SPATIAL DATA ANALYSIS

JUNE 5, 2021

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Technical Environment

- QGIS Software with Query Builder (SQL)
- Microsoft Word and Excel
- Jupyter by Anaconda
- Windows 10

Executive Summary

The purpose of this report is to demonstrate the ability to understand the functionality of Geographic Information Systems utilising QGIS software and combination skills of SQL and Python in supporting the spatial data analysis.

This is a step-by-step report with screenshots as a proof of genuine work and capability of conceptual thinking.

The datasets use for this project is collected from an open-source website that is available to download from City of Melbourne Data.

The City of Melbourne has provided extensive amount of data that can be used for analysis. This project will observe a few of the dataset listed as below:

- Municipal Boundary / Melbourne CBD area
- Metro train stations
- Bars and Pubs with Patron Capacity

This project will first apply the Municipal Boundary map, then analyze which Metro train stations are located within the Melbourne CBD area (shaped area), then filtering to how many of them have Lift facility available.

The project then add another dataset named 'Bars and Pubs with Patron Capacity', perform data cleansing on the data before implementing Nearest Neighbors technique to discover the nearest distance between bars and train stations.

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Dataset Explanatory

Municipal Boundary / Melbourne CBD area

It is a shapefile dataset shows the boundary of the City of Melbourne. There are 8 attributes with only 1 feature.

Table view:

	MCCID_GIS	MCCID_INT	MCCID_STR	NAME	MAPLABEL	XDATE	XORG	XSOURCE
1	1	0	*NULL*	City of Melbour...	*NULL*	20080701	GIS Team	Mapbase

Metro train stations

This data contains locations of train stations and their accessibility information, such as hearing aid information and lift.

There are 4 attributes with 219 features.

Table view:

	station	pids	he_loop	lift
1	Alamein	No	No	No
2	Albion	Dot Matrix	No	No
3	Alphington	Dot Matrix	No	No
4	Altona	LCD	No	No
5	Anstey	No	No	No

Bars and Pubs with Patron Capacity

This dataset shows business establishments with their trading name, bar/tavern/pub patron capacity, location and CLUE block and small area designation.

There are 10 attributes with 3,863 features.

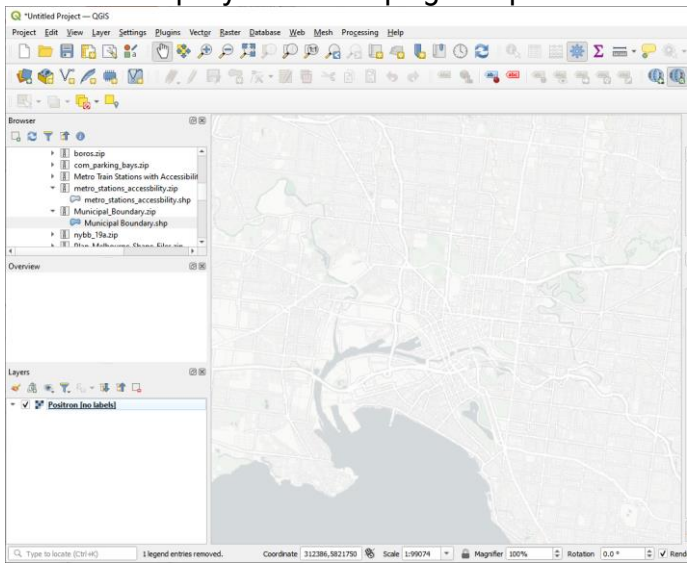
Table view:

	base_prope	block_id	census_yea	clue_small	number_of_
1	101613.0000000...	204	2002.000000000...	Carlton	239.0000000000...
2	106186.0000000...	214	2002.000000000...	Carlton	120.0000000000...
3	108202.0000000...	215	2002.000000000...	Carlton	50.00000000000...
4	101450.0000000...	228	2002.000000000...	Carlton	600.0000000000...
5	106238.0000000...	247	2002.000000000...	Carlton	200.0000000000...

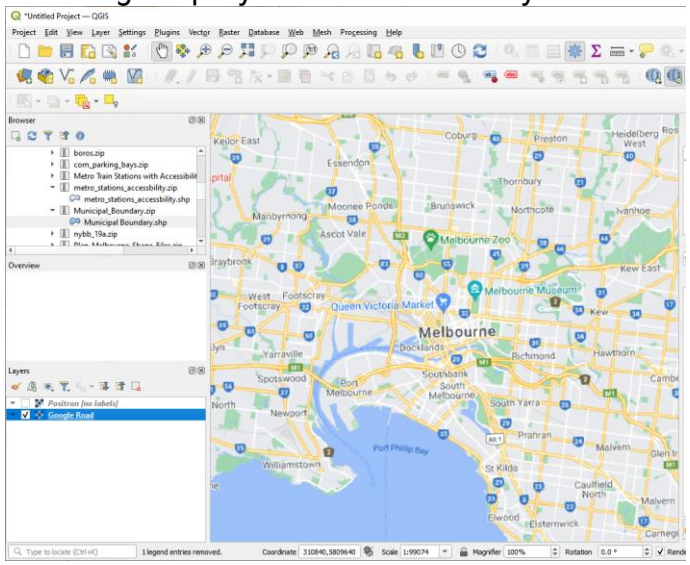
property_i	street_add	trading_na	x_coordina	y_coordina
101613.0000000...	377-391 Cardig...	Clyde Hotel	144.9658000000...	-37.7972999999...
106186.0000000...	414-422 Lygon ...	Percys Bar & Bi...	144.9678000000...	-37.7969000000...
108202.0000000...	415-421 Rathdo...	Clare Castle Ho...	144.9704000000...	-37.7965000000...
101450.0000000...	223-227 Cannin...	Dan O'Connell ...	144.9733999999...	-37.7929999999...
106238.0000000...	192-202 Lygon ...	Players On Lygon	144.9670999999...	-37.8025000000...

Map Layering

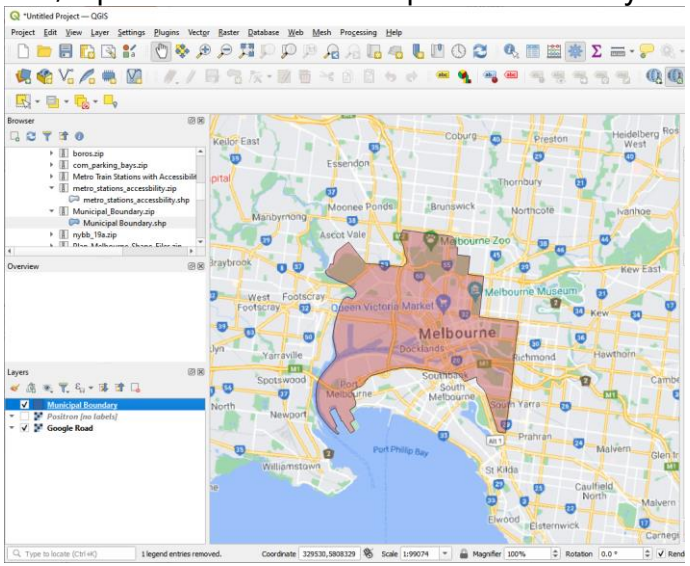
Add basic map layer from the plugin map services.



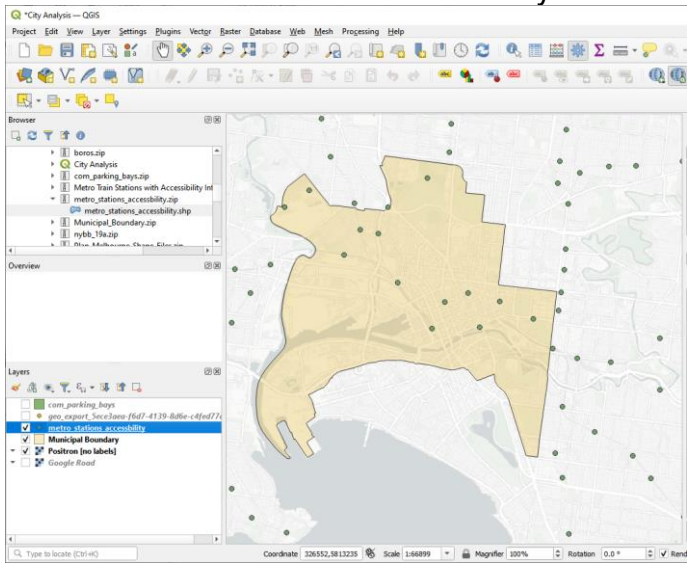
Add Googlemap layer as an alternative layer.



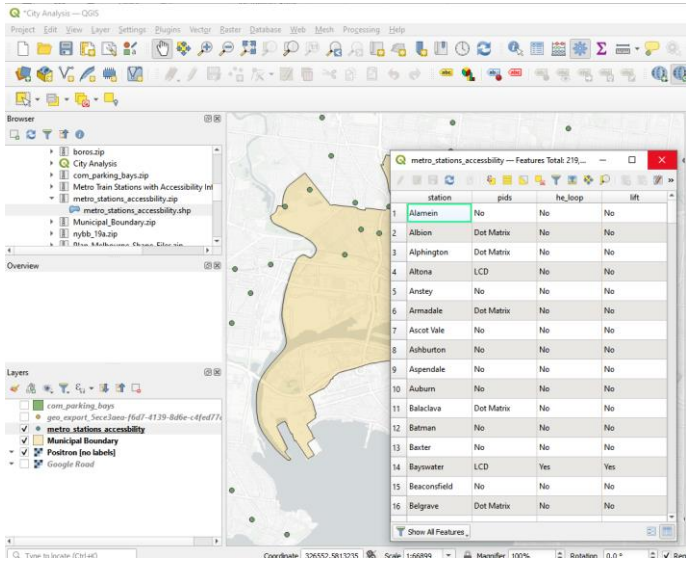
Add/import Melbourne CBD shapefile as a new layer.



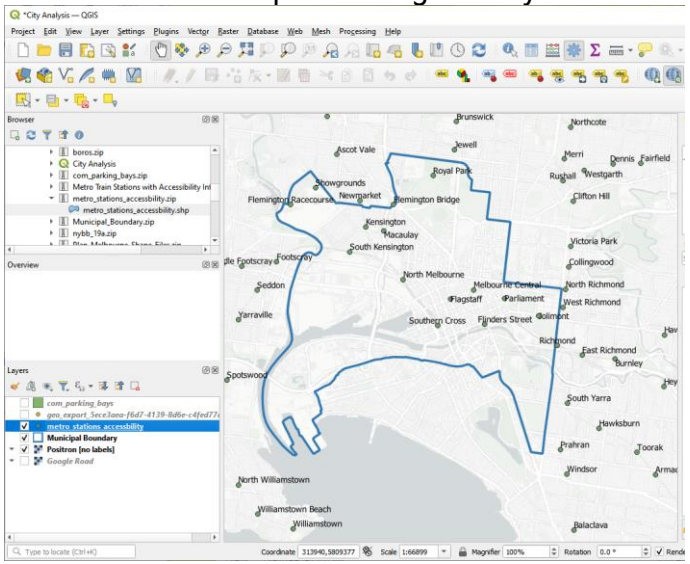
Add ‘Metro Train Stations’ dataset for analysis.



View the dataset attributes.

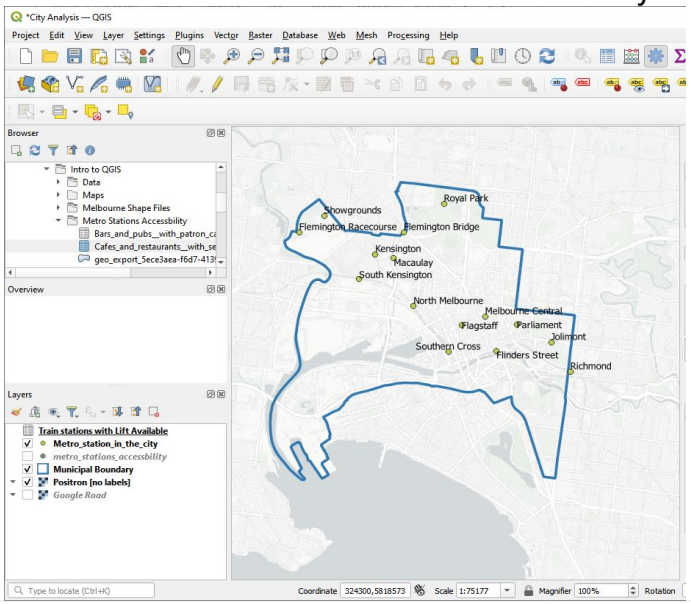


Add labels on the map and change the styles.

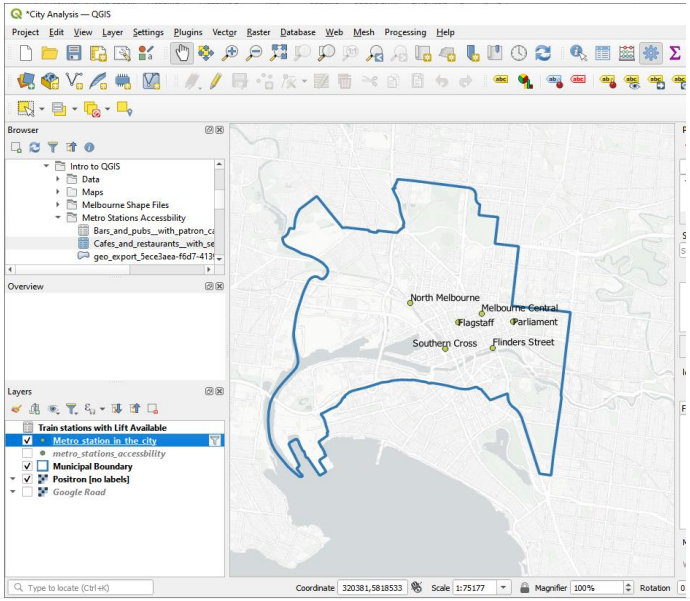


Query Selections & Nearest Neighbors

Select train stations within the Melbourne CBD only.



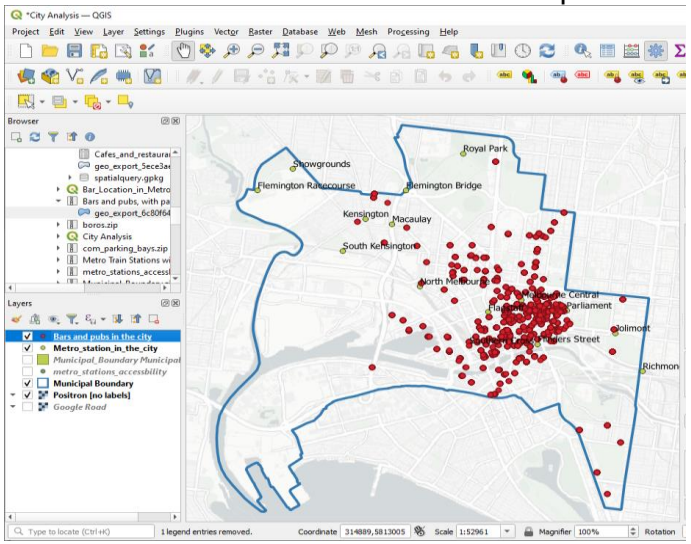
Show train stations that have lift available.



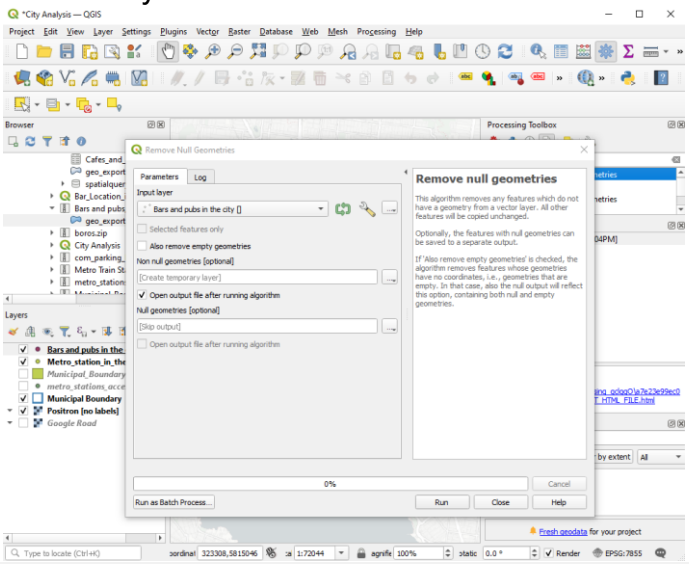
Show the list of Train Stations with lift facility in a Table.

	fid	station	pids	he_loop	lift
1	1	Flagstaff	LCD	Yes	Yes
2	3	Flinders Street	LCD	Plat 1 only	Yes
3	7	Melbourne Cen...	LCD	Yes	Yes
4	8	North Melbourne	LCD	No	Yes
5	9	Parliament	LCD	Yes	Yes
6	13	Southern Cross	LCD	No	Yes

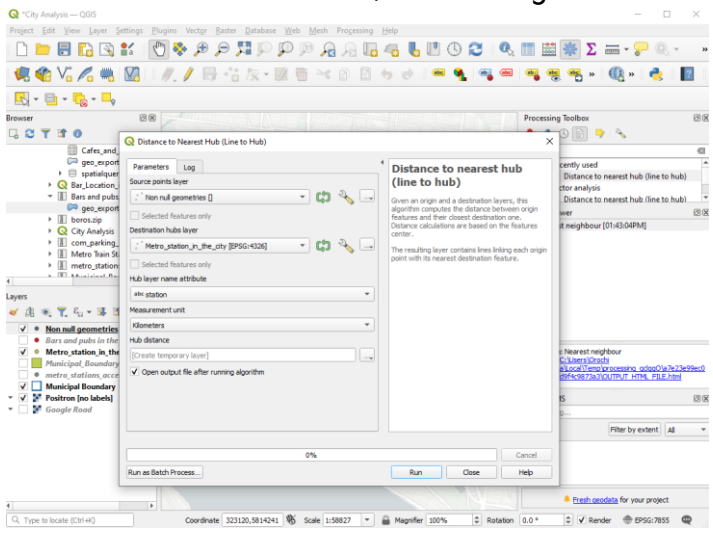
Add “Bars and Pubs” dataset in the CBD map.



Remove any null value in the dataset.

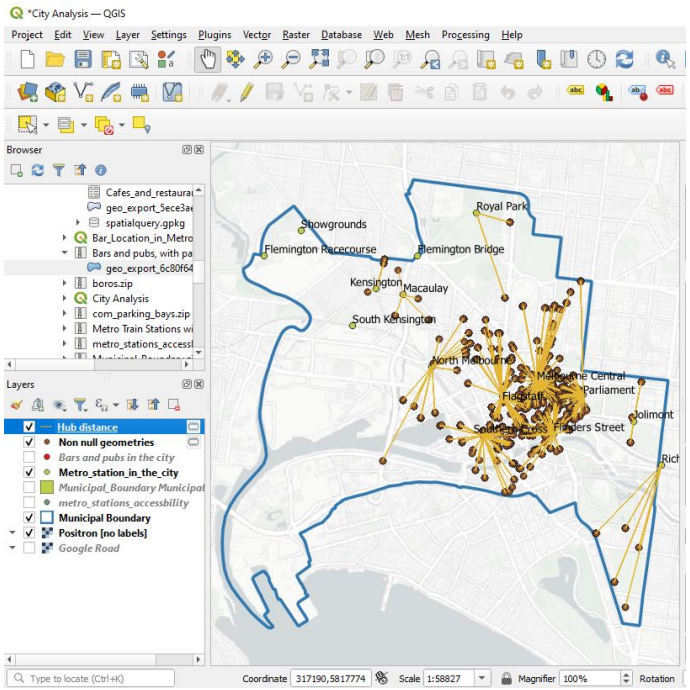


Perform nearest distance hub/Nearest Neighbors.

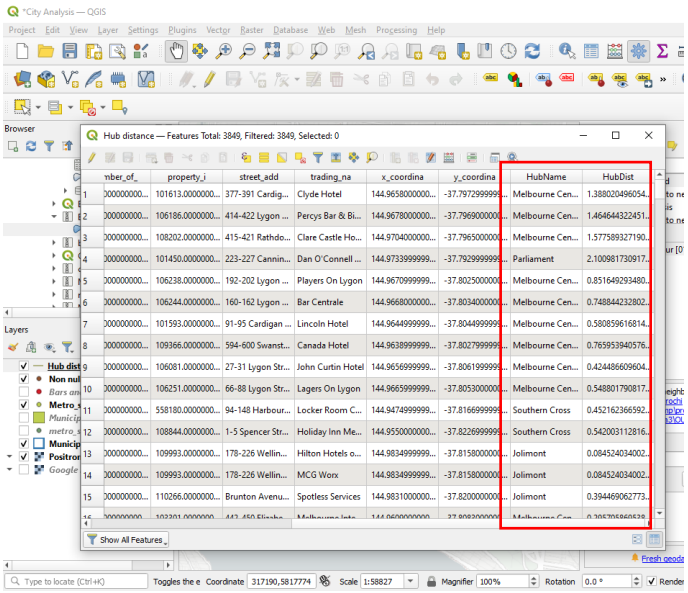


Analysis Result

Show nearest distance between bars and train station.

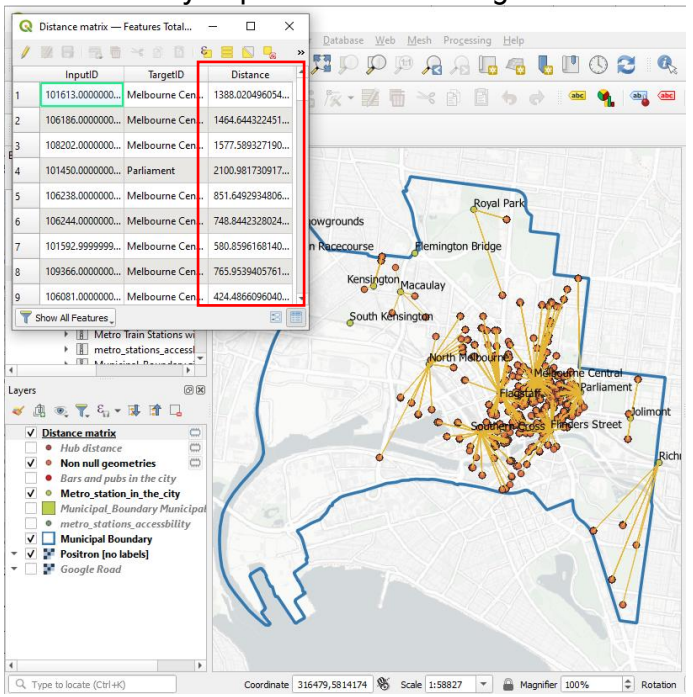


Attribute check on the hub distance.

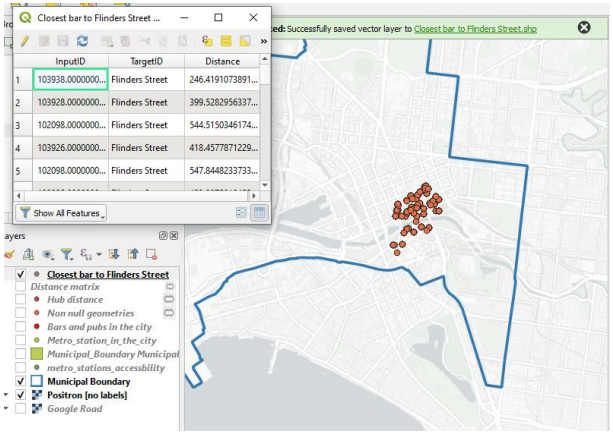


The 2 new attributes HubName and HubDist added to the original features

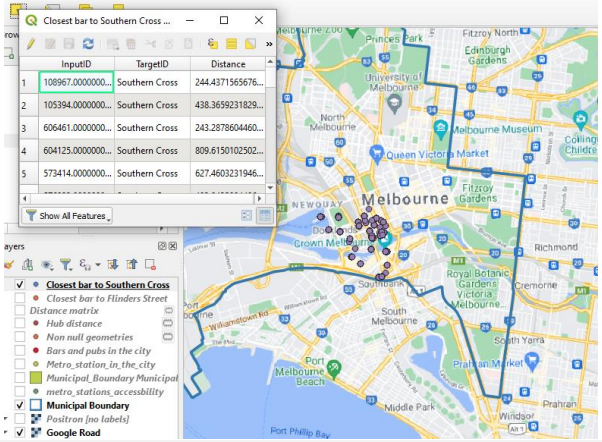
Alternative way to perform Nearest Neighbors.



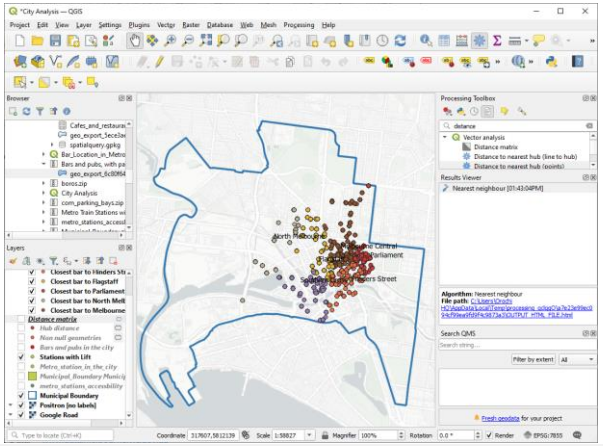
Select the closest bars to Flinders Street station.



Select the closest bars to Southern Cross Station.



Select closest bars to train stations with Lift available.



Conclusion

The first action of the analysis is to apply a map on the platform and set the Coordinate Reference System (CRS) to MGA zone 55 [EPSG: 7855]. This setting will focus only on the Geocentric Datum of Australia (highlight area of Victoria state).

The base map used on this report is Positron with no label; it is a standard map that being used commonly for spatial analysis with less graphic shown on the map. Additional map such as Google Road is also applied on the base map to ensure accuracy of the analysis.

The Municipal Boundary shape is imported into the map to focus only on the Melbourne CBD area.

The Metro Train Station dataset is imported as a new layer. This project limited the analysis to only assessing any train station that is located within the city area and with Lift facility available.

The selection process uses the intersection technique to keep only the train stations that is in the Melbourne CBD area and eliminate the rest of train stations that are out of the boundary.

The Richmond train station was found in between the border. Given the scenario that many commuters are transiting through this station, it is accepted as part of the CBD area.

Throughout the analysis, there are 6 train stations located with Lift facility available and they are: Flag Staff, Flinders Street, Melbourne Central, North Melbourne, Parliament, and Southern Cross.

The project then added another dataset named Bars and Pubs with Patron Capacity. Data cleansing was performed to remove any blank value in the dataset before implementing the Nearest Neighbors technique to discover distance between bars and train stations.

The algorithm detected the distance fairly accurate and group it as clusters.

The result shows that there are 6 train stations with lift facility available in the CBD area and clustered the closest bars and pubs to each train station.

Disclaimer

The are many techniques that can be implemented on this project depending on the intended objectives and the goals itself.
This project shows an example of how spatial data analysis can improve efficiency in decision making for an organization.

Should there be any specific techniques required to fulfill the selection criteria, I am willing to discuss further and develop the knowledge to become the successful candidate and confident in supporting & motivating the team in any phase where necessary.

Created By:
Christian O. Themin, 5 June 2021.
All supporting datasets available to download from: www.data.melbourne.vic.gov.au