

# Analysis of Refinery Chemical Emissions and Health Effects

March 2019 Report Fact Sheet

Office of Environmental Health Hazard Assessment  
California Environmental Protection Agency



## What does this report do?

This report, “Analysis of Refinery Chemical Emissions and Health Effects,” presents a list of chemicals emitted from California refineries and prioritizes the chemicals according to their emissions levels and toxicity. The report covers emissions that occur routinely in daily operations, as well as accidental and other non-routine emissions. This report does not attempt to estimate exposures or health risks in communities, but is instead a compendium of information, including health information, that may be useful for considering which chemicals to monitor near facilities, conducting emergency responses, and other efforts.

## Why was this report prepared?

The Office of Environmental Health Hazard Assessment (OEHHA) has collaborated with the California Air Resources Board (CARB) and the California Environmental Protection Agency’s Interagency Refinery Task Force to develop information on chemicals emitted from refineries and their health effects. This information can support CARB and other groups in developing plans for air monitoring in the vicinity of refineries in California. In the event of a refinery emergency, knowledge of health guidance values (that provide information on the toxicity of chemicals) and emissions of chemicals can also help emergency responders characterize potential health effects that may occur following a chemical release.

## What are the key findings?

The report identifies 188 chemicals emitted from California refineries. There are large variations in the frequency, amounts and toxicity of the emitted chemicals. There is generally good information for understanding the toxicity of the identified emitted chemicals:

- Each of the 14 chemicals with routine emissions greater than 10,000 pounds per year statewide has an OEHHA Reference Exposure Level (REL), which is a level of exposure that is not anticipated to cause non-cancer health effects. OEHHA did not attempt to determine whether or how often these exposure levels may have been exceeded in areas near refineries.
- 107 chemicals have at least one health guidance value from OEHHA or the US Environmental Protection Agency (US EPA), and 94 chemicals have at least one emergency exposure value to evaluate the harm of large unanticipated releases. Overall, 46 of the listed chemicals have none of the types of health guidance values described here; however, the absence of health guidance values does not necessarily mean that the chemicals are not hazardous. These chemicals are generally released in much lower quantities than those with guidance values.

Of the 188 chemicals identified as emitted from California refineries, the chemicals listed on the next page are the top candidates for air monitoring, based on their toxicity, average levels of emissions from refineries statewide, and involvement in multiple refinery processes and incidences.

OEHHA also derived a “toxicity-weighted” emissions score for each chemical for which emissions data were available for all refineries across California. OEHHA calculated the toxicity-weighted emissions scores using emissions data (pounds emitted per year) obtained from the Air Toxics ‘Hot Spots’ Emissions Inventory database (CEIDARS) for 2014, and a toxicity weight derived from US EPA’s Inhalation Toxicity Scores for individual chemicals. The candidate chemicals that had high calculated toxicity-weighted emissions are noted in the candidate list below with an asterisk (in alphabetical order).

An important consideration for air monitoring at individual refineries is that the candidate chemicals will differ based on location as well as year. Some top-candidate chemicals are only released in small amounts from individual refineries.

Finally, the release of these chemicals from refineries does not necessarily mean that local communities face substantial exposures or significant health risks. However, it does increase their likelihood of exposure. Air monitoring of these chemicals may inform decisions that could reduce exposures.

***Candidates for air monitoring. These were not further ranked or prioritized.***

- acetaldehyde\*
- ammonia\*
- benzene\*
- 1,3-butadiene\*
- cadmium\*
- diethanolamine\*
- formaldehyde\*
- hydrogen fluoride
- hydrogen sulfide\*
- manganese\*
- naphthalene\*
- nickel\*
- nitrogen oxide
- polycyclic aromatic hydrocarbons (PAH)\*
- particulate matter (PM)
- sulfur dioxide
- sulfuric acid
- toluene

**Where can one access the full report?**

[Link to full report "Analysis of Refinery Chemical Emissions and Health Effects" \(pdf\)](#)

[Link to OEHHA webpage for about the refinery report](#)