# Interactive Web Mapping as a Pollution Reporting Tool

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## Introduction

Los Angeles County, California has become known for its diverse population, entertainment industry, and ideal Mediterranean climate. However, due to its location it is also known as one of the regions with the worst air quality, which can be further worsened depending on where people live. Certain population groups experience a disproportionate amount of pollution due to the different stationary and mobile sources present within their communities. This project focuses specifically on the communities ( where the majority are low income, people of color) adjacent to Interstate-710, an area populated by heavy industry and diesel-fuelled semi-trucks. These communities suffer from high rates of asthma due to the unequal distribution of polluting facilities. The goal of this project was to create an interactive web map providing an educational/reporting tool addressing environmental injustices.
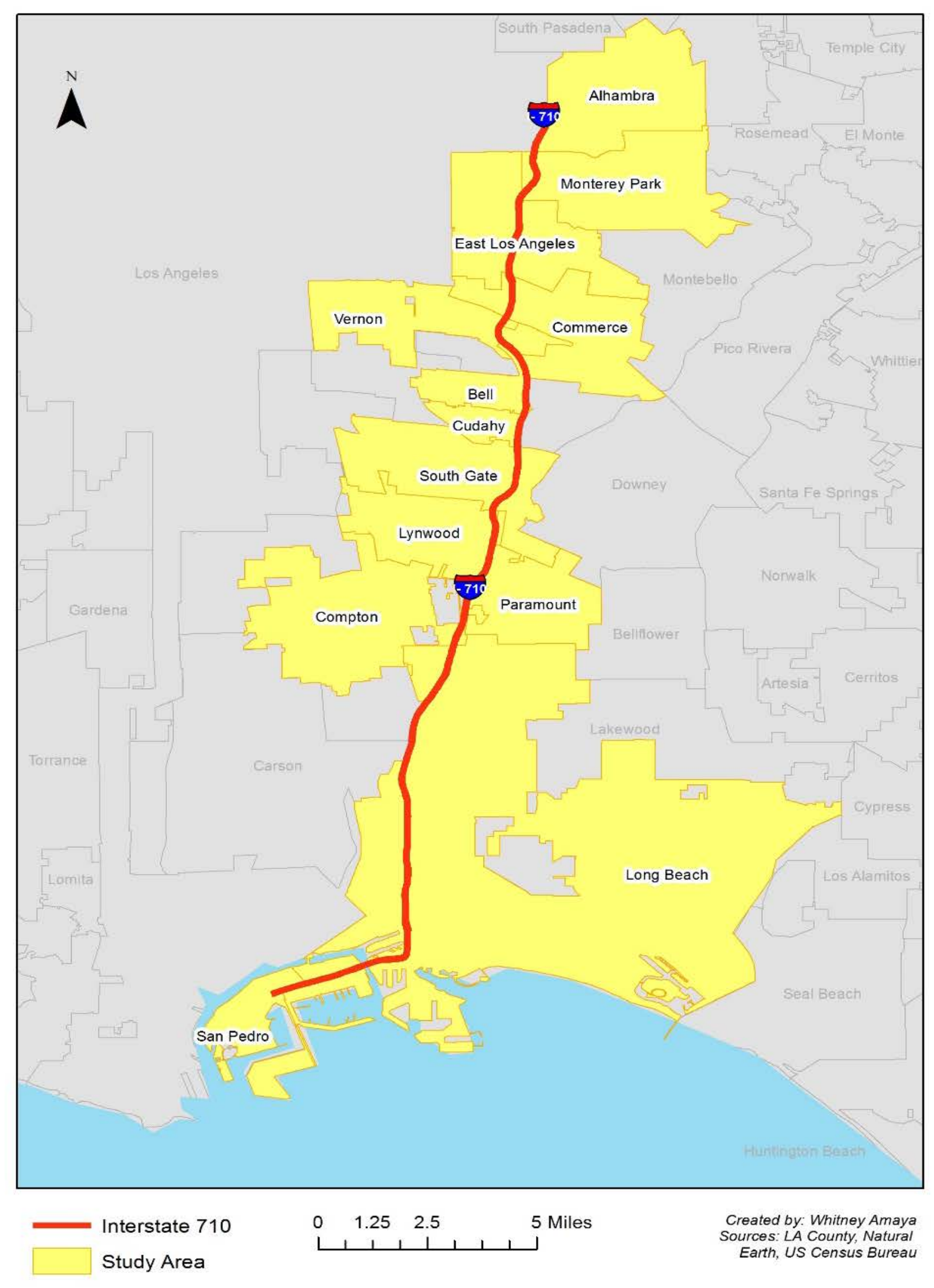


**Figure 1.** Map of the study area

## Data and Data Sources

Census tract level data on health and pollution indicators (asthma percentages, cardiovascular disease percentages, diesel particulate matter, and particulate matter 2.5), and demographic data were collected from CalEnviroScreen 3.0. Truck traffic counts were collected from CalTrans.

*Table 1. List of data and data sources used in the project*

| Dataset | Source |
|---|---|
| **Communities** | LA County |
| **Health, Pollution, Population Data** | CalEnviroScreen 3.0 |
| **Interstate-710** | US Census Bureau TIGER/Line |
| **Regulated Facilities** | EPA |
| **Truck Traffic Counts** | CalTrans |

## Methodology

In order to create the interactive web map reporting tool, several steps were taken, starting with data collection. Datasets were gathered from governmental agencies at the local, state and federal level. Once the datasets were gathered, a Python script was developed to create the desired study area.

The next step was to create the interactive web map. This was achieved through the use of the free open-source code editor, Notepad++, and the application programming interface (API), Leaflet. To build the map, a Hyper Text Markup Language (HTML) document was required to create an element that would contain the map. The Leaflet API was referenced within the HTML document to show basic map elements, such as zoom level control and popups. Cascading Styling Sheets (CSS) was used to customize the appearance of the map. Additional Leaflet plugins were installed to extend the functionality of the map. One such plugin was Leaflet.draw, which gives users the ability to add markers to the map.

The last step was to make the interactive web map available online. An Amazon Web Services free tier eligible account was created for this purpose. Using their S3 service, the datasets, API, plugins and written code were uploaded and published for public use.
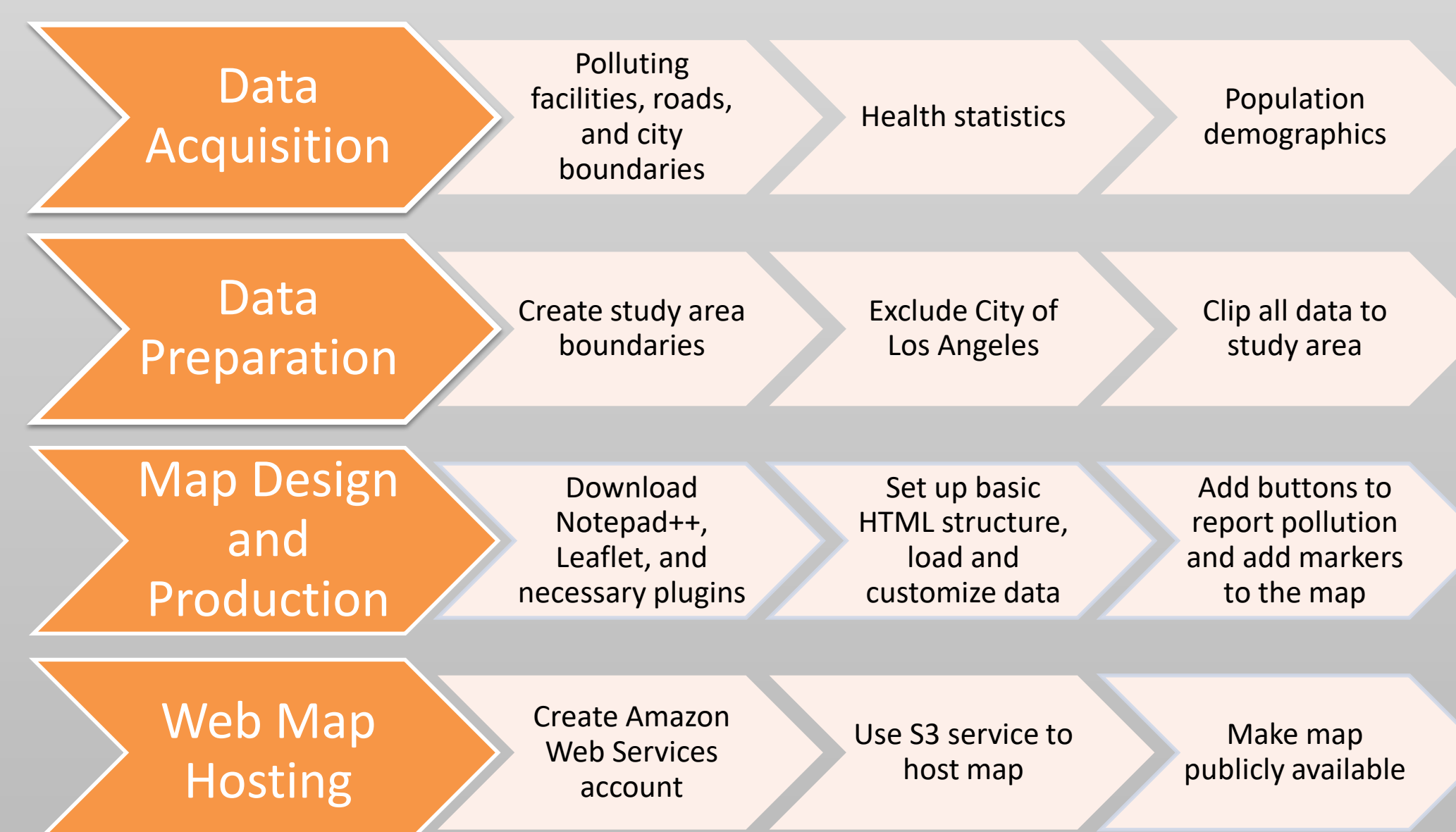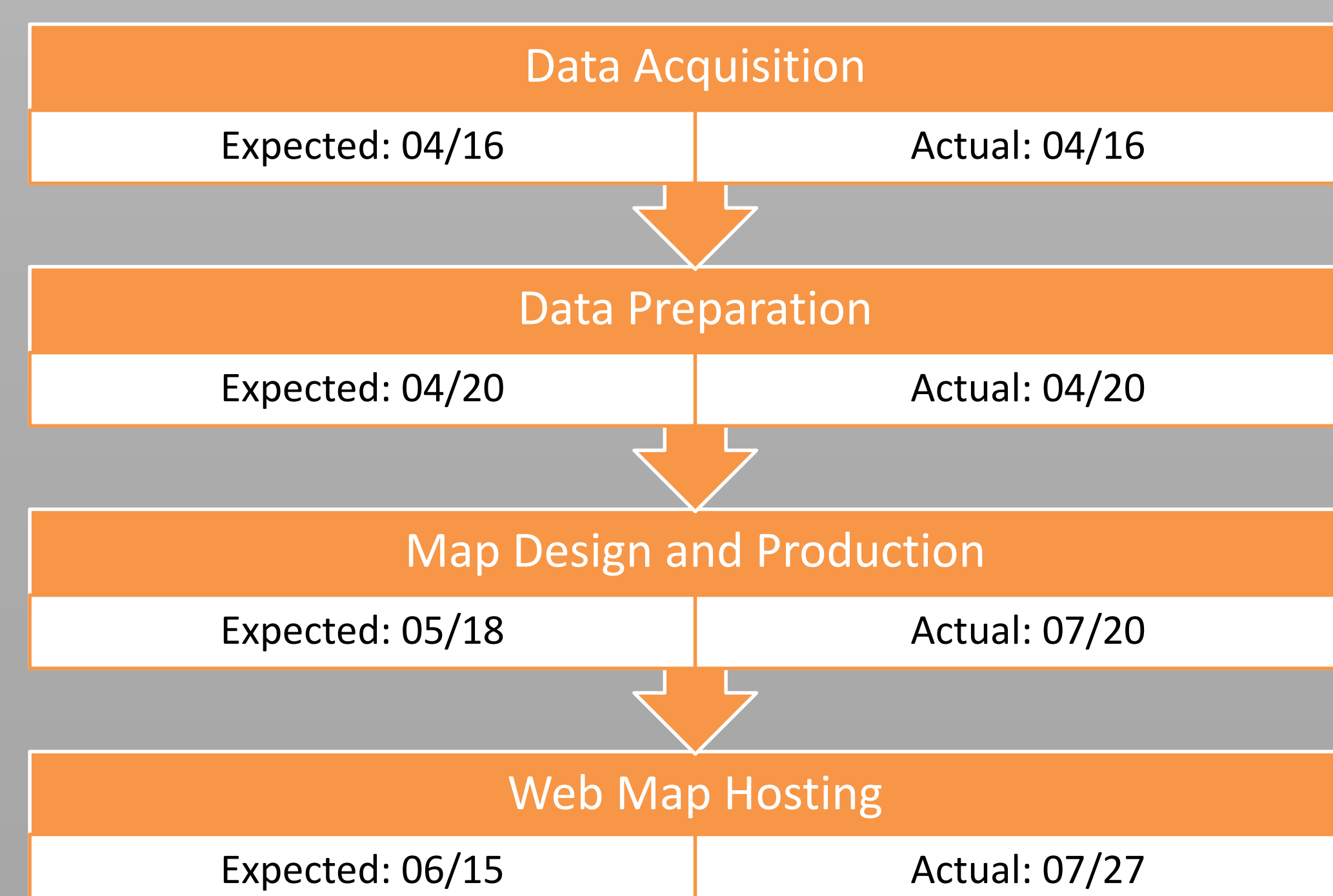


**Figure 2.** Methodology flow chart

## Timeline

### Data Acquisition
| Expected: 04/16 | Actual: 04/16 |
|---|---|

### Data Preparation
| Expected: 04/20 | Actual: 04/20 |
|---|---|

### Map Design and Production
| Expected: 05/18 | Actual: 07/20 |
|---|---|

### Web Map Hosting
| Expected: 06/15 | Actual: 07/27 |
|---|---|

## Results

The end product was an interactive web map that aimed to accomplish the two main objectives of the project: 1) address environmental justice issues in an educational and engaging manner, and 2) use web mapping as a platform for residents to report pollution and contamination in their communities. The different datasets are nested within a layer control widget that can be toggled on or off by the user. Clicking on the features of a layer will display popups with relevant, informative content. Buttons are included for the user to report pollution or to add potentially polluting facilities that were not included in the map. Clicking on the button to report pollution leads to a Google form that asks the user information about the polluting facility, the polluting activity, and how that polluting activity affected their health. When the user chooses to add a facility to the map, a popup appears asking the user to input information about the facility. The user has a chance to edit the location of the facility or to remove any of the facilities they added to the map.



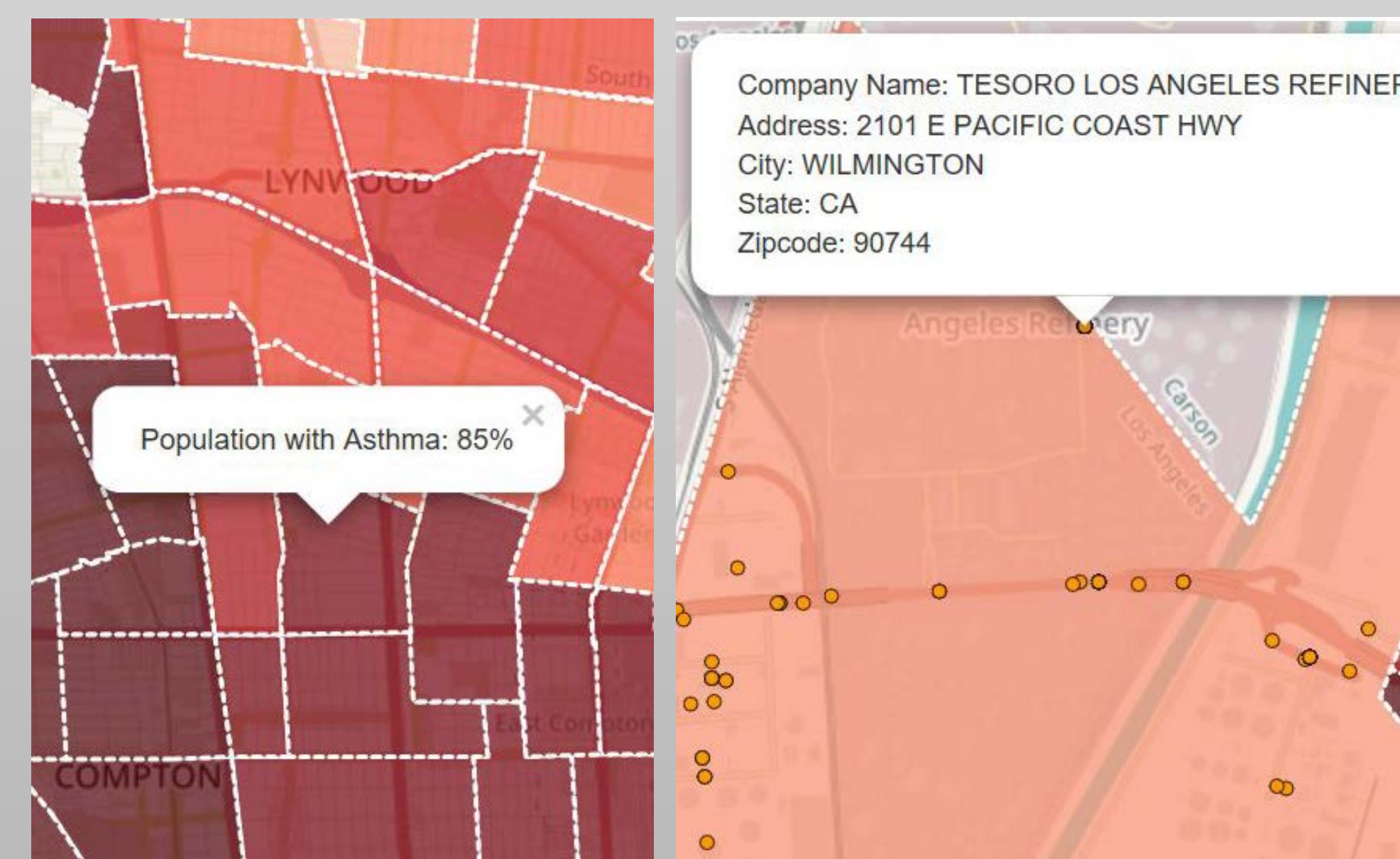**Figure 3.** Screenshot of the interactive web map



**Figure 4.** Popup content



**Figure 5.** Adding facilities to the map



**Figure 6.** Google form to report pollution

## Discussion

The timeline to build the interactive web map was longer than originally expected since there were changes to the framework of the interactive web map. The original framework included building an enterprise GIS and a relational database management system. However, due to limited knowledge and time, a simpler approach was taken. As a result, the current web map has a severe limitation to the feature that lets users add facilities to the map. Added facilities are intended to be saved and accessible by all users. However, in the map's current state, the added facilities are available only to the user who added the points and only during their current session. Regardless of the limitations, residents of these communities can report pollution or contamination, and decision-making bodies can learn more about the current situation. These combined efforts can lead to the implementation of policies or stricter regulations that would reduce pollution and improve population health.
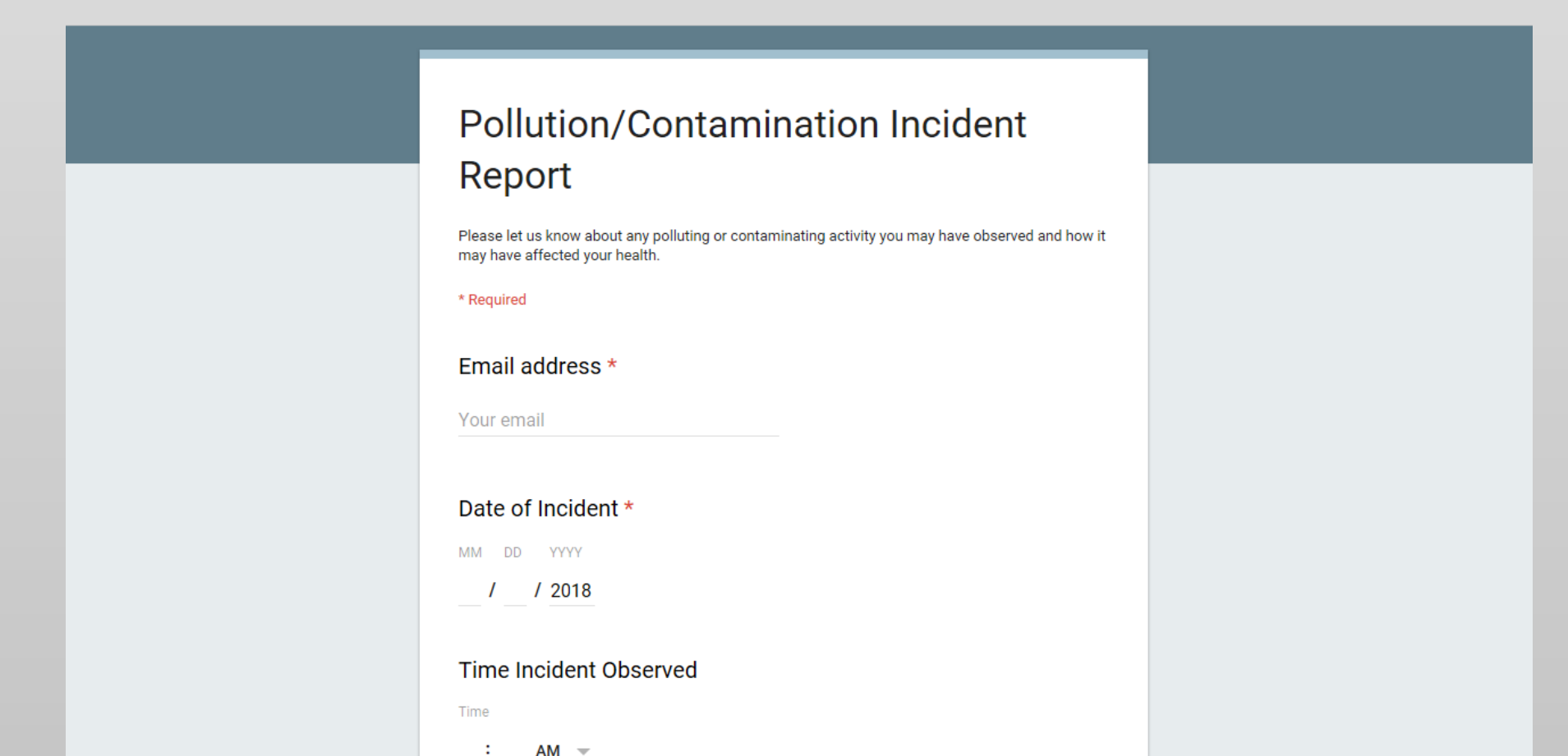
## Conclusion

The purpose of creating this interactive web map was to highlight the disproportionate amount of pollution faced by certain communities and the impact on their health. Most of the communities along the I-710 have high rates of asthma and diesel particulate matter, all of which are a result from the type of industry present within these communities. Moving forward, changes and updates should be implemented to increase the map's effectiveness. In the future, it would be best to create a backend to address the map's current limitations. The datasets should always be updated as new versions are released to increase the map's accuracy. It would also be beneficial to include different types of data, such as the boundaries of brownfields. Lastly, it is important to consider the map's accessibility to all population groups. Making the map available in multiple languages can expand the map's audience.