Action: Mobile and stationary monitoring at or near schools, childcare centers and homes

Background and Objectives

The San Bernardino and Muscoy (SBM) community steering committee (CSC) identified children's exposure to harmful air pollutants while at school as a major air quality concern. In addition to children in schools, the CSC also focused on other sensitive receptors such as childcare centers, community spaces such as park and community centers, and homes. A major pollutant of concern in this community is diesel particulate matter (DPM), generated by truck traffic, and activities related to warehouses and railyards.

Like many environmental justice communities, SBM may experience a disproportionately high level of exposure to air pollutants. Children, seniors, and people with certain medical conditions are especially sensitive to the impacts of air pollution. The CSC identified schools, including charter schools, and other places where children spend a lot of time (e.g., childcare centers, preschools, parks and community centers) as places where the South Coast AQMD should focus its efforts to reducing exposure to harmful air pollutants.

Method

As part of the AB 617 program, South Coast AQMD performs extensive mobile and stationary air monitoring to address the major air quality priorities selected by the CSC and to identify and characterize pollution hotspots within the SBM community. During these monitoring activities the locations of nearby sensitive receptors (schools, day cares, etc.) are considered to evaluate if and to what extent they are impacted by nearby emission sources. If persistent elevated air pollution levels in close proximity to schools and other sensitive receptors are found, the South Coast AQMD will evaluate short-term stationary air monitoring options to provide a more in-depth assessment of air quality conditions at those locations.

Air monitoring was conducted near areas identified by the CSC using a mobile platform capable of measuring a wide range of particulate and gaseous pollutants, including particulate matter (PM), black carbon (BC; a surrogate for DPM), ultrafine particles (UFP), and nitrogen dioxide (NO_2). Figure 1 shows the location of schools and childcare centers (sensitive receptors) in the SBM community, as well as the residential areas based on land use data. The air quality concern related to potential compressed natural gas emissions near/around the Omnitrans bus yard near Ramona Allessandro Elementary School was addressed by conducting an air monitoring investigation, which is described thoroughly in the Omnitrans progress report.

Results

- As of August 2020, a total of 8 days of mobile monitoring were carried out to measure levels of several air pollutants related to diesel emissions, including PM, BC, UFP, and NO_2 (see Attachment A for details)

- Mobile monitoring results indicate elevated concentrations of NO_2, UFP, and BC on major freeways and the surrounding streets. This suggests that schools, daycares, and any other sensitive receptors close to major freeways and roadways may experience higher levels of traffic-related air pollutants

Next steps

- Continue mobile monitoring with a focus on areas where sensitive receptors are located
- In the areas with persistent elevated air pollution levels, consider performing short-term stationary school-based air monitoring to provide air quality information at that location for short-term assessments
- Continue to assess mobile measurements data/results to support implementation and prioritization of exposure reduction strategies in sensitive receptor areas

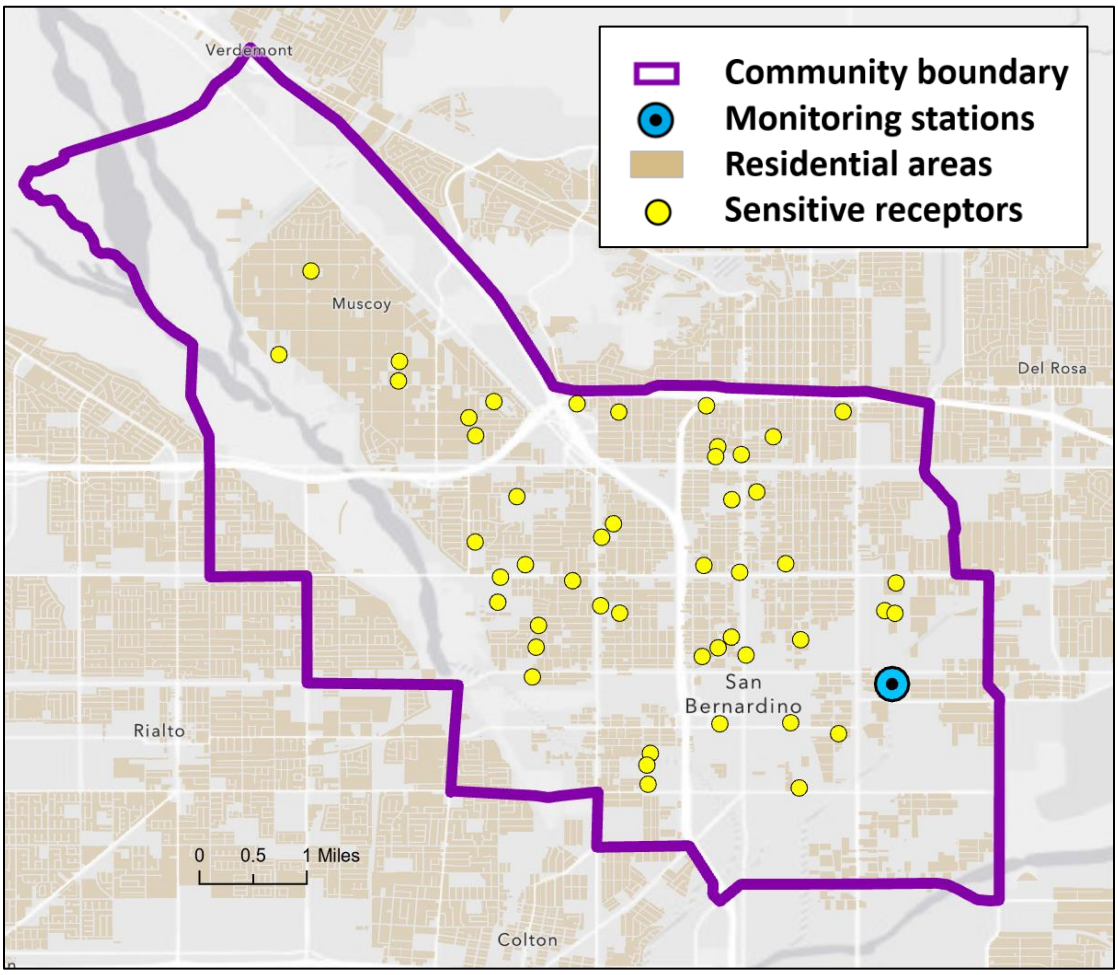

Figure 1 – Map showing the location of schools and childcare centers and the residential areas in the SBM community. as well as the location of the monitoring station for baseline measurements operated by the South Coast AQMD

Attachment A

As of August 2020, a total of 8 mobile monitoring surveys have been conducted in the San Bernardino Muscoy (SBM) 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. Mobile 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. The routes traversed by the mobile platform were designed in a way to include conduct pollution measurements surveys near schools and other sensitive receptors.

Typically, measurements from a mobile platform at a given location are relatively short, ranging from seconds to a few minutes when the platform is moving. Therefore, given the high temporal variability of most air pollutants, mobile survey measurements do not necessarily capture the typical air quality conditions of a specific location. One way to address this limitation is to increase the number of measurements runs (passes or transects) to obtain a more representative and consistent map of the spatial and temporal variability of the measured air pollutants. Figure A-1 shows the routes traversed by the mobile platforms with respect to the sensitive receptors in the SBM community. In this figure the number of passes, that is a measure of representativeness of the measured concentrations, is shown as a white-to-green color gradient, with darker green representing areas where more passes were taken. More passes were taken in areas with higher number of potential sources of emissions.

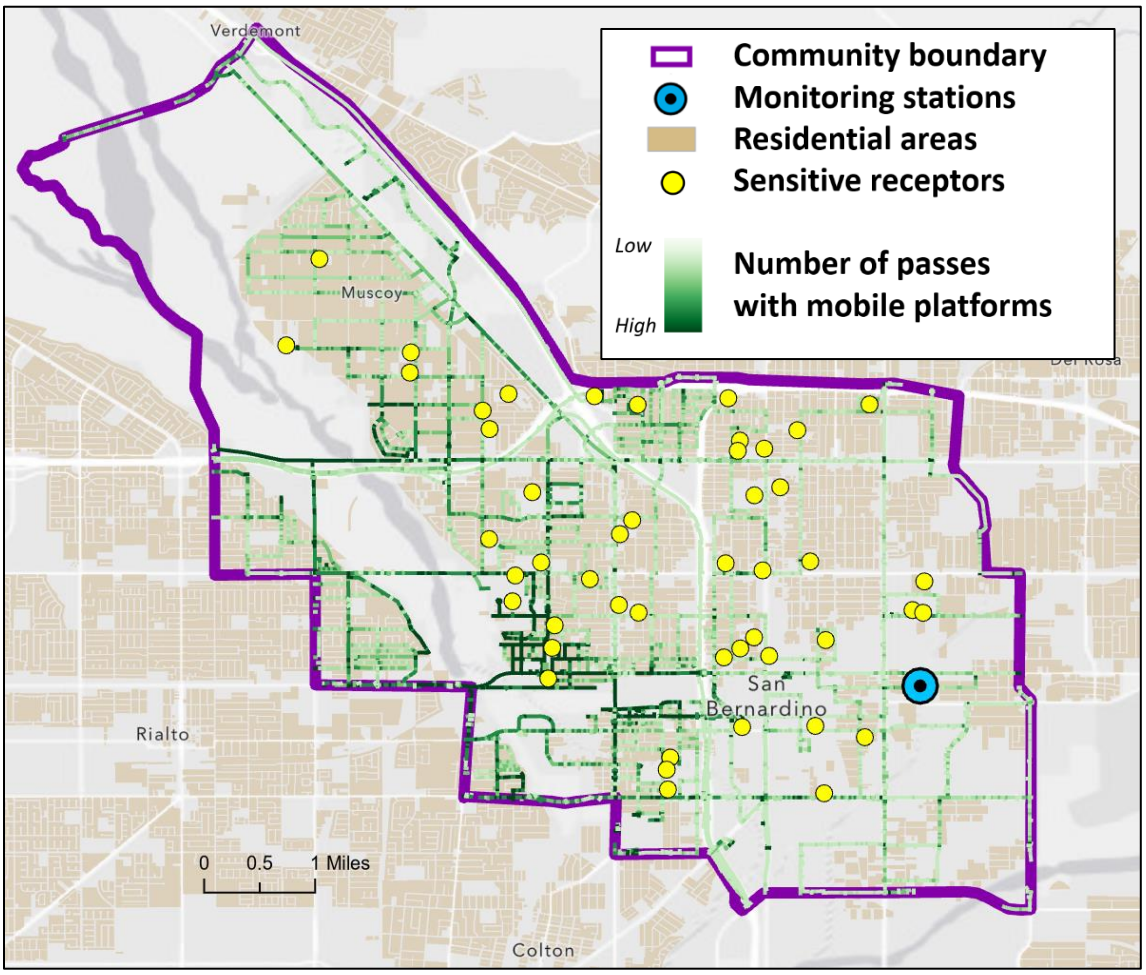

Figure A-1. Map showing the routes traversed by the mobile platforms with respect to the locations of sensitive receptors and residential areas. As of August 2020, a total of eight days of mobile monitoring has been carried out in the SBM community

Figure A-2 shows the duration and time window for the area-wide mobile measurements performed within the SBM community. As shown in this figure, mobile monitoring was performed at different times of the day during eight weekdays.

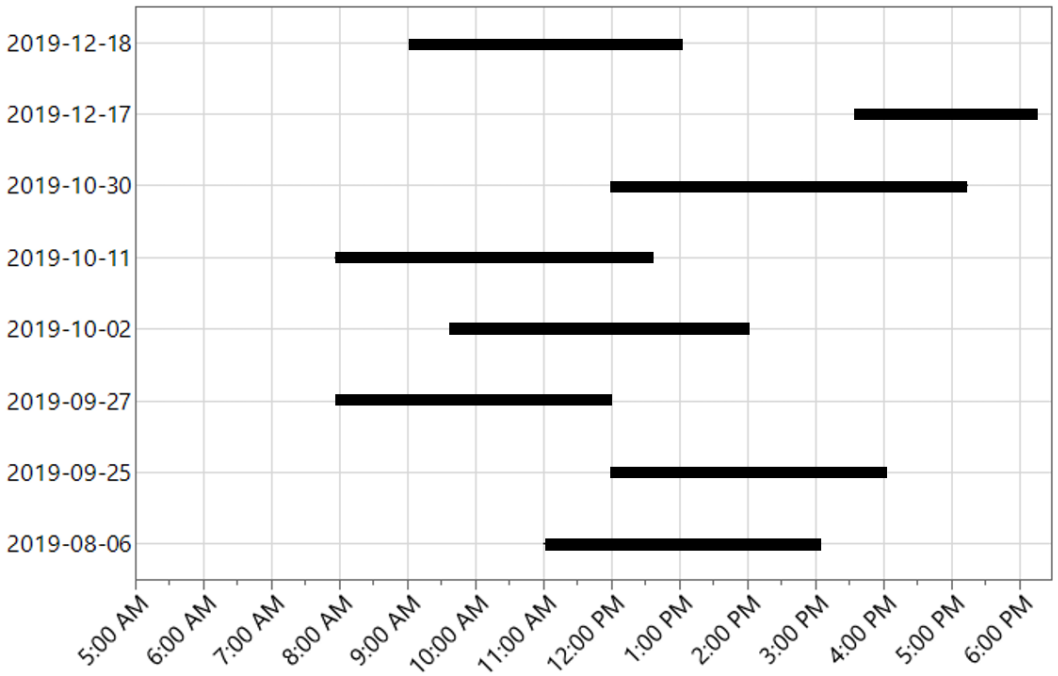

Figure A-2. The duration and time window for the area-wide mobile measurements performed within the SBM community. The time windows only include hours of active mobile measurements within the community, excluding the commute time between the South Coast AQMD Headquarters and the SBM community

Upon extensive screening and pre-processing of the data, UFP and NO_2 measurements were found to be the most robust and reliable set of diesel exhaust markers measured, with 8 and 7 (out of 8) valid days of measurements, respectively, and minimum instrument down time, followed by BC measurements, with 6 days of measurements. Figures A-3, A-4, and A-5 illustrate "aggregated" maps of the spatial patterns (or concentration gradients) of NO_2, UFP, and BC concentrations in and around freeways, major roadways, truck idling hotspots, and locations where truck traffic are of particular concern within the SBM community, as measured by the mobile monitoring platform during those 8 days. To ensure that the concentration gradient map is representative of the variations in the pollutant concentrations, individual measurements taken within each 30-meter street segment in different passes and on different days were "aggregated", by calculating their arithmetic average, and shown as colored bins on the map. Therefore, each segment 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 emission 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 air monitoring station, according to a commonly used method in the literature. To achieve this, hourly data from the San Bernardino air monitoring station (which is

part of the South Coast AQMD air monitoring network) was collected for the time period when mobile monitoring was conducted (Figure A-2). For example, on August 6th, 2019, mobile monitoring was performed from 11 am PST to 3 pm PST; therefore, a total of 4 hourly averages were calculated for each pollutant from the San Bernardino air monitoring station. Subsequently, the mobile monitoring data with 1- and 3-second time resolution were divided by the hourly averaged stationary data that corresponded to the hour in which that measurement was taken.

As shown in Figure A-3, A-4, and A-5, the mobile monitoring results indicated elevated levels of BC, UFP, and NO_2 on freeways, including the I-215 and I-210, and the streets around them. These results indicate that the sensitive receptors that are located near major freeways and roadways are more susceptible to higher levels of traffic-related air pollutant compared to those that are located farther away. It can also be observed from these maps that the concentrations of traffic-related air pollutants were generally lower in residential communities as compared to those measured in and around freeways and major roadways within the SBM community.

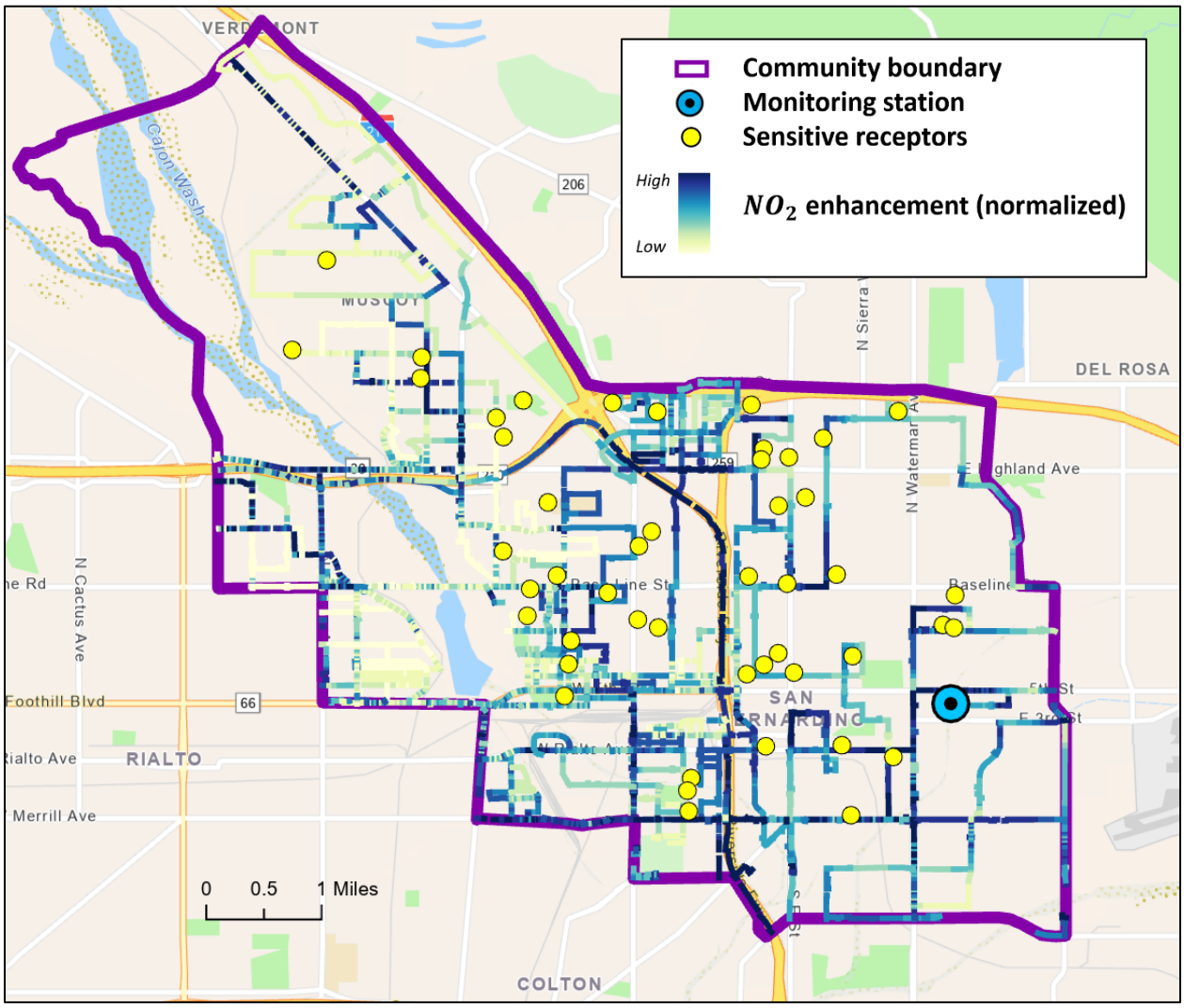

Figure A-3. Aggregated map of the spatial pattern of NO_2 concentrations and location of schools (including day cares) within the SBM community

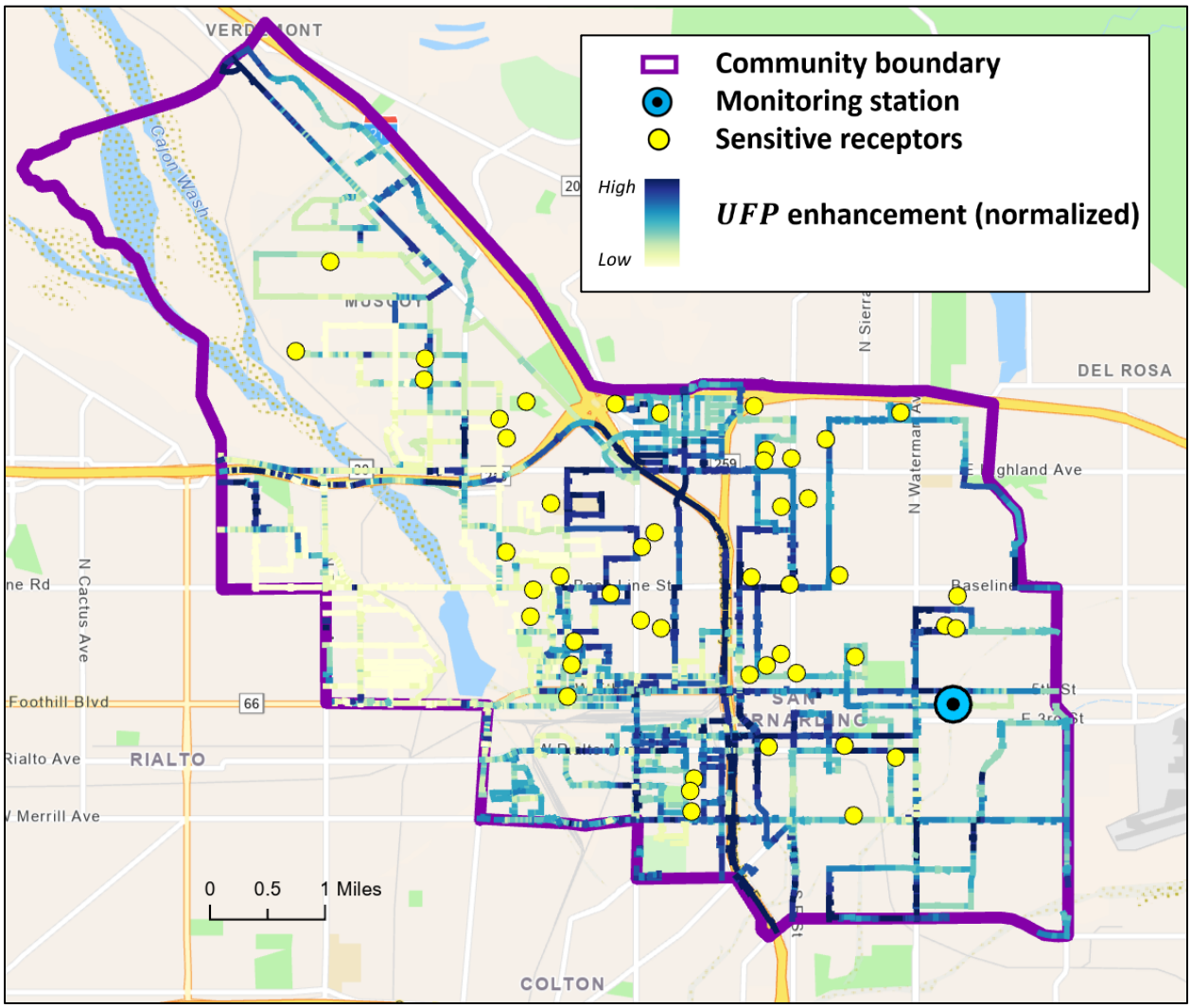

Figure A-4. Aggregated map of the spatial pattern of UFP concentrations and location of schools (including day cares) within the SBM community

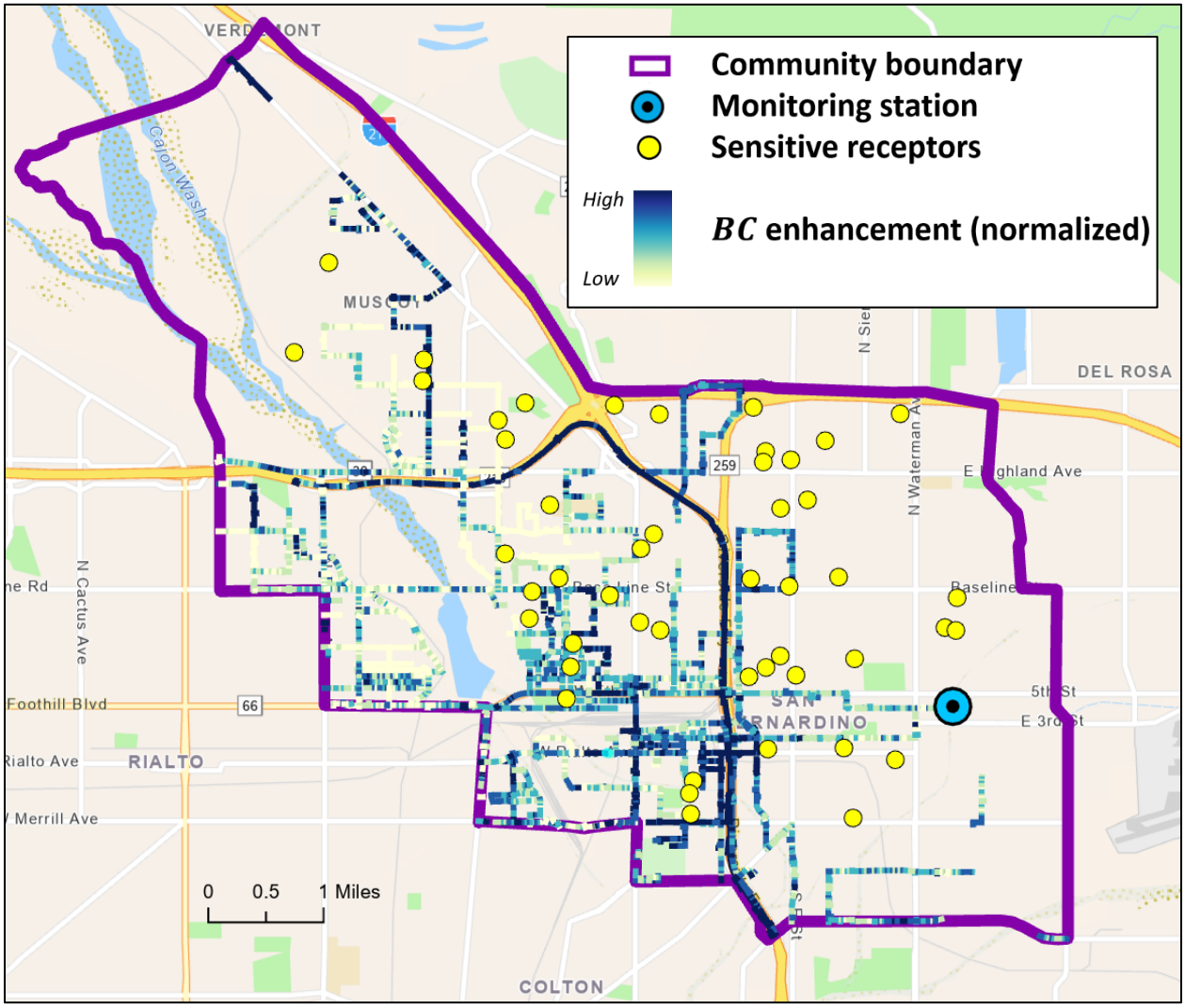

Figure A-5. Aggregated map of the spatial pattern of BC concentrations and location of schools (including day cares) within the SBM community