Emission Inventory and Source Attribution in Wilmington, Carson and West Long Beach Community

Table of Contents

List of Figures

List of Tables

1. Introduction

The Community Emissions Reduction Plan (CERP) needs to identify air pollution challenges that each community faces, and define strategies to reduce the exposure burden from sources of criteria air pollutants (CAPs) and toxic air contaminants (TACs). Identifying air quality priorities for the CERP is accomplished through listening to the community's input and expertise, along with evaluating technical data on emission sources in the community. A rigorous accounting of sources and their resulting emissions is needed to produce an accurate emissions inventory that will serve as a baseline reference from which emission reductions can be measured. This rigorous accounting of sources, their emissions and their contribution to the cumulative exposure burden is what the CARB guidelines identify as the source attribution analysis. Per the direction in the CARB guidelines, source attribution is required to meet the following AB 617 statutory requirements:

California Health and Safety Code § 44391.2 (b) (2) directs CARB to provide "[a] methodology for assessing and identifying the contributing sources or categories of sources, including, but not limited to, stationary and mobile sources, and an estimate of their relative contribution to elevated exposure to air pollution in impacted communities…"

The CARB guidelines recommended five potential technical approaches for the source attribution analysis. The options presented are: developing an emissions inventory, air quality modeling, targeted air monitoring/back trajectory/pollution roses/inverse modeling, chemical mass balance, and positive matrix factorization. Among these options, based on the availability of data and resources, this source attribution analysis employs the emissions inventory and air quality modeling analysis approaches to identify sources contributing to air pollution levels in the community, with an emphasis on identifying sources within the community (emissions inventory). More information on source attribution methods is included in the Source Attribution Methodology report.[1] The most recent air quality modeling analysis was conducted as part of the Multiple Air Toxics Exposure Study (MATES IV) in 2015, which showed that Diesel Particulate Matter (DPM) was the air pollutant that contributed most to the air toxics cancer risk in the South Coast Air Basin, with the Wilmington, Carson, West Long Beach (WCWLB) community having a higher air toxics cancer risk compared to the overall average (**Figure 3-5**). A community-specific emissions inventory was developed for criteria air pollutants (CAPs) and TACs based on the most recent available datasets.

The WCWLB community contains some obvious sources of air pollution, including Ports of Los Angeles and Long Beach, which accommodates ocean-going vessels, commercial harbor craft, locomotives, cargo handling equipment and drayage trucks. More than 40 miles of freeways and nine rail yards are located within the community. This community also encompasses large stationary industrial sources, including five petroleum refineries, one sulfur recovery plant, and two hydrogen production plants. The source attribution analysis highlights that in the year 2017, off-road mobile sources were the predominant sources of DPM, with the major contributors being ocean-going vessels, off-road diesel equipment, heavy-heavy duty trucks, medium-heavy duty trucks, and trains. In this community, 1,3-butadiene has the second largest contribution to the

[1] Methodology for Source Attribution Analyses for the first year AB 617 Communities in the South Coast Air Basin (Technical Report), 2019. [add URL when available]

community-wide air toxics cancer risk. 1,3-butadiene is emitted from point, area, off-road mobile and on-road mobile sources with industrial processes in point and area sources being the largest single industrial sector emitting this air toxic compound. Hexavalent chromium is the third largest contributor to community air toxics cancer risk, and the main sources are on-road mobile and fuel combustion process from petroleum refining among point sources. The analysis presented in this chapter provides further details on the sources of VOCs and PM2.5. Projected emissions in future years show decreases in DPM emissions, although DPM continues to be the main contributor to air toxics cancer risk. 1,3-butadiene, hexavalent chromium and benzene are the next major contributors in this community.

The community-level emissions and their sources are discussed in this report. The detailed methodology to develop these emissions is provided in the Source Attribution Methodology report[2]. Base year emissions of CAPs and TACs are provided in section 2. Future year emissions of CAPs and TACs are discussed in section 3, and a summary is provided in section 4.

2. Base year emissions inventory and source attribution

2.1 Overall profiles of CAPs and TACs

A variety of sources contribute to the emissions of criteria pollutants in the WCWLB community, with different sources emitting different air pollutant species (**Error! Reference source not found.**). In this community, off-road mobile sources are the largest emitters of NOx (45%), with ocean-going vessels (OGV) being the largest contributor (**Figure 1.** Contribution of major sources to NOX emissions, VOC emissions, PM2.5 emissions in the Wilmington, Carson, West Long Beach community in 2017. Emissions are shown in tons/year.

). Point sources are the second largest contributors (29%) due to the presence of large facilities such as petroleum refineries, sulfur recovery plant and hydrogen production plants. On-road mobile sources also contribute significantly to NOx emissions, with the largest contribution from heavy duty trucks associated with goods transport across this community.

VOC emissions are mostly from area and point sources. Typically, consumer product is the largest single source of VOC emissions in the South Coast Air Basin, however, petroleum refining industry is the largest VOC emitter in this community. Approximately 32% of the total VOC emissions in this community are attributed to processes related to petroleum refining. The second largest contributor to the community VOC emission is consumer product. Off-road and on-road mobile sources account for marginal portions of the total VOC.

The largest contribution to PM2.5 emissions in the WCWLB community originates from point sources, mostly from fuel combustion in industrial and petrochemical processes. Miscellaneous area sources, like commercial cooking, residential fuel combustion and paved road dust, also contribute to a large portion of PM2.5 emissions. PM is also emitted from mobile sources via fuel combustion exhaust and tire and brake wear. It is important to note that ambient PM2.5

[2] Methodology for Source Attribution Analyses for the first year AB 617 Communities in the South Coast Air Basin (Technical Report), 2019. [add URL when available]

concentrations in the community have decreased steadily in the past decades due to the reductions of PM2.5 precursor emissions such as NOx, SOx, and VOC. Ambient PM2.5 can be either formed through chemical reactions of its precursor pollutants or be emitted directly from sources. In the South Coast Air Basin, including in this community, the majority of ambient PM2.5 is formed by secondary chemical reactions in the atmosphere rather than directly emitted PM2.5 from local sources. Accordingly, although PM2.5 emissions has decreased marginally over the past decade, the ambient PM2.5 concentrations have been improved substantially.

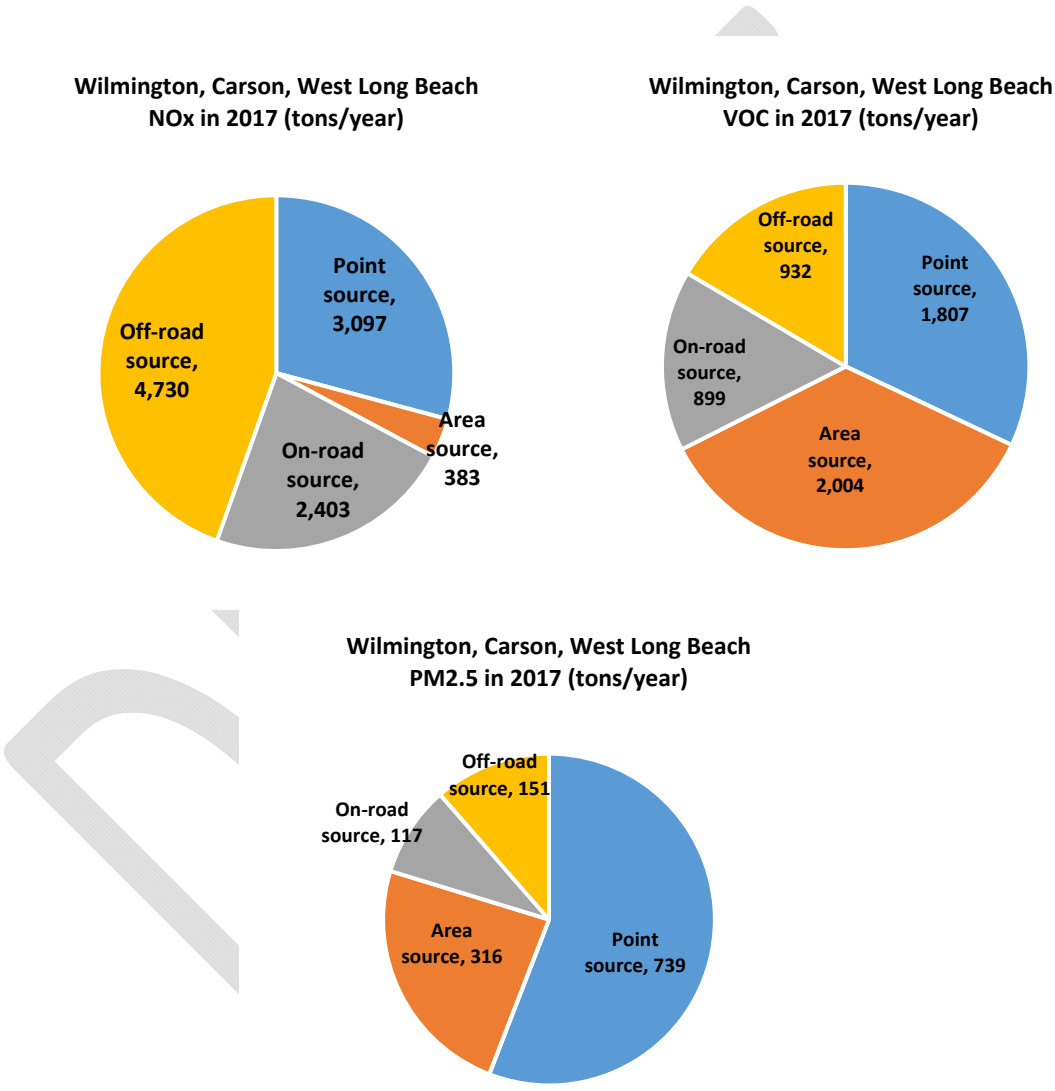

Figure 1. Contribution of major sources to NO_X emissions, VOC emissions, $PM_{2.5}$ emissions in the Wilmington, Carson, West Long Beach community in 2017. Emissions are shown in tons/year.

TAC emissions from point sources were compiled from the emissions reported by facilities. TAC emissions from area, on-road mobile, and off-road mobile sources were calculated using chemical speciation profiles applied to PM or TOG emissions. Details on the chemical speciation profiles are provided in a separate Source Attribution Methodology report[3]. In total, 22 air toxic compounds were analyzed and included in this report. These compounds are consistent with the basic TACs that facilities subject to Annual Emissions Reporting (AER) requirements report to South Coast AQMD annually, except for chlorofluorocarbons (CFCs) and ammonia. CFCs do not have an associated cancer risk, and ammonia is a PM precursor, and therefore included in the CAPs emissions table.

The contribution from point, area, on-road mobile and off-road mobile emission sources to TAC emissions in this community are presented in

Figure 2. Note that the emissions in the figure are weighted based on the air toxics cancer risk (hereafter referred as cancer risk) of each TAC relative to the cancer risk for diesel PM (DPM). For example, Cr6+ has a cancer risk that is approximately 464 times higher than that of DPM. Thus, Cr^{6+} emissions are multiplied by 464 to estimate the cancer-risk-weighted emissions of Cr^{6+}. The units in the cancer-risk-weighted DPM-equivalent emissions are expressed in pounds per year (lbs/year). This weighting approach enables comparisons across the contribution of each TAC to overall cancer risk using a consistent, toxicity-weighted scale.

[3] Methodology for Source Attribution Analyses for the first-year AB617 Communities in the South Coast Air Basin (Technical Report), 2019. [add URL when available]

Figure 2 shows that DPM is the biggest contributor to the overall cancer risk in the community, followed by 1,3-butadiene, hexavalent chromium and benzene.

Figure 2 also shows the major source categories of these main TACs. DPM emissions in this community are almost entirely from mobile sources. A significant portion of Cr6+ is also emitted

from on-road mobile sources, likely from brake wear. A detailed emissions inventory by major source categories is provided in Appendix 3b.

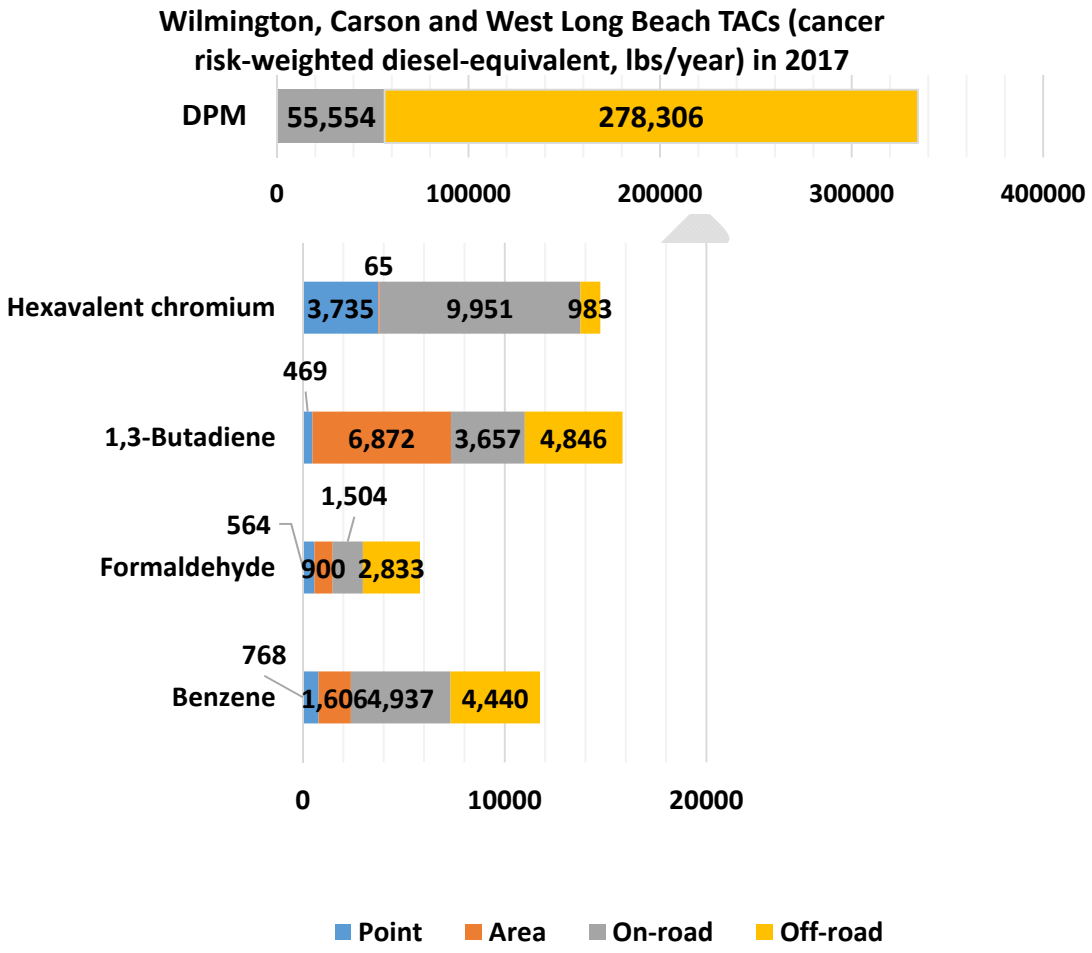

Figure 2. Contribution of major sources to toxic air contaminant emissions in the Wilmington, Carson, West Long Beach community in 2017 (shown in lbs/year, weighted by air toxics cancer risk). Note the different scale for DPM with respect to the other air toxics.

2.2 Stationary and area sources

Figure 3 indicates the sources where VOC and PM2.5 emissions are originated from in the stationary and area source sectors in the WCWLB community in 2017. The largest contribution to VOC emissions are from petroleum production and marketing, due to presence of several petroleum refineries in this community. Solvent evaporation from consumer products and industrial processes is the second largest source of VOCs, and various industries also contribute significantly to total VOC emissions.

Direct emissions of PM2.5 in the WCWLB community originate from a wide range of activities, with fuel combustion associated with the refinery industry as the largest contributor. Other important source categories contributing to PM2.5 emissions include commercial cooking, residential and commercial fuel combustion, and paved road dust.

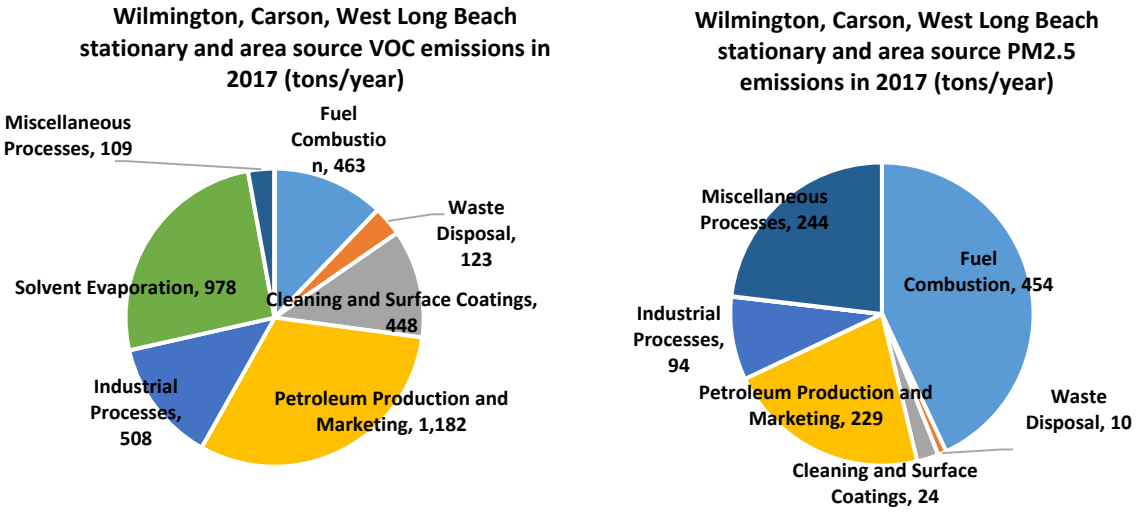

Figure 3. Source attribution of VOC emissions and PM2.5 emissions from stationary and area sources in the Wilmington, Carson, West Long Beach community for 2017

Figure 4 illustrates the emissions of the major toxic air pollutants from stationary and area sources in the community. The emissions of each pollutant are weighted by their cancer risk relative to DPM. In this community, 1,3-butadiene and hexavalent chromium and are the predominant air toxics from stationary sources. 1,3-butadiene is mostly emitted from industrial processes (**Figure 5**), especially in the chemical industry, whereas the major source for hexavalent chromium emissions is from fuel combustion in manufacturing and from the coatings industry.

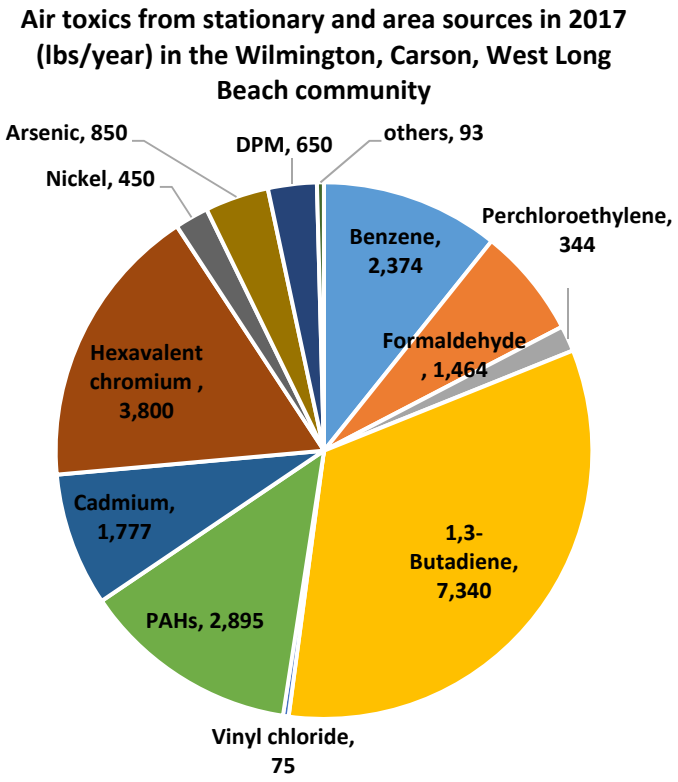

Figure 4. Toxic air contaminant emissions, weighted by air toxics cancer risk, from stationary and area sources in the Wilmington, Carson, West Long Beach community for 2017 (shown in lbs/year, weighted by air toxics cancer risk)

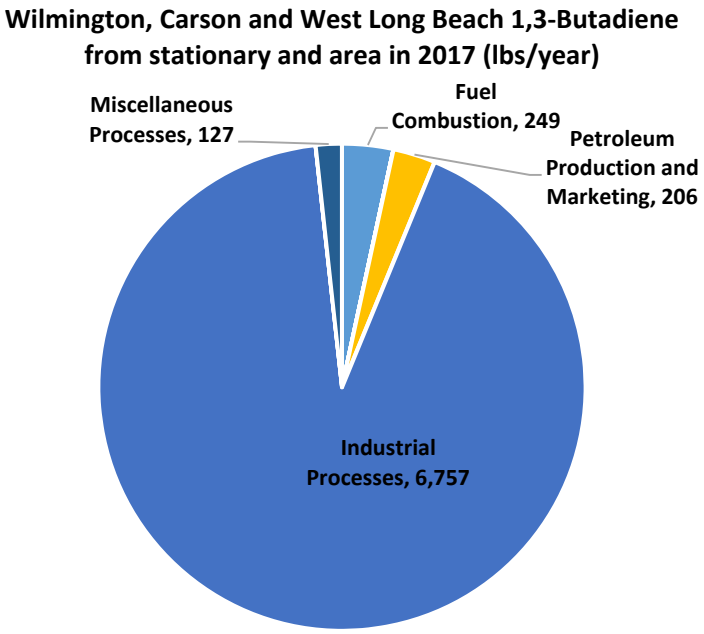

Figure 5. Source attribution of 1,3-butadiene emissions from stationary and area sources in the Wilmington, Carson, West Long Beach community for 2017 (shown in lbs/year, weighted by air toxics cancer risk)

2.3 On-road mobile sources

Figure 6 presents the contribution of different vehicle classes to total VOC and PM2.5 emissions. In general, passenger vehicles and light- and medium-duty vehicles contribute to the majority of VOC and PM2.5 emissions, with 88% and 68% of the total VOC and PM2.5 emissions, respectively. VOC emissions are mostly from gasoline vehicles[4], and, as a result, passenger cars are the main contributor to VOC emissions because of the large the number of vehicles and miles traveled by these types of vehicles in this community. Heavy-duty trucks are the second largest emitters of VOCs and PM2.5. Heavy-duty diesel vehicles tend to have higher PM exhaust and tire and brake wear emissions per mile driven compared to gasoline cars, and despite contributing to less than 10% of the total vehicle miles traveled in Los Angeles County, heavy-duty vehicles contribute to more than 25% of the total PM2.5 emissions from on-road sources[5].

[4] These emissions are largely related to evaporative and running losses
[5] Heavy-duty diesel vehicles tend to have higher PM exhaust and tire and brake wear emissions per mile driven compared to gasoline cars.

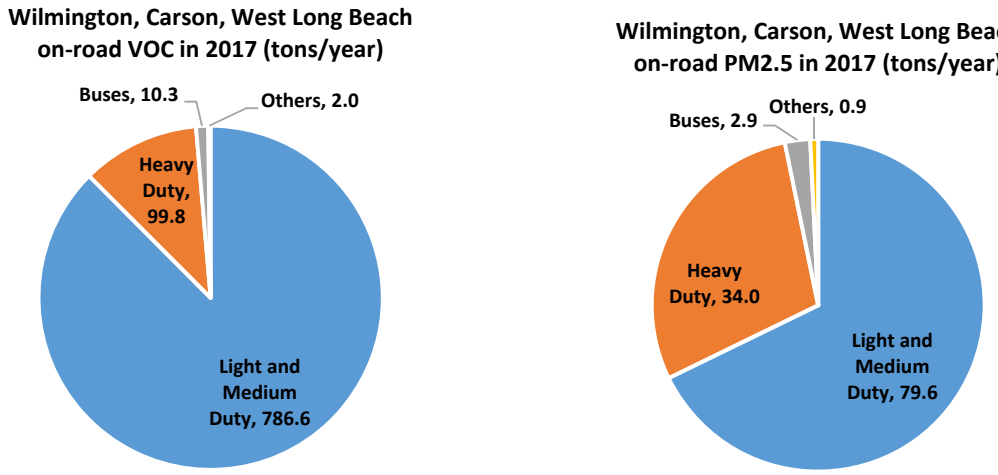

Figure 6. Source attribution of VOC emissions and PM2.5 emissions from on-road sources in the Wilmington, Carson, West Long Beach community for 2017

Air toxics emissions from on-road sources are largely dominated by DPM (**Figure 7**). The largest contributor to DPM emissions is diesel fueled heavy-duty trucks (**Figure 8**), as the largest impacts from on-road sources in the community are concentrated along the main goods movement corridors. The second largest TAC species from on-road sources is hexavalent chromium, which is likely emitted from brake wear and, to a smaller extent, from fuel combustion[6].

Other TACs emitted from on-road sources include benzene, 1,3-butadiene and formaldehyde. Benzene is generated from evaporative losses and from the incomplete combustion of gasoline, whereas formaldehyde and 1,3-butadiene emissions are generated from fuel combustion.

[6] A small fraction of hexavalent chromium was considered to originate from vehicle brake wear. The emission factors were empirically adjusted for the MATES IV analysis. While this approach worked reasonably well for the MATES analysis, further evaluation may be required for adapting this adjustment to more recent data. For example, an adjustment may be required to reflect cleaner vehicle fuels compared to those in use during previous MATES.

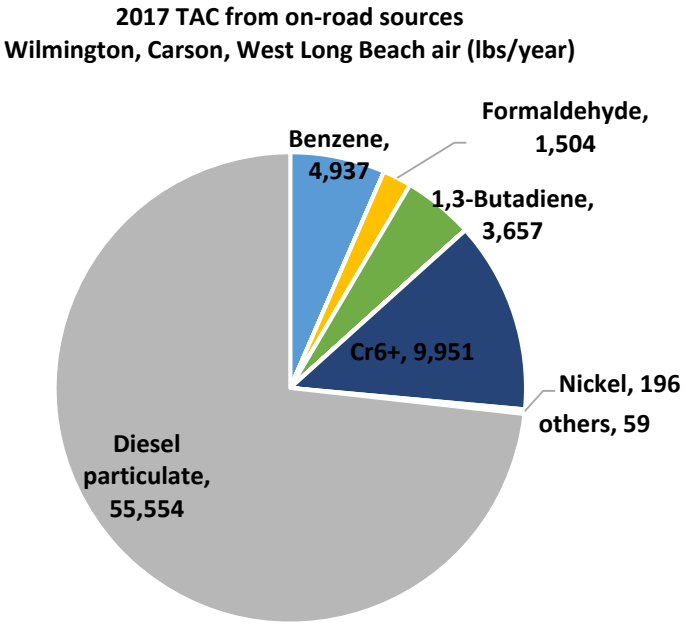

Figure 7. Toxic air contaminant emissions, weighted by air toxic cancer risk, from on-road mobile sources in the Wilmington, Carson, West Long Beach community for 2017 (shown in lbs/year, weighted by air toxics cancer risk)

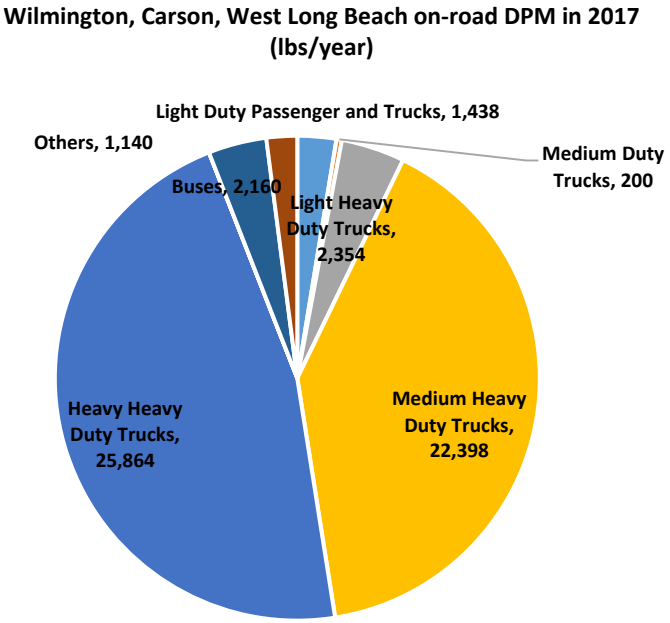

Figure 8. Source attribution of DPM emissions from on-road mobile sources in the Wilmington, Carson, West Long Beach community for 2017 (shown in lbs/year)

2.4 Off-road mobile sources

Figure 9 provides the source attribution of VOC and PM2.5 emissions from off-road sources. The emissions from small off-road equipment contribute to nearly half of the total VOC emissions in this community. This category contains small off-road spark-ignition engines that include lawn and garden, industrial, airport ground support, and commercial utility equipment, golf carts, and specialty vehicles. Port-related activities account for a significant portion of the VOC emissions in the community. OGV and commercial harbor craft emissions combined account for approximately 20%, while recreational boats, including both exhaust emissions and evaporative losses, account for 22% of the community total VOC emissions. OGVs are the largest emitters of PM2.5 from off-road sources. The second largest contribution to direct PM2.5 emissions is commercial and industrial off-road equipment.

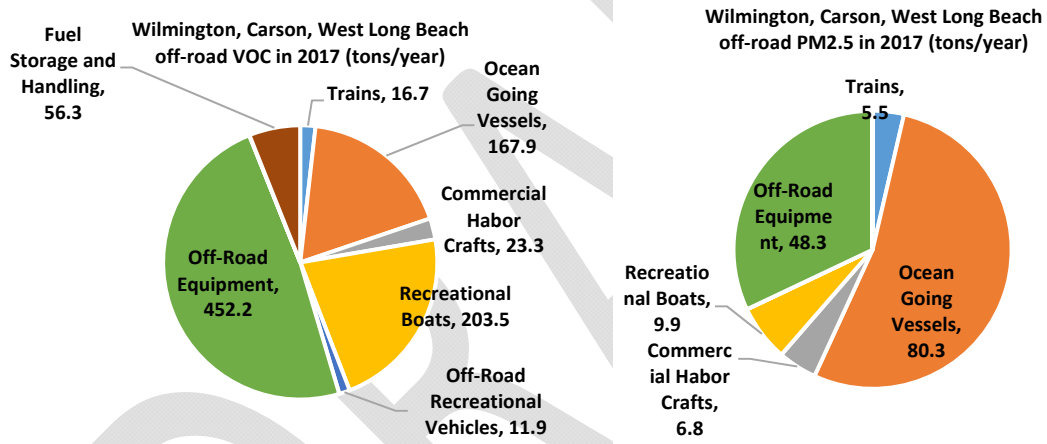

Figure 9. Source attribution of VOC emissions and PM2.5 emissions from off-road sources in the Wilmington, Carson, West Long Beach community for 2017

Similarly to the source attribution results for on-road mobile sources, DPM is the largest contributor to TAC emissions from off-road mobile sources in the WCWLB community (**Figure 10**). DPM mainly originates from OGVs (60%) and industrial off-road equipment (27%) (**Figure 11**).

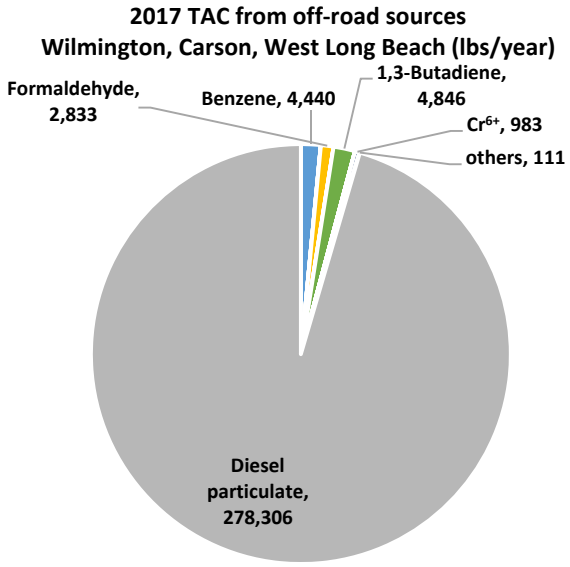

Figure 10. Toxic air contaminant emissions, weighted by air toxic cancer risk, from off-road mobile sources in the Wilmington, Carson, West Long Beach community for 2017 (shown in lbs/year, weighted by air toxics cancer risk)

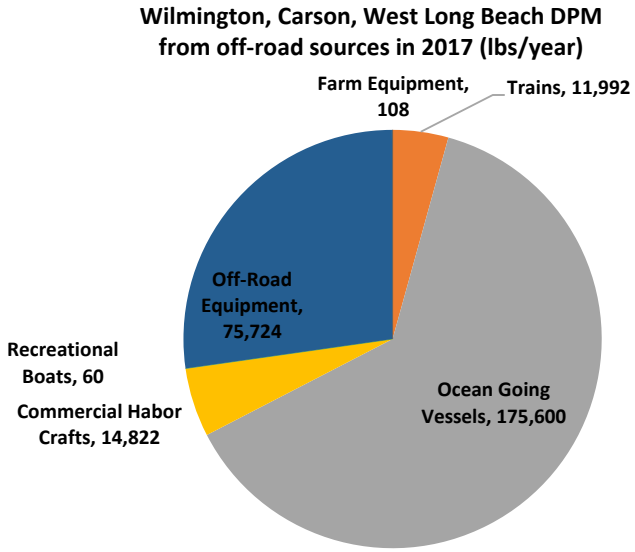

Figure 11. Source attribution of DPM emissions from stationary and area sources in the Wilmington, Carson, West Long Beach community for 2017 (shown in lbs/year, weighted by air toxics cancer risk)

3. Future year emission inventory and source attribution

3.1 Trend of emission change for CAPs and TACs

Future emissions of CAPs and TACs in the WCWLB community are projected using the best available information on socio-economic growth and emission adjustments reflecting ongoing regulations that reduce specific air pollutants. Regulations reflected in these adjustments include South Coast AQMD regulations and CARB regulations.

Based on available information, to date, there are 2 facilities within the community boundary subject to Rule 1407 (which regulates toxic emissions from metal melting operations) and/or Rule 1420 (which regulates toxic emissions from lead processing facilities); four facilities subject to Rule 1426 (which regulates toxic emissions from electroplating operations); ten facilities subject to Rule 1469 (which regulates toxic emissions from electroplating and chromic acid anodizing operations).

Furthermore, heavy-duty diesel vehicles in this community will be subject to the CARB truck and bus regulation, with implementation dates after 2017; this rule will result in reduced DPM emissions from these engines. Off-road diesel equipment is also subject to existing state regulations that will reduce DPM emissions from these sources.

South Coast AQMD and CARB are continuing to develop regulations and programs to reduce NOx and VOC emissions, since the adoption of the 2016 AQMP in March 2017. However, control factors for future regulations and programs that are still under development are not reflected in the current inventory. The current inventory for area and stationary sources reflects NOx and VOC rules adopted as of December 2015 and TACs rules adopted as of December 2017. Future versions of the emission inventory will reflect the more recently adopted regulations.

Figure 12 presents the projected major CAPs emissions (NOx, VOC and PM2.5) in the WCWLB community in the two future milestone years of 2024 and 2029, along with the base year 2017. The NOx emissions in the community are expected to decrease substantially from 2017 (10,614 tons/year) to 2024 (8,819 tons/year), mainly due to the strict regulations on mobile sources and the emission reduction commitments under the RECLAIM program. The total NOx emissions in 2029 are projected to rise slightly (9,250 tons/year) due to the increase in industrial and on-road mobile source activities. VOC emissions are expected to decrease by 7% during this 12 year period, mostly due to on-road and off-road emission reductions. Unlike NOx and VOC emissions, PM2.5 emissions remain virtually constant from 2017 to 2024, and then increase by less than 2% by 2029.

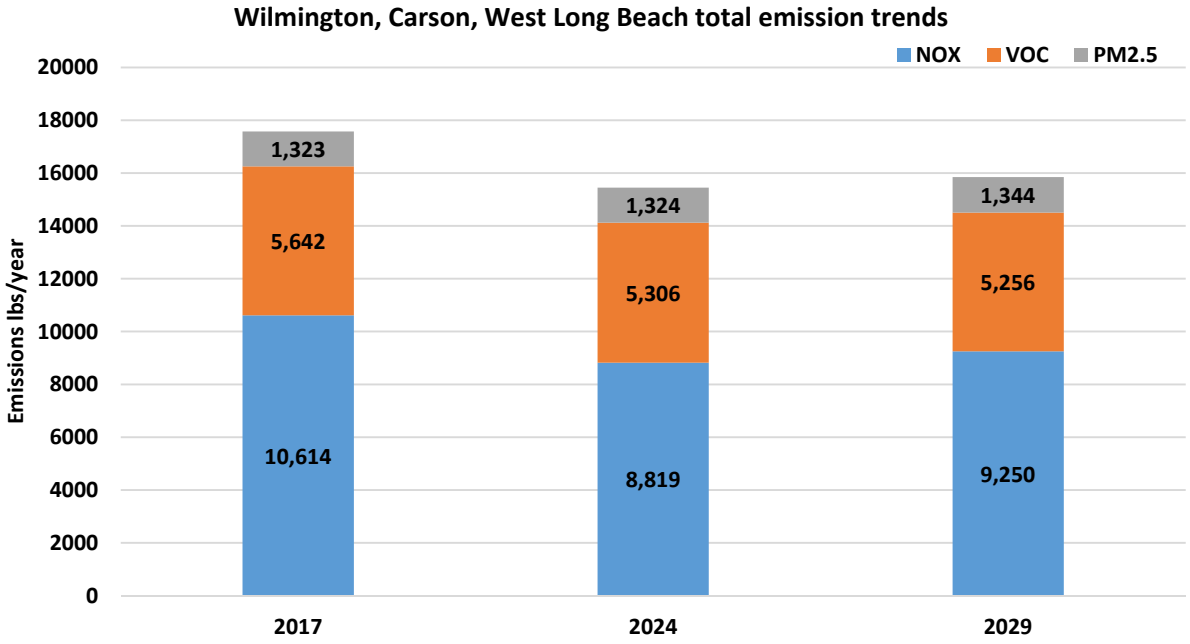

Figure 12. The community total emission trends for NOx, VOC & PM (tons/year) for the years 2017, 2024 and 2029

Trends for TAC emissions are displayed in **Figure 13**. DPM continues to dominate the TACs emission inventory in the future years despite a significant reduction in DPM from heavy-duty trucks. DPM emissions decrease by 16% between 2017 and 2024, but increases by 9% between 2024 and 2029. Tables showing detailed emissions of CAPs and TACs are provided in the Appendix 3b. The increasing trend after 2024 for DPM is mainly driven by the increase in ports activity and associated OGV emissions. 1,3-butadiene is the second largest compounds of TACs, and its emissions decline slightly due to reductions in emissions from vehicles. The third largest contributor to TACs is Cr^{6+}, whose emissions increase slightly from 2017 to 2029, due to increases in brake wear emissions and projected industrial activity growth. Benzene and formaldehyde emissions decrease during the 12 year period due to decreases in the emissions from vehicles, whereas emissions from metals (i.e., cadmium, nickel, arsenic and lead), show a slight increasing trend due to projected industrial activity growth.

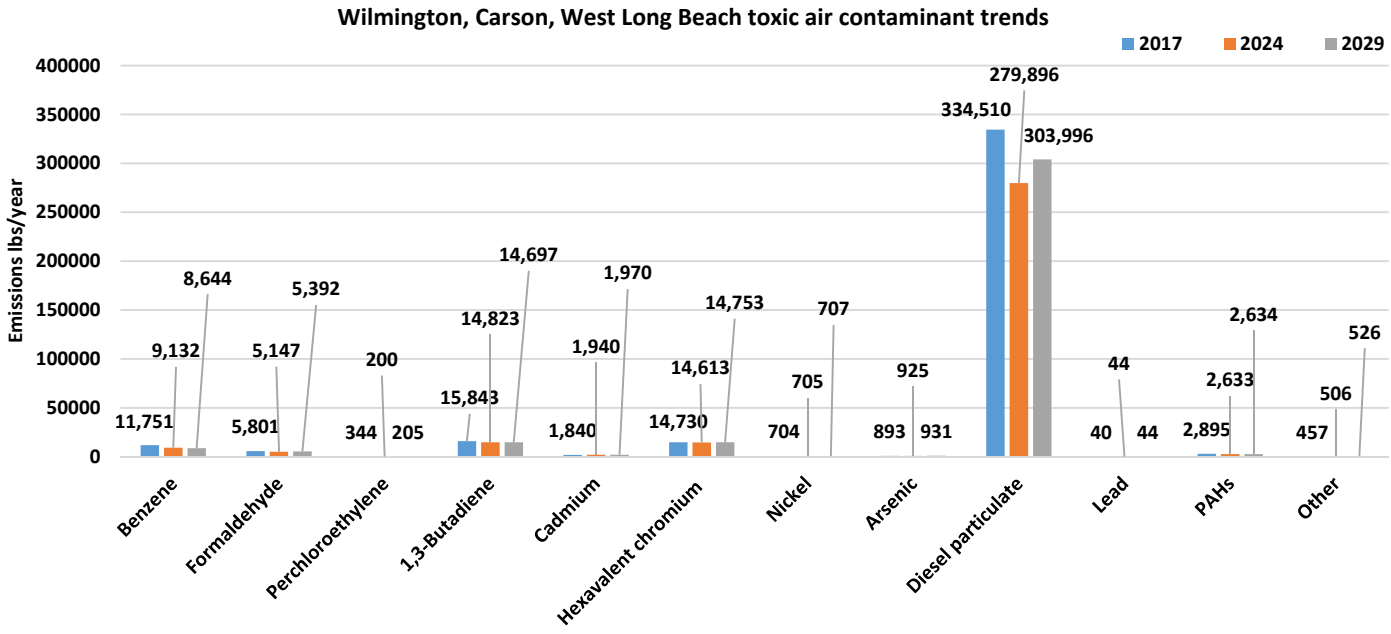

Figure 13. The community total emission trends for toxic air contaminants for the year of 2017, 2024 and 2029 (shown in lbs/year, weighted by air toxics cancer risk)

Figure 14 presents the cumulative TAC emissions by the major categories for the base and two future milestone years. The overall cancer-risk-weighted emissions decrease between 2017 and 2024, but the overall emissions increase between 2024 and 2029. In particular, diesel heavy duty trucks and off-road equipment decrease substantially over the first 7 years, driving the downward trend of the overall TAC emissions. However, the steady increase in emissions from ships brings the overall emissions up after 2024.

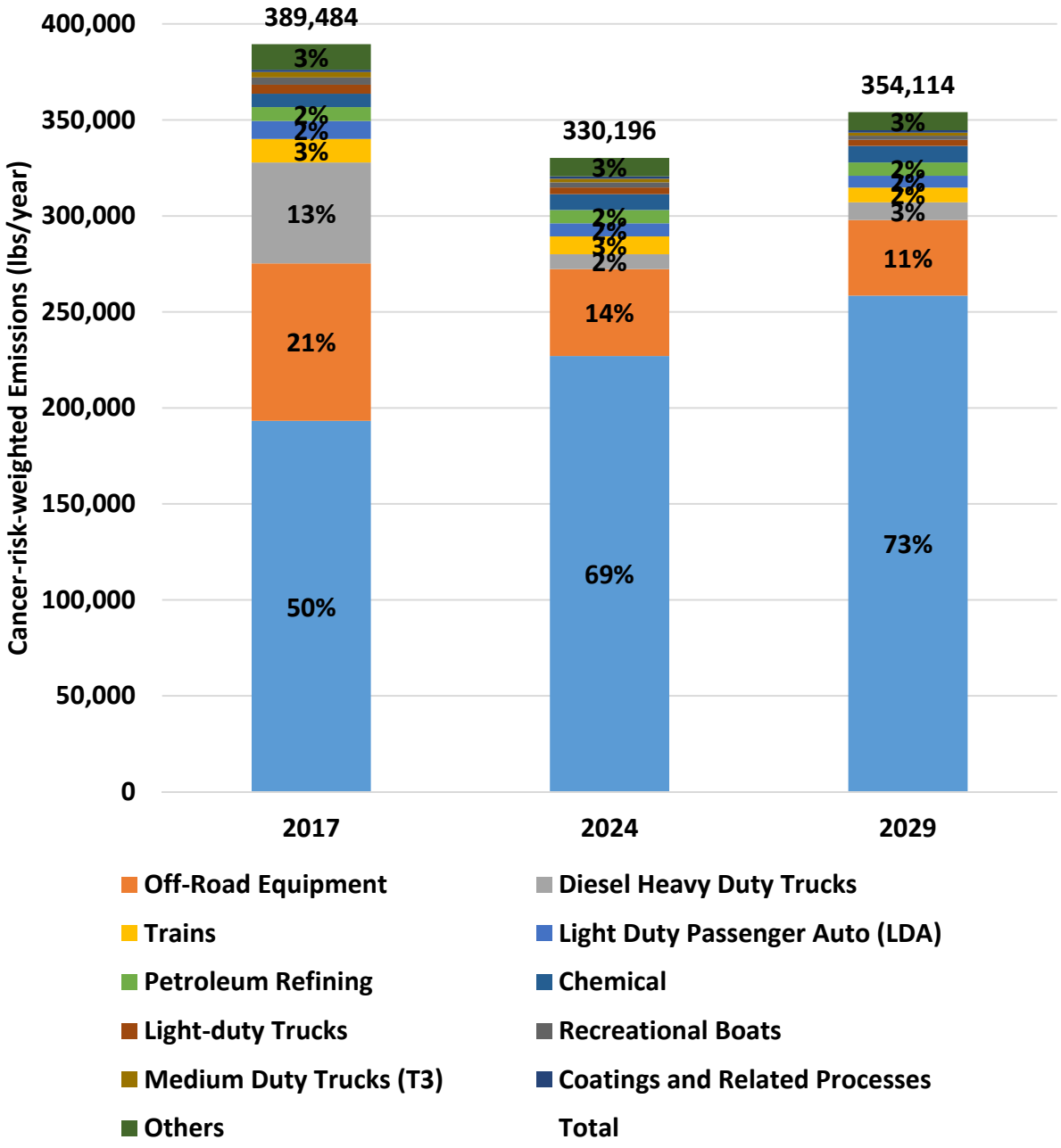

Figure 14. Toxic air contaminant emissions from all sources in the Wilmington, Carson, West Long Beach community, shown by major categories. Emissions are weighted based on their cancer risk relative to DPM.

3.2 Stationary and Area Sources

The trends in total emissions of NOx, VOC and PM2.5 from stationary and area sources in this community are shown in **Figure 15**. NOx emissions are expected to decline from 2017 to 2024

due to the emission reductions from RECLAIM facilities[7]. VOC and PM2.5 emissions are expected to grow gradually due to the projected growth in population and economic and industrial activities.

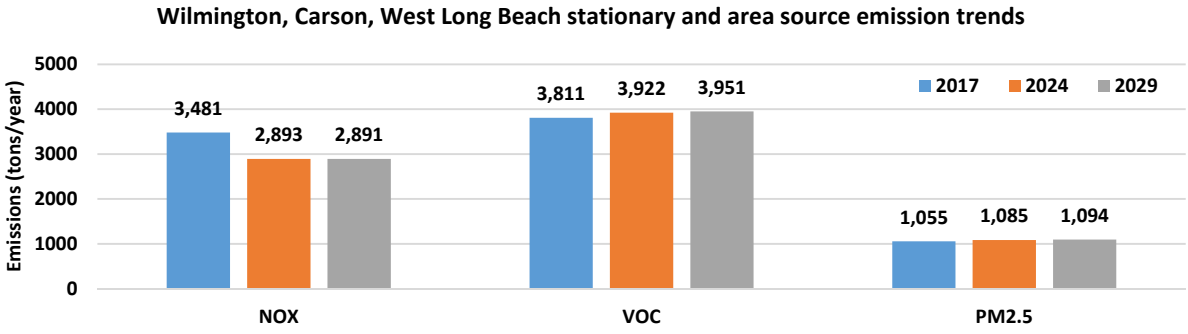

Figure 15. Trends in NOx, VOC and PM2.5 emissions from stationary and area sources in the Wilmington, Carson, West Long Beach community. Emissions are shown in tons per year.

While the total amount of emissions change in the future years, the relative contributions from the various industrial source categories to the total emissions are not expected to change significantly. In this community, petroleum refining and marketing and fuel combustion are expected to continue as the dominant sources of VOC and PM2.5 emissions, respectively, in both future milestone years.

Emissions of 1,3-butadiene and hexavalent chromium are the largest contributors to total air toxics emissions from area and stationary sources (**Figure 16**), and are expected to rise between 2017 and 2029 due to industrial activity growth during the period. Emissions of other TACs that are primarily emitted from industrial activities, i.e., formaldehyde, cadmium, arsenic, nickel, and lead, are also expected to increase due to industrial growth. Only PAHs, benzene, and perchloroethylene emissions decrease. Similar to 2017, the main source of 1,3-butadiene emissions is from industrial processes, or more specifically, emissions attributed to the chemical industry.

[7] NOx RECLAIM is an emission cap-and-trade program that includes lager stationary sources located in the Basin. The current regulation, Rule 2002 requires 12 tons per year of NOx emission reductions from 2016 to 2022. When the rule is fully implemented in 2022, no significant changes in NOx are expected except for a slight increase from 2024 to 2029 due to the growth in economic, industrial, and commercial activities. The 2016 AQMP includes a control measure to target an additional 5 tons per year of NOx reduction from the RECLAIM facilities by 2031. The impact of the additional "NOx shave" is not reflected in the community inventory since December 2015 was the cut off for stationary source regulations to reflect on the inventory. The rulemaking to achieve additional 5 TPD NOx is still ongoing and will be reflected on the inventory when it is finalized.

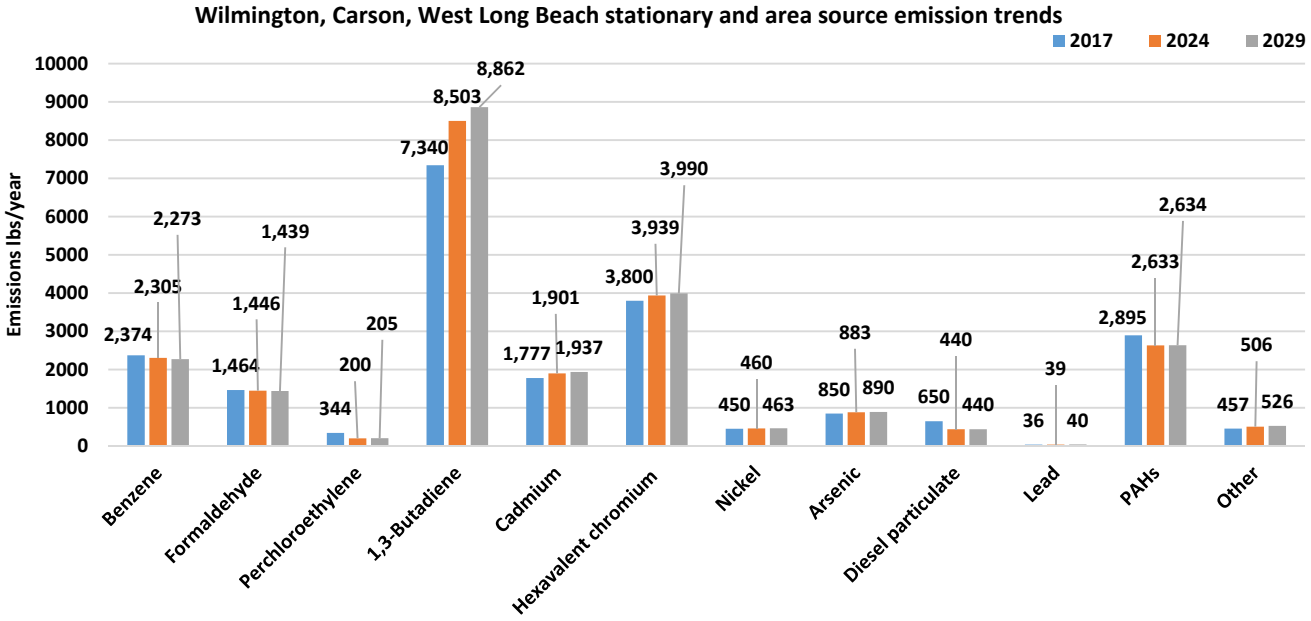

Figure 16. Trends in toxic air contaminant emissions from stationary and area sources in the Wilmington, Carson, West Long Beach community (shown in lbs/year, weighted by air toxics cancer risk)

3.3 On-road mobile sources

Trends for on-road emissions of CAPs are presented in **Figure 17**. On-road emissions are expected to decline significantly between 2017 and 2024, due to the turnover of light-duty vehicles and heavy duty trucks to cleaner vehicles. After 2024, passenger vehicles continue to become cleaner and overall emissions continue to decline, despite a continuous increase in vehicle miles traveled (VMT) for all vehicle types through the year 2029 (**Table 1**). On the other hand, increases in heavy-duty truck activity offsets the gains from regulations on heavy-duty trucks after 2024. As a result, overall NOx emissions from on-road sources increase slightly between 2024 and 2029.

VOC emissions are expected to decline for all vehicle types except for motorcycles, whose emissions grow steadily between 2017 and 2029. PM2.5 emissions are expected to decline for all vehicle types between 2017 and 2024. After 2024, the effect of vehicle regulations on light-, medium- and heavy-heavy duty trucks will be offset by their activity growth (**Table 1**), resulting in an increase in emissions of PM2.5 from heavy-duty trucks, while passenger vehicle emissions of PM2.5 continue to decline. As a result, overall emissions of PM2.5 from all vehicles combined remain unchanged between 2024 and 2029.

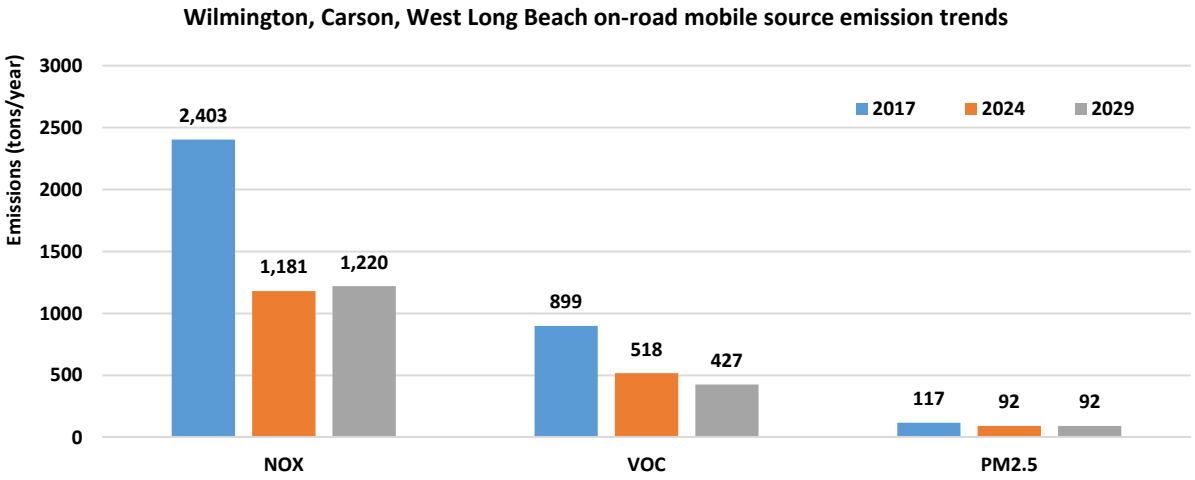

Figure 17. Trends in NOx, VOC and PM2.5 emissions from on-road mobile sources in the Wilmington, Carson, West Long Beach community. Emissions are shown in tons per year.

While NOx and VOC emissions decrease substantially with time, PM2.5 emissions decrease at a slower rate. On-road mobile PM2.5 emissions come from two separate processes – exhaust from fuel combustion and tire and brake wear. Emissions from tail pipe exhaust decrease due to regulations. However, tire and brake wear emissions are proportional to vehicle miles traveled (VMT), which are expected to increase during this time period due to economic and population growth. Therefore, the contribution of tire and brake wear to total PM emissions is expected to grow in the future. This growth in PM emissions from tire and brake wear offsets the decreases in PM emissions from vehicle exhaust due to regulation.

Table 1. Trends in VMT (vehicle miles traveled) from on-road mobile sources in the Wilmington, Carson, West Long Beach community

	Vehicle Categories					
Year	Light and Medium Duty	Light-Heavy Duty	Medium-Heavy Duty	Heavy-Heavy Duty	Buses	Total
2017	9,978	248	214	334	80	10,854
2024	10,029	244	259	409	77	11,017
2029	10,710	275	311	512	83	11,891

Unit in 1000 miles

The trends in TAC emissions from on-road sources within the WCWLB community is shown in **Figure 18**. In 2017, DPM is the major contributor to air toxics cancer risk, followed by hexavalent chromium. However, regulations on heavy-duty diesel trucks reduce the on-road DPM emissions drastically between 2017 and 2024. Beyond 2024, the decreases in DPM emissions due to regulations levels off, and DPM emissions are expected to increase slightly due to continued increases in VMT. Hexavalent chromium emissions are predominantly from tire and brake wear, which is directly related to VMT, with a small contribution from fuel combustion. Because VMT from vehicles are expected to increase, emissions of hexavalent chromium are also expected to increase from this source. However, it is important to note that there is uncertainty in the amount of hexavalent chromium emissions associated with vehicular activities, especially in brake wear. While the emission factors need further evaluation, the increase in VMT would still certainly contribute to the increase in vehicular emissions. Benzene and 1,3-butadiene emissions are projected to decline due to reductions in evaporative emissions and in vehicle exhaust emissions, respectively.

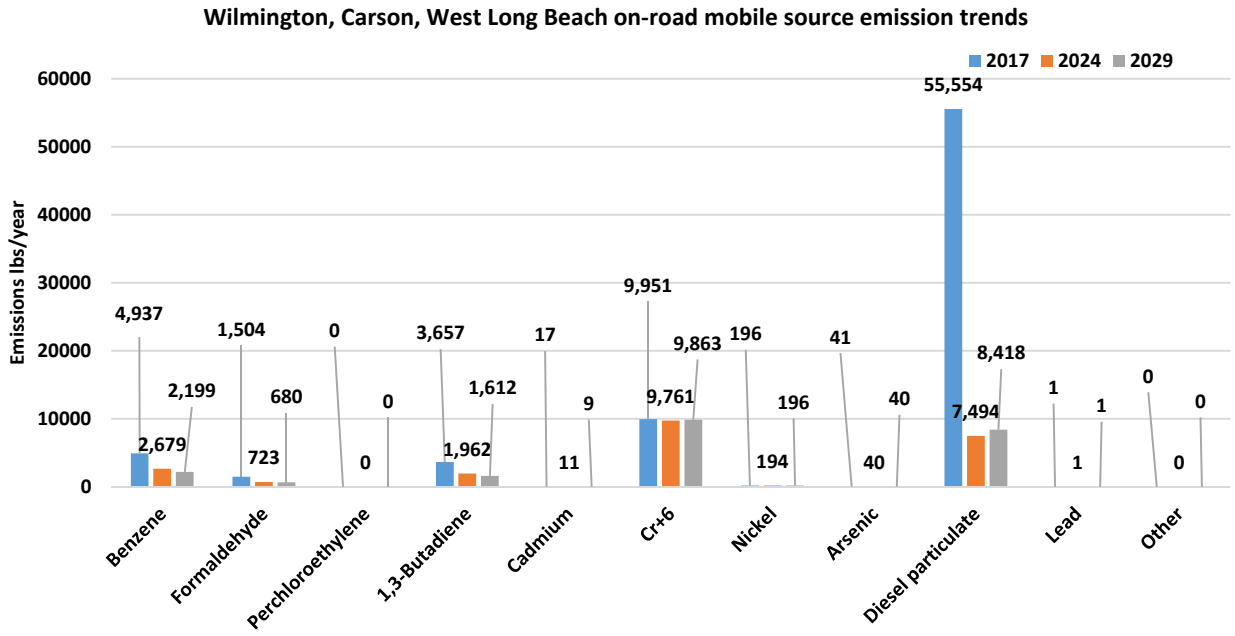

Figure 18. Trends in toxic air contaminant emissions from on-road mobile sources in the Wilmington, Carson, West Long Beach community (shown in lbs/year, weighted by air toxics cancer risk)

3.4 Off-road mobile sources

Trends in emissions of NOx, VOC, and PM2.5 from off-road sources in the WCWLB community are presented in **Figure 19**. The increase in NOx emissions is mainly driven by the projected increase in port activities, and, in particular, from OGVs. VOC and PM emissions associated with OGVs are also expected to increase over this time period. However, due to the steady decrease of VOC and PM emissions from commercial and industrial off-road equipment over this time period, the overall VOC and PM2.5 emissions from off-road sources decrease between 2017 and 2024 and increase between 2024 and 2029.

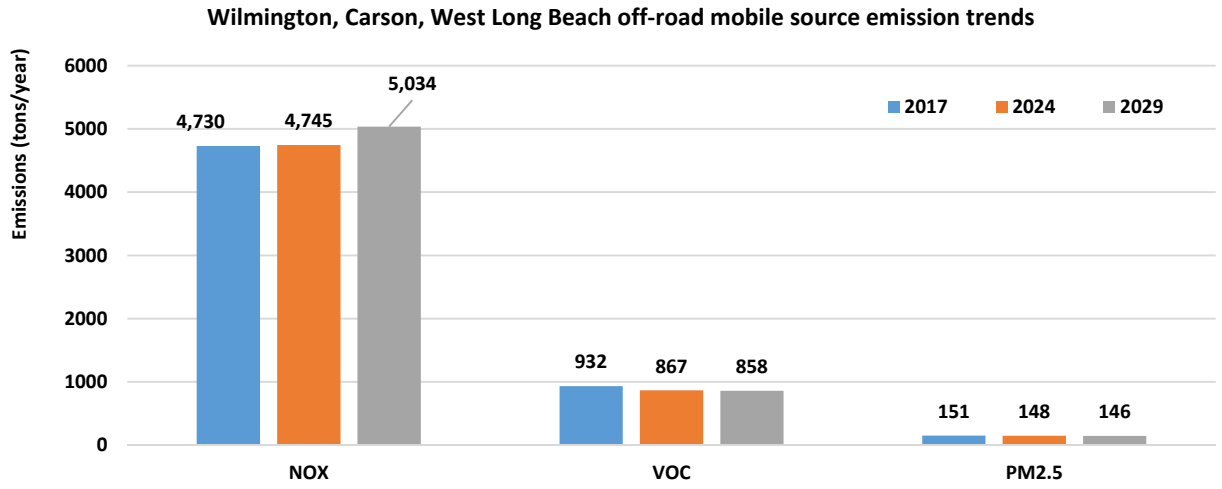

Figure 19. Trends in NOx, VOC and PM25 emissions from off-road mobile sources in the Wilmington, Carson, West Long Beach community. Emissions are shown in tons per year.

The relative contribution of the various off-road sources remain relatively stable from 2017 to 2029. OGV emissions continue being the largest contributor to total PM2.5 emissions in the community throughout 2029, and off-road equipment continues to be the largest source of VOC emissions throughout 2029.

Trends in TACs emission from off-road sources are presented in ***Figure 20***. Emissions of TAC from off-road sources in 2024 and 2029 are still expected to be dominated by DPM emissions, primarily from OGVs and off-road equipment. DPM emissions will decrease between 2017 and 2024 and increase from 2024 to 2029, due to the combined effects of increased OGV activity and decreased emissions from off-road equipment. While benzene and 1,3-butadiene emissions decrease between 2017 and 2024, the projected increase in industrial activity through 2029 offsets the effect of regulations shown in the 2017-2024 period. The emissions of the rest of relevant TACs are projected to decline as a result of regulations.

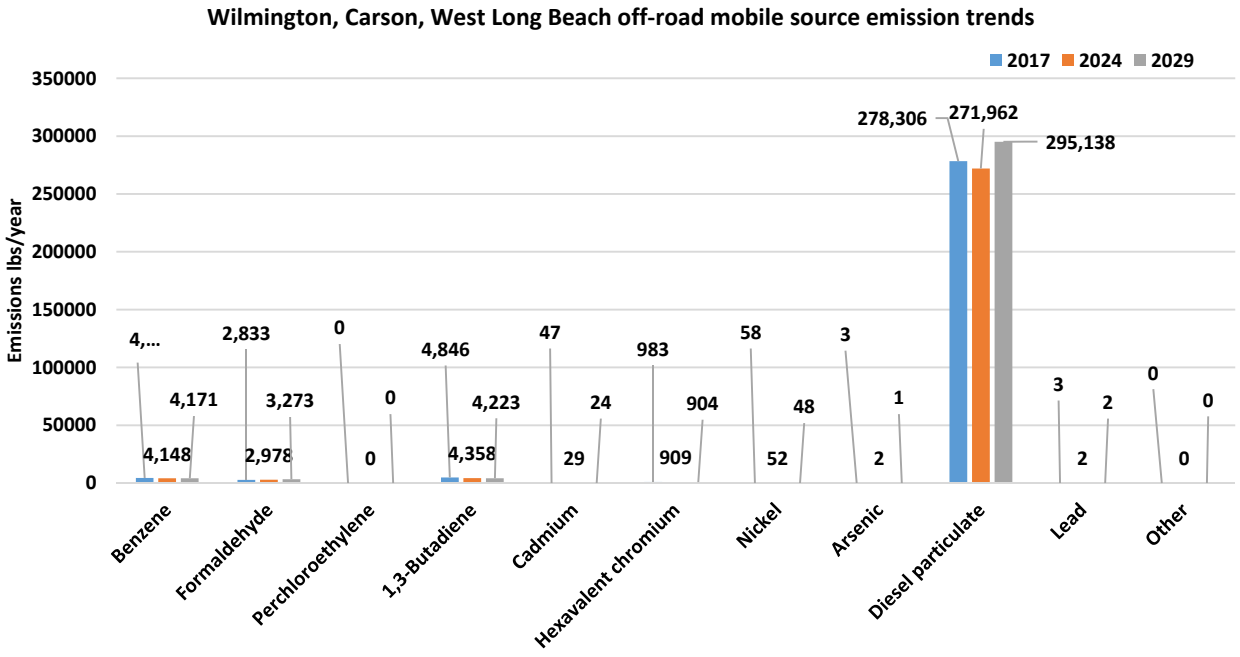

Figure 20. Trends in toxic air contaminant emissions from off-road sources in the Wilmington, Carson, West Long Beach community (shown in lbs/year, weighted by air toxics cancer risk)

4. Summary

The WCWLB community is the home of the busiest international ports in Unites States. The main sources of air pollution emissions in this community are from goods movement activities, including OVGs, off-road diesel equipment, heavy-duty trucks, trains and cargo handling equipment. This community also includes several refineries and other large industries, which contribute to the overall emissions of criteria air pollutants and toxic air contaminants.

The source attribution analysis shows that DPM from diesel exhaust is the largest contributor to TAC emissions in WCWLB community. DPM is emitted mostly from off-road and on-road mobile sources, with OGVs and heavy-duty trucks being the largest emitters. The second largest component of TAC emissions is 1,3-butadiene, mainly from the chemical industry. Hexavalent chromium is also an important TAC in this community. DPM emissions associated with heavy-duty trucks are expected to decrease due to existing regulations. However, due to the projected increase in OGV emissions from port-related activities, overall DPM emissions are expected to increase in future years. Moreover, 1,3-butadiene and hexavalent chromium emissions from stationary and area sources are expected to increase slightly due to projected industrial growth.

NO_X emissions in this community are dominated by off-road sources, with OGVs being the largest contributor. VOC and TOG emissions are dominated by petroleum productions and marketing from area and stationary sources. Consumer products is the second largest source of VOCs from area and stationary sources. Passenger vehicles and off-road equipment (e.g., lawn mowers, commercial and industrial equipment) are the largest contributor to VOC emissions from on-road and off-road mobile sources, respectively. The largest contributors to PM2.5 emissions from point sources are fuel combustion and petroleum refining. Commercial cooking and residential fuel combustion are the largest sources of PM2.5 from areas sources. Passenger vehicles and OGV are the largest contributors to on-road and off-road sources, respectively.

Future NOx emissions in this community are expected to decrease due to regulations on mobile sources and emission reduction commitments for point sources, including reductions from the RECLAIM program.