous step by that interval (in years) to yield the average percentage price rise per annum.
6. Round the result of the previous step to the nearest integer value.
7. If the result of the previous step is negative, set it to zero.

The relevant SQL code used to create and populate the **avg_pct_price_rise_pa** column is provided in the file named **CS621 – Project – Sean O'Riogain – v2.sql**, which accompanies this document.

We then used QGIS to graduate and label the **small_areas_clm** layer using the contents of the **avg_pct_price_rise_pa** column (by right-clicking on the layer>Properties>Symbology and Labels, respectively). Refer to Appendix A7 for a screenshot of the results of this exercise.

Web Map Creation

This section covers stages 8 & 9 of this study's approach, as outlined previously in this document.

To ensure that the resultant web map was not overly 'busy' and, therefore, that it would be sufficiently user-friendly, we selected the following QGIS map layers to provide the layers in the study's web map deliverable:

1. **small_areas_clm** (see the screenshot in Appendix A7).
2. **stop_points_clm** (see the screenshot in Appendix A6).

To construct that web map, we used QGIS to export those layers to disk in geoJSON format, thereby creating the following files:

1. **clm_web_map_small_areas.geojson**,
2. **clm_web_map_stop_points_geojson**,

by right-clicking on the relevant layer>Export>Save Features As>Format=GeoJSON, CRS=Default CRS: EPSG: 4326 – WGS 84, and selecting only the most informative fields/attributes in each case.

We then used the Notepad++ text editor to create the web map's HTML file called, **clm_web_map.html**, which accompanies this document. As well as the two geojson files referred to above, that HTML file also uses Leaflet, Bootstrap, JQuery and JavaScript to render the web map when that file is opened using the Firefox browser.

Note that only the Firefox browser will render this web map without needing access to a web server.
Refer to Appendix A8 for screenshots of the results of this exercise.

Note that the platecode attribute (i.e. bus stop number) of the blue bus stop map features can be used to get real-time information on the buses that serve the bus stop in question on your mobile device using the Dublin Bus app.

Conclusions

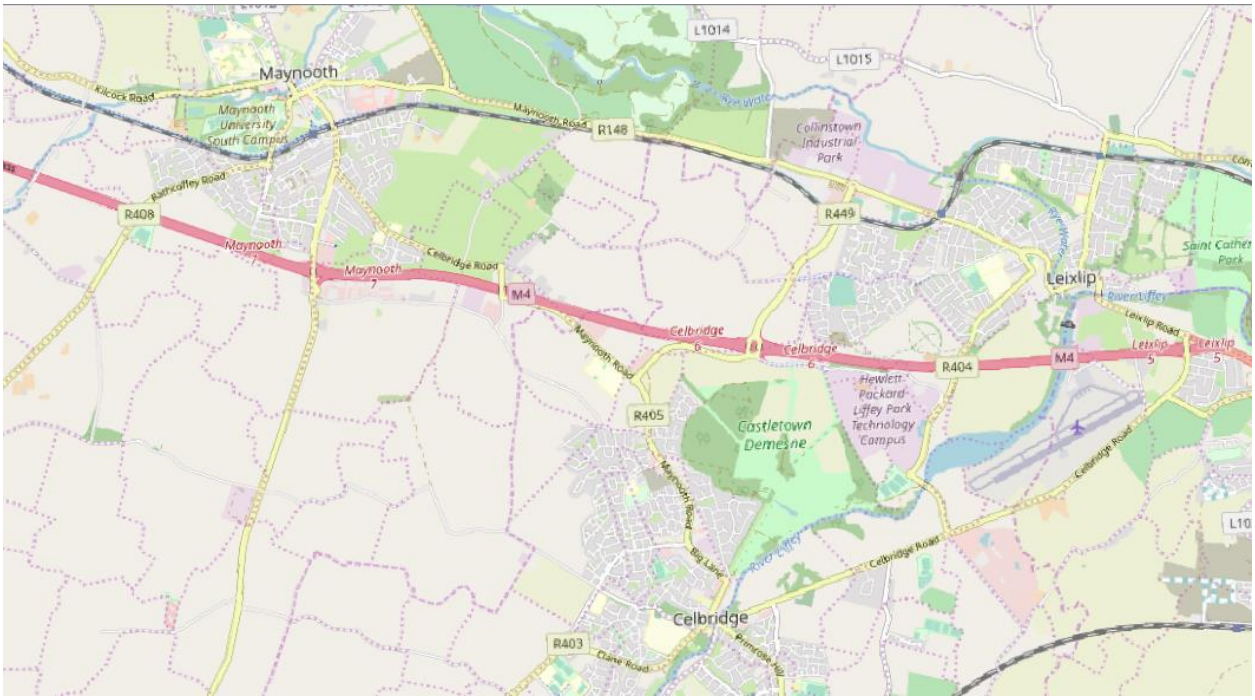
The conclusions of this study can be summarised as follows:

1. The screenshots in Appendices A3 and A4 show that there has been a significant level of house purchases in the in-scope townships (see requirement 1) in the client's price range (see requirement 4).
2. The screenshot in Appendix A5 shows that the number of such transactions recorded during the past year (2017) is rather modest, although they appear to spread rather evenly across all 3 in-scope townships.
3. Superimposing the layer in the screenshot in Appendix A7 on that in Appendix A5 indicates that a goodly number of the house purchases recorded in the past year occurred in neighbourhoods (i.e. Small Areas) with good price performance ratings.
4. The screenshots in Appendices A6 and A8 indicate that all 3 in-scope townships are well-served by public transport (Dublin Bus) and that there are bus stops within easy walking distance from all of the neighbourhoods covered by this study.
5. In the light of the above findings, and in conjunction with ongoing news reports of high demand for, and insufficient supply of, the types of property that our clients will be seeking, we strongly recommend that they bring forward their plans for initiating that search.

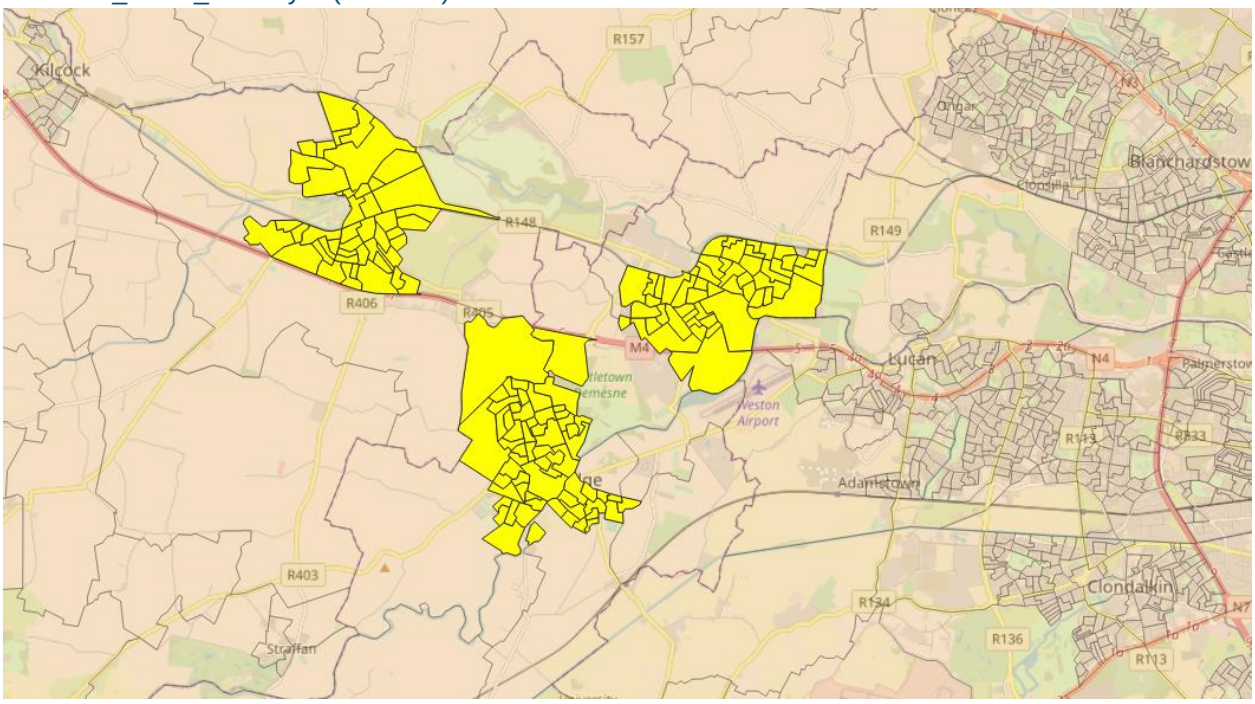
Appendices

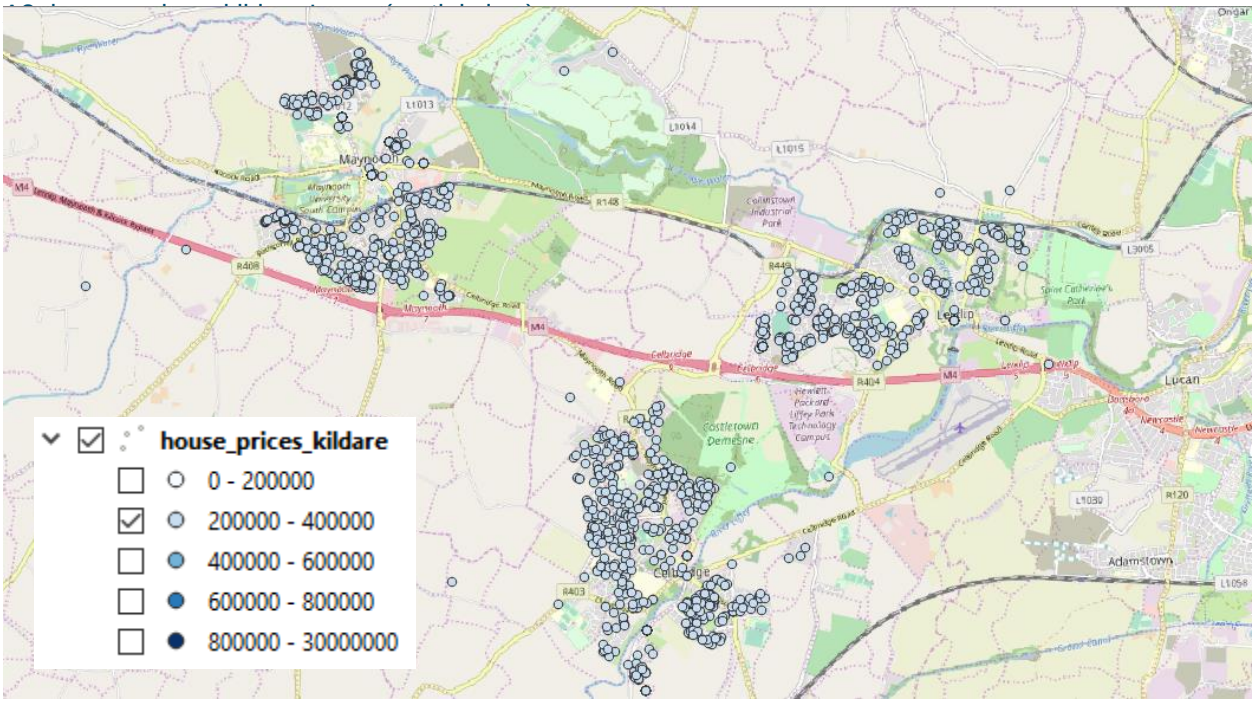
A. Screen Shots

A1. OSM Standard Background Map

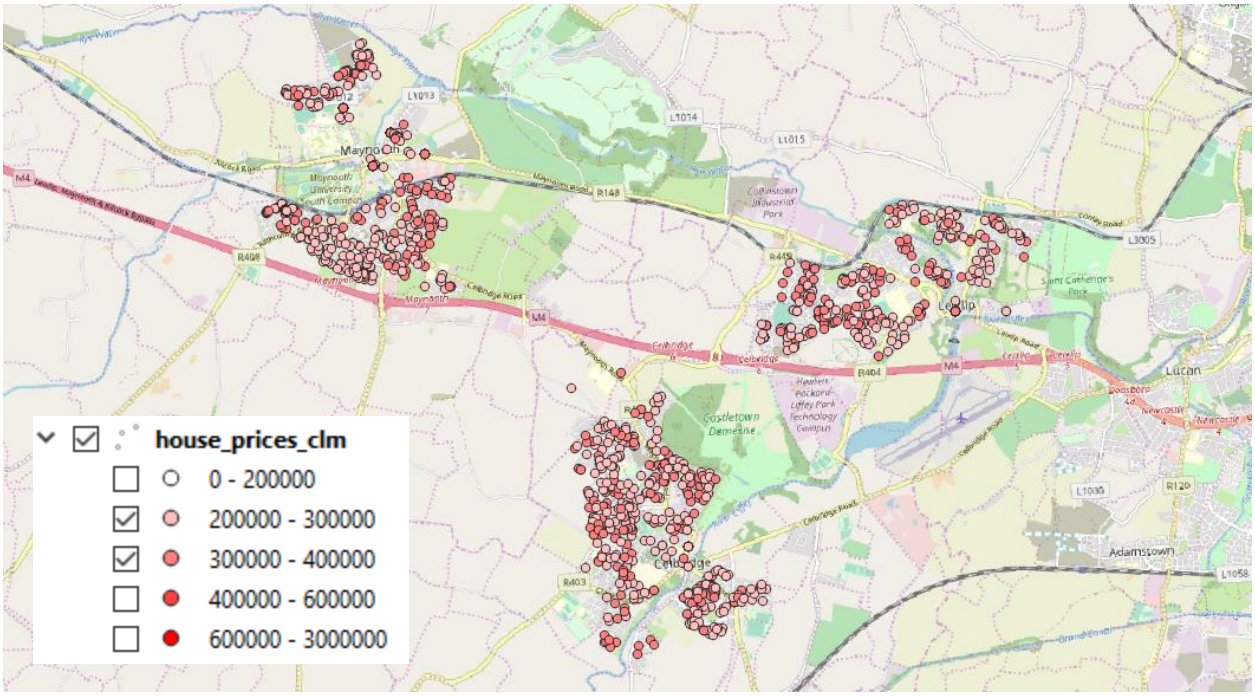


A2. small_areas_clm Layer (Creation)

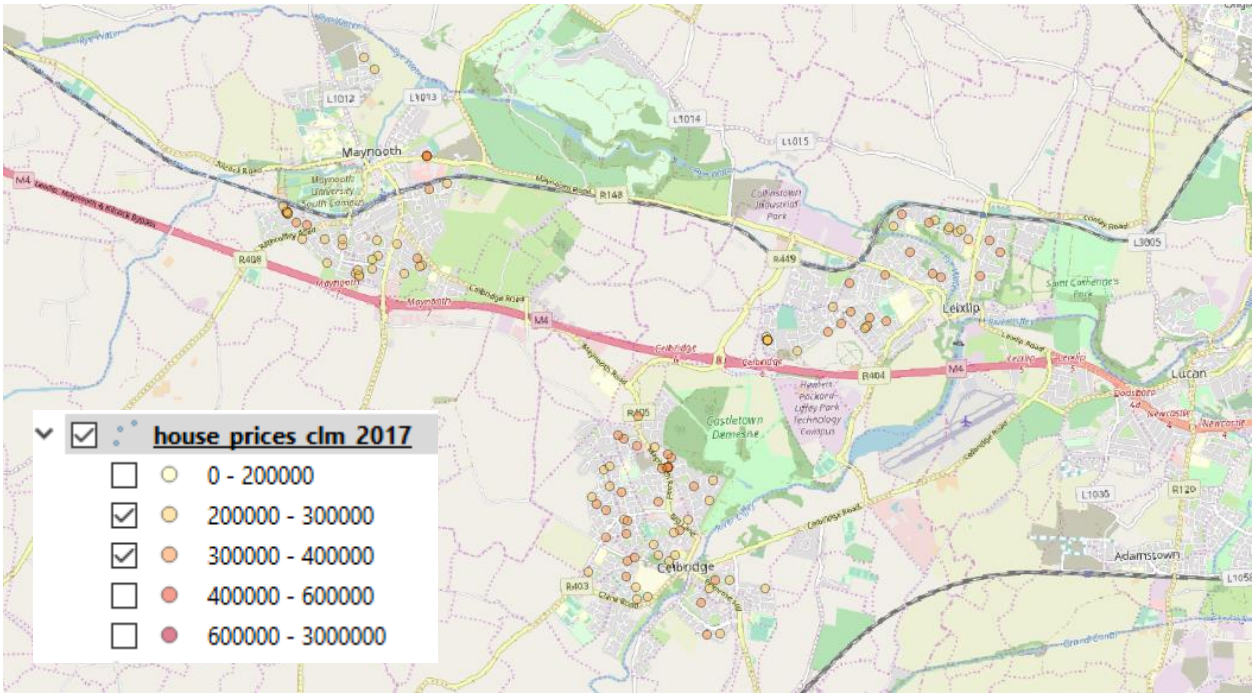




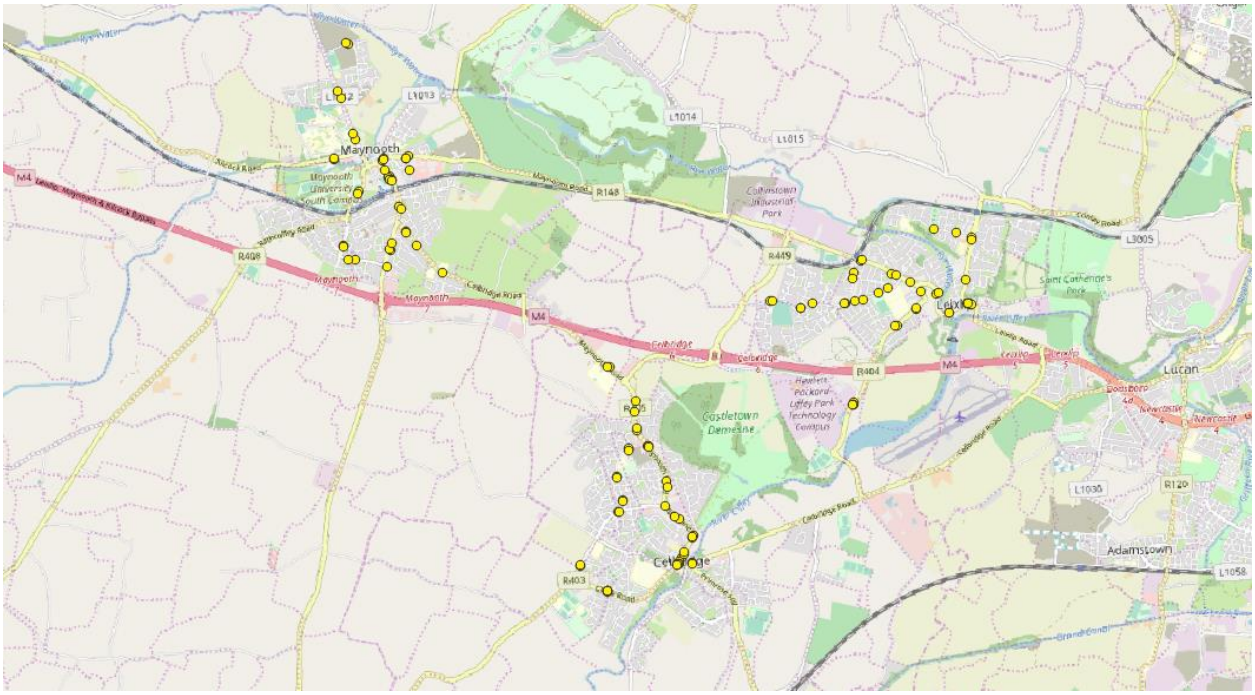
A4. house_prices_clm Layer

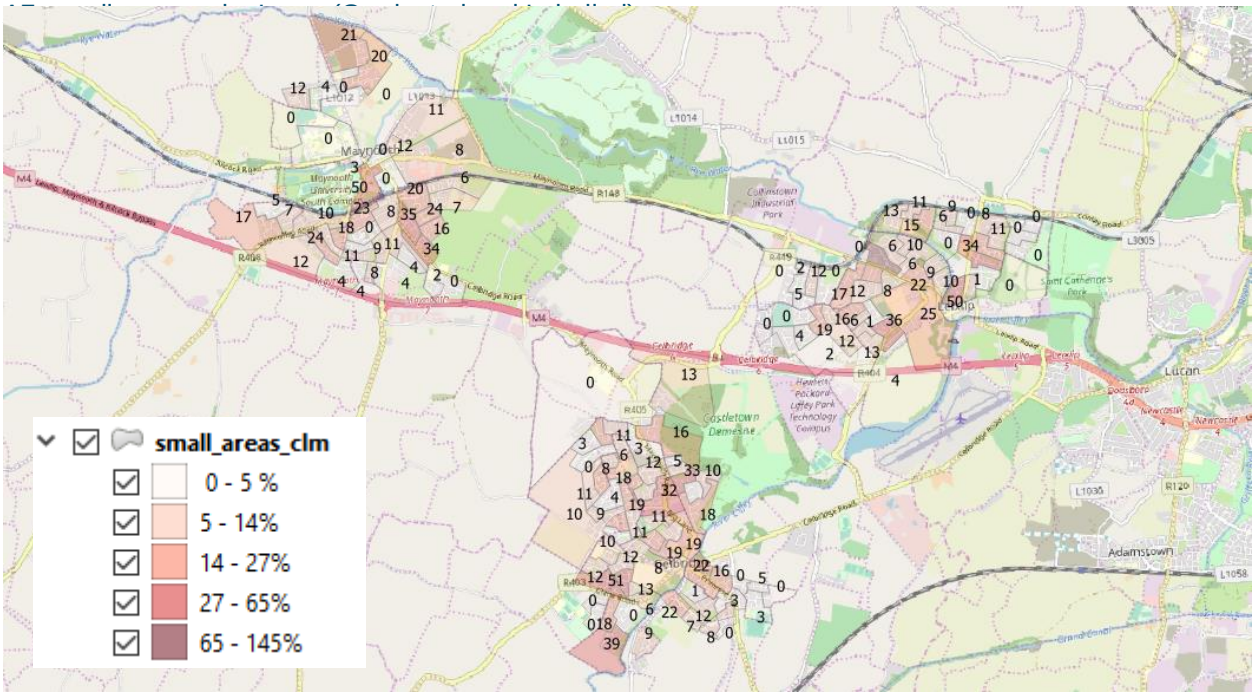


A5. house_prices_clm_2017 Layer



A6. stop_points_clm Layer





A8. clm_web_map,html (when opened with Firefox)