Action: Mobile monitoring around railyards to evaluate their impact on air quality in the nearby community

Background & Objective

The Community Steering Committee (CSC) prioritized air pollution from railyards within the Wilmington, Carson, West Long Beach (WCWLB) community based on concerns about diesel particulate emissions from trains and other diesel equipment. There are two major railyards in WCWLB community, the BNSF Railway Company (BNSF) Watson and Union Pacific (UP) Intermodal Container Transfer Facility (ICTF)/Dolores railyards. Additionally, there are several other on-dock railyards operating at the Ports of Los Angeles and Long Beach. Air pollution is mainly generated by equipment and vehicles that are used for railyard operations. These vehicles and equipment move containers and railcars around the railyard to load, unload, and transport goods in and out of the railyard. Emissions can also be generated during maintenance activities (e.g., load testing of locomotives). Examples of equipment that is used for railyard operations include: locomotives, drayage trucks, cargo handling equipment, and transportation refrigeration units.

The CSC identified specific actions to identify opportunities for emission reductions from railyards. If needed, air monitoring can also be conducted to determine source locations; identify potential sites for fixed monitoring, if appropriate; assess the potential contribution of railyards to the overall air pollution burden in the WCWLB community; and track the progress of emission reduction strategies.

Method

Mobile monitoring has been and continues to be conducted with a mobile platform capable of measuring a wide range of particulate and gaseous pollutants, including particulate matter (PM), black carbon (BC), ultrafine particles (UFP), and nitrogen dioxide (NO_2). Figure 1 shows the routes traversed by the mobile platforms near the railyards in the WCWLB community.

Results

- As of May 2020, a total of five days of targeted mobile monitoring was carried out around the railyards and in surrounding neighborhoods within the WCWLB community
- Mobile monitoring results indicated elevated NO_2, UFP, and BC levels near/downwind of the railyards within the WCWLB community, but these elevations were not as significant as those observed on major streets and freeways (Attachment A)
- It was also observed that NO_2, UFP, and BC concentrations were generally lower in residential communities as compared to those near railyards and on major streets and freeways (Attachment A)

Next steps
• Conduct additional mobile monitoring. Use air monitoring data and emissions inventory information to help identify opportunities for emission reductions

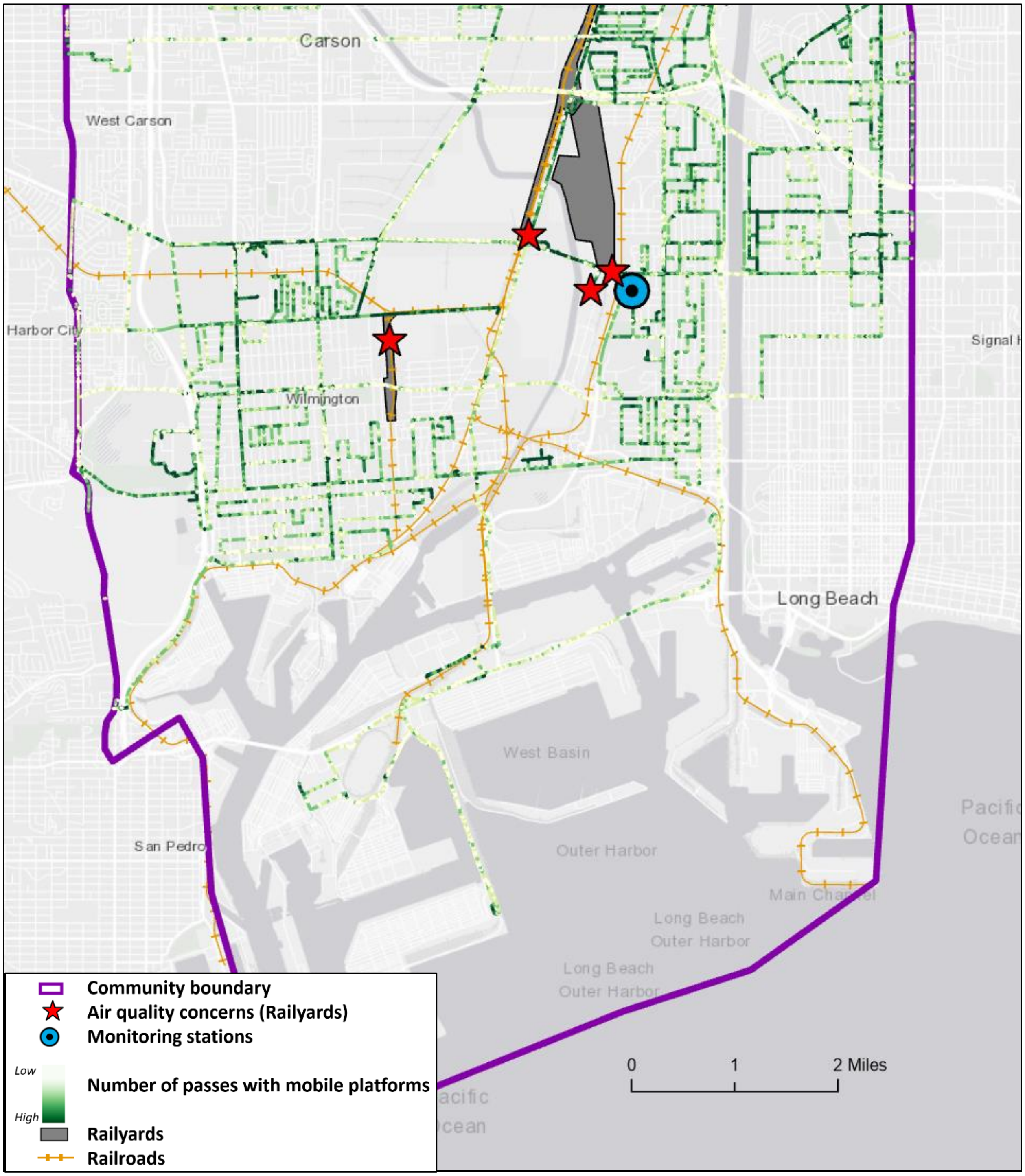

Figure 1. The routes traversed by the mobile platforms near the railyards in the WCWLB community. A total of five days of mobile monitoring was carried out around the railyards and in surrounding neighborhoods within the WCWLB community

Attachment A

As of June 2020, a total of five mobile monitoring surveys have been conducted in the Wilmington, Carson, and West Long Beach (WCWLB) community to measure diesel emissions. Diesel engines emit a complex mixture of air pollutants, including both gaseous and solid material. The solid material in diesel exhaust is known as diesel particulate matter (DPM), which is a component of PM2.5. There is no technique to directly measure DPM (a major contributor to health risk); therefore, indirect measurements based on surrogates for components of diesel exhaust are used, specifically black carbon (BC). DPM is typically composed of carbon particles ("soot", also called BC) and numerous organic compounds. Diesel exhaust also contains gaseous pollutants, including volatile organic compounds (VOC) and NOx. Measurements are conducted using a mobile platform capable of monitoring a wide range of particulate and gaseous pollutants, including particulate matter (PM), black carbon (BC), ultrafine particles (UFP), and nitrogen dioxide (NO_2), as part of the area-wide surveys. Nonetheless, the routes traversed by the mobile platform were defined in a way to perform monitoring around the railyards within the WCWLB community (Figure 1).

Figure A-1 shows the duration and time window for the area-wide mobile measurements performed within the WCWLB community and near the railyards. As shown in this figure, mobile monitoring was performed in different times of day during the five survey days. The starting time of the mobile monitoring surveys varied between 8 and 11:30 am PST (Pacific Standard Time), whereas the ending time ranged from 1 to 3 pm PST.

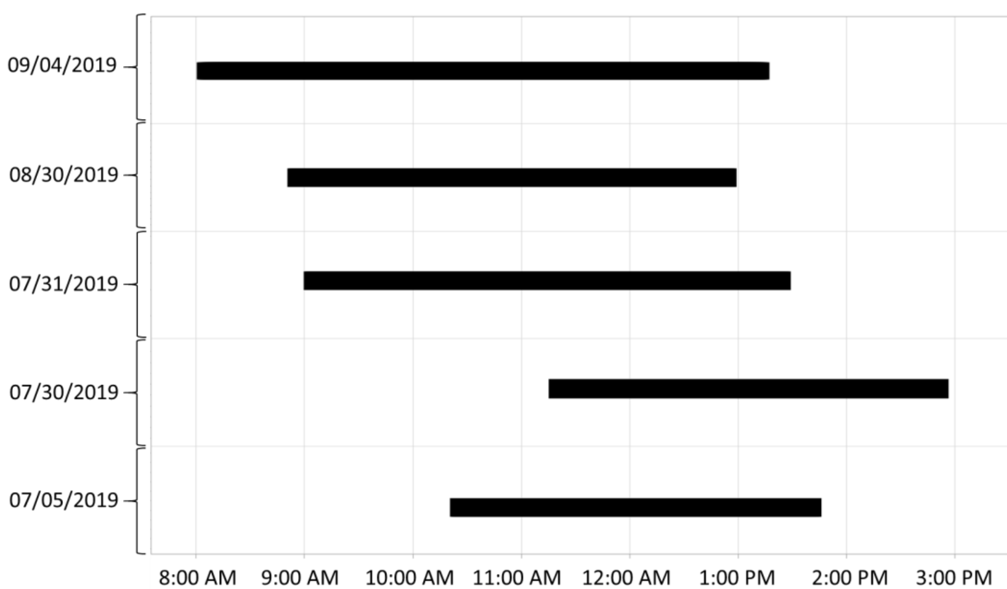

Figure A-1. The duration and time window for the area-wide mobile measurements performed within the WCWLB community and around the railyards. The time windows only include hours of active mobile measurements within the community, excluding the commute time between the South Coast AQMD Headquarters and the WCWLB community

Upon extensive screening and pre-processing of the data, NO_2 measurements were found to be the most robust and reliable set of diesel exhaust markers data measured, with 5 (out of 5) valid days of measurements and minimum instrument down time, followed by UFP and BC measurements, with 3 and 1 valid day(s) of measurements, respectively. Figures A-2, A-3, and A-4 illustrate "aggregated" maps of the spatial pattern (or concentration gradient) of NO_2, UFP, and BC concentrations within the WCWLB community and around the railyards, as measured by the mobile monitoring platform during those five days. To ensure that the concentration gradient map is representative of the variations in the pollutant concentrations, individual measurements taken within a 50-meter radius in different passes and on different days were "aggregated", by calculating their arithmetic average, and shown as colored hexagonal bins on the map. Therefore, each hexagon on the map represents multiple measurements taken at different passes. In addition, it should be noted that mobile measurements taken on different days and hours cannot be directly compared, mainly because of the day-by-day and diurnal (i.e., hour-of-the-day) variability in pollutant concentrations as a result of changes in meteorology and source emissions strengths. Therefore, in order to account for the day-by-day as well as diurnal variability in the pollutant concentrations, the mobile monitoring data need to be normalized with stationary data from a fixed site monitoring station, according to a commonly used method in the literature. To achieve this, we collected minutely data from the Hudson monitoring station and computed hourly averages of pollutant concentrations for the time period corresponding to our mobile monitoring period (Figure A-1). For example, on September 4th, 2019 mobile monitoring was performed from 8 am PST to 1:08 pm PST, therefore, a total of 6 hourly averages were calculated for each pollutant from the Hudson monitoring station. Subsequently, the secondly mobile monitoring data were divided by the hourly averaged stationary data that corresponded to the hour in which that measurement was taken.

We observed somewhat elevated concentrations of NO_2 near and downwind of the railyards within the WCWLB community, but as shown in Figure A-2, these elevations were not as significant as those observed on major streets and freeways. As shown in the map, the mobile monitoring results indicated most elevated NO_2 concentrations on freeways, including the I-710 and I-405, and major roadways, including Alameda St., Wilmington Ave, Sepulveda Blvd., and W Anaheim St. It can also be observed from the map that NO_2 concentrations were much lower in residential communities as compared to those near railyards and on major streets and freeways. It should be noted that NO_2 (and the other diesel emission tracers measured) are emitted from multiple sources. This includes trains with diesel engines, diesel trucks, off-road diesel equipment, and other diesel engines. Therefore, inferences cannot be made (at least with a high level of certainty) on how much of the levels measured using the mobile platform is attributed to each source. Nonetheless, near-source measurements are performed in close proximity to or within the source (e.g. measurements inside freeways, or right downwind of railyards) and are likely to be mostly impacted by the source in their vicinity, providing a qualitative measure to compare potential contributions of each emission source to the ambient levels. The more accurate quantitative evaluation of source contributions would require proper source apportionment studies, once more data is available over time.

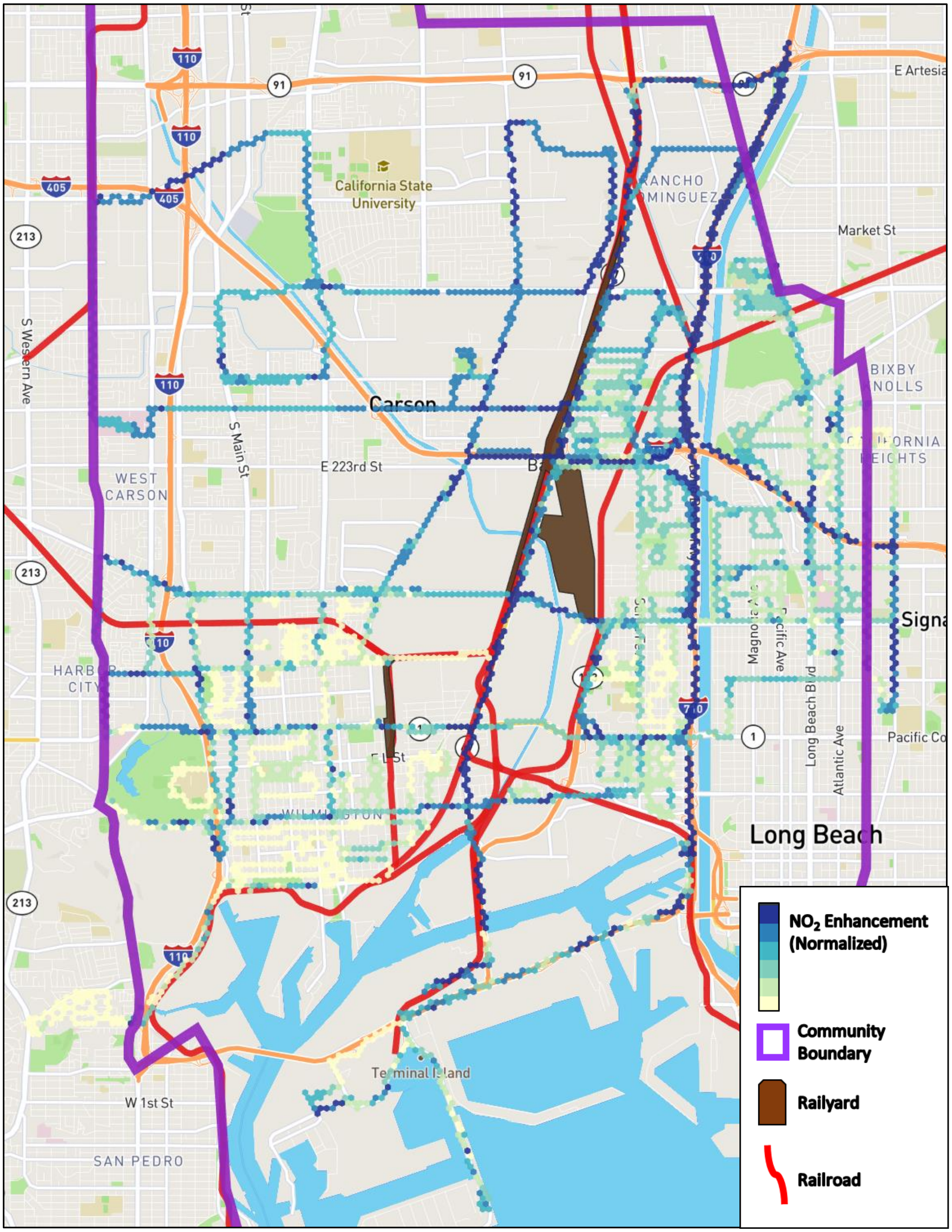

Figure A-2. Aggregated map of the spatial pattern of NO_2 concentrations within the WCWLB community and around the railyards, as measured by the mobile monitoring platform on 07/05/2019, 07/30/2019, 07/31/2019, 08/30/2019, and 09/04/2019

UFP concentrations were elevated near and downwind of the railyards within the WCWLB community (Figure A-3). However, these elevated levels were lower than concentrations observed on the I-710 freeway, or on some of the major roadways such as Santa Fe Ave and Alameda St. Similarly, to NO_2, UFP concentrations were generally lower in residential communities as compared to those measured near railyards and on major streets and freeways within WCWLB. As shown in Figure A-4, BC concentrations also showed the highest elevations on the I-710 freeway and parts of Alameda Street. We also observed somewhat elevated BC levels near/downwind of the railyards within the WCWLB community, but these elevations were not as significant as those observed on major streets and freeways. BC levels were also generally higher to the west of the I-710 freeway compared to those measured in the communities across the Los Angeles River to the east of the I-710. It is also noteworthy that even though the spatial patterns of these DPM tracers did not exactly match, the general trends were expectedly consistent, showing the highest elevated levels near and on major freeways and streets.

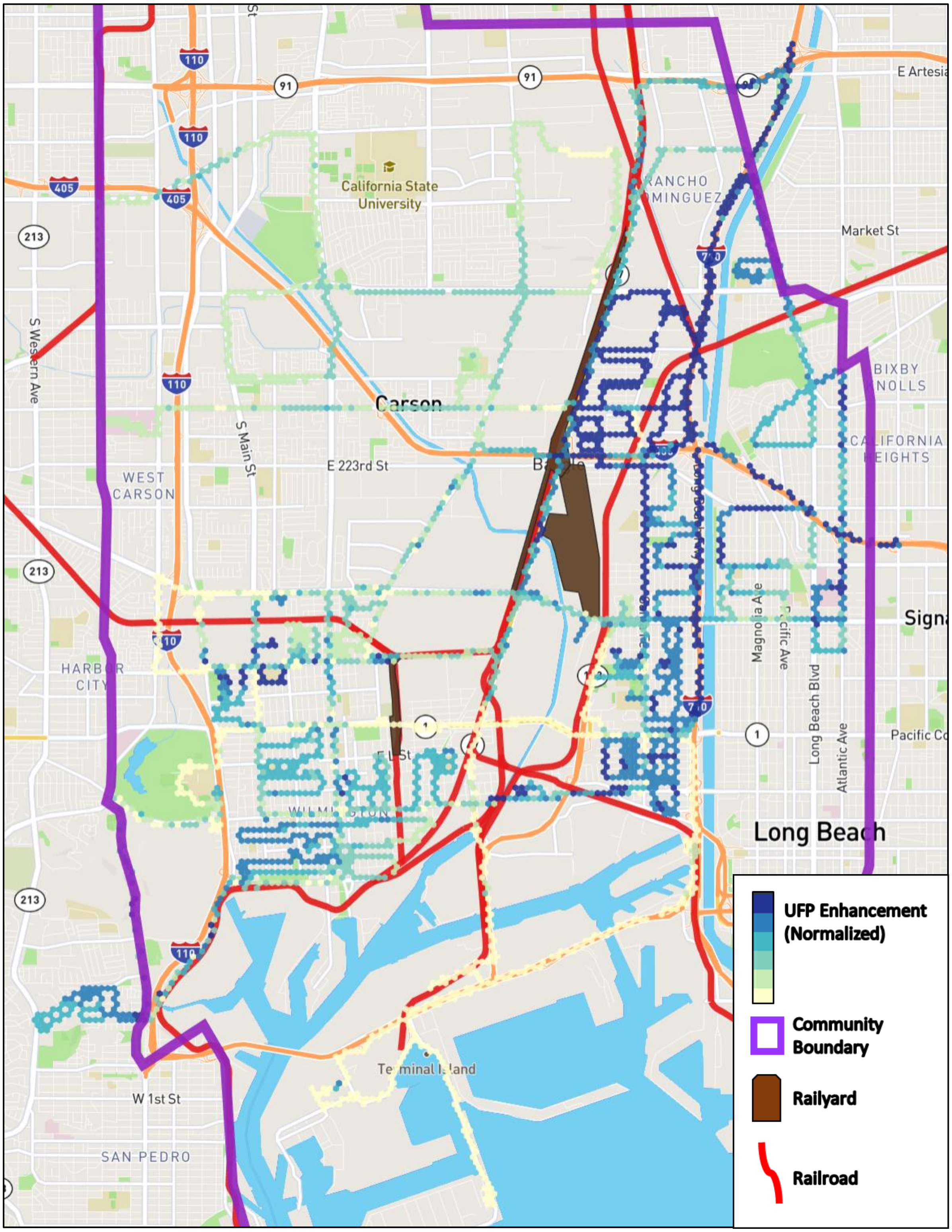

Figure A-3. Aggregated map of the spatial pattern of UFP concentrations within the WCWLB community and around the railyards, as measured by the mobile monitoring platform on 07/30/2019, 07/31/2019, and 09/04/2019

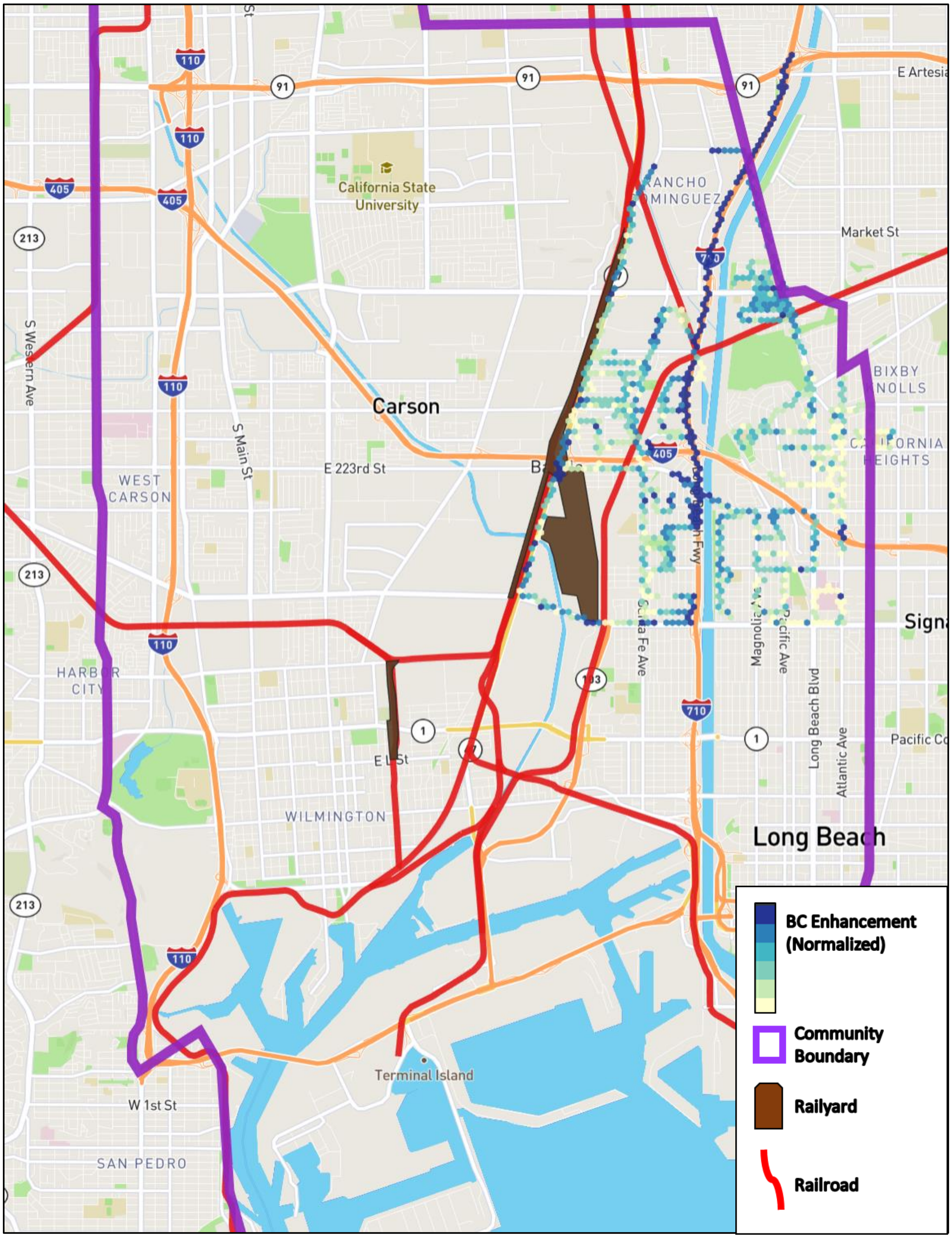

Figure A-4. Aggregated map of the spatial pattern of BC concentrations within the WCWLB community and around the railyards, as measured by the mobile monitoring platform on 08/30/2019