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GIS 4850 Final Project
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Introduction

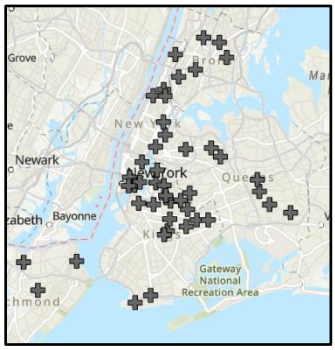
Using spatial statistics and suitability modeling, where is the most suitable location for an additional Women's Shelter in New York City based on hot spots of violent crime? What makes an area suitable for a women's shelter? Why aren't there more women's shelters in New York City? Most women in need of shelters find refuge at these accommodations after becoming domestic violence survivors. These women need access to health care, public transportation, and other services that could help them create a new life for themselves. Maintaining a safe haven away from danger and crime is critical in keeping these women safe.

Background

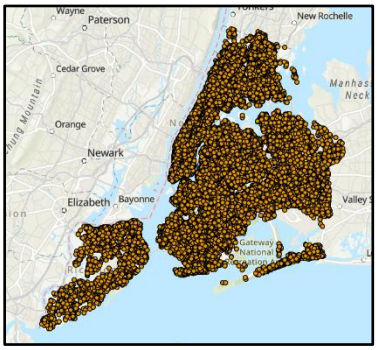
Being the largest city in America, I think there should be more women's shelters in New York City. The only women's shelter intakes in New York City are the HELP Women's Shelter in Brooklyn, or the Franklin Shelter in the Bronx (Faber, 2022). Factors that would make an area in the city good for this purpose would be residing in a low crime density area in addition to being close to a medical center, outdoor recreational space, and public transportation.

Data

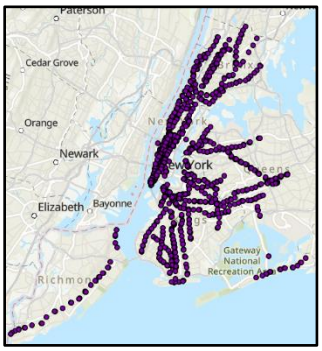
- I used the coordinate system NAD 1983 UTM Zone 18N and the units are in meters.
- **NYC Health and Hospitals** - Point data from NYC Open Data displaying locations where there are health centers and hospitals. The attribute table has the facility type, name, address, and phone numbers. This data was last updated on July 3, 2019.



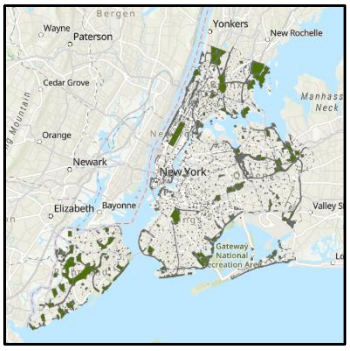
- **NYC Crime –** Point data from NYC Open Data explaining crime occurrences. The attribute table has the location and date where arrest took place, offense, and what the charge was. It also has demographic information about these crimes including age, gender, and race of the perpetrator. This data is updated quarterly and was last updated on February 1, 2023



- **NYC Subway Entrances** – Point data from NYC Open Data and has information about where the subway entrances are. The attribute table states the name as well as the subway lines that are affiliated with this entrance. This data was last updated on September 10, 2018.



- **NYC Open Space and Parks** – Polygon data from NYC Open Data outlining New York City's recreational and open space areas. The attribute table has information about land use, park names, and park size. This data was last updated on September 23, 2022.



Current Women's Intake Shelters– I just looked up the names and addresses and converted that into coordinates using LatLong.net. I then input the information into an Excel sheet and imported it into ArcGIS as point data.

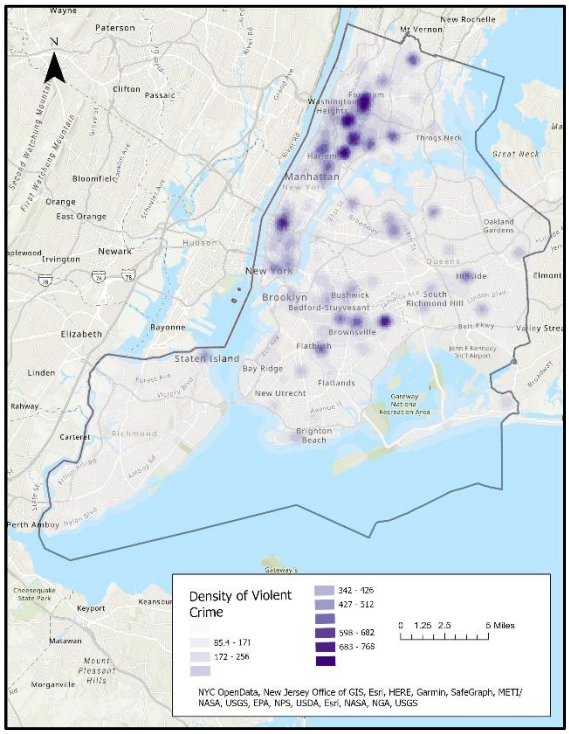
Methods

I began this project by searching on the NYC Open Data website and downloading data that I thought would fit these specifications. I also needed a city boundary to clip everything to, so I went into ArcGIS Online and downloaded a city boundaries layer and implemented a select by attributes action to choose [city] Name *equals* New York. I made sure to project everything to the NAD 1983 UTM Zone 18N using the *Project* tool.

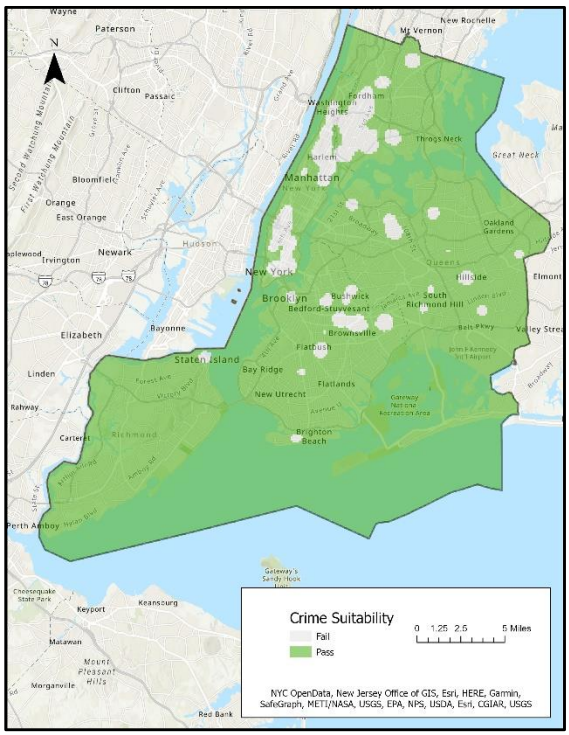
By selecting and exporting every offense in NYC_Crimes attribute table including assault, homicide (murder and manslaughter), rape, and robbery, I obtained a "Violent Crime" layer. I selected and exported attributes in the NYC_OpenSpaces layer by choosing every land use that had to do with a park, garden, or nature area to get the "Parks" layer. After that, I used the *Kernel Density* tool to find the densities and hot spots of violent crime in New York City. Utilizing the *Reclassify* tool and values from the Kernel Density layer, I found areas of suitability for low crime areas, specifically areas with less than 250 offenses per square kilometer annually.

Implementing the *Euclidian Distance* tool to find areas that were half a mile (800 meters) away from subways entrances and parks and one mile (1600 meters) from hospitals, I then was able to reclassify the distances as pass (1) or fail (0). By executing the *Weighted Sum* tool, I was prepared to create a layer that showed areas on a color ramp that fit the criteria from zero to all four criteria met. The *Raster Calculator* tool was also used to create two more suitability layers. One binary (pass or fail) layer was constructed by multiplying the four previously created suitability layers (crime_suitability, hospitals_suitability, parks_suitability, and subway_suitability) to get a map with either pass or fail locations. Pass locations fit all the criteria and fail areas do not. One ranked layer was calculated by adding the four suitability layers to calculate appropriate areas where a new women's shelter could reside. The ranked layer tells how many criteria are met on a scale from zero to four, similar to the weighted sum layer.

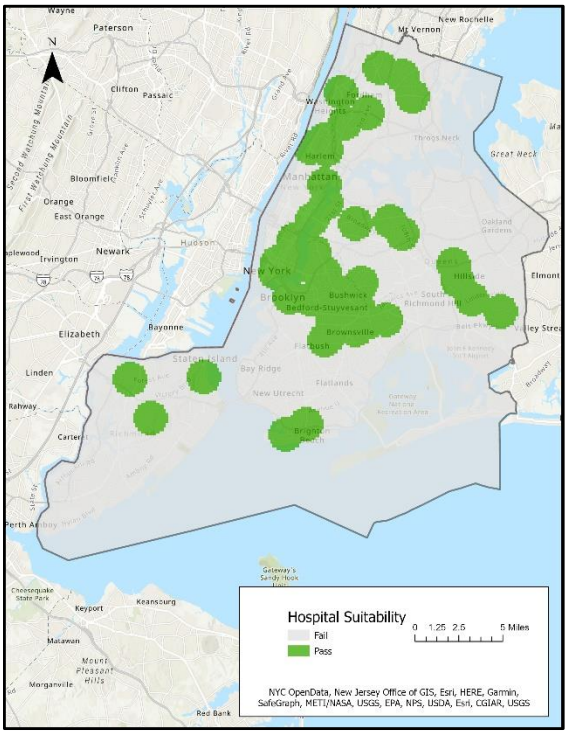
Crime Density using Kernel Density



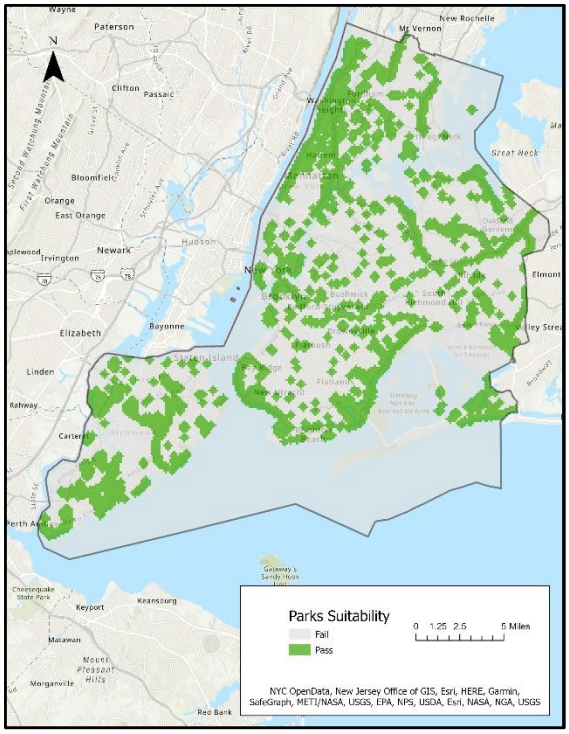
Crime Suitability



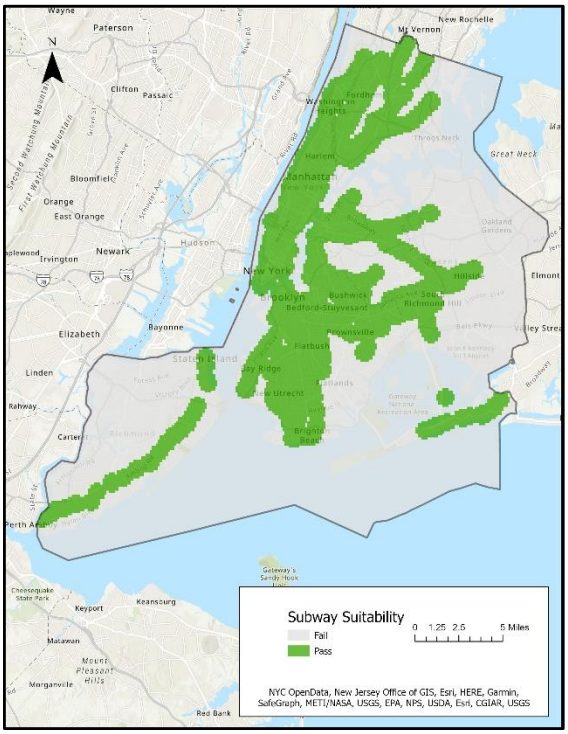
Hospital Suitability



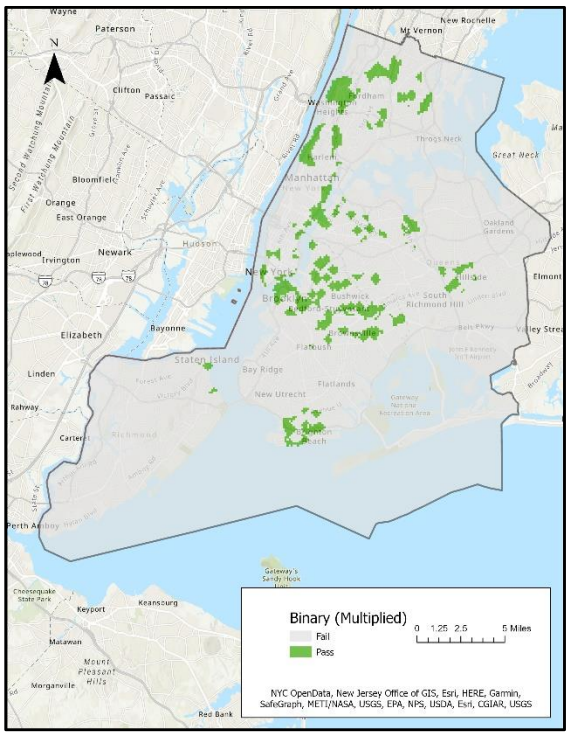
Parks Suitability



Subway Suitability

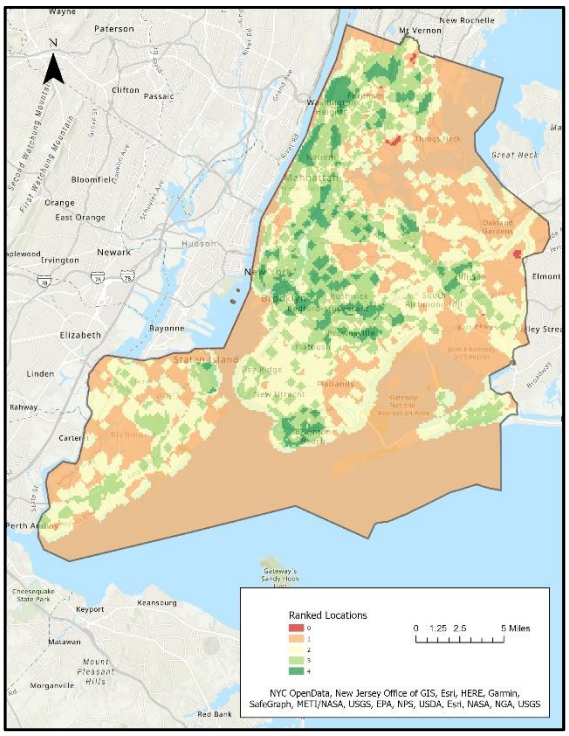


Suitabile Locations Using Raster Calculator Binary (pass/fail [multiplication])



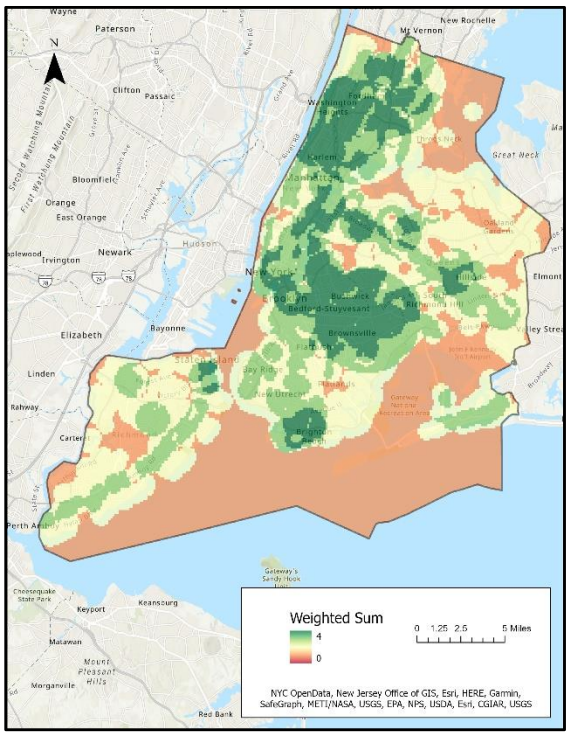
Model for Binary (pass/fail)

Suitabile Locations Using Raster Calculator Ranked (addition)



Model for Ranked (addition)

Suitabile Locations Using Weighted Sum

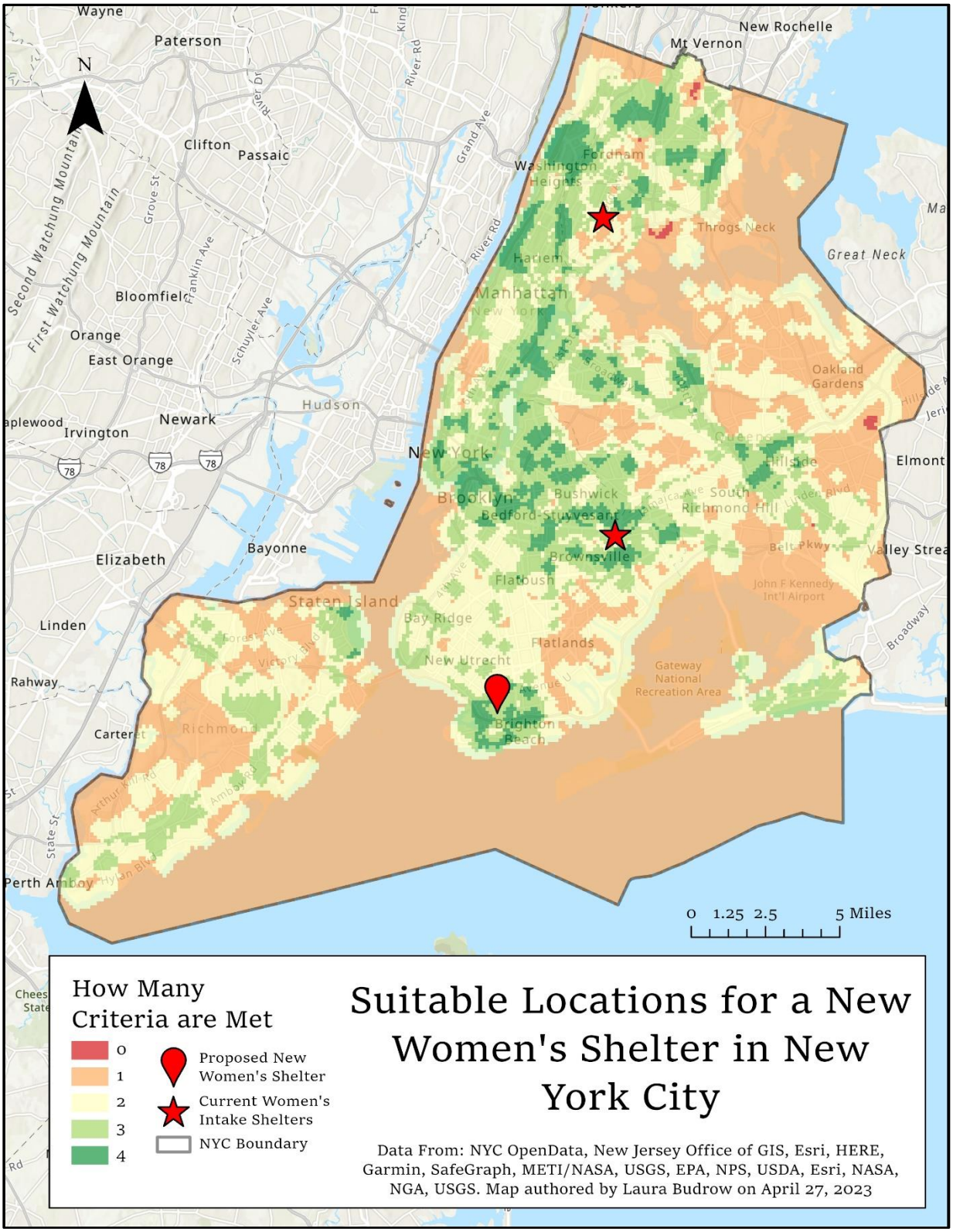


Model for Weighted Sum

Results

I used the ranked locations map as I thought it was the most visually appealing for this purpose. The parameters I used were that this new women's shelter must be in an area with low crime (less than 250 offenses per square kilometer annually), within a half a mile (800 m) away from subways entrances and parks, and one mile (1600 m) from hospitals. It looks like the two current women's intake shelters, the HELP Women's Shelter in Brooklyn, and the Franklin Shelter in the Bronx, are in fact already in suitable areas based on these criteria. I didn't want to put another shelter too close to the other two, but based on this information it looks like the most suitable location for a new women's shelter would be in South Kings near John Dewey High School on the cross streets of Avenue X and Stillwell Ave. All three suitability models show a pass, or appropriate measures, for a healthy and safe environment for women in need in this area.

Final Map


Wayne
Paterson
N
Clifton
Passaic
Second Watchung Mountain
First Watchung Mountain
Bloomfield
Orange
East Orange
Irvington
Newark
Hudson
New York
Manhattan
Harlem
Fordham
Washington Heights
New Rochelle
Mt Vernon
Throgs Neck
Great Neck
Oakland Gardens
Elmont
Brooklyn
Bushwick
Bedford-Stuyvesant
Brownsville
Flatbush
South Richmond Hill
Elizabeth
Bayonne
Staten Island
Bay Ridge
Flatlands
New Utrecht
Gateway National Recreation Area
Brighton Beach
Linden
Rahway
Carteret
Perth Amboy
0 1.25 2.5 5 Miles
How Many Criteria are Met
0
1
2
3
4
Proposed New Women's Shelter
Current Women's Intake Shelters
NYC Boundary
Suitable Locations for a New Women's Shelter in New York City
Data From: NYC OpenData, New Jersey Office of GIS, Esri, HERE, Garmin, SafeGraph, METI/NASA, USGS, EPA, NPS, USDA, Esri, NASA, NGA, USGS. Map authored by Laura Budrow on April 27, 2023

Conclusion

The most suitable location for a new women's shelter in New York City would be in South Kings. This area is relatively safe, close to public transport, health services, and outdoor recreation areas. The other two women's intake shelters in New York City are at least seven miles away from this area making it perfect for people that may be further away from Brooklyn or the Bronx. I originally was going to add the distance to the other shelters in my models and raster calculators, but it was not working as I hoped. I decided to just measure manually and pick an area that wasn't too close to the other two.

If I were to do this research again, I would do more investigation about what truly makes a location fitting for a women's shelter. The only things I found online were about what an actual shelter would require such as beds, cooking facilities, and showers in addition to what they need donated. I used educated guesses on what a woman in crisis would need to set my requirements for this new shelter.

I may try researching other shelters in New York City, although there wasn't too much information specifically on women's shelters. A lot of the information I found was about shelters in general, homeless shelters, rehabs, etc. It may be helpful to learn more about this subject to make an even better map.

References

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