

**Phillips 66 – Carson
Refinery 1180 Air Monitoring Plan**

November 15, 2019



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List of Acronyms

AERMAP – AERMOD Terrain Pre-processor

AERMET – AERMOD Meteorological Pre-processor

AERMIC – AMS/EPA Regulatory Model Improvement Committee

AERMOD – AERMIC Dispersion Model

AMS – American Meteorological Society

CAL/OSHA – California Division of Occupational Safety and Health

CARB – California Air Resources Board

CO₂ – Carbon Dioxide

DPM – Annual Diesel Particulate Matter

EPA – Environmental Protection Agency

FTIR – Fourier Transform Infrared Spectrometer H₂S – Hydrogen Sulfide

LDL – Lower Detection Limit PPB - Parts Per Billion

OEHHA – Office of Environmental Health Hazard Assessment MET – Meteorological Station

P66 – Phillips 66

PPB – Parts per Billion

QA/QC – Quality Assurance / Quality Control

QAPP – Quality Assurance Project Plan

SCAQMD – South Coast Air Quality Management District HARP – Hotspots Analysis Reporting Program

SO₂ – Sulfur Dioxide NO_x – Nitrous Oxide

UV-DOAS – Ultraviolet Differential Optical Absorption Spectroscopy UDL – Upper Detection Limit

Overview

On December 1, 2017, the South Coast Air Quality Management District (SCAQMD) adopted Regulation 1180 which requires Los Angeles refineries to develop and submit an Air Monitoring Plan to establish and operate a fence-line monitoring system. The SCAQMD also published guidelines for refineries to meet the fence-line monitoring requirements. Phillips 66 (P66) Carson used these guidelines to develop the following monitoring plan that complies with the fence-line monitoring provisions of SCAQMD Rule 1180. This includes meeting all downwind fence-line siting requirements, uptime requirements and reportable, quantifiable detection levels, as specified in Rule 1180. The critical tasks addressed in the development of the plan are included in the following sections:

- [Section 1](#) will present an evaluation of commercially available technologies used for fence-line monitoring.
- [Section 2](#) presents an evaluation of emission sources and community impact associated with emissions from the P66 Carson Refinery. This includes the use of dispersion modeling to evaluate downwind impacts to communities.
- [Section 3](#) presents the proposed site locations for the fence-line air monitoring systems at the P66 Carson Refinery and an evaluation of specific fence-line air monitoring systems to be used to detect refinery emissions at the fence line.
- [Section 4](#) presents an overview of the presentation of the fence-line data to the public.
- [Section 5](#) presents the data management program.
- [Section 6](#) presents the quality assurance and data quality control system that will be implemented for the monitoring program.

Section 1 – Assessment of Air Monitoring Technology

Overview

The following section presents an evaluation of the air monitoring technologies used as fence-line air monitoring systems at refineries. The evaluation is based on knowledge obtained from the use of fence-line air monitoring systems at the P66 Rodeo Refinery in Rodeo, California, as well as other locations where fence-line programs have been implemented. The P66 Rodeo Refinery has used open-path air monitoring systems for over 22 years and includes the use of open-path FTIR, and UV air monitoring equipment.

Technology Descriptions

Open-path air monitoring systems use beams of light to detect and quantify gases. The systems work by sending a beam of light into the open air and receiving it at a detector. When gases are present in the beam, some of that light is absorbed and the detector can distinguish between a beam received in clean air, versus a beam in which gases are present.

Gases have their own distinct way of absorbing light and may absorb light at several different wavelengths in the light spectrum. These gas-specific absorption characteristics serve like a unique fingerprint for the gas. By comparing known reference standards to the results from field measurements, the system can identify the gas based on which wavelength absorption patterns are present. Likewise, the quantity of light that was absorbed is a direct function of the concentration of the gas in the air. By analyzing the size of the absorption that took place, the system can estimate the average concentration of the gas along the beam path. A single, open-path analyzer can cover a path of up to 900 meters, making them ideal for use as a fence-line monitoring system when covering a significant linear distance is required.

The second type of air monitoring system used for fence-line monitoring programs are point sampling devices. The point sample monitoring systems are suited for use in areas where the concentrations of gases are below the detection limits of open-path technologies, for pollutants such as particulate matter that cannot be detected by open-path technologies, and for areas where the sample path is too short for open-path systems.

Each type of system has inherent advantages. Point systems have an operational advantage compared to open-path systems in that they will continue to operate during conditions when the open-path technologies will be inoperable due to weather events (e.g., heavy fog or rain). This additional coverage will enhance the community benefit of the fence-line system during times when open-path systems are hindered by adverse environmental conditions. In addition, the systems will be deployed at strategic points along the fence line to capture emissions from the refinery. Open-path systems are ideally suited for applications where emissions from a source cover a long distance and a single, monitoring system can cover the entire path length.

Open-path and point sampling technologies can be further characterized by their specific operational parameters. In the case of open-path technologies, the systems can be characterized by the type of light source used to detect gases (e.g., broad band sources vs. lasers) as well as the type of light used to detect the gases (e.g., ultraviolet light vs. infrared light). Point sample devices can be characterized by the type of pollutant detected (e.g., gases vs. particulate matter). Each of these subcategories are described below.

Open-path UV DOAS

The UV DOAS air monitoring system detects Benzene, Toluene, Ethylbenzene, Xylene and Sulfur Dioxide on a real-time basis using beams of ultraviolet light. A beam of ultraviolet light traverses open air and is collected at a light detector at the other end of the beam path. The system identifies gases by examining the wavelengths of UV light that have been absorbed by the gases present in the light beam. The concentration of gas in the air is proportional to the amount of light absorbed at specific wavelengths. The system uses a multivariate method to quantify data, which is a critical component in accounting for and reducing false detections. Each target gas has a reference library of gases covering the concentration range of the analyzer. It also includes libraries of potential interfering gases such as oxygen and ozone. In addition, the system can be challenged in the field by using either sealed or flow-through gas cells, which provide a quality assurance check under actual conditions.

Open-path FTIR

The FTIR air monitoring system uses infrared light to detect gases. This system sends a beam of light into the open air to a reflector that sends the beam back along the same path. The unit has the capability to detect total hydrocarbons and other organic gases on a real-time basis. The analytical method employed by the FTIR is a multiple regression technique that separates the total amount of light absorbance by the various gases and outputs a result for each gas. The system has the ability of undergoing data and quality assurance checks in the field by monitoring known ambient gases or by using gas standards.

Hydrogen Sulfide Monitors

Hydrogen Sulfide point sensors will be used to detect and quantify this gas on a real-time basis. The systems are designed to detect H₂S at concentrations ranging from zero to 10 parts-per-million and have the ability to detect the gas at concentrations lower than the odor threshold for humans.

Black Carbon Monitors

The Black Carbon air monitoring system detects particles in the air associated with vehicle emissions such as diesel exhaust, soot from wood burning, and particles associated with forest fires. The system uses an aethalometer to continuously collect and analyze aerosol particles.

Meteorological Station

In addition to the air monitoring equipment, a meteorological station (MET) will be installed at the refinery. The station will provide wind speed, wind direction, temperature, relative humidity and rainfall measurements. In either open-path or point detection, using the data in combination with the metrological data from a MET station located on site is helpful in determining where sources originate, and in which direction the gases are moving. The basic difference is demonstrated in Figure 1.1. In this figure, a gas plume is generated from a source and released into the air. As the gases are released, they are carried by the wind and begin to disperse and move away from the source. In this same figure, the concentration of gases in the plume will be highest in the center of the plume and closest to the source, while gas concentrations will be lower at the edge of the plume, as the distance from the source increases. The shape of the plume can be affected by changing terrain and meteorological conditions, but in general, this dispersion pattern is an accurate depiction of what happens after a gas release.

Backup Air Monitoring System

A mobile air monitoring system composed of an extractive FTIR, an extractive UV DOAS, a Black Carbon monitor, and a H₂S monitor will be installed for use at the refinery. The mobile system will be deployed in the event the main fence-line system goes off-line for longer than 24 hours. The system will be used when there is an equipment breakdown, power outage, weather event, and/or other unplanned scenarios.

Figure 1.1 Demonstration of Open-Path Average Concentration vs. Point Sampler Detection

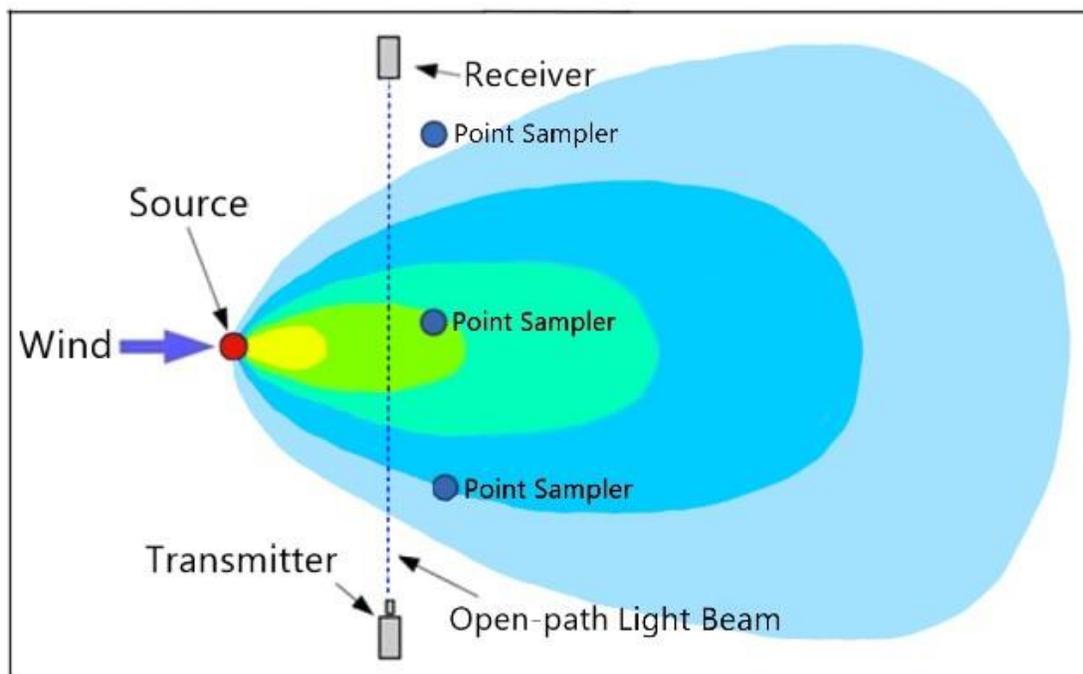


Table 1.1 summarizes the monitoring technologies proposed to comply with Rule 1180 monitoring requirements, along with the technology capabilities and common potential interferences for each instrument type and restrictions.

Table 1.1 – Monitoring Equipment Overview

Equipment	Capabilities	Interferences	Measurement Errors	Restrictions
Open-path FTIR	Detects alkanes	Water and CO ₂ which can be compensated for with analytical software	Monitoring uses multiple regression to analyze data	Heavy fog and rain
Open-path UV	Detects Benzene, Toluene, Xylene, Ethylbenzene, and Sulfur Dioxide	Ozone and Oxygen which can be compensated for with analytical software	Monitor uses partial least squares regression to analyze data	Heavy fog and rain
Hydrogen Sulfide Detector	Detects Hydrogen Sulfide gas; no loss of data quality due to rain or fog	None	None	None
Black Carbon Monitor	Detects Black Carbon particulate matter	None	None	None
Meteorological Station	Wind direction and speed, temperature, dew point, rain gauge	None	None	None

Section 2 – Evaluation of Emission Sources and Community Impact

In order to determine the optimal location to site fence-line air monitoring equipment at the P66 Carson Refinery, annual emissions of pollutants were determined for input into a dispersion model, which was then used to determine downwind impact on local communities. All emission sources at the refinery were used for the modeling. The process of evaluating emission sources and determining their potential impact on downwind communities followed guidelines outlined by the SCAQMD. The emission source information was compiled from the Hotspots Analysis and Reporting Program (HARP) and used to determine source location. A map of the emission sources for the P66 Carson Refinery is shown in Figure 2.1. Seasonal wind roses for the refinery were generated using five years of meteorological data. The resulting wind roses are shown in Figure 2.2.

It was decided to specifically focus on atmospheric dispersion models that could accommodate the complex nature of wind flow patterns over buildings and structures. AERMOD (AERMIC Dispersion Model) was selected due to its international acceptance, either as an industry standard and/or regulatory use. AERMOD is a model developed with the support of the AMS/EPA Regulatory Model Improvement Committee (AERMIC) whose objective has been to include state-of-the-art science in regulatory models. AERMOD is a dispersion modeling system with three components, namely: AERMOD, AERMAP (AERMOD terrain pre-processor), and AERMET (AERMOD meteorological pre-processor). AERMOD is an advanced, new-generation model. It is designed to predict pollution concentrations from continuous point, flare, area, line, and volume sources.

In addition, AERMOD offers new and potentially improved algorithms for plume rise and buoyancy, along with the computation of vertical profiles of wind, turbulence and temperature, all while retaining the single, straight-line trajectory limitation. AERMET input data can come from hourly cloud cover observations, surface meteorological observations, and twice-a-day upper air soundings. Output includes surface meteorological observations and parameters, P vertical profiles of several atmospheric parameters. AERMAP is designed to simplify and standardize the input of terrain data for AERMOD. Input data includes receptor terrain elevation data. The output for each receptor includes location and height scale, which are elevations used for the computation of air flow around hills. A disadvantage of the model is that spatial, varying wind fields due to topography or other factors cannot be included. Input data types required for the AERMOD include source data, meteorological data (pre-processed by the AERMET model), terrain data, building dimensions (to accommodate for building downwash effects) and information about the nature of the receptor grid.

Modeling was performed in two different modes using data from the Long Beach Airport from the time period of January 1, 2012 through December 31, 2016. Emission source data was generated using the P66 Harp2 database which included 127 emission sources at the P66 Carson refinery.

First, an initial downwind community impact was performed by modeling an annual average unit release from the center of the refinery to get an idea of the predominant wind directions for the dispersion of pollutants. This also gave an idea of which fence lines were going to receive the major impact. The result

of this modeling is shown in Figure 2.3.

The emissions were then modeled using AERMOD as described above. The modeling output gave annual and highest daily average concentrations of modeled pollutants on receptors outside of the refinery boundary. The following were considered when assessing the potential impact of the pollutants at the fence line of the refinery:

- Pollutant is emitted at greater than 5000 lbs./year
- Pollutant can be detected by open-path, fence-line technologies
- The pollutants present a specific health risk to the community
- The source of the pollutants is primarily fugitive in nature (not stack)

The pollutants that meet this criterion are listed in Table 2.1, and Figures 2.4 through 2.25.

Figure 2.1 – Emission Sources at P66 Carson Refinery

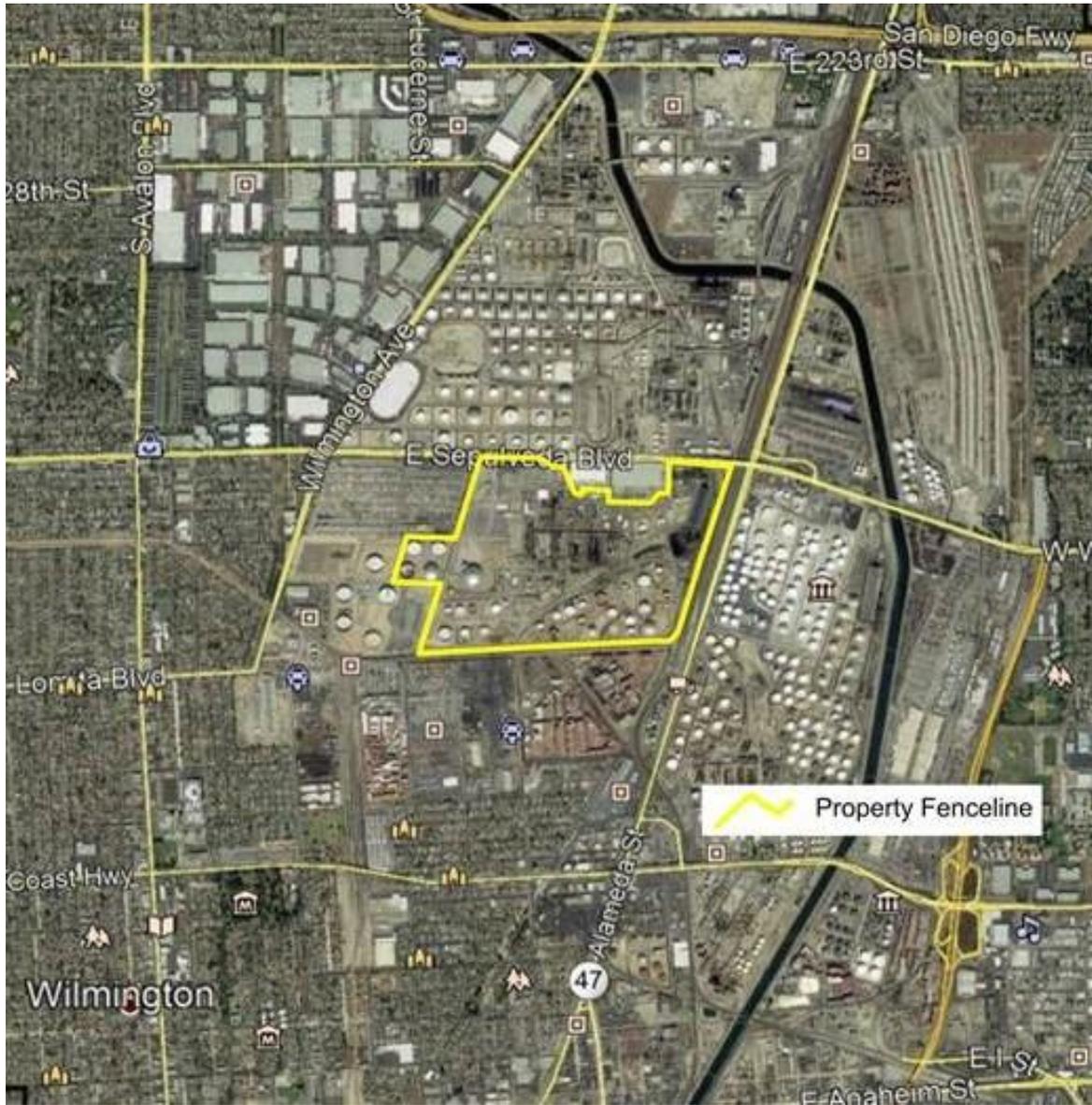


Figure 2.2 – Seasonal Wind Roses at P66 Carson Refinery

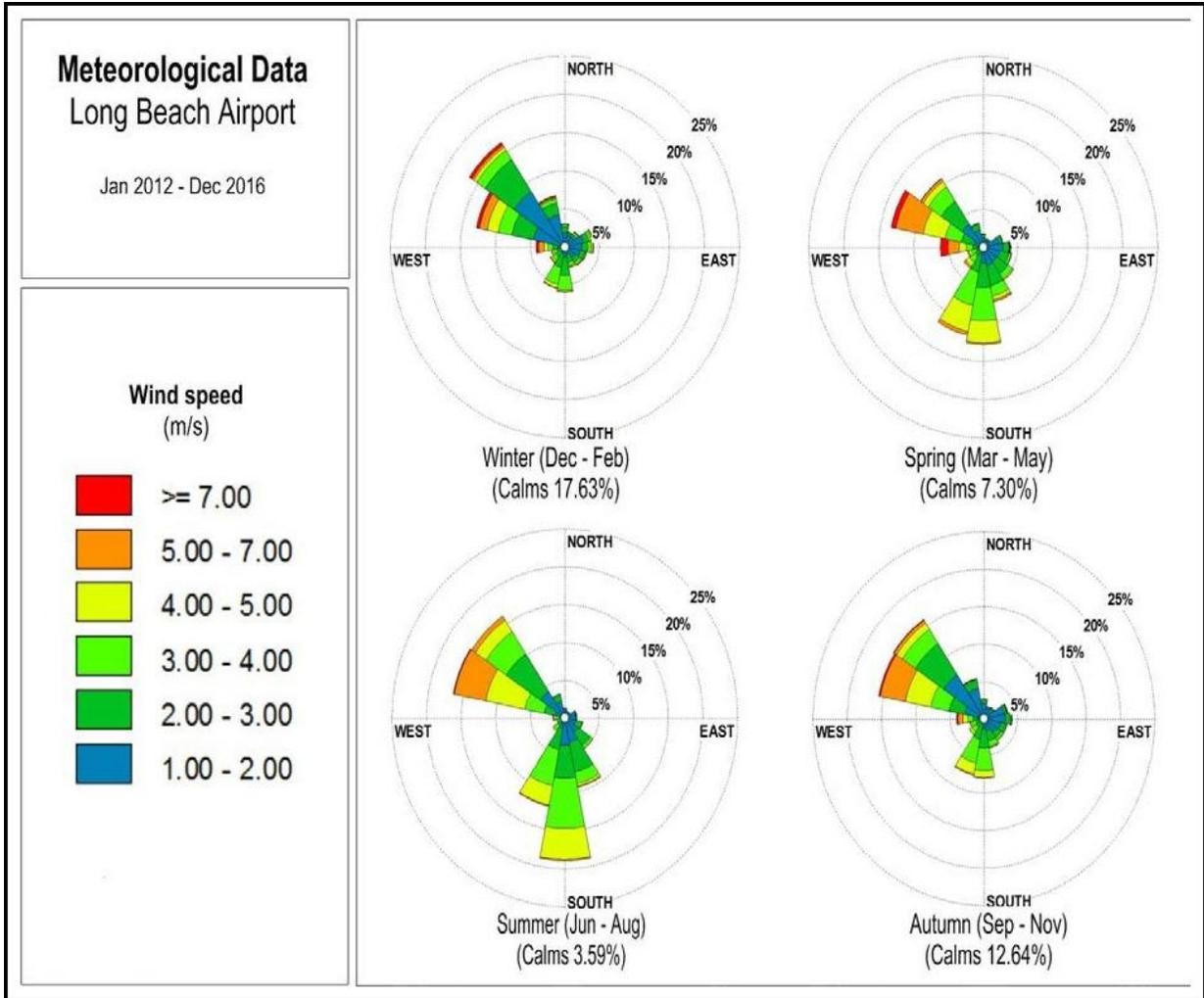


Figure 2.3 - Downwind Emission Impact

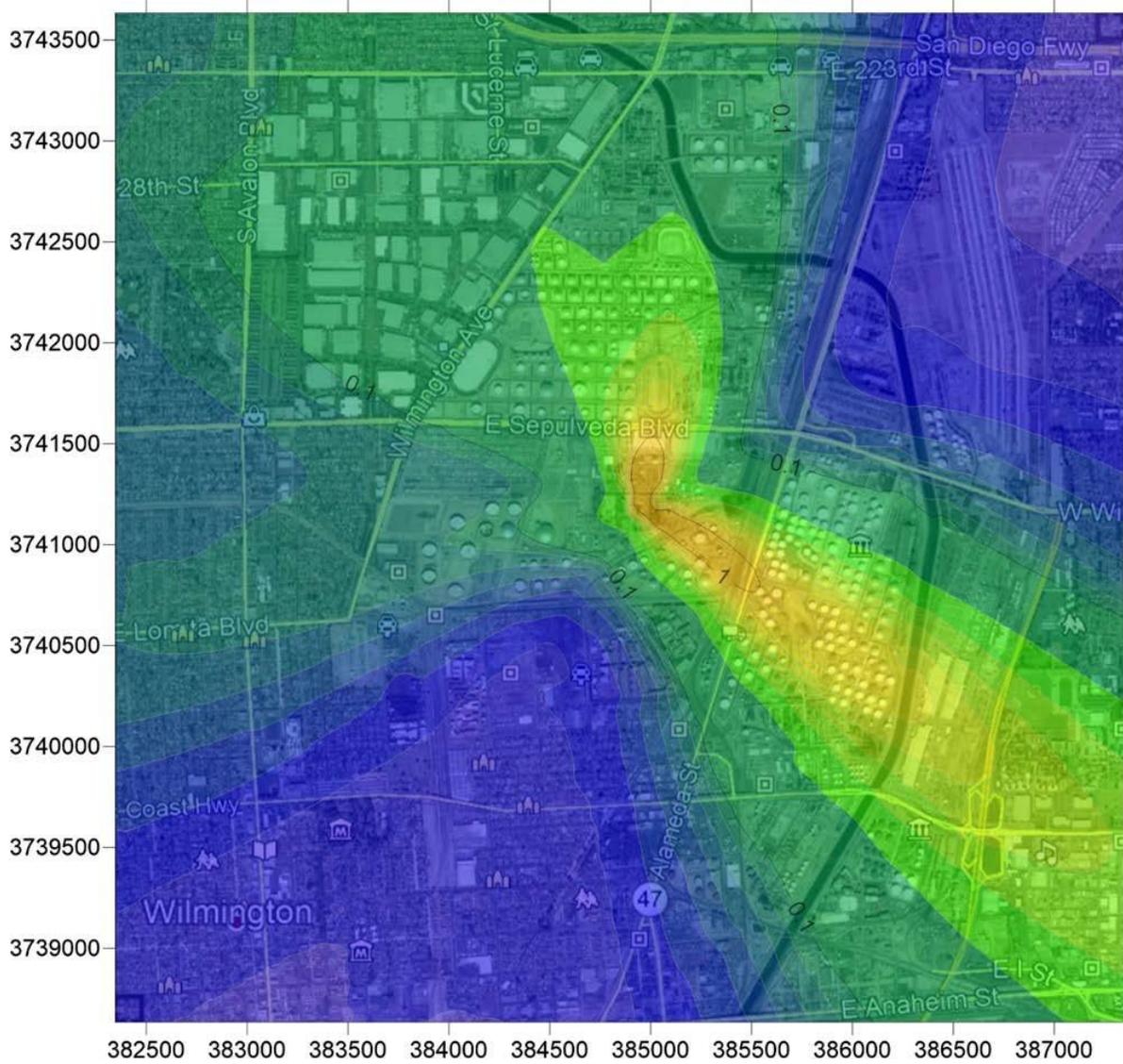


Table 2.1 - Pollutants included in Modeling

Pollutant	Pollutants Detected by Open-path Technologies	Primarily Fugitive Emissions	Emissions Greater than 5,000 Pound Per Year	Present a Specific Health Risk
Ammonia	Yes - FTIR	Yes	No	Yes
Benzene	Yes - FTIR	Yes	No	Yes
Carbonyl Sulfide	Yes - FTIR	Yes	Yes	Yes
Cyclohexane modeled as Total VOCs	Yes - FTIR	Yes	Yes	No
Black Carbon*	No - Point Source	Yes	No	Yes
Ethyl Benzene	Yes - OPUV	Yes	No	No
Hexane	Yes - FTIR	Yes	No	No
Hydrogen Sulfide**	No - Point Source	Yes	No	Yes
Methanol	Yes - FTIR	Yes	Yes	No
Toluene	Yes - OPUV	Yes	No	Yes
Xylene	Yes - OPUV	Yes	No	Yes

* Black Carbon was modeled using diesel particulate matter, and the monitoring technology is a point sample method. ** The monitoring technology for Hydrogen Sulfide is also a point sampling method.

Figure 2.4 – Maximum Hourly Ammonia Emission Concentrations

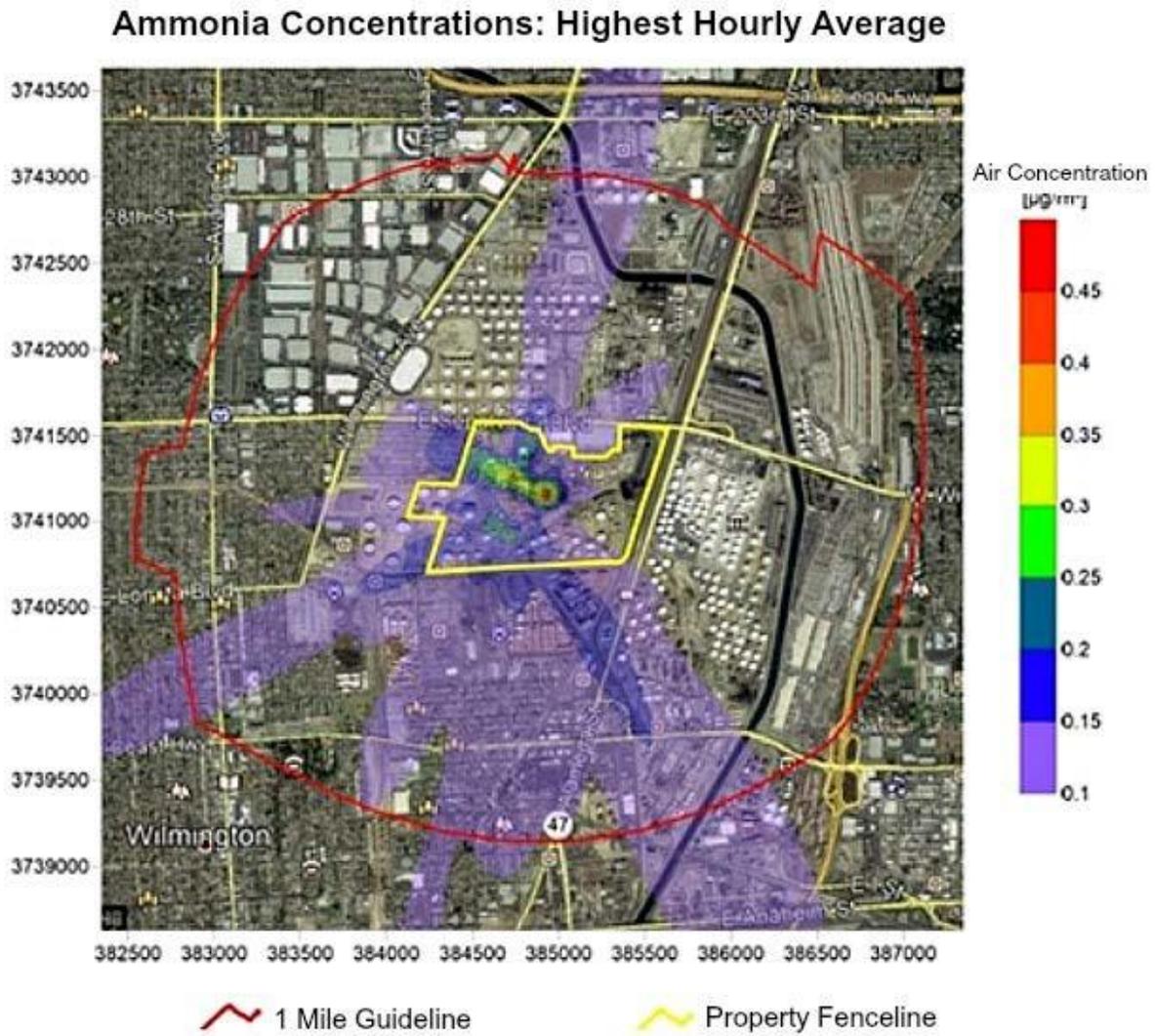


Figure 2.5 – Maximum Hourly Benzene Emission Concentrations

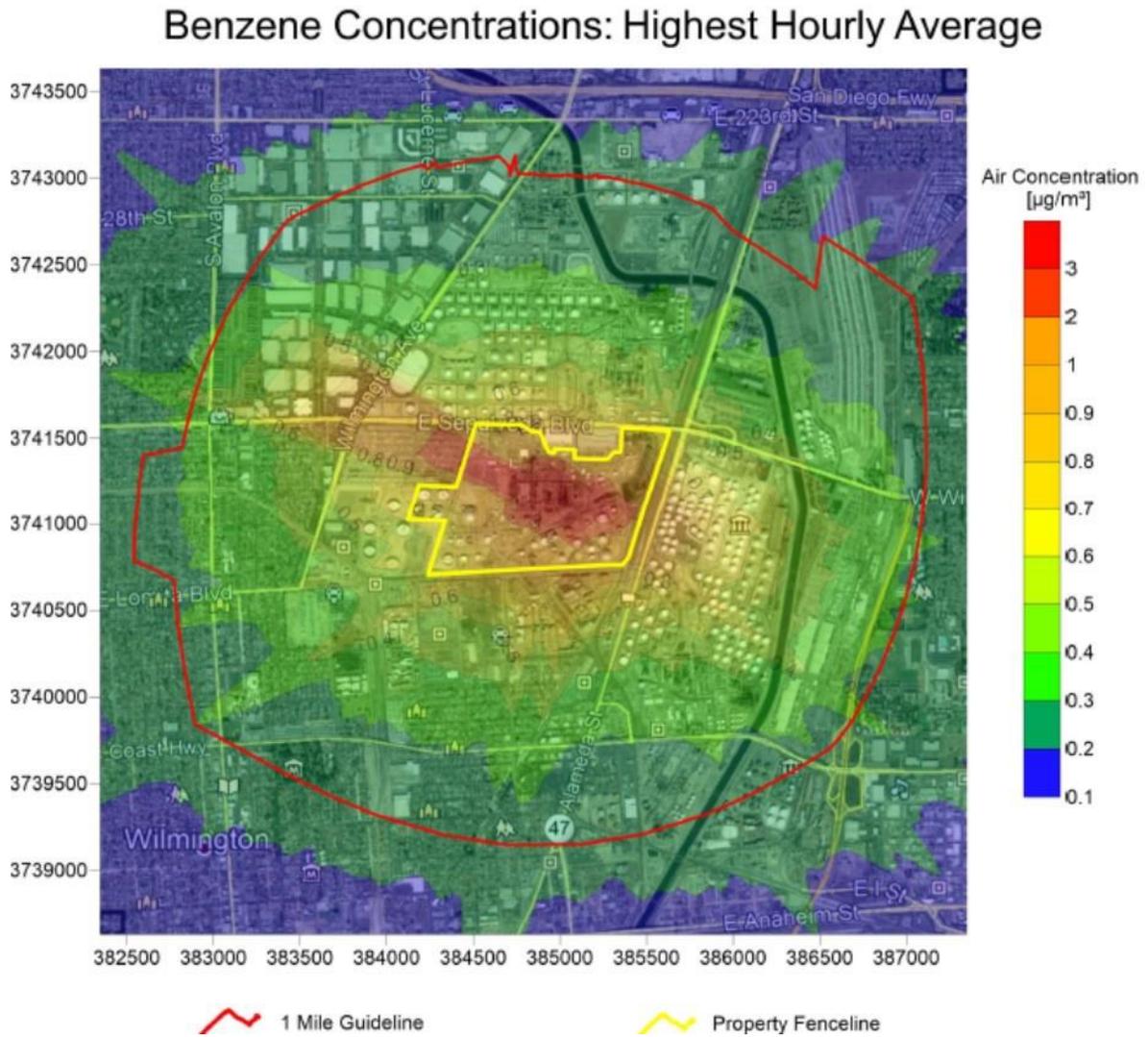


Figure 2.6 – Maximum Carbonyl Sulfide Emission Concentrations

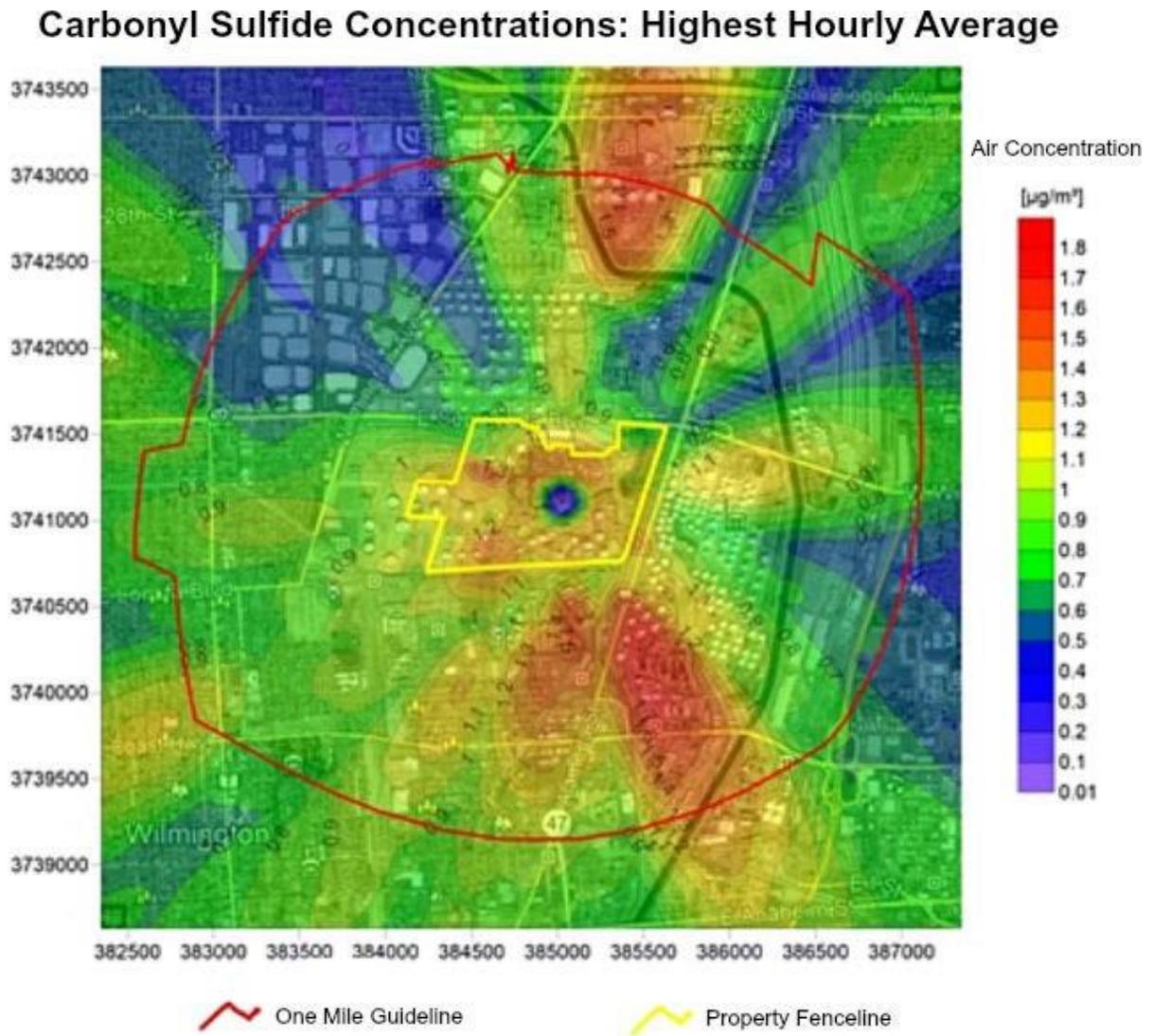
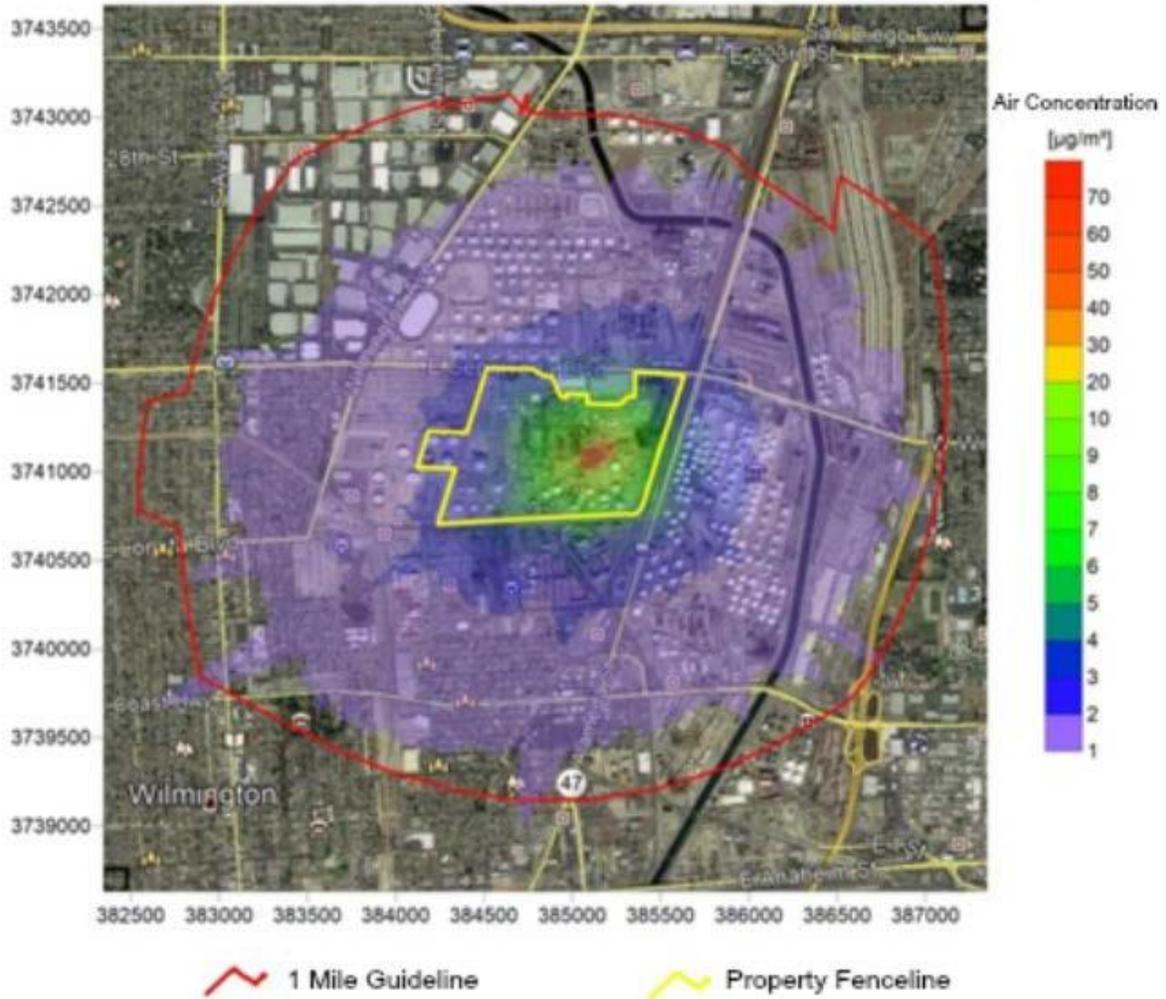


Figure 2.7 – Maximum Hourly Cyclohexane Emission Concentrations

Cyclohexane Concentrations: Highest Hourly Average



2.8 – Maximum Hourly Diesel Particulate Matter (DPM) Emission Co

DPM Concentrations: Highest Hourly Average

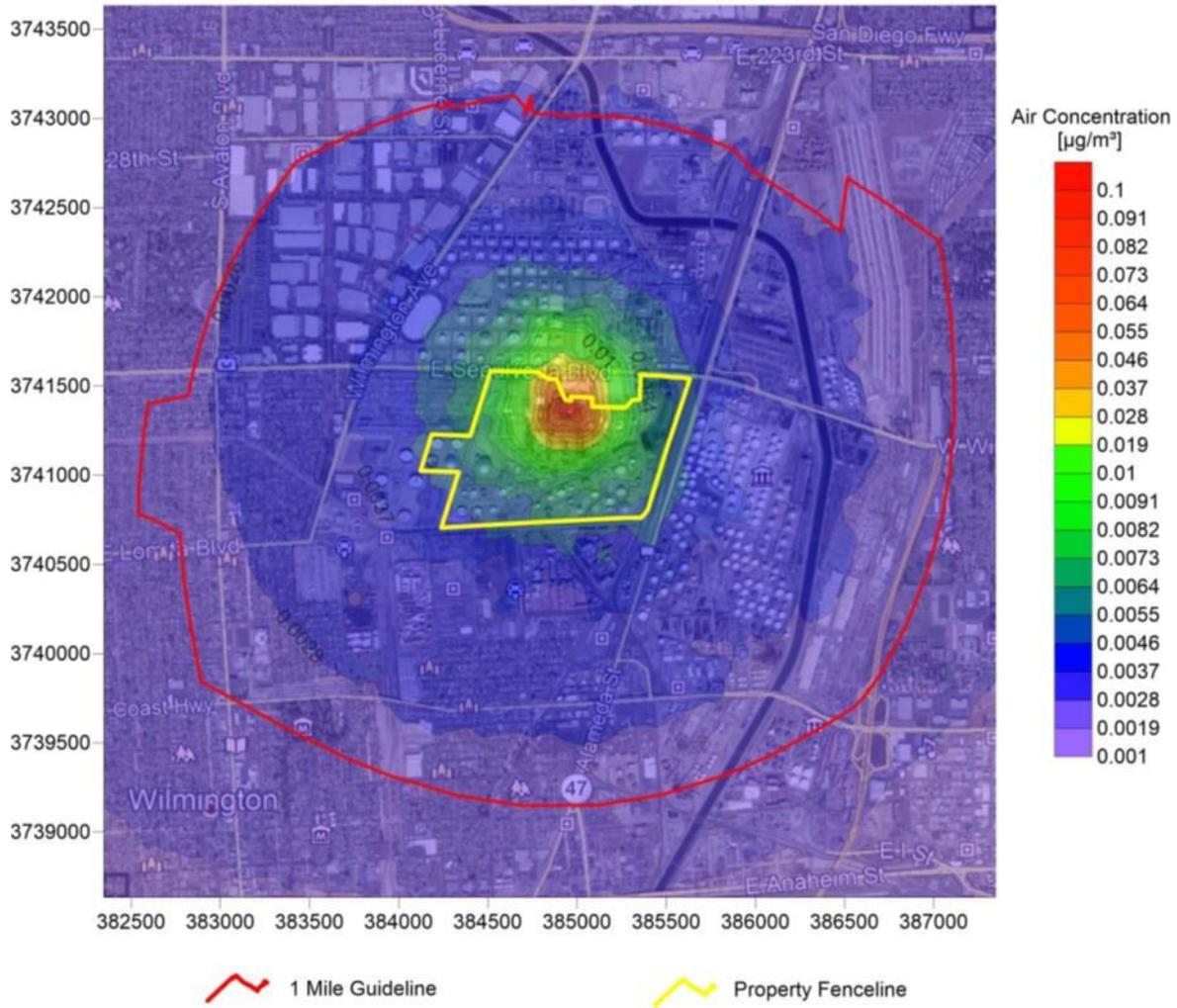


Figure 2.9 – Maximum Annual Ethyl Benzene Emission Concentrations

Ethylbenzene Concentrations: Highest Hourly Average

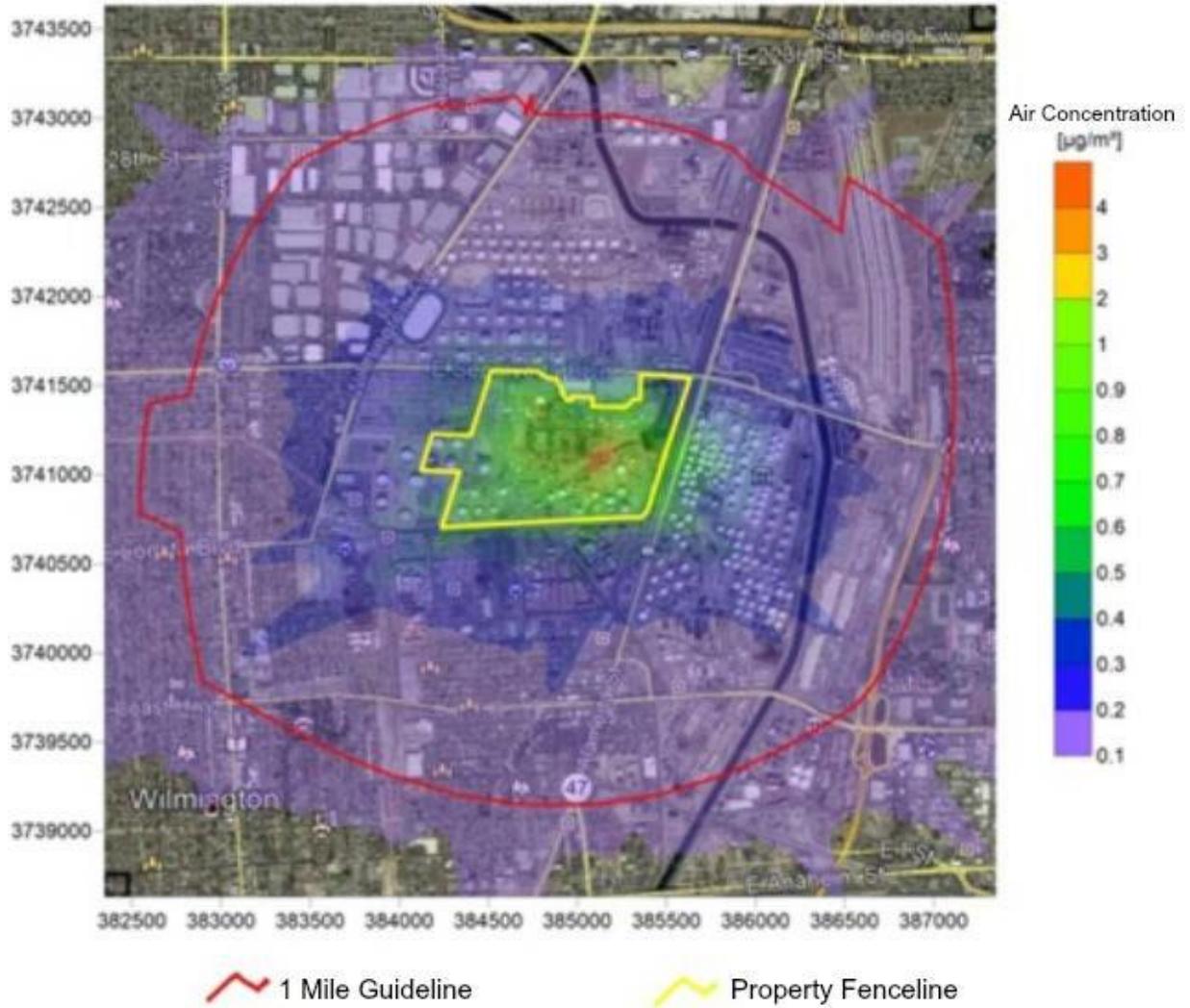


Figure 2.10 – Maximum Hourly Hexane (Total VOC Estimate) Emission Concentrations

Hexane Concentrations: Highest Hourly Average

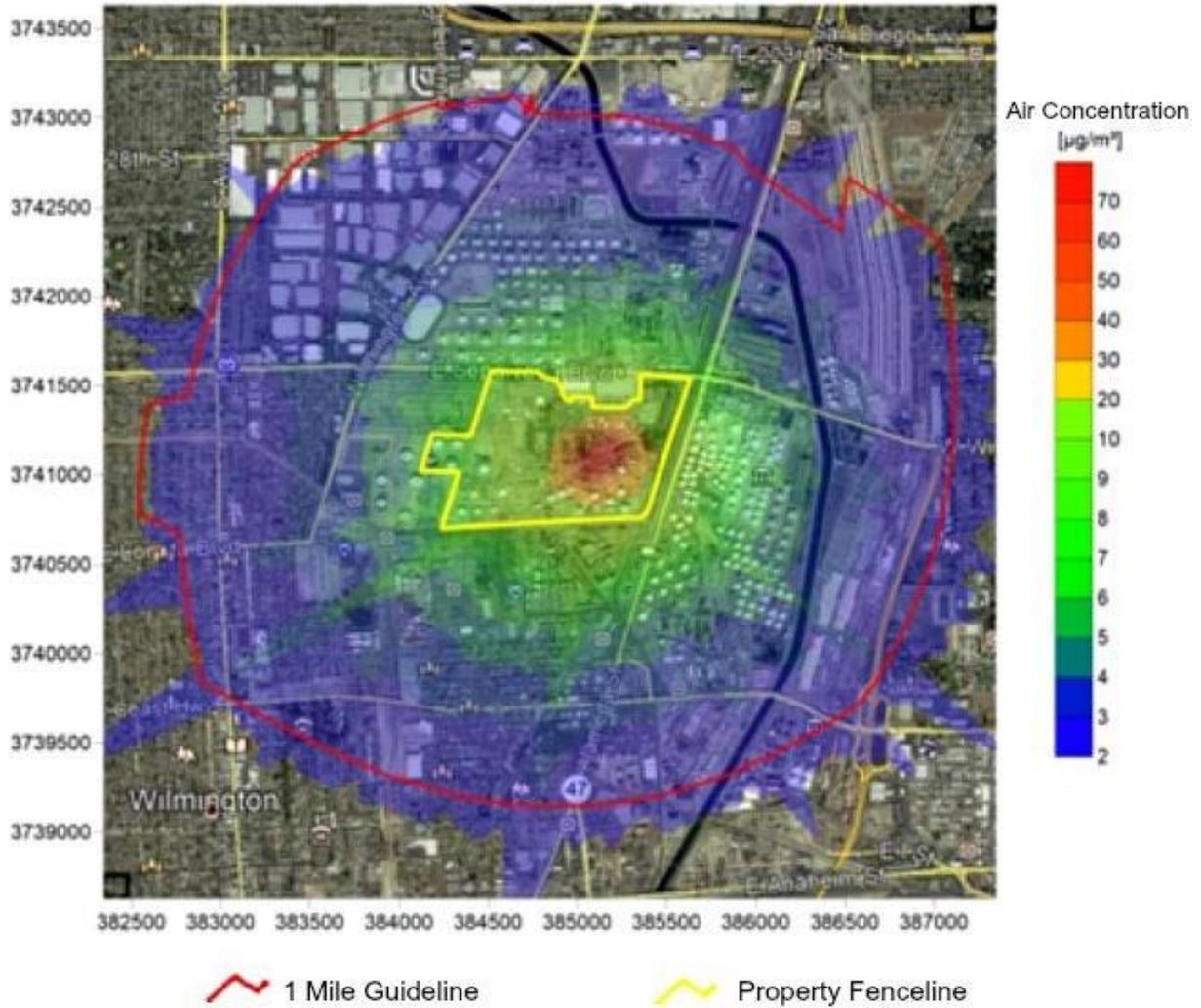


Figure 2.11 – Maximum Hourly Hydrogen Sulfide Emission Concentrations

Hydrogen Sulfide Concentrations: Highest Hourly Average

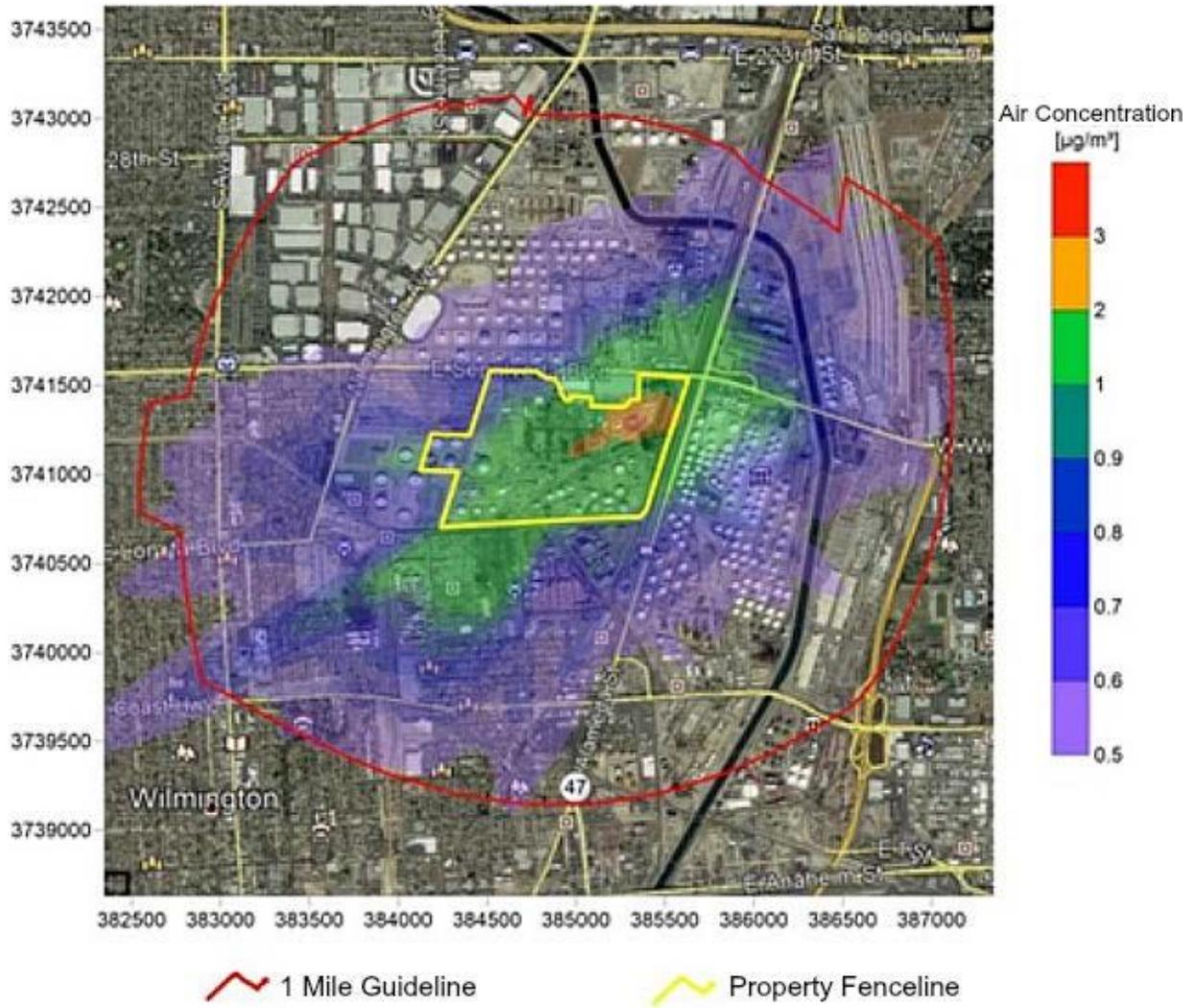


Figure 2.12 – Maximum Hourly Methanol Emission Concentrations

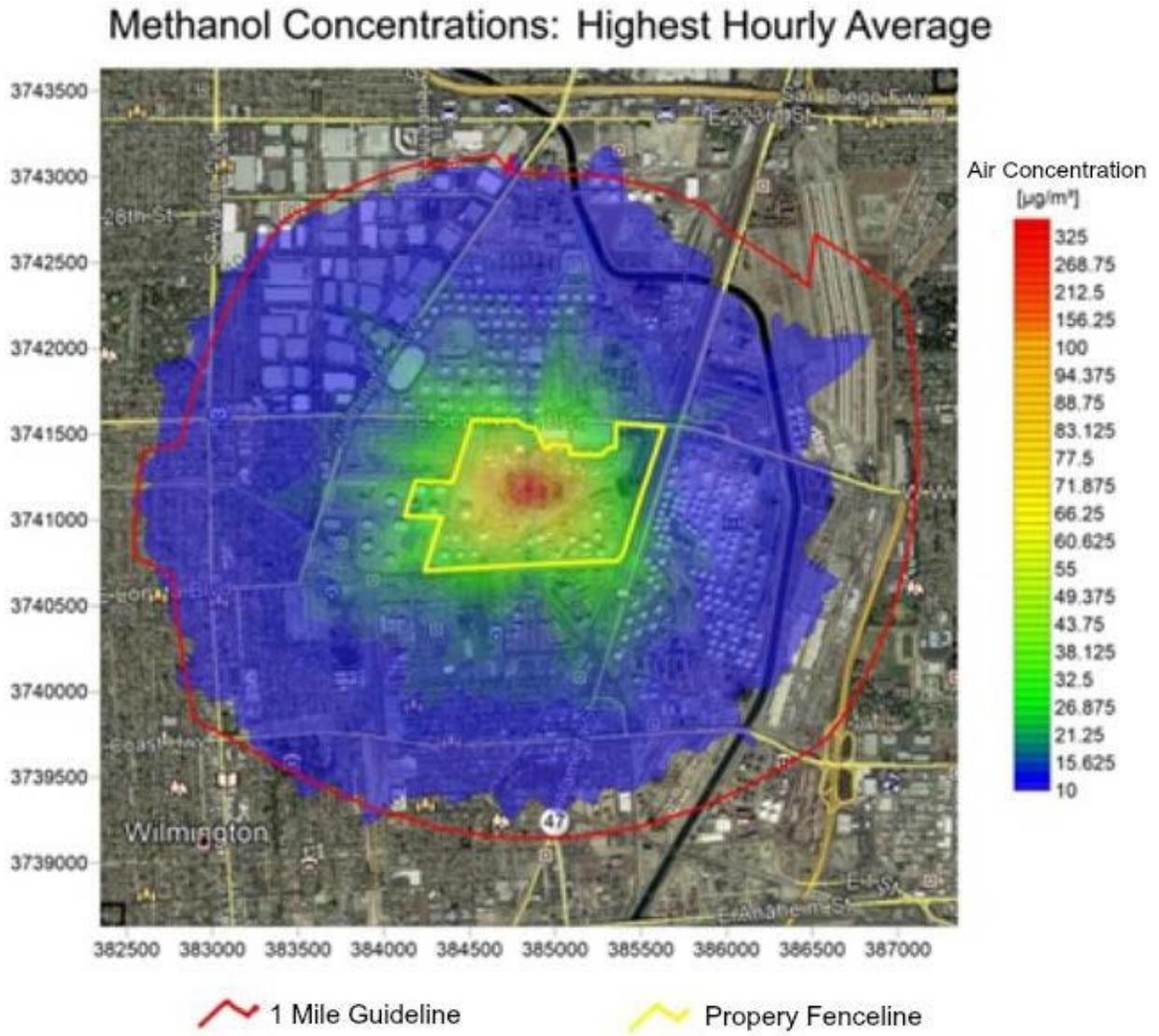


Figure 2.13 – Maximum Hourly Toluene Emission Concentrations

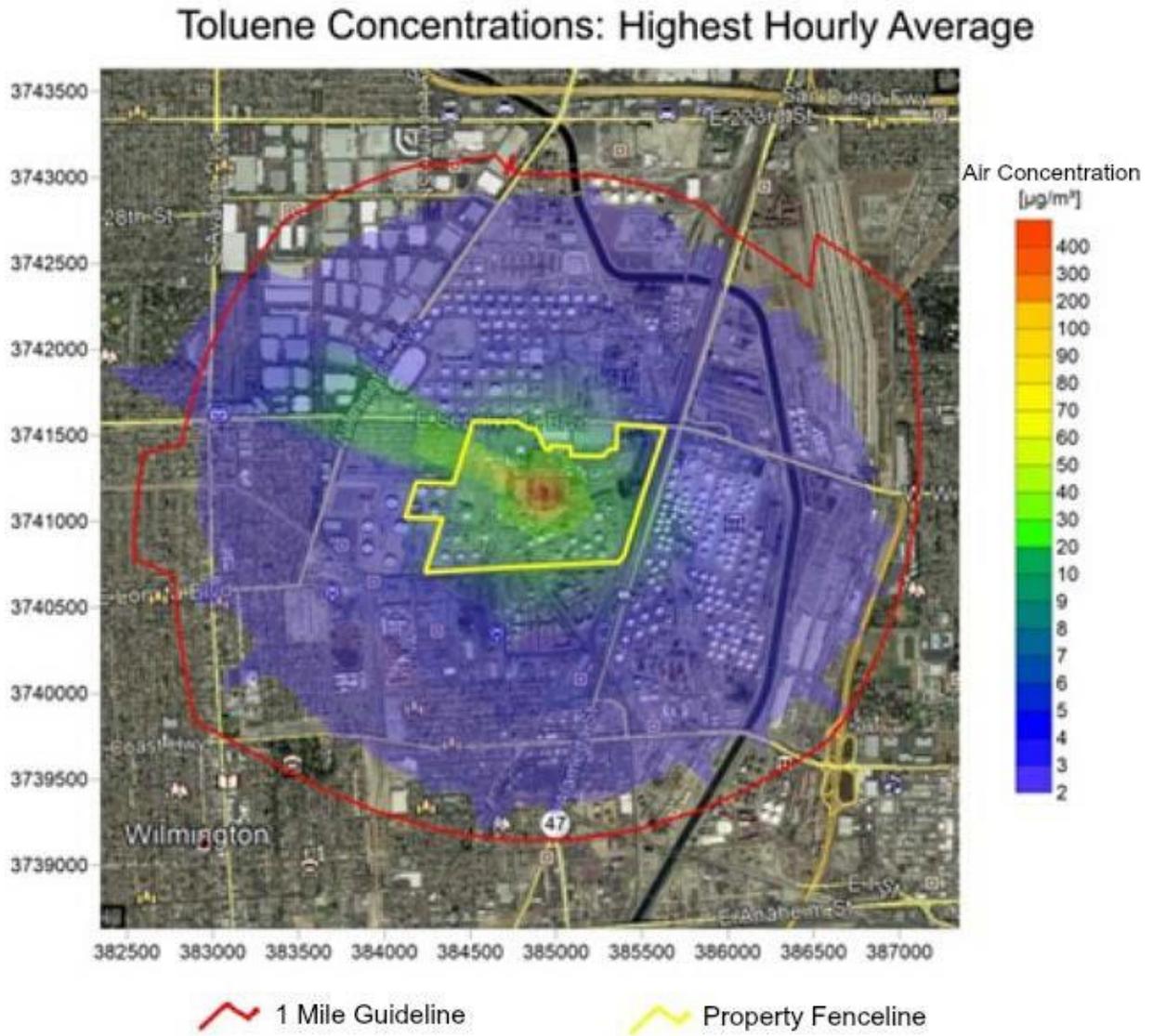


Figure 2.14 – Maximum Hourly Xylene Emission Concentrations

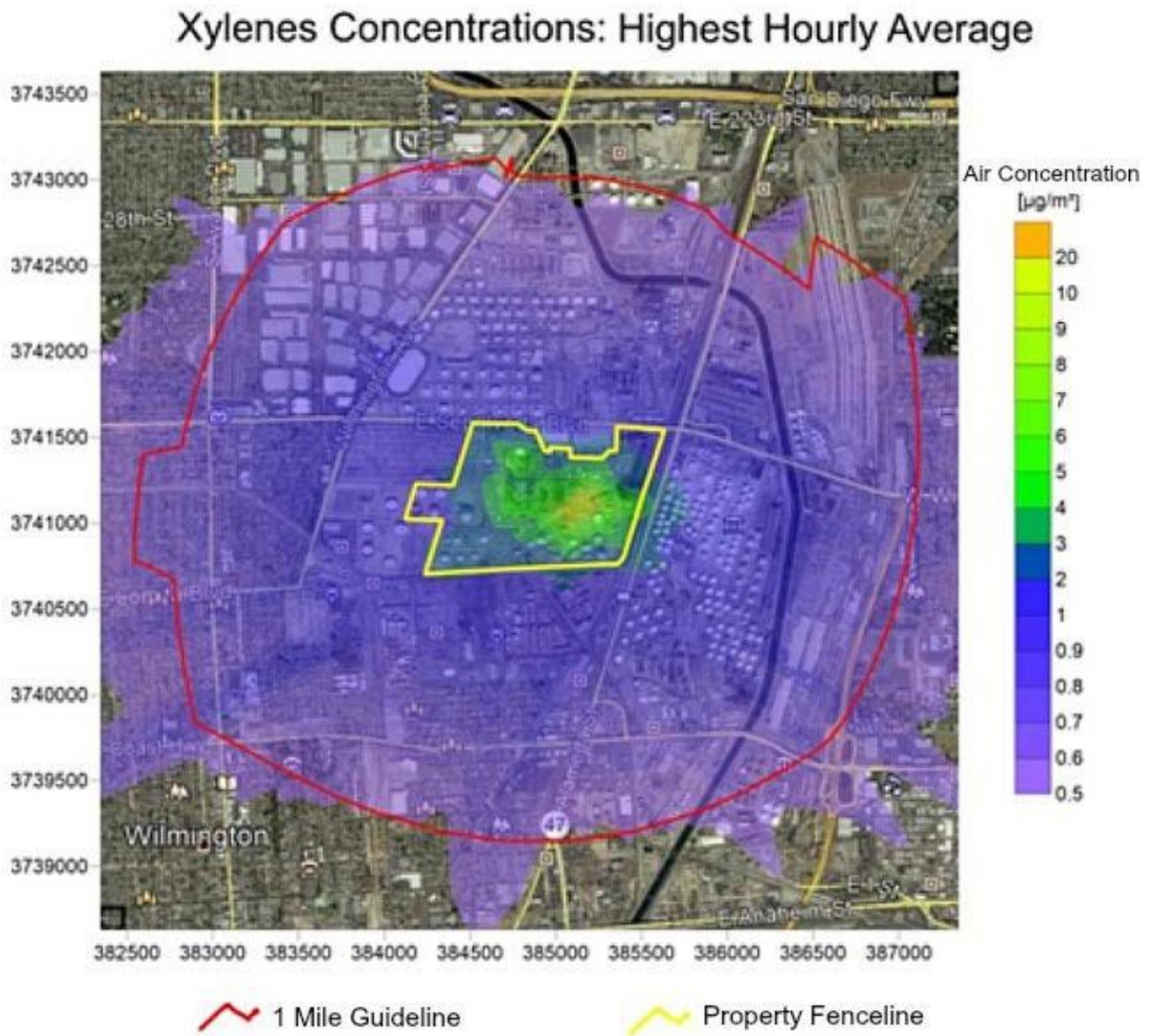


Figure 2.15 – Maximum Annual Ammonia Emission Concentrations

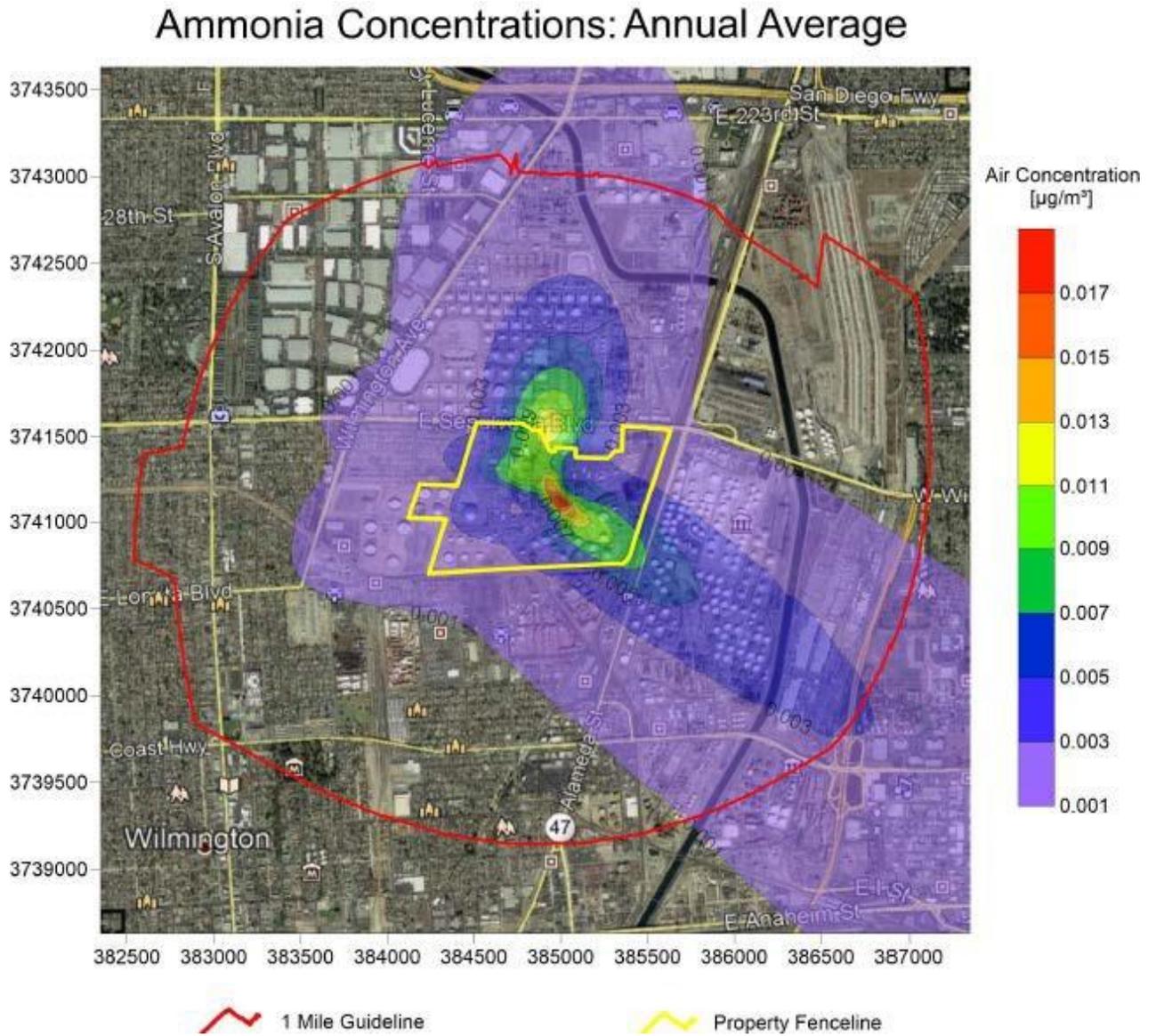


Figure 2.16 – Annual Benzene Emission Concentrations

Benzene Concentrations: Annual Average

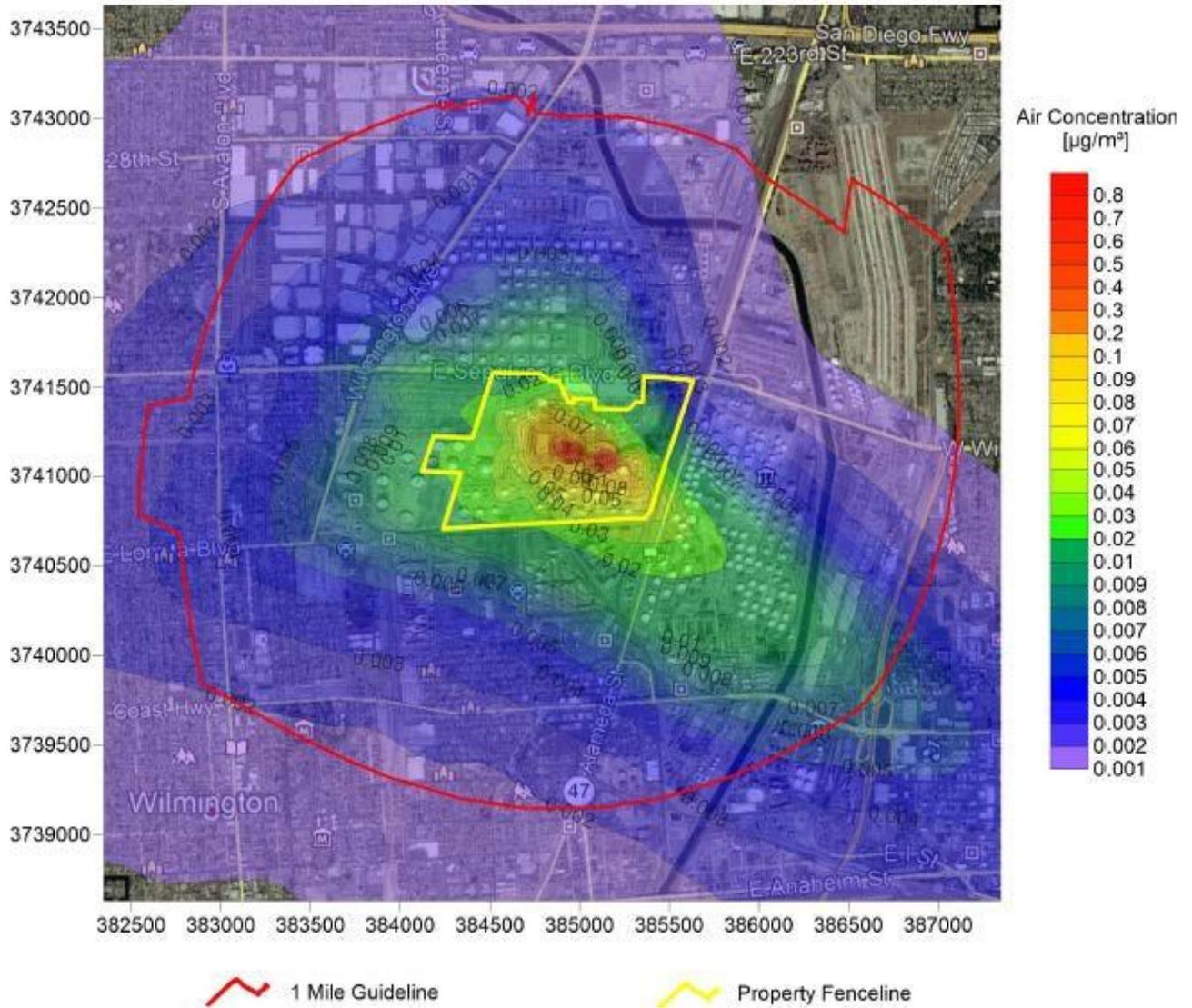


Figure 2.17 – Annual Carbonyl Sulfide Emission Concentrations

Carbonyl Sulfide Concentrations: Annual Average

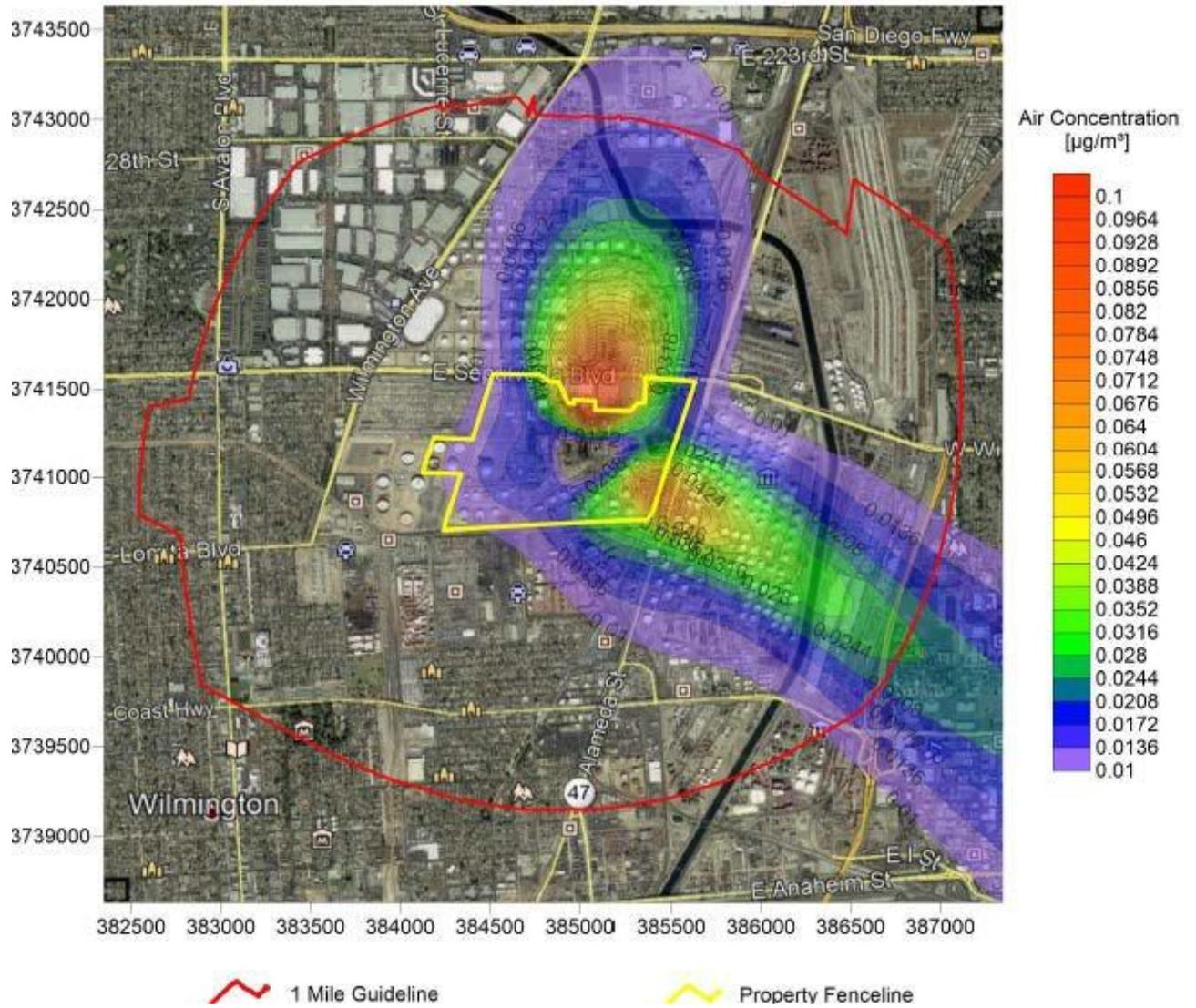


Figure 2.18 – Annual Cyclohexane Emission Concentrations

Cyclohexane Concentrations: Annual Average

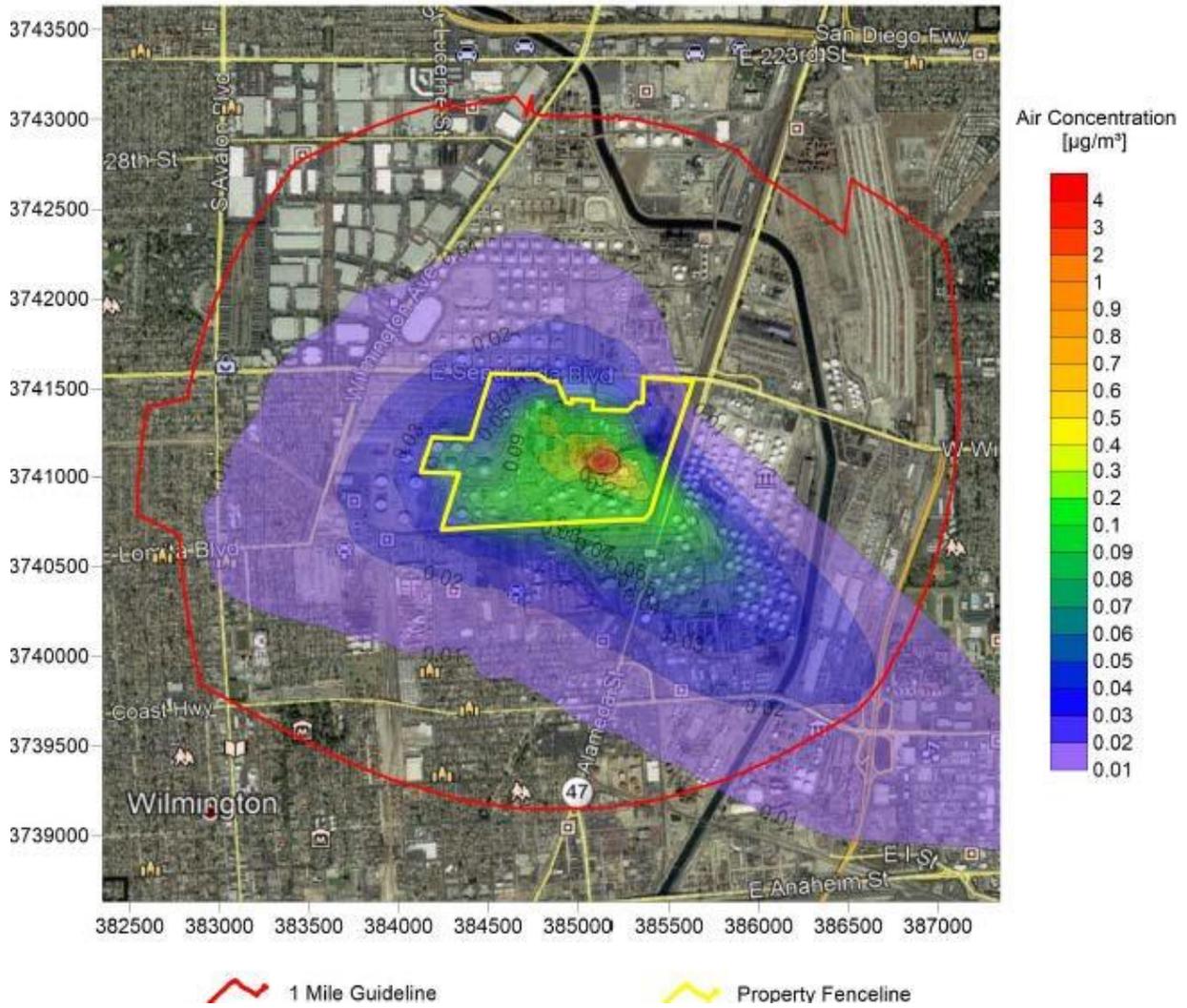


Figure 2.19 – Annual Diesel Particulate Matter (DPM) Emission Concentrations

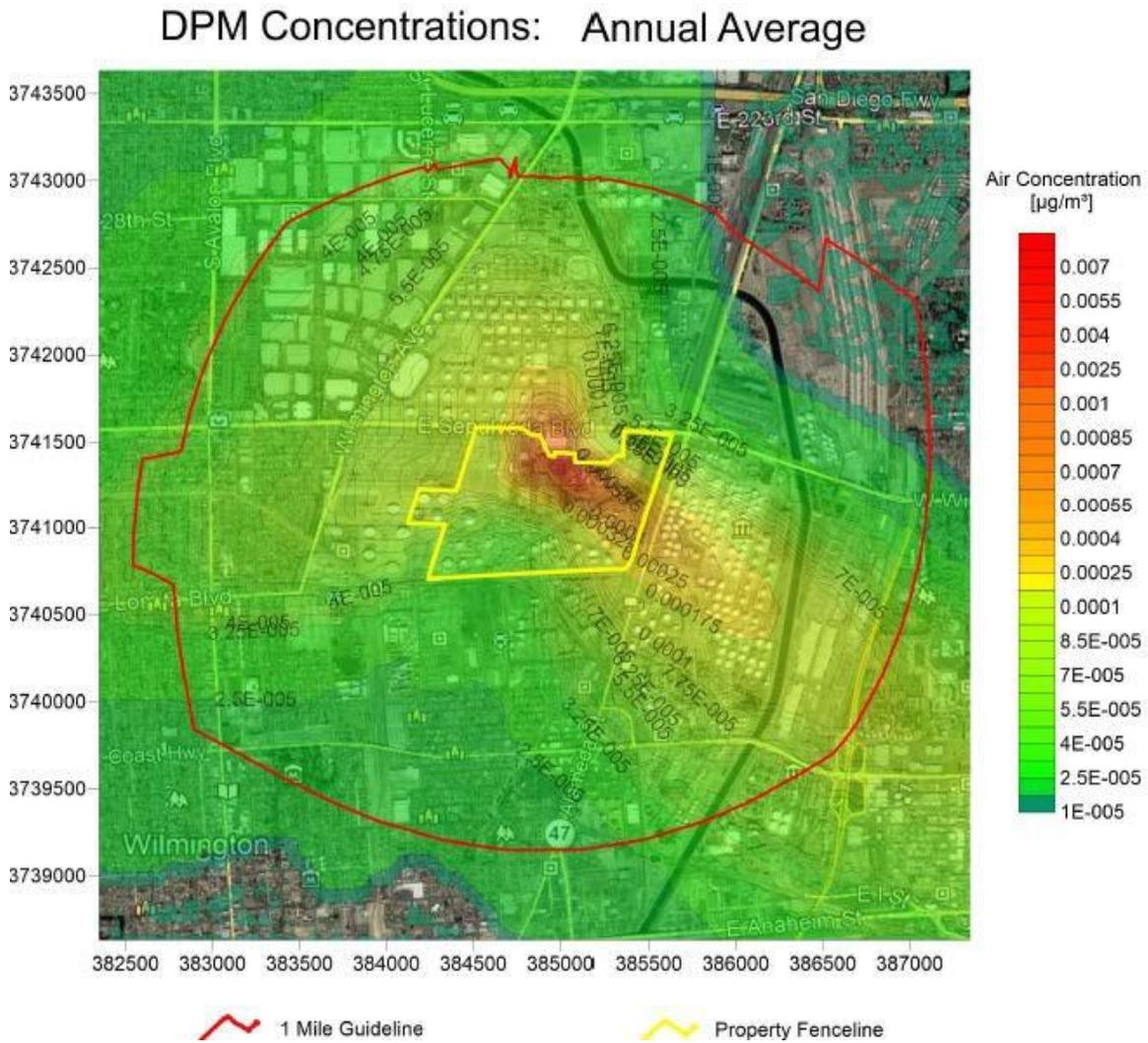


Figure 2.20 – Annual Ethyl Benzene Emission Concentration

Ethylbenzene Concentrations: Annual Average

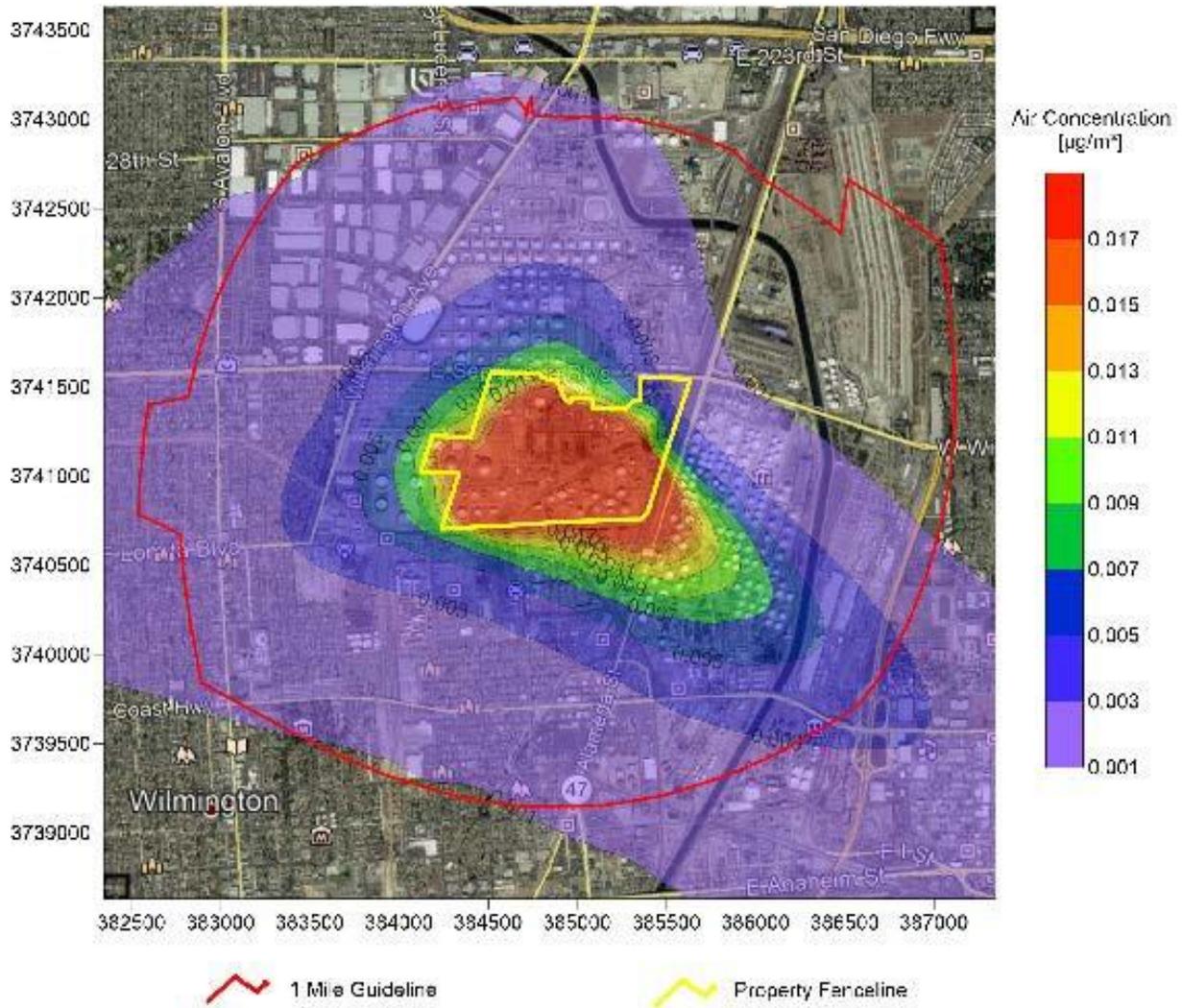


Figure 2.21 – Annual Hexane (Total VOC Estimate) Emission Concentrations

Hexane Concentrations: Annual Average

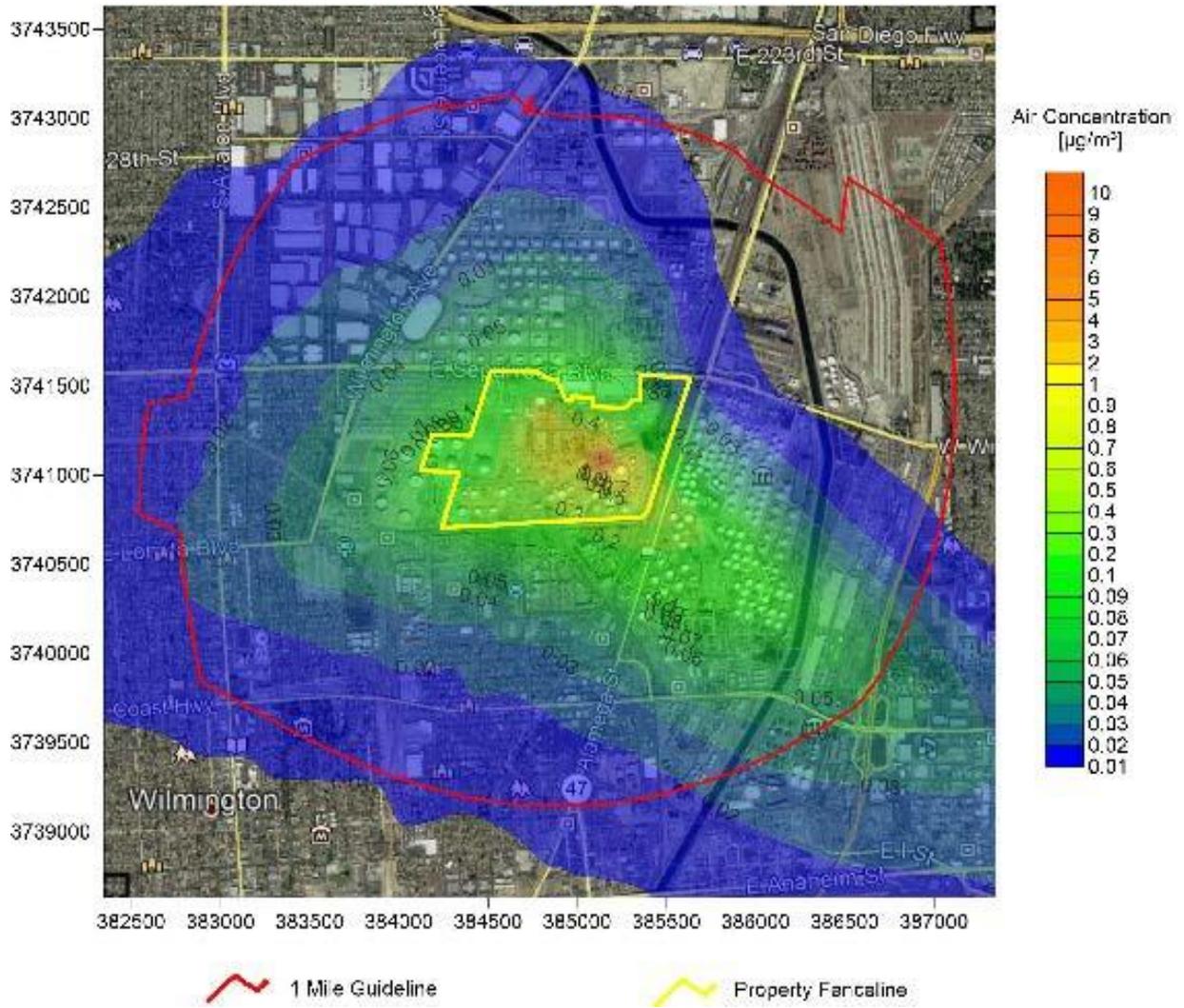


Figure 2.22 – Annual Hydrogen Sulfide Emission Concentrations

Hydrogen Sulfide Concentrations: Annual Average

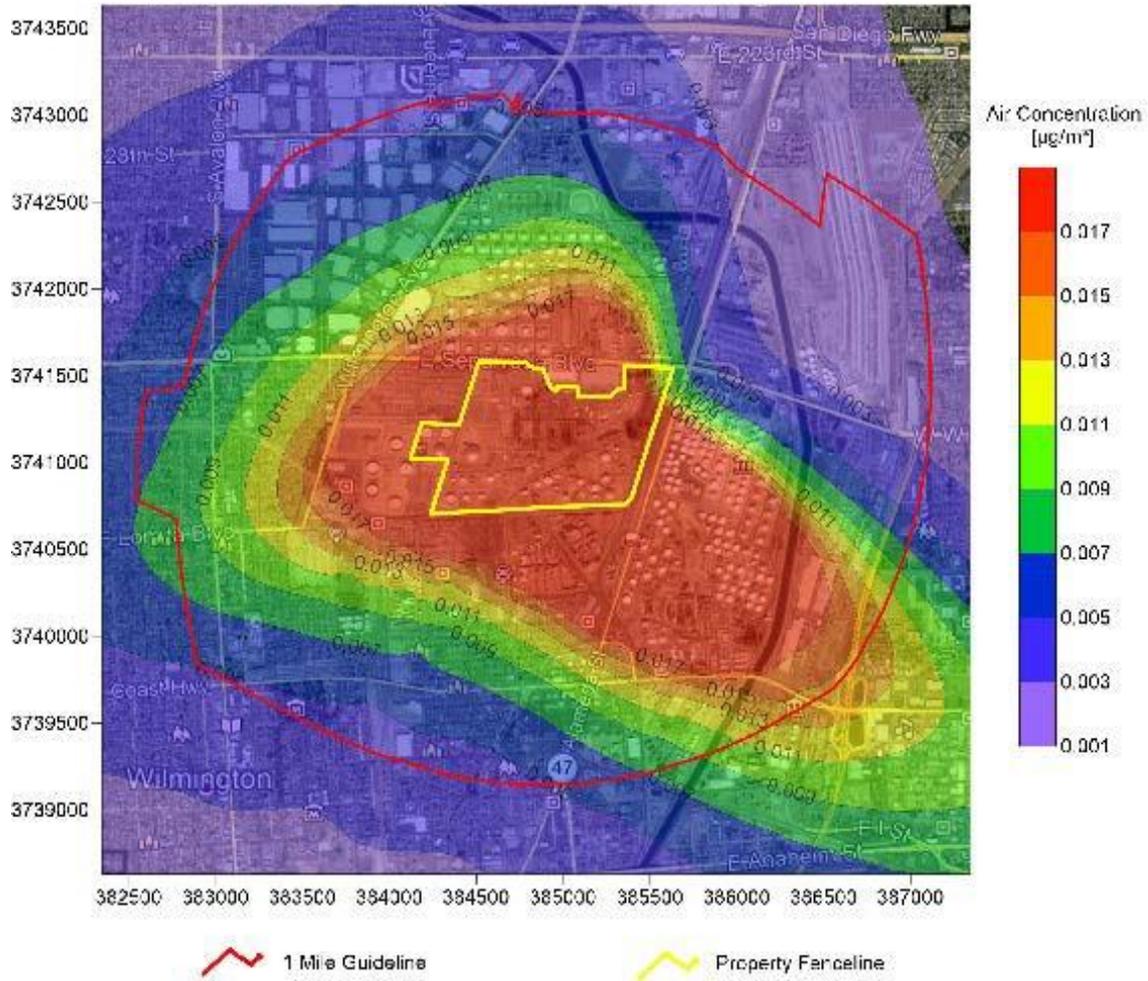


Figure 2.23 – Annual Methanol Emission Concentrations

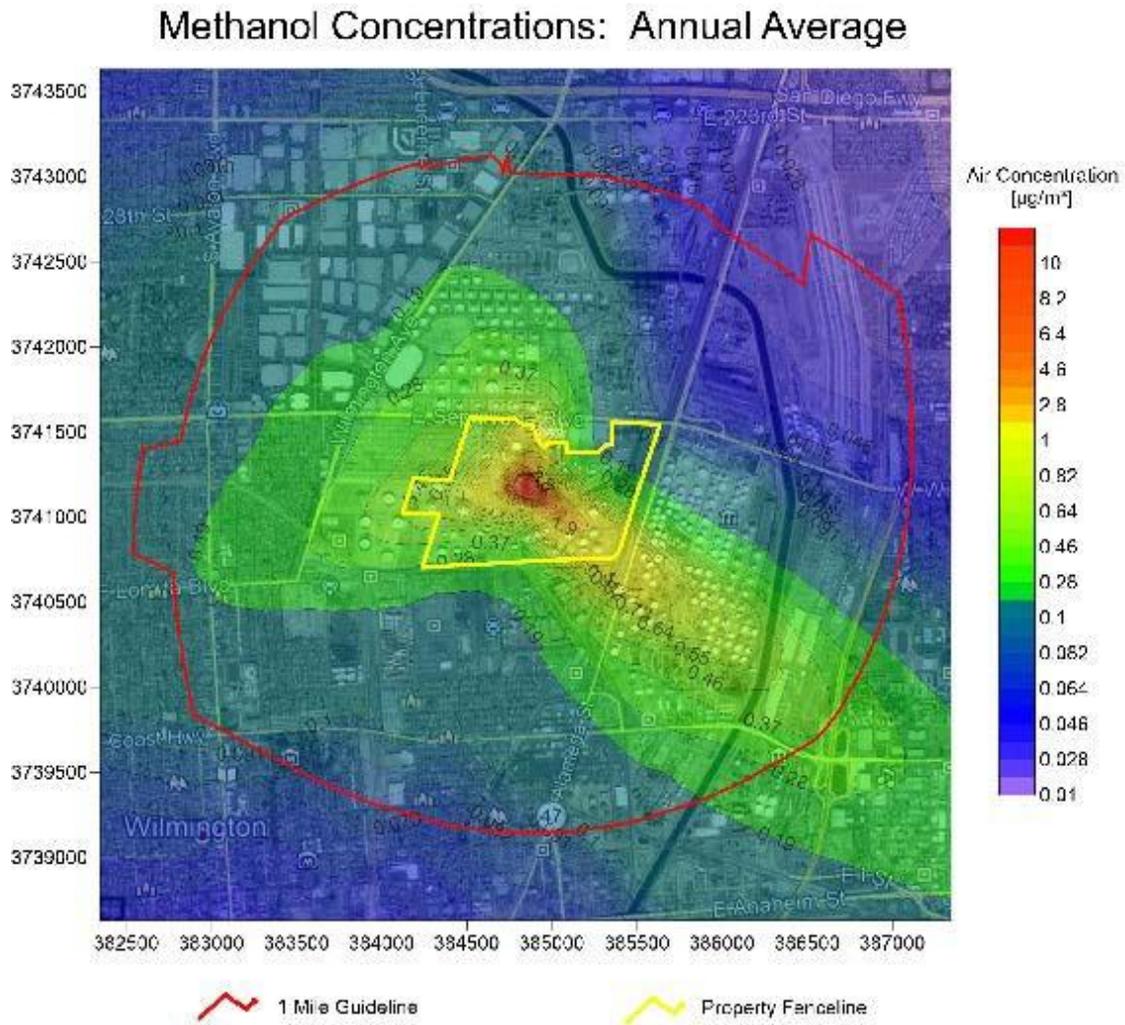


Figure 2.24 – Annual Toluene Emission Concentrations

Toluene Concentrations: Annual Average

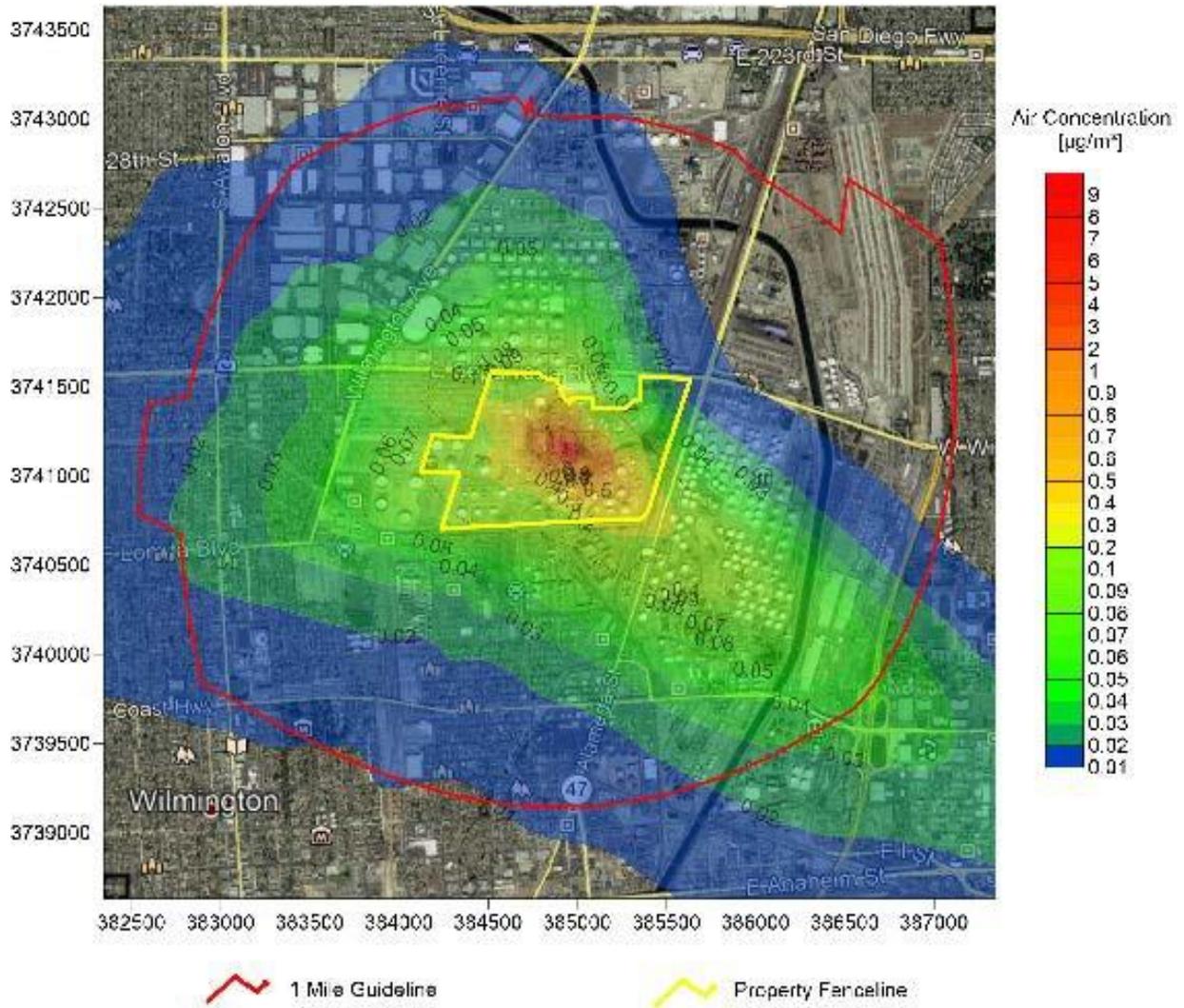
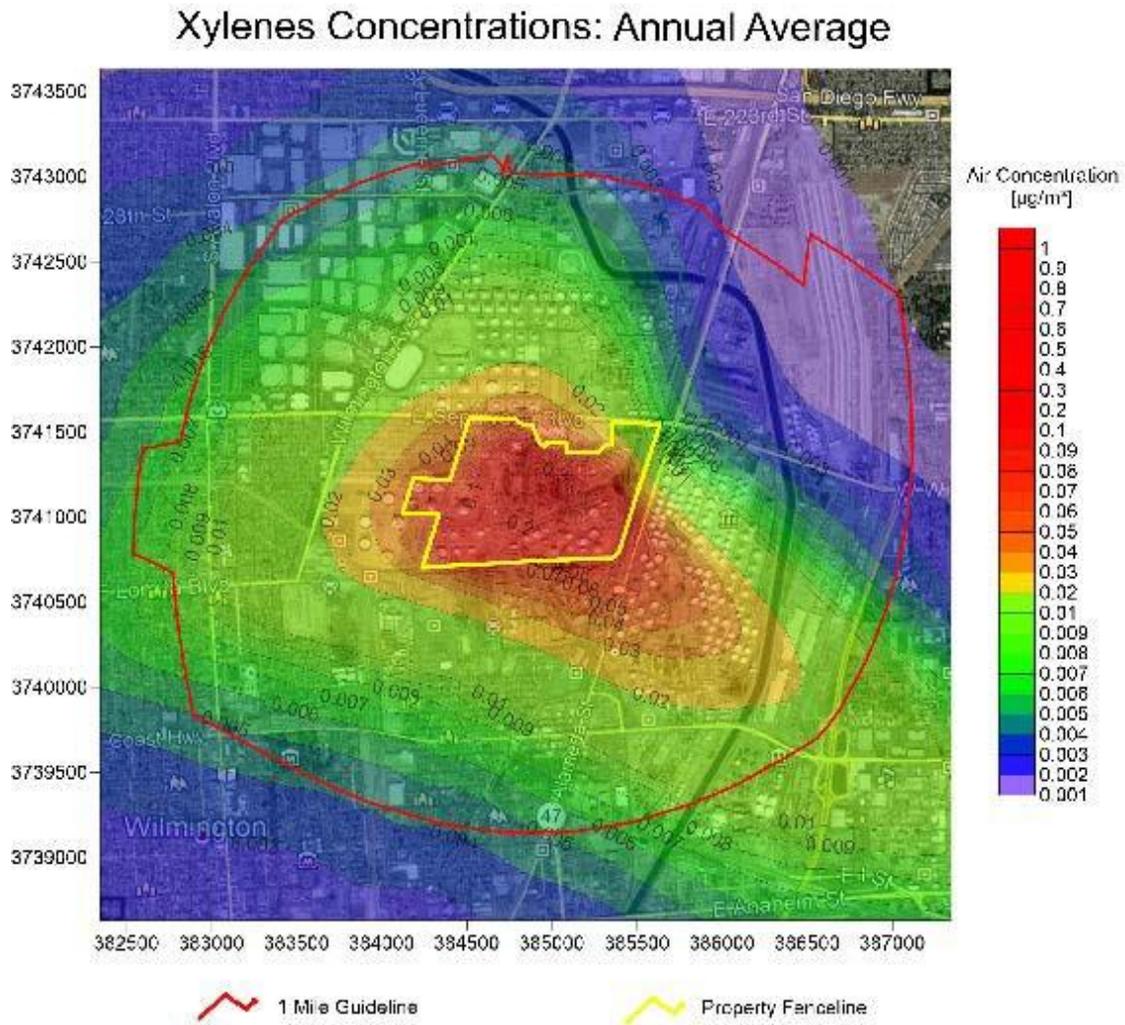


Figure 2.25 – Annual Xylene Emission Concentrations



Section 3 – Proposed Site Locations for Fence-line Monitoring Systems

Selection of Pollutants to be Monitored

Table 3.1 presents the maximum hourly concentration and the portion of the fence line impacted by each of the pollutants modeled. Once the modeling was complete, the target pollutants underwent further screening to determine if they would be detectable by commercially available open-path, fence-line air monitoring systems at the fence line of the refinery. All portions of the fence line that were within one mile of a community were considered for open-path, fence-line monitoring. If the modeling indicated the maximum concentration of pollutants was within the detection limits of an open-path air monitoring system, then the appropriate technology was selected for use along that portion of the refinery fence line. In addition, if the selected technology has the capability to detect additional gases that are present as possible emissions from the refinery, they were added to list of monitored pollutants for that system. The rationale for including the additional pollutants is that, although they are not expected to be detected on a routine basis, they could be detected in the event of an unplanned release. Table 3.2 presents the pollutants and detection limits for the gases that will be included for fence-line monitoring at the P66 Carson Refinery. The detection limits are presented for both the shortest and longest proposed pathlengths.

Table 3.1 – Maximum Hourly Impact of Pollutants Modeled

Compound	Acute Inhalation REL (ppb)	Max One Hourly Concentration at Nearest Communities (ppb)	Max One Hourly Concentration at Fence line (ppb)	Fence Line
Ammonia	4571	0.21	0.29	Path -3A
Benzene	8.45	0.18	0.63	Path - 3A
Carbonyl Sulfide	26.86	0.69	0.48	Path - 1B
Cyclohexane	-	0.006	0.09	Path - 1A
Black Carbon	-	1.7	4.6	MS #3
Ethylbenzene	460.6	0.07	0.18	Path - 1A
Hexane	1986	1.7	2.8	Path - 1B
Hydrogen Sulfide	30	0.7	1.4	MS #2
Methanol	21367	11.9	54.8	Path - 3A
Toluene	9819	2.65	5.31	Path - 3A
Xylene	5066	0.23	1.15	Path - 1A

Table 3.2 - Gases and Specific Monitoring Technologies

Technology	Min Path	Max Path
OP-FTIR	200 meters	700 meters
	(PPB)	(PPB)
1,3 Butadiene	34	10
Acrolein	27	27
Acetaldehyde	101	29
Ammonia	8	2
Carbonyl Sulfide	3.5	5
Cyclohexane	5	150
Formaldehyde	14	6
Hexane	12	150
Hydrocyanic Acid	122	17
Methane	64	150
Methanol	20	6
Nitrogen Dioxide	74	52
Propylene	45	150
Styrene	64	18
Total Non-Methane Hydrocarbons	16	150
OP-UV		
Benzene	5	1
Ethyl Benzene	60	17
Sulfur Dioxide	8	2
Toluene	10	3
Xylene	5	1

Site Location of Monitoring Equipment

It should be noted that the fence-line monitors being installed as described in this monitoring plan will complement and enhance air emission monitoring currently being done on the fence line and on emission sources throughout the refinery for compliance with SCAQMD and EPA rules. This includes but is not limited to the following air monitoring systems:

- Passive diffusion tubes are located around the refinery fence line to be analyzed for benzene beginning in 2018, as required by EPA’s Refinery Sector Rule.

- Continuous emission monitors measure NO_x emissions from heater and boiler stacks, SO₂ emissions from sulfur plants and sulfur in fuel gas, as required by both SCAQMD and EPA rules.
- Several hundred thousand valves, pumps and connections are monitored throughout the refinery to detect any low-level hydrocarbon leaks by a team of trained inspectors as required by SCAQMD and EPA rules.

Based on the modeling analysis, the majority of emissions are transported from the refinery in either a northwesterly or a southeasterly direction. For this reason, the design of the location of the open-path, fence-line systems are intended to capture pollutants transported in these directions where a community is within one mile of the refinery fence line. Monitoring stations will be positioned at the corners of the refineries with open-path air monitoring systems projecting beams of light along the fence line boundary. In addition, Black Carbon and H₂S point sample monitoring equipment will be located at the monitoring stations closest to downwind populations. The following analysis presents the siting evaluation for each sector of the refinery:

West Side of Refinery – Based on the air dispersion, modeling emissions from the refinery will impact the community west of the refinery a significant amount of the time. For this reason, open-path monitoring equipment will be placed along paths covering the west side of the refinery. The systems will include open-path FTIR, and UV air monitoring systems to cover the pollutants listed in Table 3.2.

East Side of Refinery – Based on the modeling, the impacts to any communities east of the P66 refinery are more than one mile away. However, fence-line air monitoring systems including open-path FTIR, and UV air monitoring systems will be used to cover the pollutants listed in Table 3.2. Point sampling equipment measuring Black Carbon and H₂S will be placed at Monitoring Station 4.

North Side of the Refinery – The section of the northern portion of the refinery that impacts the community to the Northwest will be covered by the open-path, fence-line and point monitoring systems located at Monitoring Station 3. Communities located due north and northeast of the refinery will be covered by the open-path, fence-line systems located at Monitoring Station 3 and the point monitoring systems located at Monitoring Station 4. The systems will cover the pollutants listed in Table 3.2.

South Side of the Refinery – The south side is outside of the predominant wind directions of the refinery and the annual pollution concentrations are below the detection limits for fence-line air monitoring systems. However, there is a community located less than one half of a mile due south of the refinery. To cover this population, open-path monitoring equipment will be placed along paths covering the south side of the refinery. The systems will include open-path FTIR, and UV air monitoring systems to cover the pollutants listed in Table 3.2. Point sampling equipment measuring Black Carbon and H₂S will be placed at Monitoring Station 2.

Figure 3.1 presents the proposed locations for the fence-line air monitoring systems at the P66 Carson Refinery. To minimize the possibility of blocking the light beams, the height of all ground level platforms will be at least three meters above ground. The height of monitoring platforms or reflectors placed on existing structures will be determined based on minimizing the possibility of beam blockage. Table 3.3 describes the specific monitoring equipment and pollutant coverage for each quadrant of the refinery.

Figure 3.1 - Map of Fence-Line Monitoring

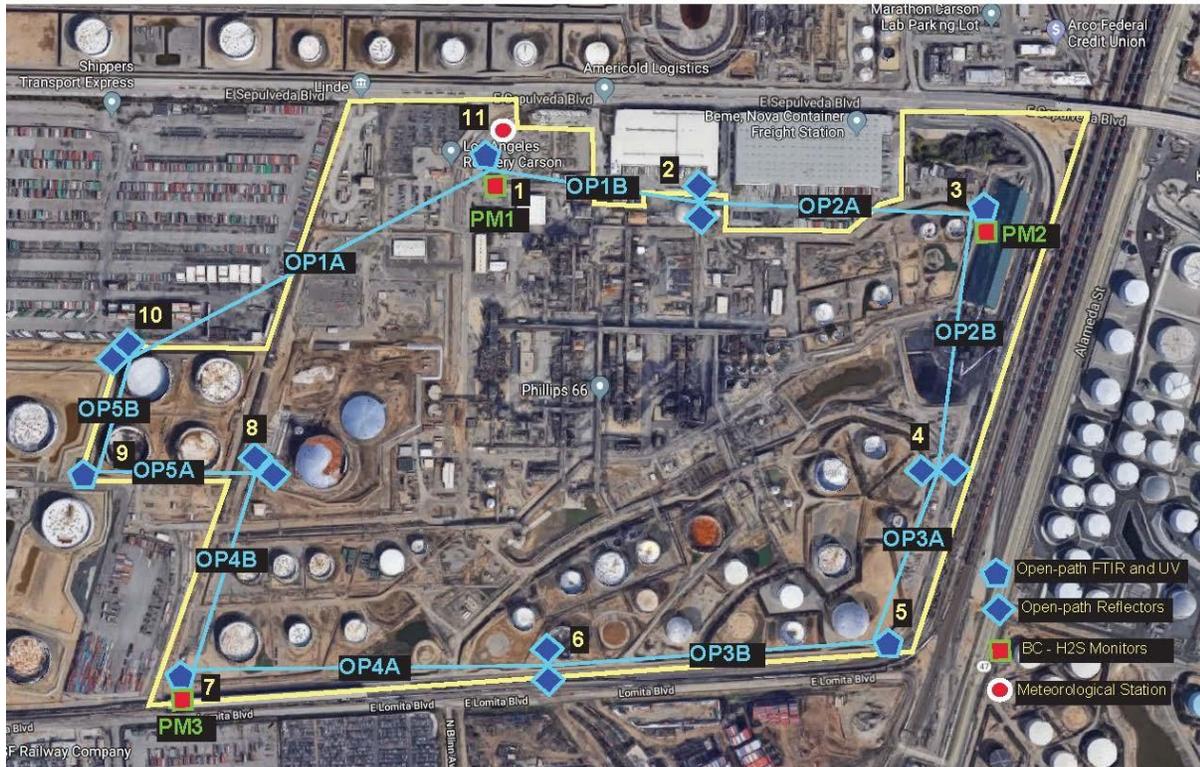


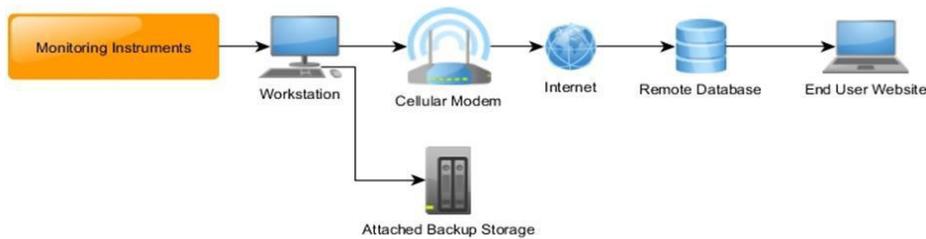
Table 3.3 - Description of Equipment of Pollution Coverage

Location Identifier	Equipment	Latitude	Longitude	Elevation (feet)
1	Open-path Analyzers, Point Monitors	33.807216	-118.245438	15'
2	UV Source, FTIR Retroreflector	33.806847	-118.242036	36'
3	Open-path Analyzers, Point Monitors	33.806622	-118.237623	15'
4	UV Source, FTIR Retroreflector	33.803263	-118.238103	35'
5	Open-path Analyzers	33.800997	-118.239212	15'
6	UV Source, FTIR Retroreflector	33.800565	-118.245256	20'
7	Open-path Analyzers, Point Monitors	33.800348	-118-250246	10'
8	UV Source, FTIR Retroreflector	33.803064	-118.249153	20'
9	Open-path Analyzers	33.803204	-118.251669	15'
10	UV Source, FTIR Retroreflector	33.804752	-118.251143	25'
11	Meteorological Station	33.807746	-118.245356	0.5'

Section 4 – Data Presentation to the Public

All air monitoring equipment specified for the P66 fence-line system will collect data on five-minute averages and be transmitted to an Internet website where the real-time results can be viewed by the public. Figure 4.1 provides an example of how the monitoring data will be communicated.

Figure 4.1 - Data Communication System



The website will be developed with input from the various stakeholders within the community and may evolve in the future as needs change. The community website will include a message board to inform the public of relevant information as needed. For example, the message board may be updated when an analyzer is undergoing maintenance, QA/QC checks are being conducted, or in other conditions where an analyzer is not in an operational state for an extended period. In addition, the public will be able to send E-mails suggesting enhancements to the public access website or any other issue of interest to the community. Data from the fence-line monitors will be transmitted to an Internet website where the near-real-time results can be viewed.

General Description of the Community Website

As part of the fence-line monitoring program, a public website will be created to educate the public on the information provided by the fence-line monitoring system. The site will present air monitor readings and is designed as an educational tool to inform the community about Carson’s air quality, as well as answer questions about the air monitoring system used to capture these readings. It will include a tutorial about where these readings come from, what they mean and how the public can learn more. The website will include four major sections:

- Learning Center
- Resources and Contacts
- Real-time Data
- Reports and Archives

Learning Center

The website will include a learning center to educate the public on the information provided on the site, which will include the following elements:

- Where the fence-line monitors are located
- Why these locations were selected
- What chemicals are being monitored
- What equipment is being used
- Terms and Definitions

Resources and Contacts

Resources and contact information will be provided for the general public to inquire about this website, the monitoring program, and resources associated with the possible health effects of the toxics being monitored. Resource links will include:

- The P66 24-hour Community Hotline
- The contractor operating and maintaining the fence-line system
- The South Coast Air Quality Management District (SCAQMD)
- The California EPA Air Resources Board (CARB)
- The California Division of Occupational Safety and Health (Cal/OSHA)
- The California Office of Environmental Health Hazard Assessment
- The U.S. Environmental Protection Agency
- The World Health Organization

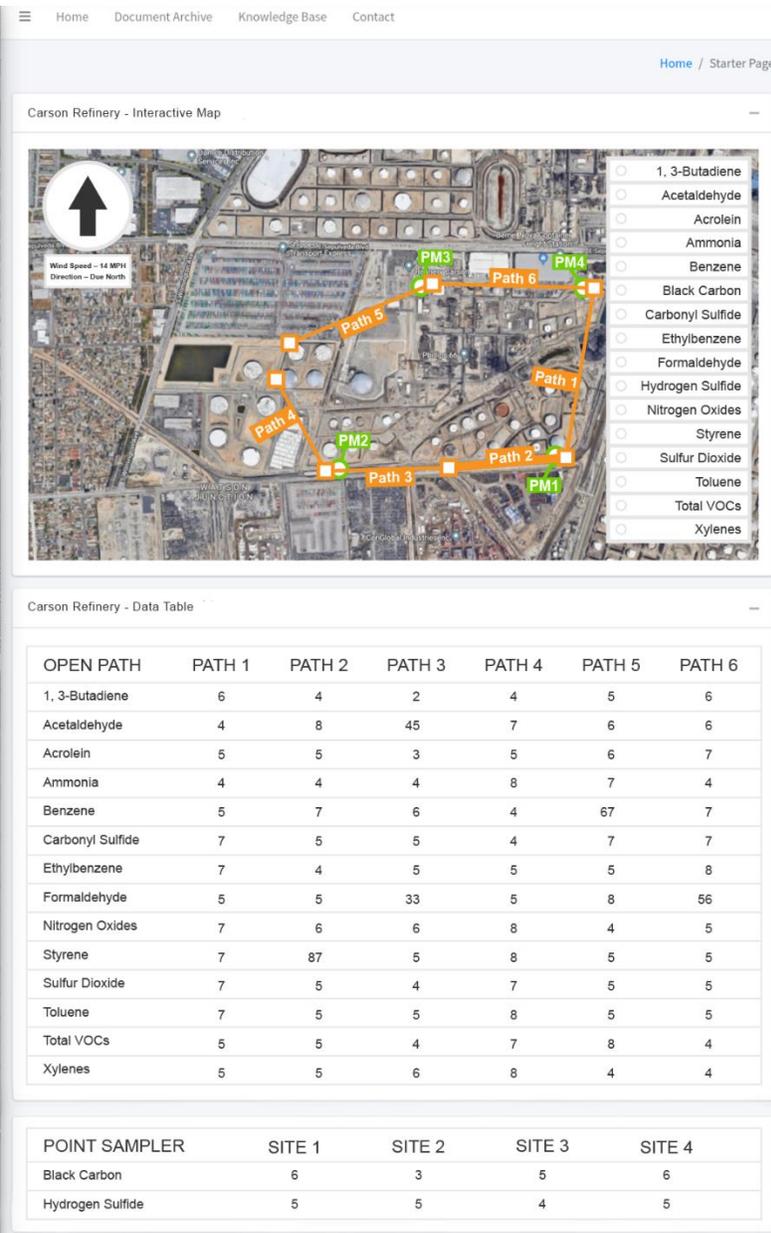
Real-time Data Display

Data will be displayed using real-time, five-minute data as well as one-hour and eight-hour averages. In addition, the website will include a method for the general public to sign up for notifications that will give them status updates associated with the community website. These updates will include notifications when instrument readings are above preset levels, an instrument is off-line or inoperable, when maintenance is being performed on the instruments, or any other significant event associated with the fence-line monitoring programs occurs.

Reports and Archives

The public will be provided access to an archive of air quality monitoring reports gathered by the air quality monitoring system. Figures 4.2 through 4.5 present the website concept for the fence-line monitoring system.

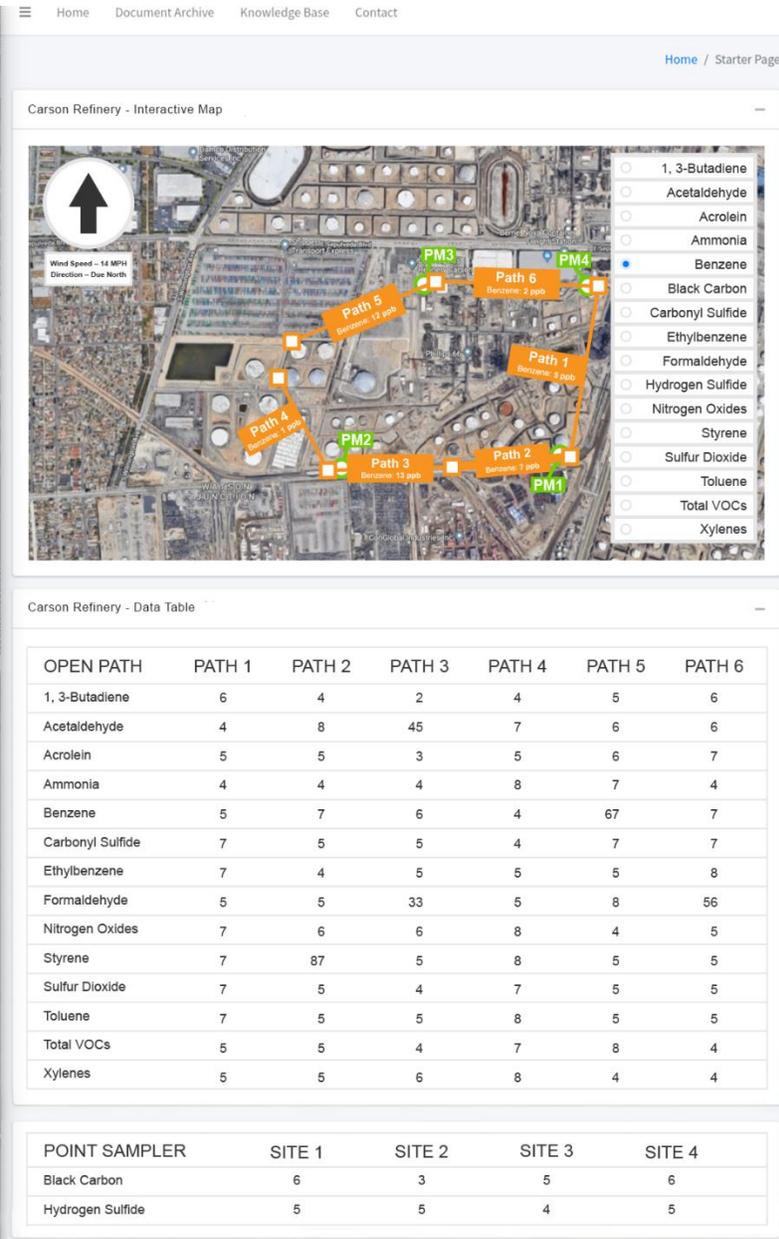
Figure 4.2 – P66 Carson Refinery Community Website Home Screen Concept



The home screen interactive map consists of:

- All open-path path-lengths and point monitors, with labels.
- An information box with an accompanying arrow to indicate wind direction and speed.
- A selectable list of gases being detected by the monitors.
- A consistently updating table below the map that lists all the detectable gases, and their current detected concentrations.

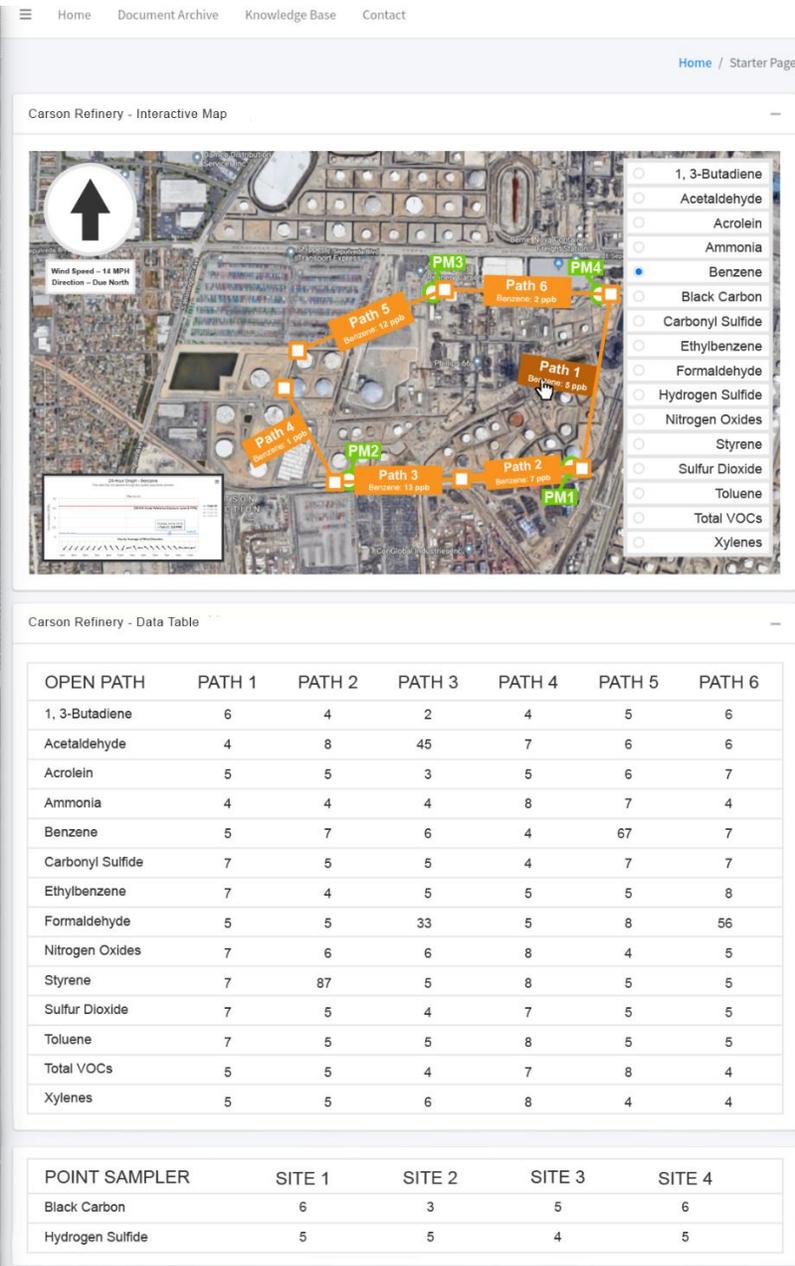
Figure 4.3 – P66 Carson Refinery Community Website Gas Selection Concept



When a gas from the selectable list is chosen:

- The most recent detected concentrations are now visible under each path-length name, for that gas.
- Concentrations are reported in (ppb).

Figure 4.4 – P66 Carson Refinery Community Website Concentration Selection Concept



When a path-length's concentration is hovered over:

- The chosen path-length changes color to indicate selection.
- A 24-hr concentration plot for the selected gas, for that path-length, appears in the bottom left corner.
- The above happens for each path-length that is hovered over.

Figure 4.5 – P66 Carson Refinery Community Website Table Concentration Selection Concept

Home Document Archive Knowledge Base Contact

Home / Starter Page

Carson Refinery - Interactive Map

Carson Refinery - Data Table

OPEN PATH	PATH 1	PATH 2	PATH 3	PATH 4	PATH 5	PATH 6
1, 3-Butadiene	6	4	2	4	5	6
Acetaldehyde	4	8	45	7	6	6
Acrolein	5	5	3	5	6	7
Ammonia	4				7	4
Benzene	5				67	7
Carbonyl Sulfide	7				7	7
Ethylbenzene	7				5	8
Formaldehyde	5				8	56
Nitrogen Oxides	7				4	5
Styrene	7	87	5	8	5	5
Sulfur Dioxide	7	5	4	7	5	5
Toluene	7	5	5	8	5	5
Total VOCs	5	5	4	7	8	4
Xylenes	5	5	6	8	4	4

24-Hour Graph - Benzene

This data has not passed through any quality assurance process.

Concentration (ppb)

Hourly Average of Wind Direction

OSHA Acute Reference Exposure Level (REL) (10 ppb)

Thursday, Oct 24, 2019

Path #1: 6.7 ppb

Path #1: 6.7 ppb

POINT SAMPLER	SITE 1	SITE 2	SITE 3	SITE 4
Black Carbon	6	3	5	6
Hydrogen Sulfide	5	5	4	5

When a concentration value in the table below the map is clicked on:

- The selected value and accompanying gas change color to indicate selection.
- A 24-hr concentration plot for the selected gas, for that path-length, appears over the table.

Section 5 – Data Management

Data generated by the fence-line monitoring equipment will undergo review throughout the measurement and reporting process. Included in this process are automated QA/QC checks that occur before data is reported on the real-time website. A complete description of the quality assurance project plan (QAPP) is included in the Quality Assurance Project Plan for the Phillips 66 Carson Fence-Line Monitoring Program. Under normal circumstances a five-minute average measurement will appear on the website within 10 minutes of the end of the measurement period.

However, the data uploaded may be impacted by Internet traffic. An automated system conducts the Q/A checks before the data is reported to the website. The site will also make available a rolling 24-hour trend of the five-minute data for each gas reported. Table 5.1 lists the real-time data quality checks. Automated data checks are listed in Table 5.1.

Table 5.1 – Real-time Data Quality Checks

Real-Time Check	Check	Action
Low Signal Alarm	Signal threshold test	If signal is below threshold value: Real-time website reports "Low Signal" to analyzer. Automated E-mail is sent to P66 and the fence-line contractor.
Instrument Error Code	Instrument Error Code	Real-time website reports "off-line" message. E-mail sent to P66 and fence-line contractor. Website message board updated to inform community that analyzer troubleshooting underway. Website updated when system is back on-line.
Instrument Workstation Off-line	Instrument Communication Check	Real-time website reports "off-line" message. E-mail sent to P66 and fence-line contractor. Website message board updated to inform community that computer workstation troubleshooting underway. Website updated when system is back on-line.
Internet Connection Lost	Backup Connection enabled	E-mail sent to P66 and fence-line contractor. Community is not notified because backup connection will be enabled.
High Detection	Valid Data Detection Above Threshold	Real-time website indicates detection above alarm threshold by color change for gas. Notification sent to P66 and fence-line contractor. Contractor will examine raw data to validate detection. P66 will initiate investigation into source. Message Board on website will be updated with information as available.

The entire fence-line monitoring system is continually monitored for system performance. This includes the instruments, workstations, and Internet communication hardware. If at any time an element of the system fails to meet performance criteria, a message is generated to key personnel at P66 and the contractor who will begin activities to correct the problem. If an issue cannot be immediately corrected, the real-time website will be updated with a notification explaining the problem and the corrective action activities. Table 5.2 lists elements and the performance thresholds.

Table 5.2 - Real-time Instrument Performance Checks

Problem	Notification	Action
Analyzer has low signal	Notification sent to contactor and P66	Website updated with low signal message for specific analyzer
Analyzer off-line	Notification sent to contactor and P66	Website updated with analyzer off- line message. Technician dispatched to correct issue.
Workstation fails	Notification sent to contactor and P66	Website updated with analyzer off- line message. Technician dispatched to correct issue.
Internet communication failure	Notification sent to contactor and P66	Backup Internet connection activated

In addition to the real-time data checks, data from the fence-line system will be reviewed and validated on a monthly basis with the results stored in a separate portion of the monitoring database from the raw data. Data review and validation include but are not limited to the following:

- Non-field data such as calibration data
- Spurious data associated with power or mechanical issues
- Data with a light signal below predetermined threshold

Data that has been flagged as non-valid will be retained along with a notation for the reason it was flagged. Table 5.3 summarizes the process by which monitoring data is reviewed and post processed.

Table 5.3 – Monthly Data Validation Checks

Post Process Data Check	Check	Action
Non-field Data Check	Maintenance logs and QA/QC logs will be checked to see when systems were not in normal operating mode.	Quality Assurance Manager will flag any data that meets these criteria. Data will be excluded from QA/QC report.
Spurious Data	Instrument error codes will be checked and flagged if instrument error codes are recorded.	Quality Assurance Manager will flag any data that meets these criteria. Data will be excluded from QA/QC report.
Low Signal	Data will be reviewed for low signal. If low signal is recorded, data will be flagged and reason for low signal will be recorded (weather, system misalignment etc.).	Quality Assurance Manager will flag any data that meets these criteria. Data will be excluded from QA/QC report.
Gas Detection Validation	Spectroscopist will review data detections.	Quality Assurance Manager includes any verified detections in QA/QC report.

Section 6 – Sensitive Receptors

Phillips 66 performed an extensive search of individuals and organizations who might be considered sensitive receptors within a one-mile boundary of the Carson Refinery. The real-time website will enable sensitive receptors as well as any individual in the community to evaluate when a detection of pollutants from the fence-line system is above normal background levels. This information can then be used by the interested parties to take appropriate action to minimize exposure from refinery emissions. Table 6.1 lists the potential sensitive receptors based on direction from the refineries.

Table 6.1 - Sensitive Receptor Groups Based on Direction – Carson Refinery

Cardinal Direction from Fence Line	Sensitive Receptors within a One-mile Area of the Carson Refinery Fence Line		Residential
	Schools/Daycare	Recreation Areas	
North			
Northwest			X
Northeast			
South		X	X
Southwest	X		X
Southeast	X	X	
East			X
West	X		X

Table 6.2 presents the current list of sensitive receptors located within a mile of the fence line boundary of the Carson refinery based on the category groups.

Table 6.2 - Phillip 66 Carson Sensitive Receptors with Addresses and GPS Coordinates

Name and Type	Address	GPS Coordinates
Phineas Banning Senior HS - School	1527 Lakme Ave, Wilmington, CA 90744	33.7940582, -118.2608353
Broad Ave Elementary School - School	24815 Broad Ave, Wilmington, CA 90744	33.8015, -118.2627
East Wilmington Vest Pocket Park - Recreation	1300 O St Wilmington CA 90744	33.7927, -118.2480
Bethune Mary School - School	2101 San Gabriel Ave, Long Beach, CA 90810	33.794400, -118.222934
Hudson Park - Recreation	2335 Webster Ave, Long Beach, CA 90810	33.799503, -118.220854
Family Ceja Daycare - Daycare	2030 W Spring St, Long Beach, CA 90810	33.811584, -118.219942

Figure 6.1 shows the location of several types of sensitive receptors with respect to the refinery, including schools and childcare facilities, adult health facilities, recreation areas, and residential areas.

Figure 6.1 - Sensitive Receptors within a Mile Border of the Carson Refinery Fence Line

