



# Civic Hackathon: Plowing Through the Data

## ABSTRACT

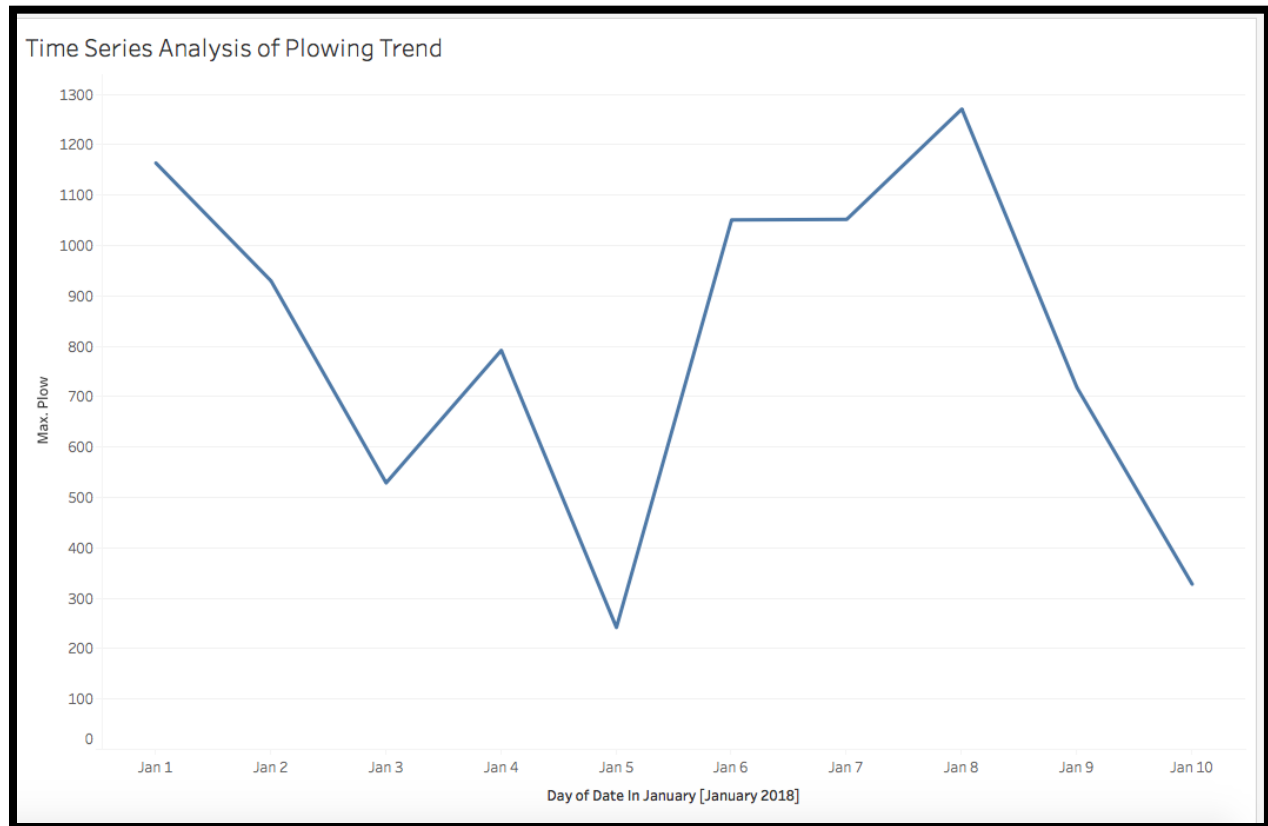
Every year, the City of Syracuse is covered with feet of snow and is often the snowiest place in the country. In this report, we have analyzed the GPS location of the snow plows and their activity to gain detailed understanding on snow plowing in the city

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- Introduction:

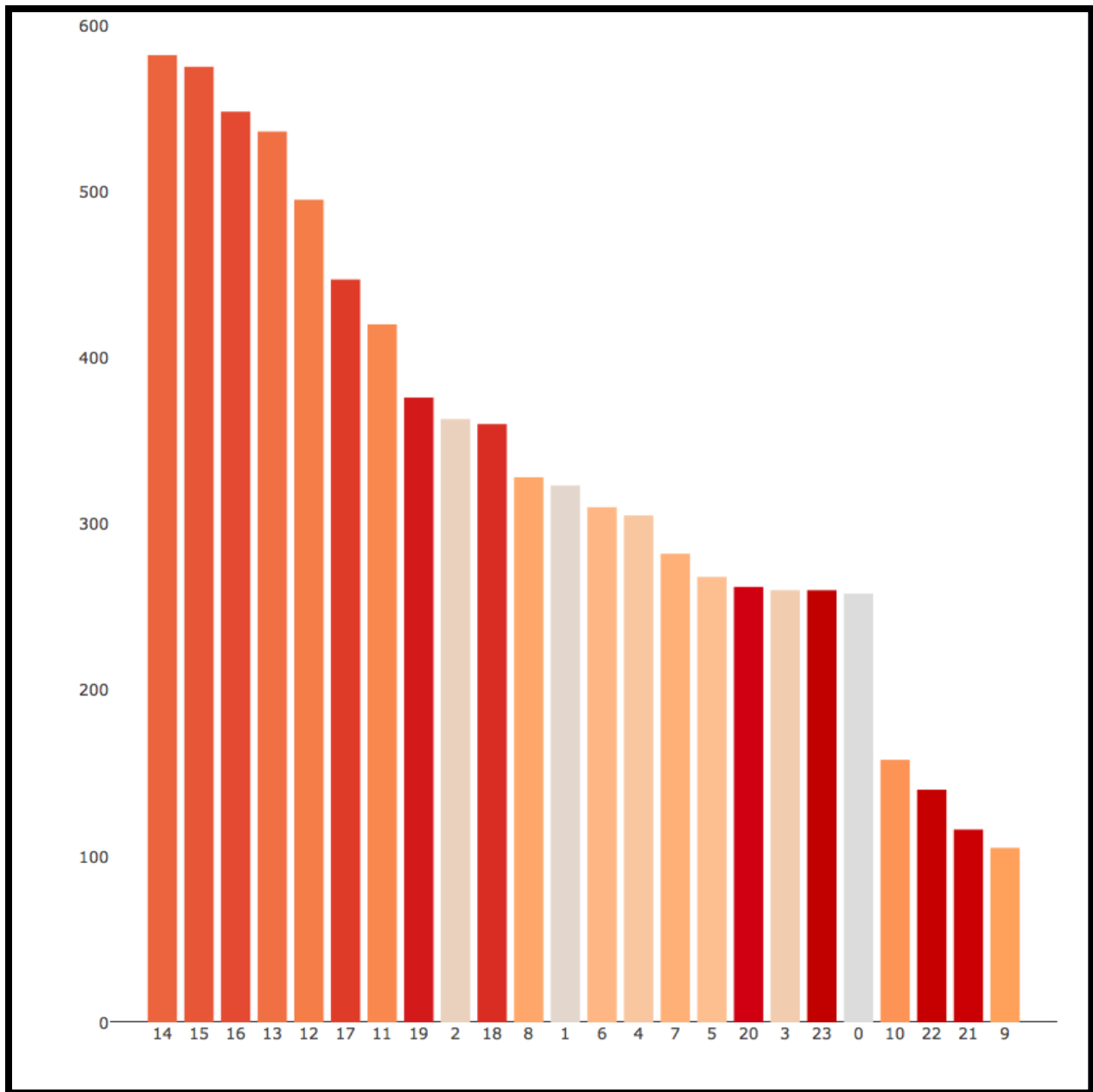
In this Analysis, we have combined all the data from Jan1st till Jan10th to completely understand the trend of plowing snow in the city of Syracuse. The total rows obtained as a result of combining the dataset is 338,912. But the constraint was that, many of these data mentioned different activity performed by the Snow plowing Machine. The activities recognized were Start Moving, Stop Moving, Plow down, Plow up, Spreader on and Spreader Off, Aux Motor ON & Off, Ignition ON, and Ignition OFF



**Time Series Analysis for the First 10 days of January:**

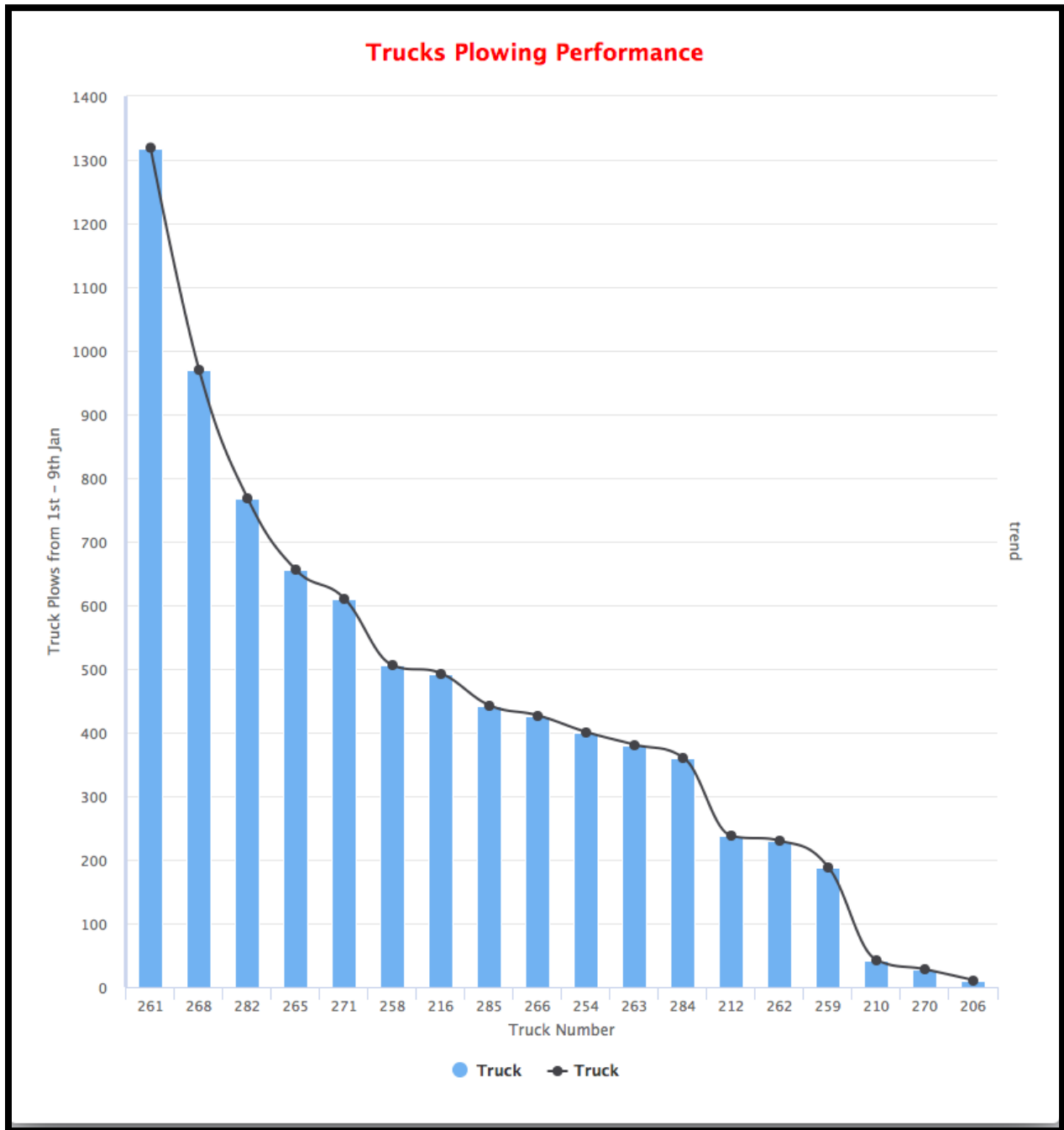
- Let us see the plowing trend for the first 10 days of January 2018. Based on compiling the given data, we can clearly infer that Jan8th and Jan1st has been the busiest days as the graph indicates lot of plowing in the Syracuse city. We can also observe the trend of plowing on other days.

- [Time of the day](#)
- Let us now focus our analysis on find the trend based on the time of the day. The given graph indicates the frequency of Snow plowed based on the GPS data of 10 days.



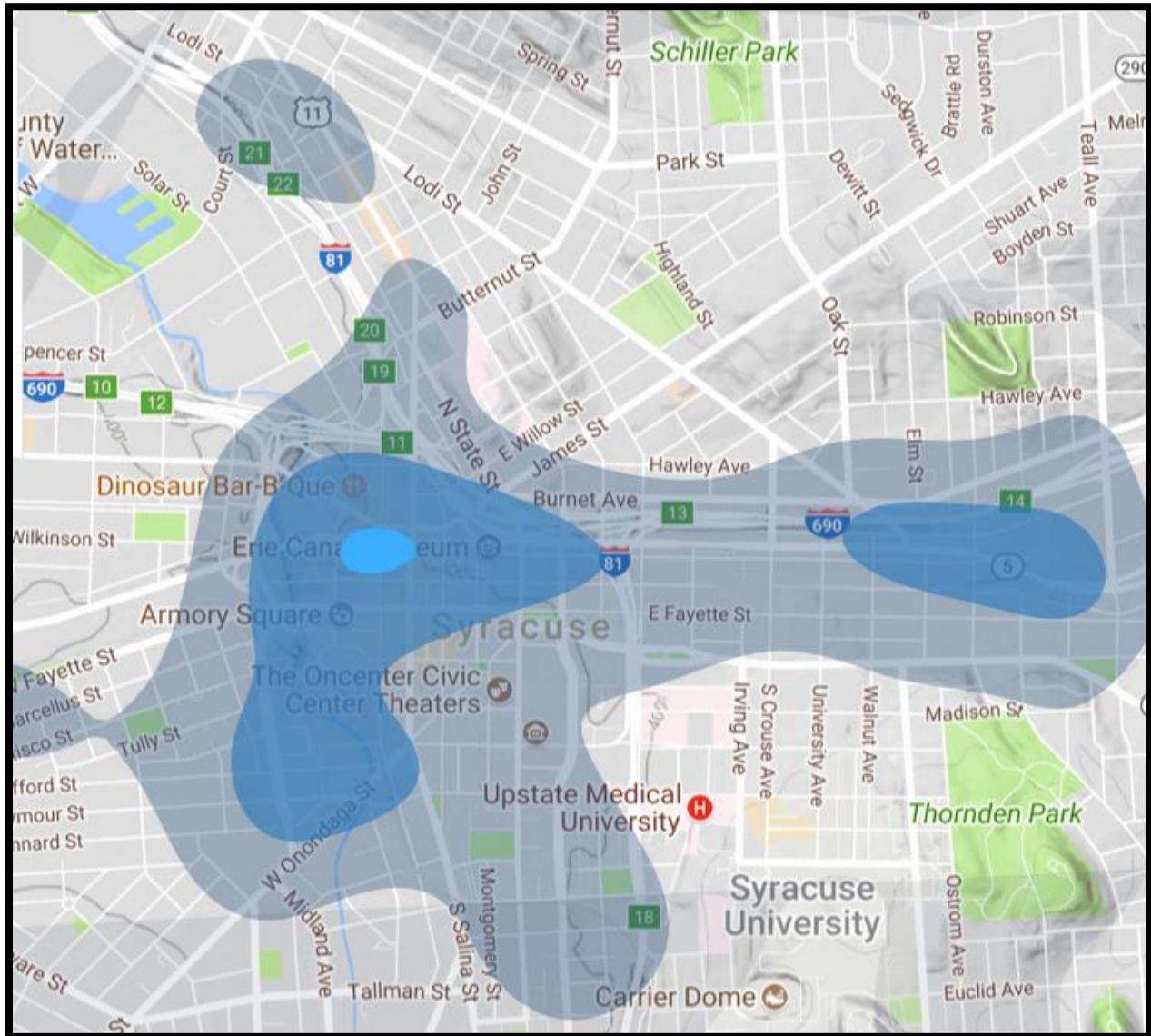
- From this graph, we can infer that the most of the snow is plowed in the time frame between 11am- 7pm. The graph shows the particular time at which we have maximum plowing which happens to be at 2PM.

- Performance of Plowing Trucks



- Based on the plowing trends mention above, we can make an inference on the performance of each truck. We can use this measure to see the efficiency of the snow plowing and use this information for optimizing the snow plowing process elsewhere.

- Plowing Density across the City:



- The map above indicates the plowing density across the city. The dark epicenter represents location with high plows within the first 10 days of January.
- We can also see that maximum plowing has been done in the center part of the city or Downtown, where we have lot of corporate establishments.
- Apart from the Downtown, locations where there are markets and other business centers have also been plowed a lot within the given time frame.

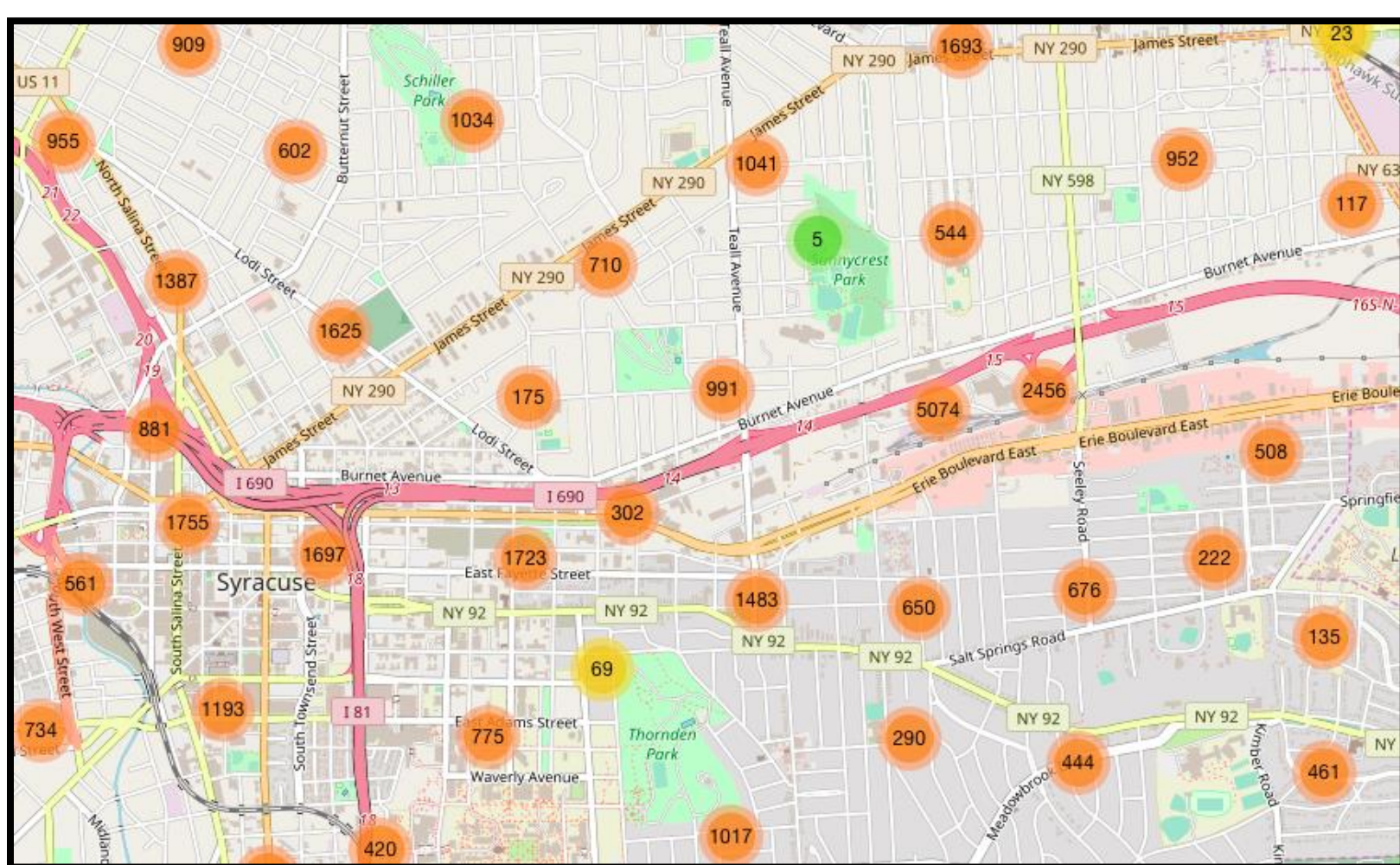








- Let us look deeper based into the plowing Trend in the city,



Based on the previous density map, we can now look into the part of the city and observe the same.

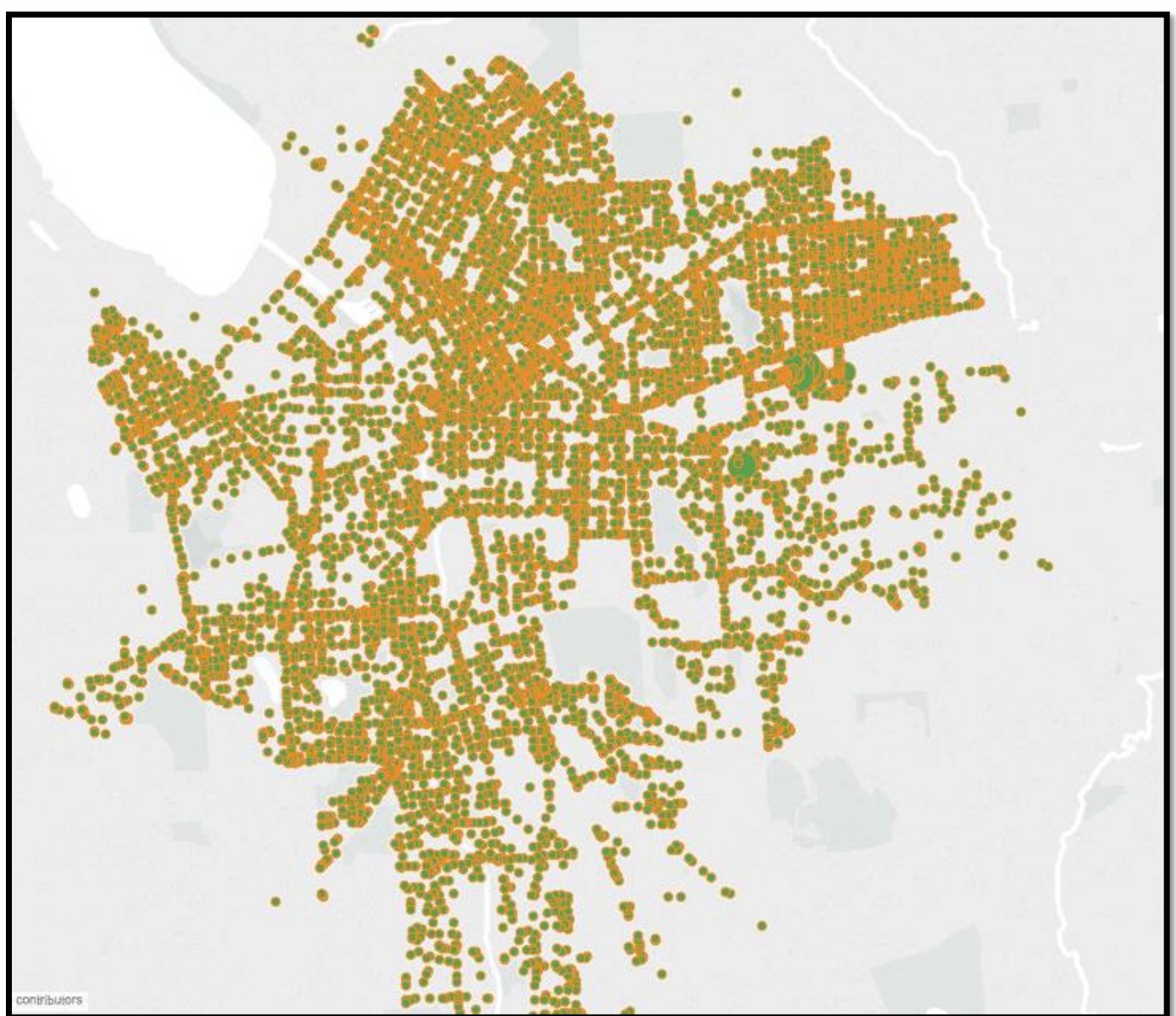
These regions are heavily Plowed regions of city.

The Downtown, followed by Erie Boulevard East Street are some of the frequently plowed streets in the City

If we use more number for snow plows for these regions then we can reduce the optimize the plowing rate of these regions



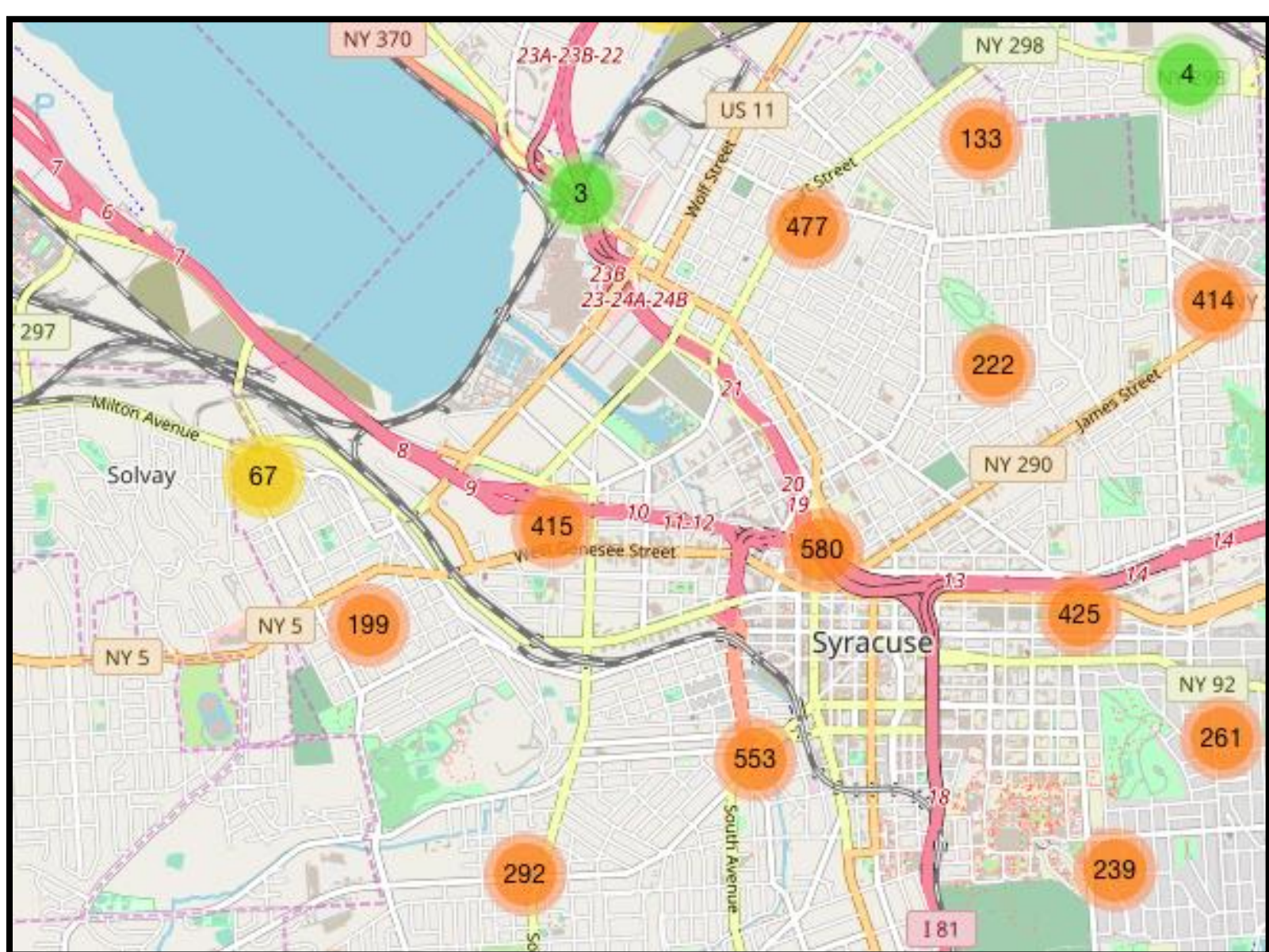
- Let us focus onto the other activities performed by the Snow plowing trucks to better understand the pattern of snow plowing in the city.



The above representation describes the locations around the city where the Salt Spreader is turned ON. From this we can see which streets have been salted across the city



- Plow is UP: The Snow plow is idle.



- From the above map, we can identify the locations where the snow machine's plow was up, which means not plowed region. We can see that there are lesser number of regions compared to the number of regions plowed.
- From this map, we can also see the regions that need to be plowed more. We can see that the region with 553 locations unplowed can be optimized by keep the plow down more number of times to reduce unplowed regions.

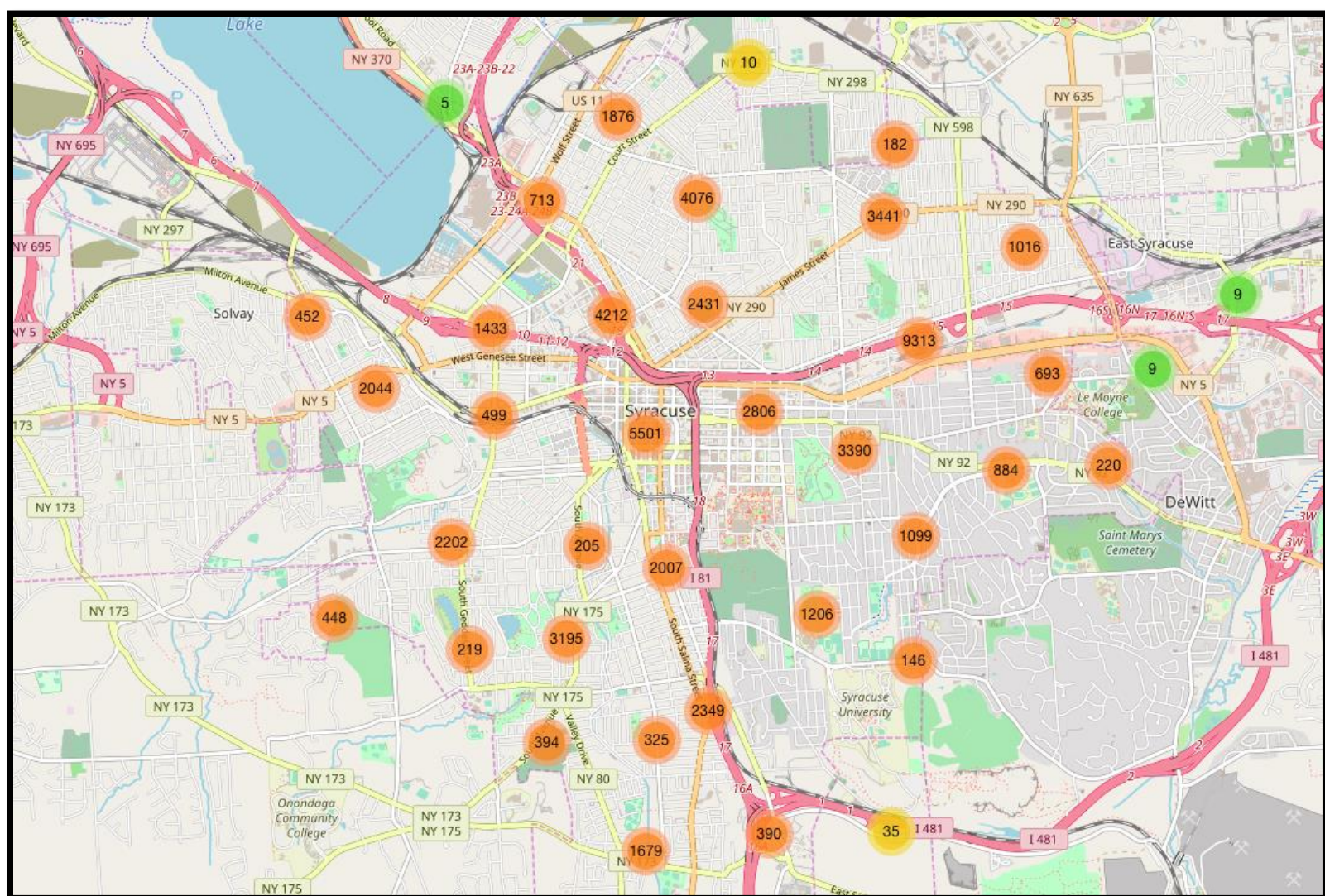
- [Salt Spreader Turned Off:](#)



- The above visualization depicts the regions where the Salt Spreader have been turned off, which means the following locations indicated on top have not been salted and they are much likely to get snow again.
- This would increase the frequency of plows in those regions unnecessarily.



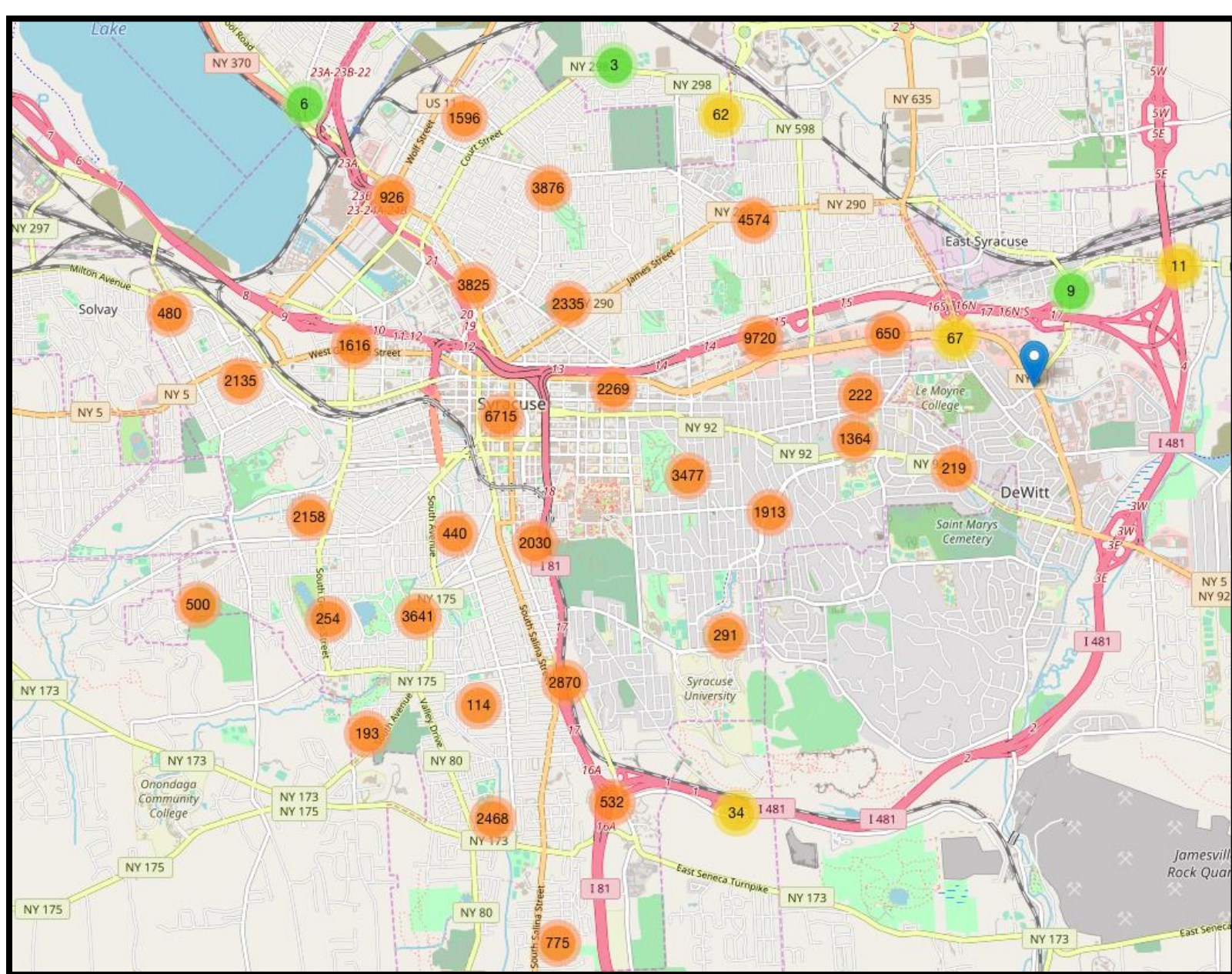
- Vehicle Started Moving: In the blow map we can see the locations where the vehicle has started moving from a rest position



- We can use this to infer the traffic or plowing pattern in the city. The regions with high traffic tends to have more start and stops.
- The regions with lesser traffic have fewer Starts compared to the freeways and the main hubs of the city



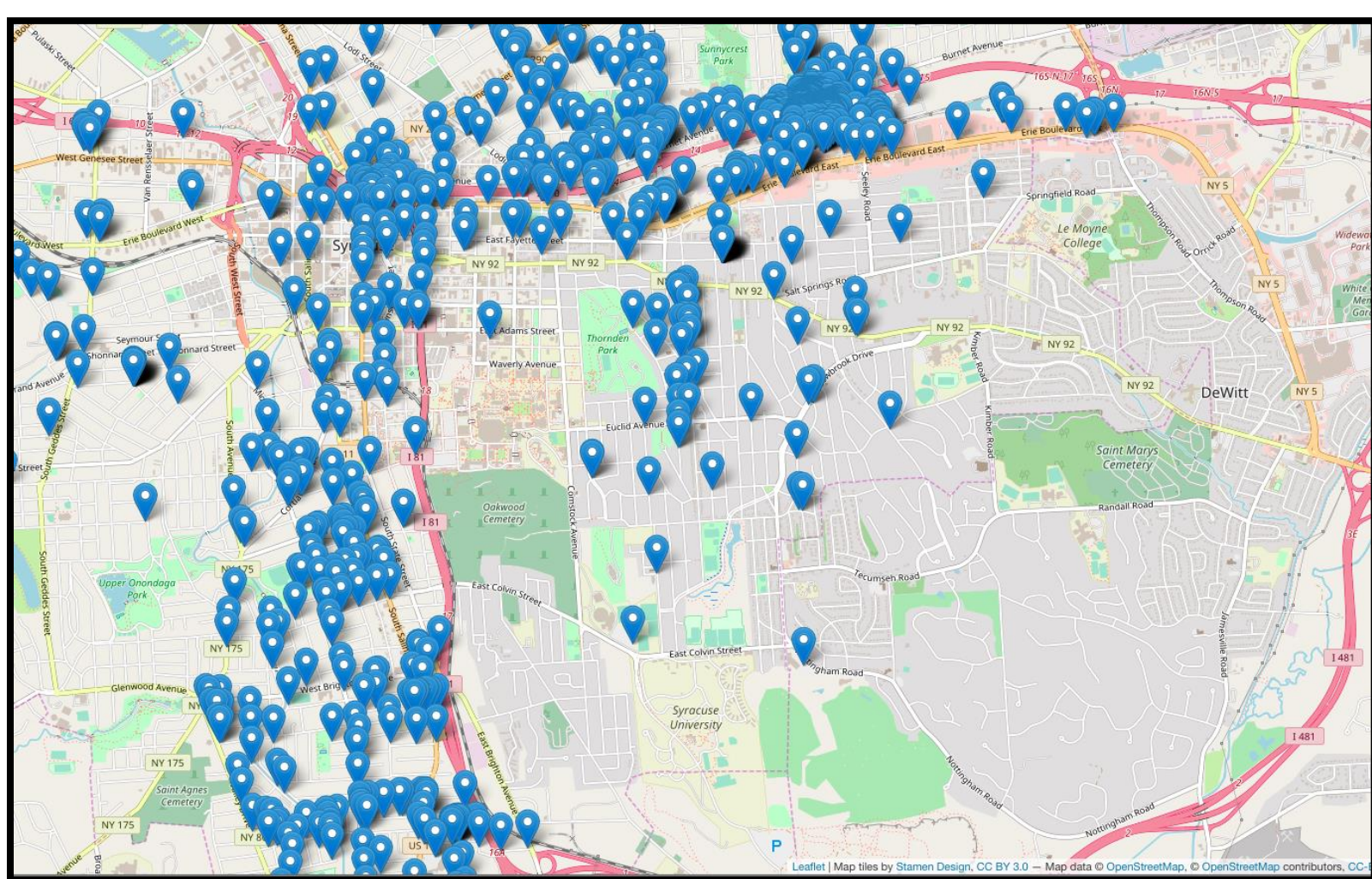
- Vehicle Stopped Moving



- Similar to the previous analysis, this map indicates the stops made by Snow plowing machine.
- With this information, we can analyze the traffic patterns and also regions that require additional snow plowing machines.



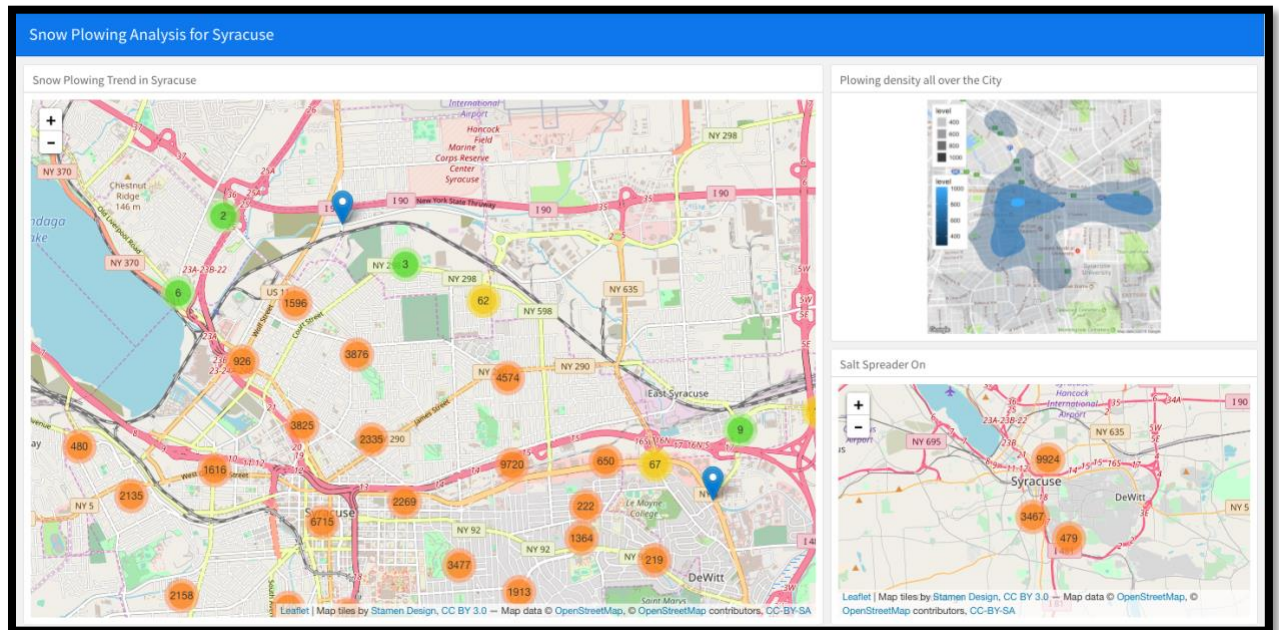
- Ignition turn on:



- In this particular map, we can see the locations where the vehicle was switched off.
- These locations could be possible rest points for the Vehicles.
- We can leverage this information to redirect snow plowing trucks wherever required around the city.

- **Dashboard:** To have a more interactive view on the above graphs, we have created a dashboard in R Studio.

Link to the dashboard: <http://rpubs.com/ssampath/365422>



- The dashboard allows the user to have a more in-depth understanding the trends based on the maps. The maps basically cluster the different plowed region and shows then count of those regions so that the user can easily understand the maps