EPA Review of Available Documents and Rationale in Support of Final Emissions Factors and Negative Determinations for Flares, Tanks, and Wastewater Treatment Systems

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U.S. Environmental Protection Agency
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Table of Contents

Page

List of Figures

List of Tables

Section 1
Summary

On May 1, 2013, Air Alliance Houston, Community In-Power and Development Association, Inc. (CIDA), Louisiana Bucket Brigade, and Texas Environmental Justice Advocacy Services (TEJAS) (collectively, "Plaintiffs") filed a lawsuit against the U.S. Environmental Protection Agency (EPA) alleging that the EPA had failed to review and, if necessary, revise emissions factors at least once every three years as required in Section 130 of the Clean Air Act (CAA). Air Alliance Houston, *et al.* v. McCarthy, No. 1:13-cv-00621-KBJ (D.D.C.). In the complaint, which is included as Appendix A to this report, the Plaintiffs sought to compel the EPA to expeditiously complete a review of the volatile organic compounds (VOC) emissions factors for industrial flares ("flares"), liquid storage tanks ("tanks"), and wastewater collection, treatment and storage systems ("wastewater treatment systems"), and, if necessary, revise these factors. In Paragraphs 35 and 36 of their complaint, the Plaintiffs cited several reports and studies that allegedly show VOC emissions from flares, tanks, and wastewater treatment systems "can be several orders of magnitude higher than AP-42 emissions factor estimates." Complaint, ¶ 36. The reports cited in the complaint are listed in Table 1-1 in the order in which they were cited.

Table 1-1. Scientific Studies Cited in the May 2013 Complaint

Ref No.	Cited Document	Study Type
1	Patrick Milligan, Frank Martinsky, Kevin Good, and Bill Nelson, Office of Inspector General, *Evaluation Report: EPA Can Improve Emission Factors Development and Management*, Report No. 2006-P-0017 (2006). Available at: http://www.epa.gov/oig/reports/2006/20060322-2006-P-00017.pdf	Review
2	Brenda Shine, EPA/SPPD. Memorandum to EPA Docket No. EPA-HQ-OAR-2003-0146 dated July 27, 2007. *Potential Low Bias of Reported VOC Emissions from the Petroleum Refining Industry.* Available at http://www.regulations.gov/, search for EPA-HQ-OAR-2003-0146-0010.	Review
3	David T. Allen and Vincent M. Torres, Univ. of Tex. at Austin, Ctr. Energy & Envtl. Res., *TCEQ 2010 Flare Study Final Report* (2011), available at www.tceq.texas.gov/assets/public/implementation/air/rules/Flare/2010flarestudy/2010-flare-study-final-report.pdf	Passive FTIR
4	David Randall & Jeff Coburn, EPA, EPA 453/R-10-002, *Critical Review of DIAL Emission Test Data for BP Petroleum Refinery in Texas City, Texas*, at ES-2 tbl. 1 (2010), [BP Texas City, TX] available at www.epa.gov/airtoxics/bp_dial_review_report_12-3-10.pdf	DIAL

Ref No.	Cited Document	Study Type
5	Loren Raun & Dan W. Hoyt, Bur. Pollution Control & Prevention, City of Houston, *Measurement and Analysis of Benzene and VOC Emissions in the Houston Ship Channel Area and Select Major Stationary Sources Using DIAL (Differential Absorption Light Detection and Ranging) Technology to Support Ambient HAP Concentrations Reductions in the Community (DIAL Project)* (2011), [Shell Deer Park, TX] available at www.greenhoustontx.gov/dial20110720.pdf	DIAL
6	Marathon Petroleum Co., LLC, *Performance Test of a Steam-Assisted Flare with Passive FTIR* (May 2010), available at www.tceq.texas.gov/assets/public/implementation/air/rules/Flare/2010flarestudy/mpc-txc.pdf	Passive FTIR
7	Marathon Petroleum Co., LLC, *Performance Test of a Steam-Assisted Elevated Flare with Passive FTIR –Detroit* (2010), available at www.tceq.texas.gov/assets/public/implementation/air/rules/Flare/2010flarestudy/mpc-detroit.pdf	Passive FTIR
8	Flint Hills resources Port Arthur, LLC, *PFTIR Test of Steam-Assisted Elevated Flares–Port Arthur* (2011), available at www.epa.gov/compliance/resources/publications/civil/programs/caa/portarthur-report.pdf	Passive FTIR
9	Allan Chambers & Mel Strosher, Alberta Research Council, Inc., *Refinery Demonstration of Optical Technologies for Measurement of Fugitive Emissions and for Leak Detection* (2006), available at www.environmentalintegrity.org/pdf/publications/EIP_Att_D_Total_Upset.pdf	DIAL

EPA entered into a consent decree with the Plaintiffs to settle the lawsuit. Under the terms of the consent decree, by August 19, 2014, EPA was to review and either propose revisions to the VOC emissions factors for flares, tanks and wastewater treatment systems under CAA section 130 or propose a determination under CAA section 130 that revision of these emissions factors is not necessary. On August 19, 2014, EPA proposed new VOC emissions factors for flares and proposed a determination that it was not necessary to revise the VOC emissions factors for tanks and wastewater treatment systems. By April 20, 2015, EPA must issue final revisions to the VOC emissions factors for flares, tanks and wastewater treatment systems or issue a final determination that revision of these emissions factors is not necessary. EPA posted the proposed and final revision and determinations on its website on the dates indicated above.

There are two basic types of cited reports listed in Table 1-1:

1. "Review" studies summarize information from a number of other studies but do not provide any specific new measurement data.
2. "Measurement" studies that contain measurement data for a single emissions source or for a variety of different emissions sources at a refinery. Measurement reports include studies using differential absorption lidar (DIAL) and passive Fourier transform infrared spectrometer (FTIR).

EPA reviewed each of the cited reports as well as other studies identified during the emissions factor review process to determine if the data provided in the available reports could be used to support emissions factor development (or to support no revisions to certain emissions factors). Section 2 describes the "Review" studies and Section 3 provides a brief overview of the various types of measurement methods available and used in the "Measurement" studies to provide the reader some background information to better understand available measurement study emissions data. Sections 4, 5, and 6 present and discuss the study results for flares, tanks, and wastewater treatment systems, respectively. Section 7 provides conclusions regarding all of these reports and the EPA's final determinations regarding whether revisions of the VOC emissions factors for flares, tanks and wastewater treatment systems are necessary.

While the reports reviewed provide valuable information regarding the potential emissions from petroleum refineries and process units, the data from these studies cannot be used for emissions factor development for tanks and wastewater treatment systems due to (1) the lack of operational data by which to normalize the emissions rates, (2) the fact that many of the measurements do not isolate one particular emissions source and/or (3) the fact that the studies did not attempt to characterize the range of normal operating conditions. Based on our review of the data, EPA has determined that it is not necessary to revise the AP-42 emissions factors for tanks and wastewater treatment systems at this time. EPA has determined that it is possible to form emissions factors for certain pollutants for flares using DIAL, extractive measurements, and passive FTIR data. EPA has determined that it is necessary to revise the AP-42 VOC emissions factor for flares and has included the final revision in Section 13.5 of AP-42.

Section 2
Review Studies

Plaintiffs cited two review studies to support the allegation that "[t]he EPA has acknowledged, and scientific studies show, that the AP-42 emissions factors for flares, tanks, and wastewater treatment systems significantly underestimate VOC emissions from these processes." Complaint, ¶ 35.

2.1 Office of Inspector General Review

The Office of Inspector General (OIG) Review (Ref No. 1 in Table 1-1) ("OIG Review") "sought to determine whether the air emissions factors used by the Environmental Protection Agency (EPA) are of acceptable quality for making key environmental decisions, and whether EPA's process for developing, improving, and rating emissions factors is sufficient to meet users' needs." The report provides the following recommendations:

- Develop emissions factors guidance that addresses the development and appropriate use of emissions factors for non-inventory purposes.
- Establish a rating system that provides the quantitative range of uncertainty for emissions factors for both inventory and non-inventory purposes.
- Work with industry, State and local agencies, and others to leverage available resources for meeting increasing demands for new factors.
- Establish a workgroup to develop a comprehensive strategic plan for the Emissions Factors Program and ensure that requested resources are used to achieve program goals.

The OIG Review notes that EPA has increased the number of rated emissions factors included in AP-42 from 8,838 in 1996 to 17,110 in 2004, but it also notes that the majority of AP-42 emissions factors still have a below average (D) or poor (E) rating factor. In 1996, 56 percent of the AP-42 emissions factors were rated D or E, while 62 percent of the emissions factors were rated D or E in 2004. Thus, while the report notes that the EPA has made progress in developing rated emissions factors, the quality of the emissions factors remains low.

The OIG Review also highlights the point that AP-42 emissions factors are intended for use in wide-area emissions inventories and should be used only as a last resort when developing site-specific emissions estimates. The OIG Review described the misuse of AP-42 emissions factors in situations such as setting permit emissions limits and estimating a facility's potential to emit. The introduction to AP-42 (EPA, 1995) includes the following recommendations and limitations on the use of emissions factors:

- "Data from source-specific emission tests or continuous emission monitors are usually preferred for estimating a source's emissions because those data provide the best representation of the tested source's emissions."
- "Emission factors in AP-42 are neither EPA-recommended emission limits (e. g., best available control technology or BACT, or lowest achievable emission rate or LAER) nor standards (e. g., National Emission Standard for Hazardous Air Pollutants or NESHAP, or New Source Performance Standards or NSPS). Use of these factors as source-specific permit limits and/or as emission regulation compliance determinations is not recommended by EPA. Because emission factors essentially represent an average of a range of emission rates, approximately half of the subject sources will have emission rates greater than the emission factor and the other half will have emission rates less than the factor. As such, a permit limit using an AP-42 emission factor would result in half of the sources being in noncompliance."
- "If representative source-specific data cannot be obtained, emissions information from equipment vendors, particularly emission performance guarantees or actual test data from similar equipment, is a better source of information for permitting decisions than an AP-42 emission factor. When such information is not available, use of emission factors may be necessary as a last resort. Whenever factors are used, one should be aware of their limitations in accurately representing a particular facility, and the risks of using emission factors in such situations should be evaluated against the costs of further testing or analyses."

The OIG Review highlighted three industries for which emissions factors were considered unacceptable for the decisions being made, one of which was petroleum refineries. For petroleum refineries, the report cites a *Texas 2000 Air Quality Study* (TNRCC, 2000) ("TRNCC Study") that compared ambient measurements of VOC concentrations with those

projected by emissions inventory estimates. According to the OIG, the TNRCC Study found that VOC emissions were under-reported, primarily due to under-reporting for flares, process vents, cooling towers, and process equipment leaks. Based on the TNRCC Study, Texas revised its emissions estimation guidelines and thereby improved its emissions inventory. Based on the improved emissions inventory, Texas revised its State Implementation Plan to include goals for VOC emissions reductions and to relax the previous goal for NOx emissions reductions. In this example, AP-42 emissions factors were being used for a wide-area emissions inventory, so their application was not necessarily incorrect, but reliance solely on AP-42 emissions factors rather than more detailed site-specific information resulted in an inaccurate assessment of what was needed in order to meet ozone air quality standards. The OIG review noted that Philadelphia and California's Bay Area Air Quality Management District found similar issues with their inventories. Philadelphia then adopted the guidelines developed by the Texas Commission on Environmental Quality (TCEQ) to improve their emissions inventory and the Bay Area Air Quality Management District issued a new rule [Regulation 12 Rule 11, which required monitoring flare vent gas flow and composition] to obtain more accurate emissions data.

As the OIG Review does not contain any emissions measurement data or recommended emissions factors, we reviewed the current TCEQ emissions inventory guidelines (TCEQ, 2013) ("TCEQ Guidelines") to better understand the emissions inventory improvements cited in the OIG review. The TCEQ Guidelines contained improved instructions on how to estimate emissions and when and how to use AP-42 emissions factors (including instructions for using the TANKS model), but in most cases the TCEQ Guidelines did not provide revised emissions factors. For example, the TCEQ Guidelines for estimating emissions from cooling towers is to use measured VOC concentrations and water recirculation rates to estimate cooling tower emissions. If VOC concentration data in the cooling water are not available, then the TCEQ Guidelines specify that the uncontrolled AP-42 emissions factor should be used. Based on these guidelines, the controlled AP-42 emissions factor should never be used. However, in the absence of these guidelines, most refineries used the controlled AP-42 emissions factor for cooling towers because they considered monitoring of chemical additive rates or other operating parameters to warrant the use of the controlled cooling towers AP-42 emissions factor (Lucas, 2007).

The one exception to the TCEQ Guidelines not providing revised emissions factors is the table of emissions factors for NOx and CO from flares. TCEQ's revised emissions factors are based on the results of the historical flare study data (circa 1983 and 1985) with which the AP-42 emissions factors were developed (listed as reference 1 of AP-42 Section 13.5). As seen in Table 2-1, the TCEQ Guidelines subcategorized the emissions factors by flare type (steam-assisted versus air-assisted or unassisted) and by heat content of the flare vent gas ("high Btu" versus "low Btu"). The TCEQ Guidelines also provide instructions to use data with high time resolution in order to apply the correct emissions factor. As there were limited data within each subcategory, and these data are quite old, it is questionable whether the subcategorization of these data are statistically justified. Furthermore, as discussed in detail in Section 4 of this document, significantly more data by which to evaluate the NOx and CO flare emissions factors in AP-42 is now available. Finally, these recent studies suggest that, for steam-assisted flares, it is the net heating value of the waste gas/steam mixture in the combustion zone that impacts combustion efficiency and emissions rather than the direct net heating value of the waste gas, which is likely the reason the NOx emissions factor for steam-assisted flares with high Btu content is lower than that for low Btu content.

Table 2-1. TCEQ's Recommended Emission Factors for Flares (TCEQ, 2013)

Contaminant	Assist Type	Waste Gas Stream Net Heating Value[a,b]	Emission Factor
NO_x	Steam	High Btu	0.0485 lb/MMBtu
		Low Btu	0.068 lb/MMBtu
	Air or Unassisted	High Btu	0.138 lb/MMBtu
		Low Btu	0.0641 lb/MMBtu
CO	Steam	High Btu	0.3503 lb/MMBtu
		Low Btu	0.3465 lb/MMBtu
	Air or Unassisted	High Btu	0.2755 lb/MMBtu
		Low Btu	0.5496 lb/MMBtu

[a] High Btu: > 1000 Btu/scf

[b] Low Btu: 192–1000 Btu/scf

Based on our review of the TCEQ Guidelines, the emissions inventory improvements made by Texas were not based on improvements to or replacement of AP-42 emissions factors. The emissions inventory improvements were accomplished through better instructions on how to determine site-specific emissions estimates based on available monitoring data along with specific instructions on how and when to apply the AP-42 emissions factors when site-specific monitoring data are not available. These guidelines effectively implement the recommendations and limitations on the use of AP-42 emissions factors as stated in the AP-42 introduction.

2.2 Shine Review

The Shine Review (Ref No. 2 in Table 1-1) summarized the findings from several studies, including the DIAL Alberta study (Ref. No. 9 in Table 1-1), the TNRCC Study and the OIG Review, that indicated that the refinery emissions inventories may be under-estimating VOC emissions. Key points made in the Shine Review include:

- Emissions inventories generally do not include emissions that occur during process upsets, malfunctions, startups or shutdowns.
- Unusual or unexpected emissions, such as leaks in heat exchange systems that cause high emissions from cooling towers or tank roof landings, are often omitted from emissions inventories.
- Improper characterization of process operating parameters used in emissions estimation methodologies can significantly impact the estimated air emissions.

The Shine Review did not critique or criticize AP-42 emissions factors or AP-42 emissions estimation methodologies, but rather the scope and rigorousness of compiled emissions inventories. The Shine Review also did not present any new emissions factors or data by which new emissions factors could be developed. In efforts to improve refinery emissions inventories to address the issues identified in the Shine review, the EPA funded the development of the *Emission Estimation Protocol for Petroleum Refineries* (RTI, 2011) ("*Refinery Protocol*") to provide guidance on preferred means to develop site-specific air emissions estimates, including methods for estimating emissions during process upsets, malfunctions, startups or shutdowns. Similar to the TCEQ Guidelines and in accord with the AP-42 discussion on the use of AP-42 emissions factors, the *Refinery Protocol* describes a preference for continuous emissions measurement data or site-specific test data, with AP-42 emissions factors used as a last

resort. The EPA required petroleum refineries to submit detailed, site-specific emissions inventories following the methodologies outlined in the *Refinery Protocol* in order to develop an improved emissions inventory for its refinery sector rulemakings, including the risk and technology review and New Source Performance Standards reconsideration (EPA, 2011).

It is also important to note that AP-42 emissions factors were never intended to estimate emissions during periods of startup, shutdown, or malfunction. These events are too random and unique in nature, and can dramatically alter the emissions during normal operating conditions, particularly in the case of a malfunction or bypass of emission control systems. We have provided guidance in the *Refinery Protocol* (RTI, 2011) that emissions from startup, shutdown, and malfunction events should be characterized on a per event basis and should be added to the "normal" emissions estimated using AP-42 emissions factors or other emissions estimation methods when developing an annual emissions inventory (see Sections 11 and 12 of the *Refinery Protocol*).

Section 3
Measurement Method Studies

3.1 DIAL Studies

DIAL is a laser-based measurement method for determining pollutant concentration profiles in the ambient air. The DIAL monitoring system has been used in a variety of studies to measure emissions from petroleum refinery and petrochemical sources. The DIAL studies cited in the complaint are report Ref Nos. 4, 5 and 9 in Table 1-1.

The DIAL monitoring system is typically situated downwind of an emissions source and the laser beam is shot across the emissions plume and pivoted to form a two-dimensional vertical scan plane (see Figure 3.1). Small portions of the light from the laser are backscattered due to particles and molecules in the measurement path. This backscattered light is collected through a telescope system adjacent to the laser and measured via a sensitive light detector. The timing of the received light provides a measure of the distance of the emissions plume.

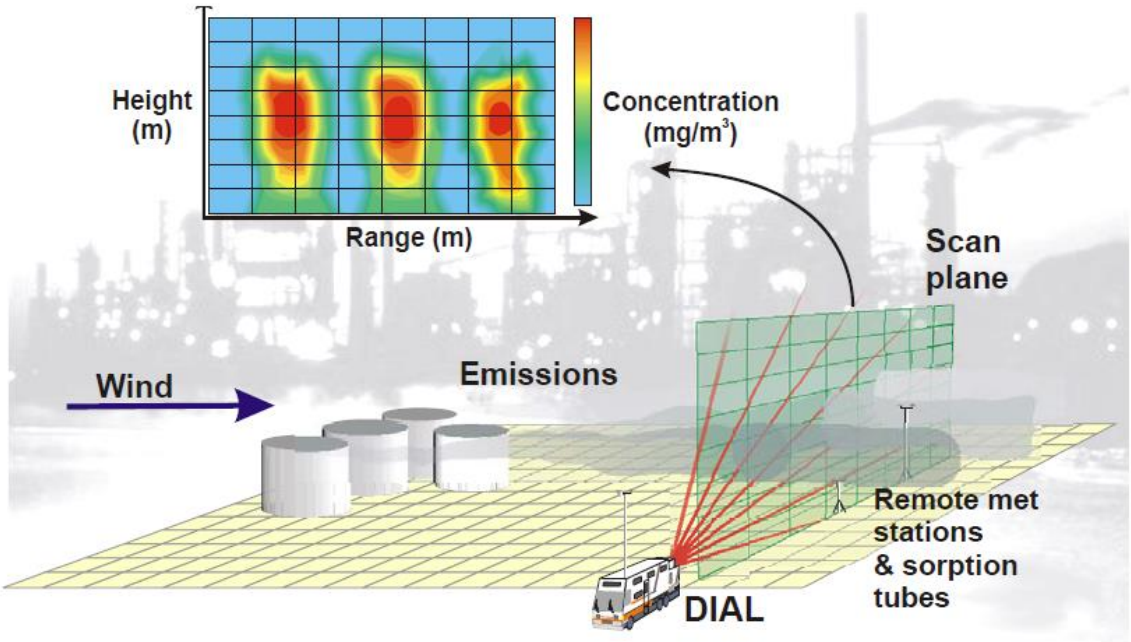

Figure 3-1. Schematic of DIAL System Measuring Emissions (from Chambers and Stosher, 2006).

DIAL measurements can be made specific to one compound, such as benzene, or general for a class of similar compounds, such as saturated hydrocarbons. Two different wavelengths of light are pulsed in quick succession: one wavelength that is absorbed strongly by the pollutant of interest and one of similar wavelength that is not absorbed. The difference in the returned signal strength between these two light pulses provides a measure of the concentration of the pollutant. Thus, a unique advantage of the DIAL monitoring system is that it can provide spatially resolved pollutant concentrations in the two-dimensional scan plane.

Using the DIAL's measured pollutant concentration profile across the scan plane, and site-specific wind speed and direction measurements, it is possible to calculate a mass emissions rate for the pollutant of interest. If the wind speed and direction are too variable during the measurement scan, there can be high uncertainties in the calculated mass emissions rate. Therefore, the ability to accurately measure emissions from an emission source or set of sources using the DIAL instrumentation is dependent on an acceptable wind direction and wind speed conditions. Furthermore, measurement scans close to large objects, such as tanks, can be affected by wind speed changes caused by the large objects. These wind speed changes can create inaccuracies in the DIAL measurements.

At a refinery or petrochemical facility, there are typically multiple emission sources in close proximity. Emissions sources upwind of the DIAL scan plane can contribute to the measured emissions rate; therefore, the DIAL investigator must perform scans upwind of the source of interest to rule out interfering sources. However, depending on the configuration of the plant, the wind direction, and the timing of the measurement scans, it is not always possible to perform upwind scans or to isolate a single emissions source when performing upwind scans. As such, DIAL measurements can include emissions contributions from several sources, and it can be difficult to attribute emissions to particular sources, if upwind scans are not done correctly or if site-specific configurations limit the ability to isolate an emissions source.

A typical measurement scan is about 10-15 minutes in duration, so the method provides good time resolution. Multiple scans can be completed in succession, as long as the wind direction remains consistent. If winds are too variable, only periodic scans can be performed. Measurements made over short time periods may not be representative of average emissions from the source. Therefore, the most useful DIAL data are those where multiple DIAL scans were made at different times to account for variable source operating conditions. For purposes

of emissions factors review, measurements are only useful when the operating conditions of the emitting source at the time of the measurements are known.

The DIAL studies reviewed as part of this document review included the Alberta DIAL Study (Ref No. 9 in Table 1-1), the Houston Area DIAL Study (Robinson et al., 2008), and the Shell DIAL Study (Ref No. 5 in Table 1-1; Raun and Hoyt, 2011).

3.2 Solar Occultation Flux Studies

The Solar Occultation Flux (SOF) method utilizes the sun as the light source, and gas species that absorb in the infrared portion of the solar spectrum are measured from a mobile platform using FTIR (see Figure 3-2). The instrumented vehicle travels along the boundary of a facility and measures the concentration of pollutants at a certain location. This information combined with wind speed data can be used to estimate the total mass rate of emissions from a source. The method can be used to screen and quantify VOC emissions from industrial conglomerates down to sub-areas in individual plants. Figure 3-3 illustrates a typical facility boundary traverse.

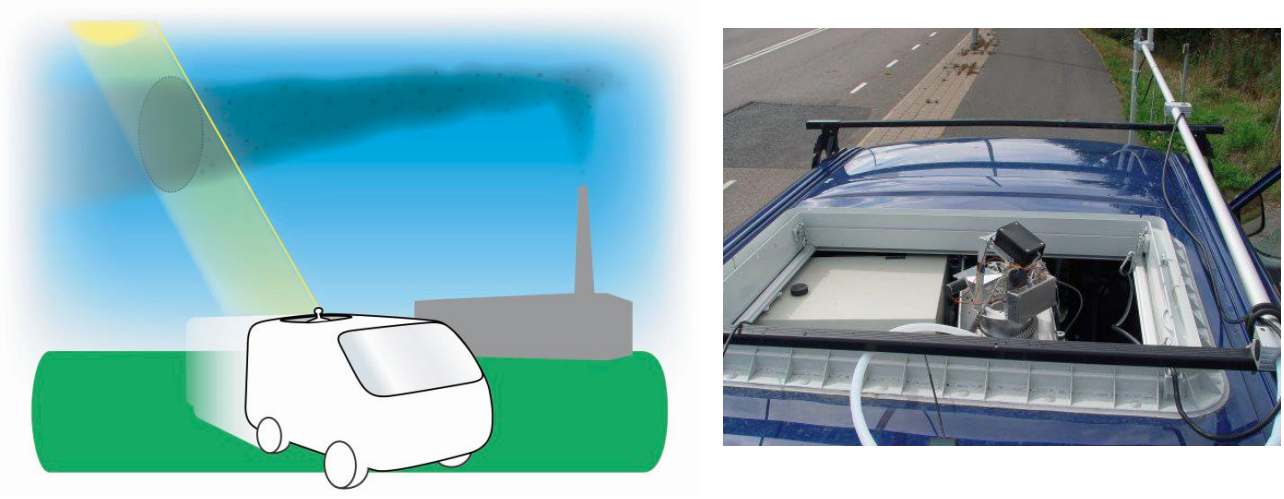

Figure 3-2. Illustration of solar occultation flux (SOF) mobile system. (Illustration Karin Sjöberg from Mellqvist et al., 2014a).

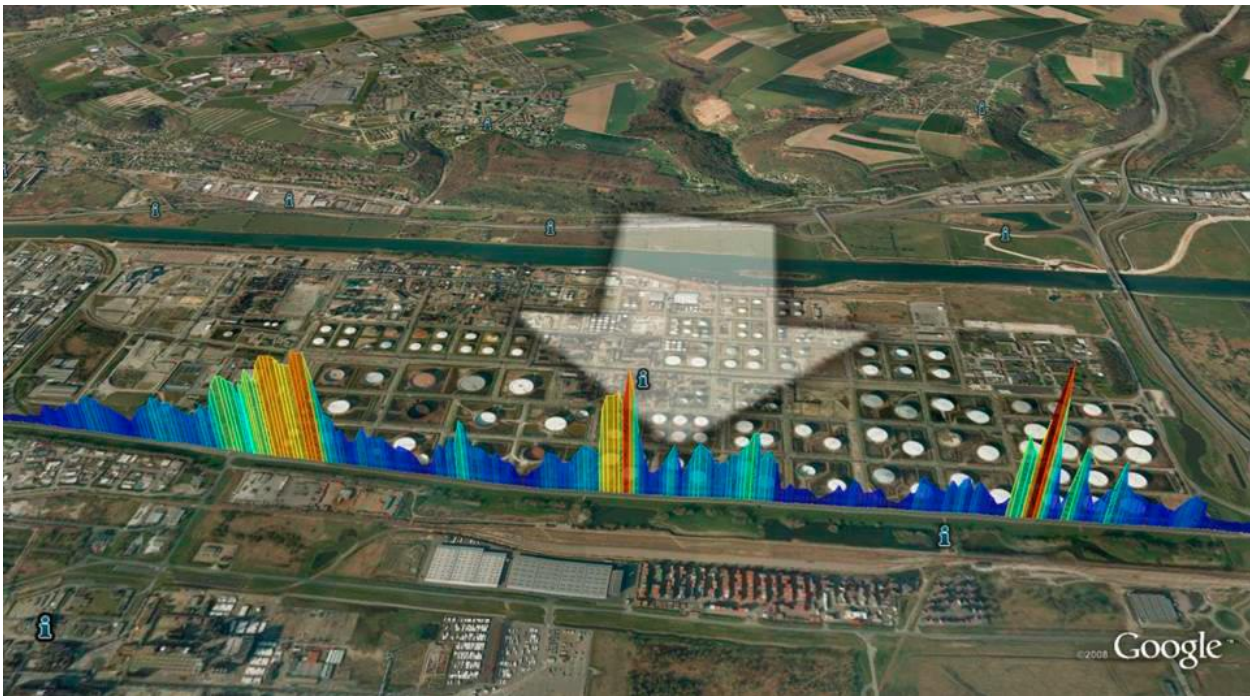

Figure 3-3. Illustration of a SOF transect past a refinery (from Mellqvist et al., 2014a)

As seen by the illustration in Figure 3-3, the SOF method may be used to estimate emissions from an industrial complex or portion of the facility, but it cannot attribute the emissions to a specific emissions source within the facility. Two pilot studies (one in the Carson Area and one in the Bay Area in California; Mellqvist et al., 2014a and 2014b) were performed using the SOF method to measure VOC emissions and mobile differential optical absorption spectroscopy (mobile DOAS) to measure SO_2 and NOx emissions. Measurements were made at two refineries in the Carson Area study and three refineries in the Bay Area study. These studies indicated that the measured VOC emissions were consistently 3 to 10 times higher than projected based on the refineries' emissions inventories. The studies also indicated that the measured SO_2 and NOx emissions were very comparable to those expected based on the refineries' emissions inventories. However, these studies cannot be used to develop emissions factors because the emissions cannot be properly apportioned between the sources (i.e., tanks, wastewater treatment systems, flares, etc.), a requirement for emissions factor development.

3.3 Passive FTIR Studies

Passive FTIR means that an "active" infrared light source is not used. Instead, the hot gas from a high temperature emissions source (like a flare) is the infrared source. The FTIR

spectrometer is used only as a receiver. This approach is possible because the infrared emission spectra of hot gases have the same patterns or "fingerprints" as their absorption spectra do. Consequently, observing a flare with an infrared instrument allows for identification and quantification of species through emission spectroscopy just as with absorption spectroscopy. Since passive FTIR is only applicable to high temperature emission releases, this measurement technique is not applicable to storage tanks or wastewater treatment systems; however, a number of passive FTIR studies have been conducted for flares. The passive FTIR studies reviewed as part of this document review included the 2010 TCEQ flare study project (Ref No. 3 in Table 1-1; Allen and Torres, 2011), two different Marathon Petroleum refinery flare test reports (Ref No. 6 and 7 in Table 1-1), the Flint Hills Port Arthur Refinery flare test report (Ref No. 8 in Table 1-1; contains data for two different flares at the refinery), a Shell refinery flare report (Shell, 2011a and 2011b) and an INEOS chemical plant flare report (INEOS, 2010a and 2010b).

3.4 Extractive Measurement Studies

The EPA has developed a number of extractive test methods used to determine pollutant concentrations and emissions rates, typically for emissions discharged via an emissions stack. Generally, extractive sampling procedures are not applicable to fugitive emissions releases or other emissions that are not discharged to the atmosphere through a stack or duct. In order to apply an extractive test method to a tank or wastewater treatment system, the unit would need to be enclosed, so that the total volume of gas and pollutant concentration of that gas can be measured in order to determine a mass emissions rate from the source. Extractive testing has been performed on flares, but high temperatures, difficulty in keeping the sampling probe in the exhaust stream, and the unknown degree of stratification across the flare plume all provide difficulty in the sampling and uncertainty in the results of such testing. Given the difficulties associated with capturing the gases from flares, tanks, and wastewater treatment systems, few extractive emissions measurements studies are available for these sources. As part of the 2010 TCEQ flare study project (Allen and Torres, 2011), investigators conducted some extractive measurements using the plume sampling system as seen in Figure 3-4. The International Flaring Consortium (IFC) investigated small scale flares in a wind tunnel (Gogolek et al., 2010 and 2012). These studies were also reviewed as part of this document review.

Figure 3-4. Picture of extractive sampling system used as part of the 2010 TCEQ flare study project (from Allen and Torres, 2011)

Section 4
Measurement Studies for Flares

AP-42 provides selected emissions factors for flares in Section 13.5. These emission factors were developed based on performance studies conducted in the 1980s (EPA, 1983 and 1985). Following the Houston Area DIAL Study (Robinson et al., 2008), which documented high emissions from a flare due to poor destruction efficiency, several studies were conducted, predominantly using passive FTIR measurements, to better understand the performance envelope for flares. These studies evaluated changes in heat content of the flare vent gas as well as changes in the steam assist rates and flare combustion efficiency. All of these recent flare performance studies, as well as historical data on flare performance (see EPA, 1983 and 1985), were reviewed, compiled, and analyzed and the EPA prepared a report summarizing its findings and distributed the report for peer review (EPA, 2012). Based on comments received during the peer review process, the data were recompiled and analyzed using increased time resolution (minute-by-minute data) (see Sertkaya et al., 2013). Upon reviewing these data, the EPA concluded that some refinery flares, particularly steam- or air-assisted flares with low flare gas flow rates, were not achieving 98 percent destruction efficiency. Because it is the Agency's position that a well operated flare should, at minimum, be able to achieve this destruction efficiency, the EPA has proposed to amend the Refinery MACT standards (40 CFR part 63 subparts CC and UUU) to establish more stringent monitoring requirements and operating limits to ensure flares achieve a minimum destruction efficiency of 98 percent (79 FR 36880).

Thus, there has been significant recent activity to determine flare emissions and develop suitable operating parameters to ensure flares are achieving high combustion or destruction efficiencies. The term combustion efficiency relates to the percentage of carbon in the flare vent gas that gets completely converted to carbon dioxide. The term destruction efficiency relates to the percentage of a specific pollutant in the flare vent gas that is converted to a different compound (such as carbon dioxide, carbon monoxide or other hydrocarbon intermediate). The destruction efficiency of a flare will always be greater than the combustion efficiency of a flare. It is generally estimated that a combustion efficiency of 96.5 percent is equivalent to a

destruction efficiency of 98 percent (EPA, 2012). The recent flare measurement studies conducted as part of this effort are summarized in this section.

4.1 Houston Area DIAL Study

The Houston Area DIAL Study (Robinson et al., 2008) measured VOC emissions from multiple petrochemical industry sites in the Houston area during the summer of 2007, including a refinery in the Houston area (BP Texas City Refinery). During the Houston Area DIAL Study, DIAL measurement scans were performed for three flares at the refinery: the ultracracker (ULC) flare, Flare No. 6, and a temporary flare. For many of the measurement scans, two flares were upwind of the scan plane, but DIAL's ability to identify and map the location of the emissions plume indicated that the bulk of the emissions were coming from the ULC flare. Based on vent gas flow rates, vent gas composition data, and DIAL measurement data, the temporary flare appeared to have a destruction efficiency of approximately 99.9 percent, and Flare No. 6 appeared to achieve a destruction efficiency of approximately 98 percent. However, the ULC flare appeared to achieve a destruction efficiency of only 50 to 80 percent. The ULC flare had a high steam to vent gas flow and did not have a visible flame, which suggested the poor destruction efficiency was likely caused by over-steaming of the flare.

The EPA has determined that the DIAL measurements, along with the process data, provided by BP for Flare No. 6 are sufficient for use in calculating a VOC emissions factor for flares. Therefore, the DIAL VOC measurement data for Flare No. 6 are available and have been incorporated into the emissions factor development process (EPA, 2015). The EPA has also determined that some of the data from the ULC and temporary flares is sufficient for use in developing flare emissions factors. Even though most of the scan planes for the ULC flare also had the temporary flare as an upwind contributing source, by using the combined heating value of both flares the scans were able to be incorporated into the emissions factor development process. Although the temporary flare was included in three scans by itself, the EPA has determined that this data is not sufficient for emissions factor development. There were only three DIAL scans where emissions measurements included only the temporary flare; these three scans represent less than one hour of measurement data. In general, emissions factors are developed with tests consisting of three or more hours of data, which provides some information on the variation in emissions that can be expected to occur over time. The less than one hour of

available data for the temporary flare alone represents significantly less data than other testing included in the emissions factor development process and may not adequately represent the variation in emissions expected of the source. Because all sources are weighted equally in the emissions factor development process, including a source with so little data may unrepresentatively weight the results in the factor development process.

4.2 2010 TCEQ Flare Study

The purpose of the 2010 TCEQ flare study project (Ref No. 3 in Table 1-1; Allen and Torres, 2011) was to conduct field tests to measure flare emissions and collect process and operational data in a semi-controlled environment to determine the relationship between flare design, operation, vent gas lower heating value (LHV), vent gas flow rate, destruction and removal efficiency (DRE), and combustion efficiency (CE). The TCEQ's primary objectives, as stated in the study report, included the following:

- Assess the potential impact of vent gas flow rate turndown on flare CE and VOC DRE.
- Assess the potential impact of steam/air assist on flare CE and VOC DRE at various operating conditions, including low vent gas flow rates.
- Determine whether flares operating over the range of requirements stated in 40 CFR § 60.18 achieve the assumed hydrocarbon DRE of 98 percent at varying vent gas flow rate turndown, assist ratios and vent gas heat content.
- Identify and quantify the hydrocarbon species in flare plumes visualized with passive infrared cameras.

Commensurate with the study objectives, the study report focused on VOC emissions at or near the operating conditions where flare performance deteriorates. Because the study specifically investigated flare performance while varying steam flow rates, some of the emissions measured during these tests are not considered to be representative of normal operating conditions. By limiting the data to times when the flares were in compliance with the requirements of the General Provisions of 40 CFR Part 60 or Part 63 and times when the flares were meeting the combustion efficiency the EPA expects a well operated flare to achieve, it was deemed reasonable to use the data to create a VOC emissions factor for flares. The flare study project is unique in that extractive measurements were conducted from the flare plume along

with remote sensing measurements. The extractive measurements generally agreed well with the passive FTIR tests. Data for measured VOC emissions from both the extractive and passive FTIR tests for both the steam-assisted and air-assisted flares have been incorporated into the final emissions factor development process (EPA, 2015).

Although the 2010 TCEQ study report itself (Allen and Torres, 2011) does not include any passive FTIR data on the CO and NOx emissions, raw data on the emissions concentration measured during this study are available and the CO emissions data have also been incorporated into the final emissions factor development process (EPA, 2015). The passive FTIR spectrometer for this study was not calibrated for NOx and therefore these data cannot be used, as the quality of the data has a high degree of uncertainty.

The 2010 TCEQ flare study also contained extractive data measurements for NOx. However, the report specifies that "NOx was also measured during the flare tests, but it is not included because NOx was measured using a commercial chemiluminescence analyzer. This instrument did not meet the data quality objectives over all the ranges of DRE observed." (See p. 124 of Allen and Torres, 2011). The report provides no further details on which data quality objectives the instrument failed to meet and whether all data was affected. As such, there is a high degree of uncertainty with all of the NOx extractive data obtained from the flare study. Because the extractive NOx measurements did not meet the data quality objectives, the resulting data are not appropriate for use in developing revised NOx emissions factors for flares. .

4.3 Marathon Petroleum Flare Tests

Passive FTIR tests were conducted at two different Marathon Petroleum refineries (Ref No. 6 and 7 in Table 1-1). The main objective of these tests was to better understand the impacts of steam on the overall performance of the flare CE. As with the TCEQ flare study, many of the test runs were conducted with varying steam flow rates to determine how varying steam rates impact CE. Consequently, some of the emissions measured during these tests are not considered to be representative of normal operating conditions. By limiting the data to times when the flares were in compliance with the requirements of the General Provisions of 40 CFR Part 60 or Part 63 and times when the flares were meeting the combustion efficiency the EPA expects a well operated flare to achieve, it was deemed reasonable to use the data to develop emissions factors. Although the reports themselves do not include any data on the VOC, CO and NOx emissions,

raw data on the emissions concentrations measured during the Marathon flare tests are available, and the VOC and CO emissions data have been incorporated into the final emissions factor development process (EPA, 2015). The passive FTIR spectrometer in this study was not calibrated for NOx, so the NOx data from this study should not be used for emissions factor development, as the quality of the data has a high degree of uncertainty.

4.4 Flint Hills Flare Test

Passive FTIR tests were conducted on two different flares at the Flint Hills Port Arthur Refinery (Ref No. 8 in Table 1-1). The overall objectives of the Flint Hills flare test program were as follows:

- Evaluate the impacts of CE over a range of operating scenarios by changing both flare vent gas composition and steam rates.
- Evaluate key operating parameters such as steam to vent gas ratio (S/VG) and Net Heating Value of the Combustion Zone (NHVcz) as indicators that may assist in maintaining flare operation at high efficiency conditions during day-to-day operation.

As with the other flare studies, because the objective of the tests was to evaluate conditions that affect flare CE, many of the test runs were conducted with varying steam flow rates so that some of the test runs are not considered to be representative of normal operating conditions. By limiting the data to times when the flares were in compliance with the requirements of the General Provisions of 40 CFR Part 60 or Part 63 and times when the flares were meeting the combustion efficiency the EPA expects a well operated flare to achieve, it was deemed reasonable to use the data to develop emissions factors. Although the report itself does not include any data on the VOC, CO and NOx emissions, raw data on the emissions concentrations measured during this study are available, and the VOC and CO emissions data (for test runs meeting selected net heating value criteria) were included in the final emissions factor development process (EPA, 2015). The passive FTIR spectrometer in this study was not calibrated for NOx, so the NOx data from this study should not be used for emissions factor development, as the quality of the data has a high degree of uncertainty.

4.5 Additional Passive FTIR Flare Tests

In addition to the passive FTIR studies cited in the complaint, we are aware of passive FTIR studies conducted on two other flares (Shell, 2011a and 2011b; INEOS, 2010a and 2010b). These studies were similar to the previous passive FTIR studies in that they were largely conducted to identify the operating limits where flare performance begins to deteriorate. As with the other flare studies, because the objective of the tests was to evaluate conditions that affect flare CE, many of the test runs were conducted with varying steam flow rates so that some of the test runs are not considered to be representative of normal operating conditions. By limiting the data to times when the flares were in compliance with the requirements of the General Provisions of 40 CFR Part 60 or Part 63 and times when the flares were meeting the combustion efficiency the EPA expects a well operated flare to achieve, it was deemed reasonable to use the data to develop emissions factors. Raw data for measured VOC, CO and (for the INEOS study only) NOx emissions concentrations collected during these studies are available. The VOC and CO emissions data were included in the final emissions factor development process (EPA, 2015). The passive FTIR spectrometer for the INEOS study was not calibrated for NOx, so the NOx data from this study should not be used for emissions factor development, as the quality of the data has a high degree of uncertainty.

4.6 Additional Extractive Flare Tests

In addition to the passive FTIR studies, the IFC conducted a series of studies on a small (3 inch diameter) flare tip in a wind tunnel so the entire flare plume could be exhausted through the wind tunnel stack (Gogolek et al, 2010). The results of the IFC studies are reported by Gogolek et al. (2012). We attempted to obtain the raw test data for this study as well as the QA procedures and results to ensure data quality. We were not able to obtain the raw data, so we cannot incorporate these data into a revised NOx emissions factor for flares. However, the current NOx emissions factor for flares in AP-42 falls within the range of values reported from the IFC studies.

4.7 Conclusions Regarding Flare Measurement Study Data

The flare measurement studies summarized above provide data that can be used to finalize revisions to the existing AP-42 CO emissions factor and finalize a new VOC emissions

factor for flares. The original AP-42 flare emissions factors are based on testing of only two flares, one steam-assisted and one air-assisted, burning a single fuel (crude propylene). The new data available for use in developing emissions factors for flares includes additional testing at a flare vendor using limited fuel inputs (natural gas with propylene or propane) similar to the previous study, a chemical manufacturing plant using actual fuel gas, and several petroleum refineries using actual fuel gas. Consequently, we consider the new measurement study data to be more representative of real-world flares used in the refining and petrochemical industries than the data set that was originally used to develop the flare emissions factors. We note that refineries and chemical plants represent a large majority of industrial flares. While we note that all of the data used to develop both the previous and new flare emissions factors consists of flares that are steam-assisted or air-assisted, we believe this is representative of the flares in these industries. We have data indicating that 80 percent of refinery flares are steam-assisted, 10 percent are air-assisted and 10 percent are unassisted.

Based on the available information, we have determined that we now have data for a much greater number of flares over a wider range of flare gas characteristics than we had previously. We have reviewed these data and excluded runs that were considered unrepresentative of normal flare operation (i.e., runs where conditions were purposely adjusted to determine where combustion efficiency deteriorated). The remaining run data are considered to be representative of normal flare performance. We believe the new measurement data for CO and VOC are from accurate and calibrated instruments using appropriate analytical methods. Therefore, we conclude that it is necessary and appropriate to revise the CO emissions factor and develop a VOC emissions factor for flares. Therefore, we are revising section 13.5 of AP-42 to incorporate the new emissions factors for CO and VOC developed with these data.

Although some of the studies summarized above also reported NOx emissions data, the instruments were not calibrated for measuring NOx and/or the measurement system failed data quality objectives. For this reason, the NOx data are not appropriate for use in revising the NOx emissions factor for flares. Nonetheless, the extractive NOx data that are available, while not fully validated, is in the range of the existing AP-42 factor. Therefore, we also conclude that it is not necessary at this time to revise the existing AP-42 NOx emissions factor for industrial flares.

Section 5
Measurement Studies for Tanks

Section 7.1 of AP-42 provides a series of correlation equations to estimate emissions from organic liquid storage tanks based on a number of factors including the tank size, throughput, content properties, ambient temperatures, and the types of roofs, seals, and fittings. The emissions factor correlations were developed by the American Petroleum Institute (API). API retains the copyright to these equations, but has granted the EPA permission for the nonexclusive, noncommercial distribution of this material in AP-42. The equations are rather complex and depend on a multitude of inputs. To make it easier to implement the AP-42 emissions factors equations to estimate the emissions from organic liquid storage tanks, the EPA developed the TANKS model, although the equations in Section 7.1 remain the official AP-42 emissions estimation methodology. This section summarizes the measurement studies that were reviewed in the context of determining whether changes should be made to the existing emissions estimation methodologies for tanks in Chapter 7 of AP-42.

5.1 CONCAWE 90-hour Study

CONCAWE, a division of the European Petroleum Refiners Association, investigated and compared DIAL measurement data for external floating roof storage tanks with emissions estimates made using the AP-42 emissions factor methodology (see Smithers, et al., 1995). This study used a fairly longer (90 hour) measurement period than most other DIAL measurement studies. Direct process and meteorological data were used to provide hourly input data for the organic liquid storage tank emissions factor equations developed by the American Petroleum Institute (API), which at the time were published as API Publication 2571 (which is provided in Section 7.1 of AP-42). Thus, the equations presented in AP-42 are essentially the same as those in the Addendum to API Publication 2571 (although more recent revisions to the API methods have also been incorporated into the 2006 update of AP-42 Section 7.1). As seen in Figure 5-1, the temporal variations in the hourly emissions calculated using the Addendum API 2517 (i.e., AP-42) equations agree reasonably well with the DIAL measurements.

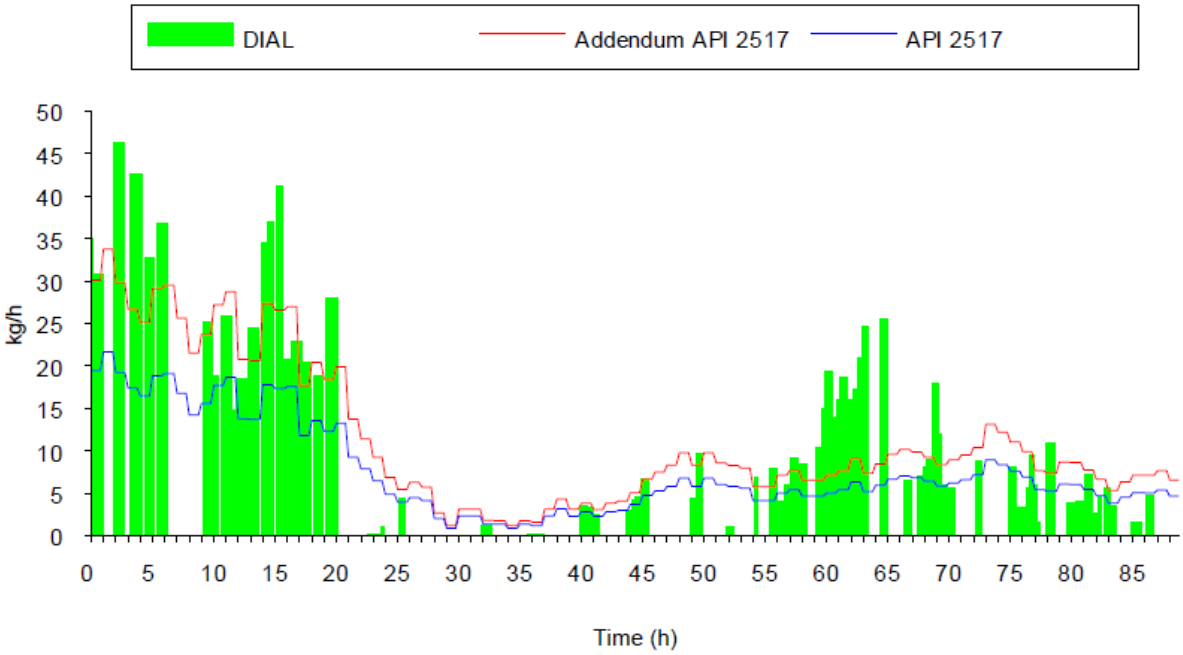

Figure 5-1. Comparison of DIAL and AP-42 Emission Estimates in CONCAWE 90-hour Study (Smithers et al., 1995).

Smithers et al, (1995) determined that the DIAL measurement was 10% greater than predicted using the Addendum to API 2517, but noted that there were times when measured emissions were higher than predicted by the AP-42 emissions equations. During hours 2 through 6 and hours 14-16, there were periods of high wind gusts. The deck fitting correlations were developed for average wind speeds from 2 to 15 miles per hour (mph) and API 2517 (as well as AP-42) specifically notes that these factors only apply when the average ambient wind speed is below 15 mph. According to the study authors, it appears that application of the deck fitting correlations during times when wind speeds exceed 15 mph will result in an underestimate of the deck fitting emissions. The increase in the emissions during hours 55 to 64 appeared to be correlated with filling of the tank from half full to full during hours 55 to 62. While the AP-42 emissions methodology approach failed to predict this increase in emissions, Smithers et al, (1995) emphasized the overall difference between the measured and calculated emissions over the duration of the 90 hour testing period was only 10 percent. Thus, the CONCAWE study appears to support the assertion that the AP-42 emissions methodology can provide an accurate estimate of long-term emissions from storage tanks in situations where detailed, site-specific data are used in the calculations.

However, the CONCAWE 90-day study demonstrates that emissions from tanks can be highly variable. While the AP-42 emissions methodology provided a reasonable estimate of the average emissions, it did so by using hourly operating data. Most facilities estimate their annual emissions using annual process data and annual average temperatures. The question was then posed: is hourly modeling needed to obtain accurate annual average emissions estimates, or can annual average conditions be used to accurately estimate annual average emissions? To answer this question, Coburn and Icenhour (2008) developed an external executable program to run the TANKS model (which implements the AP-42 emissions methodology) numerous times and save the results. This allowed input of hourly meteorological data and post-processing of the results to simulate the annual emissions that would be estimated if the TANKS model allowed for hourly input data. Emissions estimates were developed for a generic storage vessel storing a single fluid (gasoline RVP-7) and using meteorological data for Houston, Texas. They found that the annual emissions estimated for the model tank when using hourly input data agreed within 20 percent with the annual emissions estimated using annual average inputs. This study also found that, for this case, the highest hourly emissions rate (summer, high winds and day time high temperatures) was a factor of 5 to 10 times higher than the annual average emissions rate.

Based on the results of the CONCAWE 90-hour Study and the hourly TANKS model evaluation performed by Coburn and Icenhour, it is reasonable to conclude that long-term emissions rates can be reasonably estimated using the AP-42 emissions estimation methodology. It is also important to note that emissions during short time periods can be up to 10 times higher than the reported annual average emissions. Therefore, one must be cautious when comparing short term emissions measurements with annual average emissions rates.

5.2 Global Companies LLC–South Portland, Maine

Global operates a petroleum terminal handling distillate and residual oil products and asphalt in South Portland, Maine. EPA Region 1 issued a testing order to Global's South Portland facility under Section 114 of the Clean Air Act to quantify emissions from two storage tanks to determine compliance with various Clean Air Act requirements. Global tested headspace vapors from Tank No. 9 in July and August 2012 (Eastmount, 2012b). Tank No. 9 stored liquid asphalt at the time of the test. A temporary total enclosure (TTE), designed in accordance with EPA Method 204, was fitted over the single tank exhaust vent. The total

hydrocarbons (THC) concentration, measured with EPA Method 25A, and methane concentration, measured with EPA Method 18, of the storage tank emissions were logged continuously for a period of 30 days. The testing timeframe included a period of filling the storage tank so that both breathing and working losses were represented. The methane emissions were subtracted from the THC readings to get a non-methane total gaseous organic compound concentration, as a measure for VOC. Global conducted similar testing on Tank No. 3 in April 2013 (Eastmount, 2013b). Tank No. 3 stored No. 6 fuel oil at the time of the test. A TTE was fitted on the two exhaust vents. The THC and methane concentrations of the emissions were logged continuously for a period of 15 days. The testing timeframe included a period of filling the storage tank so that both breathing and working losses were represented.

The measured VOC tank breathing losses when extrapolated over the course of a year were 5.3 tons per year (tpy) for Tank No. 9 and 7.43 tpy for Tank No. 3. Hourly emissions during the filling operation were observed to increase approximately 33% for Tank No. 9 and 100% for Tank No. 3 from the emissions observed during non-filling operations.

While the data from the testing at the Global facility are interesting, the equations for estimating tank emissions in AP-42 are not based on a single emissions factor (EPA, 1995). AP-42 Chapter 7 contains a series of complex equations that rely heavily on site-specific inputs, including tank specific inputs (diameter, height, shell color and condition, type of roof, etc.), fuel specific inputs (vapor pressure, vapor molecular weight, throughput, etc.), and location specific inputs (to determine average temperature and solar insolation information). In order for the algorithms to provide reasonable estimates, the site specific information must be correct. In order to determine whether revisions to the AP-42 Chapter 7 equations are appropriate, targeted testing would need to be performed to isolate each input parameter to determine how each parameter affects the output of the equations. Testing would need to include tanks of different sizes, different places in the country, different times of year, different throughputs, different colors, different storage materials, etc. At this time, the necessary data to perform this analysis is not available.

5.3 Sprague Operating Resource LLC– Searsport, Maine

Sprague Operating Resource LLC (Sprague) operates a tank terminal in Searsport, Maine handling bulk liquid cargoes (including residual oil and asphalt), dry bulk products, and special

heavy lift projects. Sprague also received a testing order under Section 114 of the Clean Air Act from EPA Region 1 to quantify emissions from storage tanks at the facility to determine compliance with various Clean Air Act requirements. Sprague tested headspace vapors from Tank No. 3 in July and August 2012 (Eastmount, 2012a). Tank No. 3 stored No. 6 fuel oil at the time of the test. A TTE was fitted over the two tank exhaust vents. The THC and methane concentrations were logged continuously for a period of 30 days. The testing timeframe included a period of filling the storage tank so that both breathing and working losses were represented. Sprague conducted similar testing on Tank No. 2 in May 2013 (Eastmount, 2013a). Tank No. 2 stored liquid asphalt at the time of the test. A TTE was fitted on the single exhaust vent. The THC and methane concentrations of the emissions were logged continuously for a period of 15 days. The testing timeframe included a period of filling the storage tank so that both breathing and working losses were represented.

The measured VOC tank breathing losses when extrapolated over the course of a year were 10.6 tpy for Tank No. 3 and 4.2 tpy for Tank No. 2. Hourly emissions during the filling operation were observed to be approximately four times higher for Tank No. 3 and decreased by 20 percent for Tank No. 2 from the emissions observed during non-filling operations. These emissions were much higher than expected, based on Sprague's emissions inventory estimates for the years 2006-2009 (Sprague 2011). A review of the emissions inventory calculations revealed the use of several default values that should not have been used. The emissions estimation equations cannot reasonably be expected to predict emissions accurately with the use of incorrect input data.

Once again, while the data from the testing at the Sprague facility are interesting, in order to conclude whether revisions to the AP-42 Chapter 7 equations are appropriate, targeted testing would need to be performed to isolate each input parameter to determine how each parameter affects the output of the equations. Testing would need to include tanks of different sizes, different places in the country, different times of year, different throughputs, different colors, different storage materials, etc. At this time, the necessary data to perform this analysis is not available.

The testing performed at Sprague did highlight the need for site-specific data when using the AP-42 Chapter 7 equations for estimating emissions from tanks. This is especially important for a material like asphalt, for which no default data are available, or No. 6 fuel oil, which is

often mixed with more volatile cutter material. The majority of emissions in this type of material are expected to come from the cutter stock, and as such, it is important to account for the vapor pressure contributed by the cutter when determining the vapor pressure of the fuel oil (API, 2013).

5.4 Alberta DIAL Study

The Alberta DIAL Study (Ref No. 9 in Table 1-1) was conducted in August and September of 2005 at a 140,000 bbl/day refinery, and it measured emissions from a variety of sources at the refinery. Among the study findings, investigators measured emissions from the product storage tank area that were significantly higher than expected based on the emissions inventory for the facility. Specifically, the Alberta DIAL Study investigators used the emissions measured during the study to project annual emissions by assuming the emissions rates measured occurred continuously for 8,760 hours per year. The extrapolated VOC emissions for the refinery's storage tanks were projected to be 5,090 tonnes/yr compared to 153 tonnes/yr as reported in Canada's National Pollutant Release Inventory (NPRI). However, as Coburn and Icenhour (2008) demonstrated, measurements made over short time periods may not be representative of average emissions from a source. There are a variety of reasons why short-term emissions may be significantly higher than annual average emissions. For example, the Alberta DIAL Study was conducted in the summer (at higher than average temperatures) and during the day (when vessel loading activity is higher), so the emissions measured during this time would be expected to be greater than average emissions across the year because the annual average emissions would also include emissions during the winter months (colder temperatures) when the emissions would be projected to be significantly lower than the average. Including data measured only during summer days would lead to higher than average annual emission estimates. Given the short-term nature of the DIAL measurements, it is difficult to conclude that the high short-term emissions rates measured during this study are truly representative of the long-term average emissions from storage tanks at the facility.

In addition, no corresponding process-specific data were available for the product storage tanks measured. It is unknown, for example, what products were being stored in the tanks tested, what type of controls, if any, were on the storage tanks (fixed roof or floating roof), and whether the tanks were being actively filled during the test. Due to the lack of process operating data at

the time of the test, it is impossible to develop emissions factors from the study data (i.e., no values are available to normalize the emissions). Given the lack of process data, it is also difficult to conclude whether the emissions inventory estimates were properly determined or if there may have been unusual process conditions that explain the high short-term emissions. It is possible that high-emitting tanks measured by DIAL were defective and in need of repair. Considering these limitations, the Alberta DIAL Study is insufficient to support the assertion that the emissions estimation methodology for storage tanks as presented in AP-42 underestimates the long-term emissions from refinery storage tanks.

Although the Alberta DIAL Study measured emissions exceeded the annual average emissions inventory by a factor of 30, there is not enough data to determine the cause of the discrepancy. Because no information is provided on the calculations for the emissions inventory, it is difficult to know if these calculations were performed in accordance with actual site conditions or in keeping with the recommended methodologies in AP-42. Likewise, it is unknown if the tanks measured may store different liquids over the course of the year, which could cause greater uncertainties in extrapolating annual emissions from short-term emissions measured for a single stored fluid. Based on these considerations, there is no direct evidence from the Alberta DIAL Study that the equations in AP-42, when correctly applied, systematically underestimates VOC emissions from storage tanks, and, based on the lack of process operating data at the time of the test, no emissions factors for tanks can be created from the data in the Alberta study.

5.5 Houston Area DIAL Study

The Houston Area DIAL Study (Robinson et al., 2008) measured VOC emissions from multiple petrochemical industry sites in the Houston area during the summer of 2007, including a refinery in the Houston area (BP Texas City Refinery). The Houston Area DIAL Study at the BP Texas City Refinery included measurements for various storage tanks, among other sources. A critical review of the VOC measurements performed at the BP Texas City Refinery was conducted by Randall and Coburn (Ref No. 4 in Table 1-1) to compare the DIAL emissions estimates for sources at the BP Texas City Refinery with refined emissions estimates based on AP-42 emissions methodologies, taking into account the process operating characteristics that existed during the time of the measurements. Specifically, storage tank emission estimates were

developed using the TANKS model and detailed information about tank contents and loading rates were provided by plant personnel. The refinery did not do any special sampling and analysis of storage tank contents during the measurement period, but unlike the Alberta DIAL study, there was a significant amount of process data (e.g., tank contents, temperature, daily loading rates) that could be used for emissions model input. Table 5-1 provides a summary of the comparison of the measured DIAL emissions versus the air emissions estimates based on AP-42 methodologies. The column "Estimated emissions using standard estimating procedures with actual conditions at the time of the DIAL test, lb/hr" are the emissions estimates developed by Randall and Coburn (2010). The column labeled "2007 EIQ average ozone season emission rates, lb/hr" are the average ozone season emissions rates reported to TCEQ by the BP Texas City Refinery in their emissions inventory.

There are over 100 storage tanks at the BP Texas City Refinery, but the Houston Area DIAL Study included measurement scans for only 14 tanks (Robinson, et al, 2008). In their *Critical Review*, Randall and Coburn (2010) identified 26 storage tanks that they opined may have contributed to the measured emissions attributed to the 14 tanks specified in the Houston Area DIAL Study. For the BP Texas City Refinery storage tanks, the reported measured emissions were generally higher than the emissions estimated using the AP-42 emissions methodology when considering only the tanks included in the Houston Area DIAL Study. (In Table 5-1, the lower value in the range of estimated emissions is based on only the tanks reported to be measured in the Houston Area DIAL Study.) However, when emissions were projected for all tanks upwind of the scan plane (the upper value in the range of estimated emissions in Table 5-1), the estimated emissions often agreed well with the DIAL measurements, although the extent to which the upwind tanks contributed to the emissions is not well understood. The possibility that some of the target tanks were defective and emitting more than AP-42 estimates cannot be ruled out. Additionally, in some cases, non-storage tank emissions sources appeared to the authors to contribute to higher than estimated emissions for certain storage tanks. For example, Tanks 1052, 1053, and 1055 (crude oil storing tanks) were downwind of the wastewater treatment system, and it appeared to the authors that the high emissions attributed to these tanks were likely caused by the emissions from the upwind wastewater treatment system.

Table 5-1. Summary of Emissions Comparison from the Houston Area DIAL Study

Source	Source Description	Compound	Average DIAL flux, lb/hr[a]	Estimated emissions using standard estimating procedures with actual conditions at the time of the DIAL test, lb/hr	2007 EIQ average ozone season emission rates, lb/hr[b]
Tanks 1020, 1021, 1024, and 1025	EFR[c] tanks storing crude oil	VOC	6.4[d]	1.3 – 1.9[e]	2.6 – 3.5[e]
Tanks 1052, 1053, and 1055	EFR tanks storing crude oil	VOC	16.3[d]	1.8 – 2.3[e]	2.4 – 2.9[e]
Tanks 501, 502, 503, and 504	EFR tanks storing light distillates	VOC	8.6[d]	3.0 – 3.9[e]	6.7 – 8.0[e]
Tank 43	VFR[f] tank storing fuel oil #6	VOC	2	1.3	0.2
			9.3	1.3	0.2
Tanks 60, 63, 11, 12, 18, 42, 61, and 65	VFR and EFR tanks storing various products	VOC	9	0.6 – 9.1[e]	4.6 – NA[e,g]
Tanks 54, 55, 56, and 98	VFR and EFR tanks storing various products	VOC	3.1[d]	0.3 – 9.7[e]	1.0 - NA[e,g]
Tanks 53 and 55	VFR tanks storing diesel fuel	VOC	23.8[d]	4.8 – 5.2[e]	1.0 – 2.0[e]
F-8 EBU	Activated sludge unit	VOC	30	22 – 55[h]	6.7
API separator	API separator	VOC	7	ND[i]	NA[g]
Wastewater vents	Vents from collection system	VOC	9	ND	NR[j]
Flare #6	Ground flare	VOC	13	17[k]	40
Temporary flare	Temporary flare	VOC	6	100 – 300[k]	196
ULC flare	Ultracracker flare	VOC	192	3 - 25[k]	28.3
Coker Unit C	Coker	VOC	18	ND	NR
Coker Unit C	Coker while cutting coke	Benzene	1.8	ND	NR

[a] The tabulated values typically represent the average of calculated fluxes for several scans.
[b] In their 2007 emissions inventory, BP reported average ozone season emissions in lb/d; these values were divided by 24 to estimate the tabulated average hourly emission rates.
[c] EFR means external fixed roof tank.
[d] The results for storage tanks typically are summarized for a group of tanks because the DIAL scans typically could not isolate individual tanks. All scans along the same path and covering the same range were grouped, and the calculated fluxes for the scans in a group were averaged. The averages for all groups of

scans that apply to a group of tanks were then averaged to obtain the tabulated flux. Note that some groups of scans captured emissions from all of the listed tanks, while other groups of scans were downwind of only some of the listed tanks.

[e] Emissions were estimated for all tanks that appeared to be upwind of a group of scans, and the estimates for the individual tanks were summed. For each group of scans, the total emissions were estimated by summing the applicable individual tank emissions estimates. The upper end of the tabulated range represents the average of these sums. The lower end of the range represents the average emissions assuming only the tank(s) to which NPL attributed emissions were upwind of the scans.

[f] VFR means vertical fixed roof tank.

[g] The upper end of the range could not be determined because some of the tanks could not be found in the 2007 emissions inventory. The specific API separator of interest also could not be identified in the inventory.

[h] The low end of the range is based on pollutant properties used in modeling by BP, the measured benzene concentration, and annual average concentrations for other pollutants. The high end of the range is based on using the default pollutant properties in WATER9, the measured benzene concentration, and an assumption that all other pollutant concentrations at the time of DIAL testing were higher than average by the same percentage as benzene.

[i] ND means not determined.

[j] NR means not reported in the annual inventory.

[k] Estimated emission rates are based on assumed 98 percent destruction of C3+ hydrocarbons in flare gas at the time of DIAL testing. A range is presented for the temporary flare and ultracracker flare because the flow and composition of the flare gas varied significantly during the DIAL test period.

It is also possible that one or more of the tanks had defective floating roofs. The largest discrepancy noted between measured and modeled emissions is for Tanks 53 and 55. Tank 53 was being actively filled during the time of the DIAL measurements. Emissions associated with working losses during loading events are generally much higher than breathing losses during non-loading periods. This likely contributed to the higher than expected measured emissions. It appears that the AP-42 emissions methodologies can reasonably predict the emissions from storage vessels, assuming the storage vessels are not defective and the correct inputs are used.

Because the BP Texas City DIAL measurements often included a number of upwind emissions sources and the tests are conducted over a limited operating range (temperatures/wind speeds), there is no direct means by which to use the emissions measurements made during this study to develop new emissions factors for storage tanks. Additionally, the comparison of the DIAL measurement data with emissions model estimates using site specific data suggests that the AP-42 emissions equations for storage tanks provide a reasonably accurate means for estimating emissions from these sources.

5.6 Houston Ship Channel/Shell Deer Park DIAL Study

The Shell DIAL study (Ref No. 5 in Table 1-1; Raun and Hoyt, 2011) measured VOC emissions from a combined petroleum refinery and chemical complex (Shell Deer Park facility) in the Houston Ship Channel area. Like the Houston Area DIAL Study, the Shell DIAL study included DIAL VOC measurements around various storage tanks as well as other sources at the refinery. For many of these sources, FTIR measurements were also conducted to improve compositional characterization of the plume. Estimates based on emissions factors (presumably based on AP-42 emissions factor methodologies) were also reported. A summary of the comparison of the emissions measurements and emissions factor estimates from the Shell DIAL study for some of the measured sources is provided in Table 5-2. (Note: The measured estimates are labelled "Estimate of 95th Upper Confidence Limit of the Mean.")

Similar to the Houston Area DIAL Study, there are over 100 storage tanks at the Shell Deer Park refinery and emissions estimates were reported for 19 of these storage tanks. The emissions measured for the 19 storage tanks cited in the report were higher than the estimated emissions. In reviewing the scan planes for specific storage tank measurements, it appears that there were often four or more tanks upwind of the scan plane (or between "upwind" and

"downwind" scans), but the emissions as reported (see Table 5-2) were often cited as including emissions for only one or two of these tanks. It is possible that there could be more emissions sources that are contributing to the measured emissions than are being accounted for in the Shell DIAL study emissions factor estimates, but the data is not conclusive with respect to these tanks.

With respect to the storage tank emissions factor estimates, it appears that some of the emissions estimates were developed using time dependent input factors (e.g., there are different emissions factor estimates for Southwest Tank AP-17 for January 15 and January 19), so at least some site-specific conditions were accounted for in these emissions estimates. However, the report lacks any real description or documentation regarding how these calculations were made and the level of site-specific operating data available for these emissions factor estimates. It could be possible that only wind speed and temperature were varied for the differing emissions factor estimates and data for other site-specific conditions (e.g., whether the tank was being actively filled, actual composition of tank contents, etc.) were not accounted for in the emissions factor estimates. The Shell DIAL study does appear to show that most of the tanks at the Shell Deer Park refinery that were targeted for DIAL measurement scans had higher than expected emissions during the time of the DIAL test. However, given the lack of process data, it is not possible to revise the emissions factor methodologies for storage tanks based on the reported Shell DIAL study data.

5.7 Conclusions Regarding Tank Measurement Study Data

The AP-42 emissions factor correlation equations provide a sophisticated modeling method to estimate emissions from organic liquid storage tanks considering a wide variety of tank-specific variables including the tank size, throughput, content properties, ambient temperatures, and the types of roofs, seals, and fittings. When this detailed information is properly used with the AP-42 equations, the emission estimates agree well with the measurement data we have evaluated, suggesting the AP-42 equations for tanks are appropriate and accurate.

Table 5-2. Summary of Emissions Comparison Included in the Shell DIAL Study Report

Area		Date	Emission Factor Based Calculation (lbs/hr)	VOC (V) or Benzene (B)	Estimate of the 95th Upper Confidence Limit of the Mean (lbs/hr)**	Potential Underestimation Multiplier
Southwest Tanks	A-333	13-Jan	0.43	V		
	A-330	13-Jan	0.45	V		
	A-332	13-Jan	1.27	V		
		Total	2.15		20.18	9
	A-325	15-Jan	0.22	V		
	A-326	15-Jan	0.34	V		
	Total		0.56		13.15	23
	AP-17	19-Jan	0.46	V		
		Total	0.46		42.6	93
	AP-17	15-Jan	0.25	V		
	AP-16	15-Jan	0.14	V		
	Total		0.39		51.53	132
West Tanks	A-310	1/14	0.17	V		
	G-324-R1	1/14	0.26	V		
	Total		0.43		15.8	37
CR-3		21-Jan	20.67	V		
		25-Mar	20.67	V		
	Average		20.67		27.37	1
East Tanks	J-327	22-Jan	0.14	V		
	J-328	22-Jan	0.12	V		
	J-331*	22-Jan	4.63	V		
	J-332*	22-Jan	4.63	V		
	Total		9.52		37.05	4
	J-327	23-Jan	0.15	V		
	J-328	23-Jan	0.12	V		
	Total		0.27		18.07	67
	J-327	28-Jan	0.11	V		
	J-328	28-Jan	0.16	V		
	J-331*	28-Jan	4.63	V		
	J-332*	28-Jan	4.63	V		
	Total		9.53		35.98	4
Northwest Wastewater		25-Jan	6.5	V		
		30-Jan	15	V		
		5-Feb	11.5	V		
	Average		11		1192	108
		9-Feb	0.019	B		
		13-Feb	0.2	B		
	Average		0.11		7.3	67

* permit limits

** from ProUCL

Table 3-2. (Continued)

Area		Date	Emission Factor Based Calculation (lbs/hr)	VOC (V) or Benzene (B)	Estimate of the 95th Upper Confidence Limit of the Mean (lbs/hr)**	Potential Underestimation Multiplier
East Wastewater		1-Feb	5.88	V		
	Total		5.88		43.35	7
Tanks T-OL913 and T-OL920	T-OL913	8-Feb	1.15	B		
	T-OL913	10-Feb	1.17	B		
	T-OL913	23-Mar	1.18	B		
	T-OL920	8-Feb	0.83	B		
	T-OL920	10-Feb	0.83	B		
	T-OL920	23-Mar	0.83	B		
	Total of Tank Averages		2.00		19.76	10
ACU BEU		12-Feb	3.41	B		
		15-Feb	3.41	B		
	Average		3.41		16.77	5
		26-Mar	2.49	V		
	Total		2.49		77.48	31
Tanks South of ACU BEU	D-350	2-Feb	0.03	B		
	D-351	12-Feb	0.09	B		
	D-381	15-Feb	0.3	B		
	D-352	22-Mar	0.02	B		
	Total		0.44		41.13	93

** from ProUCL

We recognize that the equations in AP-42 can inaccurately estimate emissions when default values are used inappropriately or when site-specific inputs are not entered into the equations. For example, it is important to develop site-specific vapor pressure information for materials, like No. 6 fuel oil, which are routinely mixed with more volatile materials. However, we find that misapplication of the equations or use of inaccurate input information does not support the need for revising the AP-42 emissions factor equations. We have included a primer for TANKS model user in Appendix C of the *Refinery Protocol* (RTI, 2011) to highlight key model input parameters and to provide instructions on how to enter site-specific information and override TANKS defaults (e.g., for roof types and number of roof hatches and other roof fittings)

We have also investigated differences in short term tank emissions and annual average tank emissions (Coburn and Icenhour, 2008). We found that short-term (hourly) emissions rates can be 5 to 10 times higher than the annual average emissions rate. Thus, comparisons of short-term measured emissions with annual emissions reported in an emissions inventory must

consider the variability in the emissions across different temperature, wind speed, and operating characteristics. Thus, we find that, when process-specific data are not available for direct modeling comparisons, short-term measurement data within a factor of 5 of the annual average emissions inventory value does not provide justification that the emissions inventory is incorrect or that the emissions factor equations need to be revised.

It is also important to note that the emissions estimation procedures only account for emissions in normal operating scenarios. Emissions from tanks that are improperly operated, defective (e.g. damaged floating roof rim seals and deck fittings), or in disrepair cannot be accurately estimated using these methods. Furthermore, there is no universal method by which to estimate the emissions from these events, since the specific type of event would require detailed analysis. Again, we have included guidance in the *Refinery Protocol* (RTI, 2011) for estimating emissions during malfunctions or upsets, but each such event would require specific engineering calculations to estimate the emissions from these occurrences.

Based on this information, the EPA believes that the AP-42 tank equations provide reasonably accurate estimates of measured emissions rates when appropriate process data are used in the AP-42 equations. Therefore, we determine that it is not necessary to revise the tank emissions estimation equations in AP-42 Chapter 7 or create a VOC emissions factor for tanks. The AP-42 tank emissions estimation equations sufficiently estimate emissions with accurately characterized tanks, site-specific inputs, and properly operated and maintained equipment.

Section 6
Measurement Studies for Wastewater Treatment Systems

Currently, AP-42 Chapter 4.3 provides a set of process model equations to estimate emissions from wastewater treatment systems based on specific treatment unit parameters. The process model can become very complicated, especially since there are typically a number of units operated in series. To help implement these equations, the EPA has developed the WATER9 emissions model and, more recently, prepared a simplified spreadsheet modeling tool, RWET (RTI, 2011). There have been no studies that specifically investigated wastewater treatment system emissions, but some of the general DIAL studies performed measurements of the facilities' wastewater treatment operations. The data from these reports were reviewed in the context of determining whether changes should be made to the existing emissions estimation methodologies for wastewater treatment systems in Chapter 4.3 of AP-42.

6.1 Houston Area DIAL Study

The Houston Area DIAL Study (Robinson et al., 2008) measured VOC emissions from multiple petrochemical industry sites in the Houston area during the summer of 2007, including a refinery in the Houston area (BP Texas City Refinery). The Houston Area DIAL Study at the BP Texas City Refinery included measurements for the refinery's wastewater treatment system. A critical review of the VOC measurements performed at the BP Texas City Refinery was conducted by Randall and Coburn (Ref No. 4 in Table 1-1) to compare the DIAL emissions estimates for sources at the BP Texas City Refinery with refined emissions estimates based on AP-42 emissions methodologies, taking into account the process operating characteristics that existed during the time of the measurements. Specifically, emissions from the wastewater treatment system were developed using WATER9 based on information received from the refinery operators regarding wastewater flows, treatment unit size, and other pertinent operating parameters. The refinery did not do any special sampling and analysis of wastewater contents during the measurement period, but there was a significant amount of process data that could be used for emissions model input.

The wastewater treatment system had measured emissions rates during the Houston Area DIAL Study higher than projected by the refinery in its annual emissions inventory. The refinery

typically runs two activated sludge units in parallel. During the time of the DIAL measurements, one of the activated sludge units was down for maintenance and all of the wastewater flow was managed in the one operating activated sludge unit. Operating one activated sludge unit to handle the volume of wastewater typically handled by two units is not normal operation. The unusually high VOC emissions measured during the test were caused by the reduced residence time in the operating activated sludge tank due to all of the wastewater flow being processed in the single operating activated sludge tank. When the single activated sludge unit was modeled based on the flow and concentrations during the time of the DIAL measurements, the modeled emissions estimates (AP-42 emissions equations as implemented in WATER9 emissions model) of 22 to 55 lbs VOC/hr agreed well with the DIAL emissions measurements of 30 lbs VOC/hr. Therefore, it appears that the AP-42 emissions equations were accurate for estimating the emissions from the activated sludge system for the defined operating conditions.

6.2 Houston Ship Channel/Shell Deer Park DIAL Study

The Shell DIAL study (Ref No. 5 in Table 1-1; Raun and Hoyt, 2011) measured VOC emissions from a combined petroleum refinery and chemical complex (Shell Deer Park facility) in the Houston Ship Channel area. Like the Houston Area DIAL Study, the Shell DIAL study included DIAL VOC measurements of the wastewater treatment system. For many of these sources, FTIR measurements were also conducted to improve compositional characterization of the plume. Emissions estimates provided by plant personnel (presumably based on AP-42 emissions factor methodologies) were also reported.

Very high emissions were measured from the northwest wastewater treatment system. In late January and early February, the northwest wastewater treatment area had measured VOC emissions that ranged from 4 to 80 times higher than those projected based on emissions factors. According to the Shell refinery representatives, there was a temporary malfunction of a skimmer on one of the dissolved air flotation units, which caused an oil layer to develop on the top of the tank contents that impacted some of the measurements. Emission measurements taken during a malfunction are not appropriate for use in developing or revising emissions factors. Emissions from the wastewater treatment facility were also higher than estimated at times when the process was operating normally; however, the report does not appear to include sufficient process data

from which to evaluate the appropriateness of the modeled emission estimates or the AP-42 emissions factors.

Given the lack of process operating data, the Shell DIAL study cannot be directly used to update or revise emissions factors for wastewater treatment systems. Additionally, as noted in the Shine review (Ref No. 2 in Table 1-1), high emissions events that occur during process upsets, malfunctions, startups and shutdowns are not typically characterized in a facility's emissions inventory and emissions factors are not generally available or applicable for estimating emissions from these events. The Shell DIAL study certainly documents that high emissions can occur as a result of such events, as noted by the high emissions measured at the northwest wastewater treatment area during the malfunction of the DAF. The AP-42 emissions factors are intended for estimating emissions during representative normal operating conditions; they are not intended to account for emissions that occur as a result of process upsets or startup or shutdown events.

6.3 Conclusions Regarding Wastewater Treatment System Measurement Study Data

The AP-42 emissions factor correlation equations provide a sophisticated modeling method to estimate emissions from a wide variety of wastewater treatment systems taking into account unit-specific variables including the unit size, throughput, wastewater pollutant concentrations, ambient temperatures, and other loss mechanisms (biodegradation and absorption). When this detailed information is properly used with the AP-42 equations to model site-specific emissions, the emissions model (AP-42 equations/WATER9) provides an accurate estimate of actual VOC emissions. However, we recognize that the misapplication of the equations or use of inaccurate input can lead to inaccurate emissions estimates. We have included guidance in the *Refinery Protocol* (RTI, 2011) to highlight key model input parameters and to provide instructions on how to develop site-specific information (e.g., unit-specific biodegradation rates) when applying the AP-42 equations.

While we have not performed an identical hourly evaluation of the wastewater treatment system emissions as was performed for storage tanks by Coburn and Icenhour (2008), the wastewater AP-42 emissions factor equations' dependency on temperature and wind speed suggests that there can be a similar variability in short-term emissions rates as was observed for

tanks. Therefore, comparisons of short-term measured emissions with annual emissions reported in an emissions inventory must consider the variability in the emissions across different temperature, wind speed, and operating characteristics. Thus, we find that, when unit-specific data are not available for direct modeling comparisons, short-term measurement data within a factor of 5 of the annual average emissions inventory value do not provide justification that the emissions inventory is incorrect or that the emissions factor equations need to be revised.

It is also important to note that the emissions estimation procedures only account for emissions in normal operating scenarios. Emissions from wastewater treatment units that are improperly operated (e.g., unit has an oil film when they should not or if the biological treatment unit receives a shock load) would require special emission modeling to consider the event. Many of the AP-42 emissions factors equations may be able to provide a reasonable emissions estimate during the event (as was seen when one wastewater train was down for repair); however, there is no universal method by which to estimate the emissions from these events since the modeling required would be specific to the type of event that occurred. We have included guidance in the *Refinery Protocol* (RTI, 2011) for estimating emissions during malfunctions or upsets, including spills, but each such event would require specific engineering calculations to estimate the emissions.

We found that the AP-42 wastewater treatment system equations provided reasonably accurate estimates of measured emissions rates when appropriate process data were used in the AP-42 equations. Therefore, we determine that it is not necessary to revise the wastewater treatment system emissions estimation equations in AP-42 Chapter 4 or develop a VOC emissions factor. That is, we find that the AP-42 wastewater treatment system emissions estimation equations sufficiently estimate emissions with accurately characterized units and site-specific inputs.

Section 7
Conclusions

The following conclusions are based on a review of the reports cited in the Plaintiffs' May 2013 complaint, along with other associated reports, available documents, and recent tank emissions testing.

1. Emissions inventory estimates can underestimate actual emissions because they often do not adequately account for site-specific conditions and do not generally account for unusual emissions that occur as a result of process upsets, malfunctions, startups and shutdowns. Improving emissions inventory guidelines, as done by TCEQ (2013) or as provided by the *Refinery Protocol* (RTI, 2011), appears to be the most effective way to improve emissions inventories. We have, through the *Refinery Protocol*, provided guidance that emissions from startup, shutdowns, and malfunction events should be characterized on a per event basis and these emissions should be added to the "normal" emissions estimated using AP-42 emissions factors when developing annual emissions inventories.
2. There are numerous recent studies conducted to measure emissions from flares with measurement data for CO, NOx, and VOC. These data should be used to revise the emissions factor for CO and to develop a new emissions factor for VOC from flares. As such, the EPA has incorporated these data into the emissions factor development process and we have revised section 13.5 of AP-42 to incorporate the new and revised emissions factors developed with these data. The NOx data could not be used for emissions factor development because the instruments were not calibrated for measuring NOx and/or the measurement system failed data quality objectives. Nonetheless, the extractive NOx data that are available, while not fully validated, is in the range of the existing AP-42 factor which suggests that the existing NOx emissions factor is reasonably accurate.
3. For tanks, it is important to note that the equations in AP-42 can only be expected to provide accurate emissions estimates when appropriate site-specific input values are entered into the equations. It is also important to note that the emissions estimation

procedures only account for emissions in normal operating scenarios and that emissions during normal operations can vary significantly over time so that hourly emission rates can be 5 to 10 times higher than annual average emissions. Understanding these points, we found that the AP-42 tank equations provided reasonably accurate estimates of measured emissions rates when appropriate process data were used in the AP-42 equations. Therefore, we determine that it is not necessary to revise the tank emissions estimation equations in AP-42 Chapter 7 or to create a VOC emissions factor. The AP-42 tank emissions estimation equations sufficiently estimate emissions with accurately characterized tanks, site-specific inputs, and properly operated and maintained equipment.

4. For wastewater treatment systems, it is important to note that the equations in AP-42 can only be expected to provide accurate emissions estimates when appropriate site-specific input values are entered into the equations. We found that the AP-42 wastewater treatment system equations provided reasonably accurate estimates of measured emissions rates when appropriate process data were used in the AP-42 equations. Therefore, we determine that it is not necessary to revise the wastewater treatment system emissions estimation equations in AP-42 Chapter 4 or to create a VOC emissions factor. The AP-42 wastewater emissions estimation equations sufficiently estimate emissions with accurate site-specific inputs.

Section 8
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Appendix A

COMPLAINT

MAY 2013

UNITED STATES DISTRICT COURT
DISTRICT OF COLUMBIA

AIR ALLIANCE HOUSTON
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COMMUNITY IN-POWER AND DEVELOPMENT ASSOCIATION, INC
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Houston, TX 77011;

Plaintiffs,

v.

Bob Perciasepe, in his official capacity as Acting Administrator, United States Environmental Protection Agency,
1101A EPA Headquarters, Ariel Rios Building
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460

Defendant.

Case No. _____

COMPLAINT FOR DECLARATORY AND INJUNCTIVE RELIEF

INTRODUCTION

1. Plaintiffs Air Alliance Houston, Community In-Power and Development Association (CIDA), Louisiana Bucket Brigade, and Texas Environmental Justice Advocacy Services (TEJAS), (collectively, "Plaintiffs") bring this action pursuant to section 304(a)(2) of

the Clean Air Act ("CAA" or the "Act"), 42 U.S.C. § 7604(a)(2), to compel Defendant Bob Perciasepe, Acting Administrator of the United States Environmental Protection Agency ("EPA"), to perform the nondiscretionary duties required by section 130 of the Act, 42 U.S.C. § 7430. Specifically, the Administrator has failed to review and, if necessary, revise the emission factors for volatile organic compounds (VOCs), carbon monoxide, and nitrogen oxides at least once every three years. 42 U.S.C. § 7430.

2. An emission factor is a "representative value" or "tool" used to estimate emissions of a specific pollutant from an air pollution source. Emission factors are central to the CAA, and are used to calculate roughly eighty percent of air emissions from virtually all industrial sectors. Emissions data calculated from emission factors is used to: design regulations; develop emission control strategies; establish emission limits and other applicable permit requirements for major sources; guide enforcement priorities; and evaluate compliance with air quality standards.

3. Refineries and petrochemical plants release VOCs and other toxic pollutants that poses significant health risks to nearby communities and to the environment. VOCs are organic chemicals that readily vaporize into the air, and can combine with nitrogen oxides to form ozone. Ozone is a criteria pollutant that is responsible for respiratory ailments and increased hospital admissions for coughing, chest pain, throat and nose irritation, lung inflammation and other respiratory issues. Some VOCs are also toxic pollutants, such as benzene, 1,3-butadiene, and hexane—all known carcinogens.

4. VOC emissions from petroleum refineries, petrochemical plants, and other industrial sources are significantly underestimated because inaccurate emission factors are used to quantify emissions from industrial flares ("flares"), liquid storage tanks ("tanks"), and

wastewater collection, treatment, and storage systems ("wastewater treatment systems") at these facilities. Numerous scientific studies have found that VOC emissions from these sources are several orders of magnitude higher than emission factor estimates, in some cases measuring VOC emissions 132 times above the estimated amount.

5. Under section 130 of the Act, 42 U.S.C. § 7430, the Administrator has a mandatory duty to review and, if necessary, revise, emission factors used to estimate emissions of VOCs from emission sources at least once every three years. The failure to comply with this mandate compromises EPA's ability to implement the CAA in a manner that protects public health and the environment. Yet, the Administrator has failed to perform the nondiscretionary duty to review and, if necessary, revise the emission factors used to estimate VOC emissions from flares, tanks, and wastewater treatment systems within the statutory timeframe.

6. With this action, Plaintiffs seek to compel the Administrator to expeditiously complete a review of the VOC emission factors for flares, tanks, and wastewater treatment systems, and, if necessary, revise these factors as required by section 130 of the Act, 42 U.S.C. § 7430.

JURISDICTION AND VENUE

7. This Court has jurisdiction over this action pursuant to 42 US.C. § 7604(a)(2) (action arising under the CAA citizen suit provision), 28 U.S.C. § 1331 (federal question), and 28 U.S.C. § 1361 (mandamus). This Court may order the Administrator to perform the requisite acts and duties, may issue a declaratory judgment and may grant further relief pursuant to 42 U.S.C. § 7604(a), (d) and 28 U.S.C. §§ 2201, 2202.

8. Pursuant to section 304(a) of the CAA, 42 U.S.C. § 7604(a), "the district courts shall have jurisdiction . . . to order the Administrator to perform such act or duty [which is not discretionary]."

9. Plaintiffs have a right to bring this action pursuant to section 304(a)(2) of the CAA, 42 U.S.C. § 7604(a)(2), and the Administrative Procedure Act, 5 U.S.C. §§ 701 to 706.

10. By certified letter posted July 18, 2012, Plaintiffs sent Administrator written Notice of Intent to Sue ("Notice") and have thereby complied with the notice requirements of section 304(b)(2) of the CAA, 42 U.S.C. § 7604(b)(2), and 40 C.F.R. pt. 54. *See* Ex. A. More than 60 days have passed since Plaintiffs provided Notice. The Administrator has not responded to Plaintiff's Notice or remedied the alleged violations. Therefore, an actual controversy exists between the parties.

11. Venue is vested in this Court under 28 U.S.C. § 1391(e) because the Administrator resides in this district.

PARTIES

12. Plaintiff Air Alliance Houston is a nonprofit, non-membership organization, incorporated and existing under the laws of the State of Texas, located in Houston, Texas. Air Alliance Houston works to reduce air pollution exposure and related health effects on behalf of communities in the Houston region. Air Alliance Houston is concerned that inaccurate accounting of VOC emissions from the many petroleum refineries and petrochemical plants in the Houston area undermine its efforts to reduce air pollution. Communities in the Houston region are vulnerable to VOCs emitted from Houston facilities because of: the toxins they contain and the smog they produce; the lack of accurate information about air pollutants, concentrations, and resulting exposures has made, and continues to make, it difficult for

Houstonians to determine how to best protect themselves; the inaccurate emissions data caused by poor quality emissions factors has made, and continues to make, it difficult for community members to effectively exercise their right to review and comment on CAA permits designed to protect ambient air quality; and, the underreporting of emissions may expose community members to pollutants at levels that are higher than the law allows and in concentrations deleterious to human health.

13. Plaintiff Community In-Power and Development Association (CIDA) is a nonprofit, membership corporation located in Port Arthur, Texas. CIDA advocates for its members' environmental justice, social, and economic rights. CIDA is concerned about accurate accounting of VOC emissions from petroleum refineries and petrochemical manufacturing plants in the Port Arthur area. Members of CIDA are exposed to VOCs, and the related toxins and smog, emitted from these facilities where they live and work; the lack of information about air pollutants, concentrations, and resulting exposures has made, and continues to make, it hard for them to determine how best to protect themselves; the inaccurate and poor quality of emissions data has made, and continues to make, it difficult for them to effectively exercise their right to review and comment on CAA permits designed to protect ambient air quality; and, the underreporting of emissions may expose members to pollutants at levels that are higher than the law allows and in concentrations deleterious to human health. CIDA brings this action on behalf of itself and its members that live, work, and recreate near petroleum refineries and petrochemical plants in the Port Arthur area in Southeast Texas.

14. Plaintiff Louisiana Bucket Brigade is a nonprofit, membership-based environmental health and justice organization located in New Orleans, Louisiana. Its mission is to work with communities to create Louisiana neighborhoods that are free of toxic air pollution

from refineries and other industrial sources. Louisiana Bucket Brigade is concerned about accurate accounting of VOC emissions from Louisiana's many petroleum refineries and petrochemical manufacturing plants. Members of Louisiana Bucket Brigade are exposed to VOCs, and the related toxins and smog, emitted from these facilities where they live and work; the lack of information about air pollutants, concentrations, and resulting exposures has made, and continues to make, it hard for them to determine how best to protect themselves; the inaccurate and poor quality of emissions data has made, and continues to make, it difficult for them to effectively exercise their right to review and comment on CAA permits designed to protect ambient air quality; and, the underreporting of emissions may expose members to pollutants at levels that are higher than the law allows and in concentrations deleterious to human health. Louisiana Bucket Brigade brings this action on behalf of itself and its members that live, work, and recreate near petroleum refineries and petrochemical plants in Louisiana.

15. Plaintiff Texas Environmental Justice Advocacy Services (TEJAS) is a nonprofit corporation located in Houston, Texas. TEJAS's mission is to create sustainable, healthy communities in the Houston Ship Channel region by educating individuals on health impacts from environmental pollution and empowering individuals to promote enforcement of environmental laws. TEJAS is particularly concerned about accurate accounting of VOC emissions from petroleum refineries and petrochemical manufacturing plants in the Houston Ship Channel. Members of TEJAS are exposed to VOCs and the related toxins and smog emitted from these facilities where they live and work; the lack of information about air pollutants, concentrations, and resulting exposures, has made, and continues to make, it hard for them to determine how best to protect themselves; the inaccurate and poor quality of emissions data has made, and continues to make, it difficult for them to effectively exercise their right to

review and comment on CAA permits designed to protect ambient air quality; and, the underreporting of emissions may expose members to pollutants at levels that are higher than the law allows and in concentrations deleterious to human health. TEJAS brings this action on behalf of itself and its members that live, work, and recreate near petroleum refineries and petrochemical plants in the Houston Ship Channel.

16. The Plaintiffs and their members live, work, recreate, and breathe the air near petroleum refineries and petrochemical plants that emit VOCs from flares, tanks, and wastewater treatment systems. Plaintiffs' members have experienced, continue to experience, or are likely to experience, harm to their health and to their environmental, recreational, aesthetic, and economic interests due to the Administrator's ongoing failure to complete a review of emission factors as required by section 130 of the Act, 42 U.S.C. § 7430.

17. Defendant Bob Perciasepe is the Acting Administrator of the EPA and in that role is charged with the duty to review and, if necessary, revise, the emission factors in accordance with Section 130 of the Act. 42 U.S.C. § 7430.

LEGAL BACKGROUND

18. The CAA was established "to protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population" and "to initiate and accelerate a national research and development program to achieve the prevention and control of air pollution." 42 U.S.C. § 7401(b).

19. A "primary goal" of the Act is "pollution prevention." *Id.* § 7401(c).

20. As part of the regulatory framework prescribed by the Act to accomplish these objectives, EPA must establish "methods ('emission factors') used…to estimate the quantity of

emissions of . . . volatile organic compounds . . . from sources of such air pollutants." 42 U.S.C. § 7430.

21. EPA must periodically review and revise these emission factors. Section 130 provides that "at least every 3 years [after Nov. 15, 1990], the Administrator *shall* review and, if necessary, revise, the methods ('emission factors') used for purposes of [the CAA] to estimate the quantity of emissions of . . . volatile organic compounds . . . from sources of such air pollutants." 42 U.S.C. § 7430 (emphasis added). Section 130 requires that the Administrator complete a review, and either make a formal determination that revision is not appropriate, or revise the emission factors for VOCs within the statutory deadline. *See id.*

22. The timely review and, if necessary, revision of VOC emission factors is crucial to EPA's ability to implement the CAA in a manner that is protective of public health. The EPA recognizes that timely review and revision of emission factors is critical because new test data, information, and technology can render existing emission factors obsolete or prove them to be unreliable.

FACTUAL BACKGROUND

23. An emission factor is a "representative value" or "tool" used to estimate emissions of a specific pollutant from an air pollution source. EPA regulations define an "emission factor" as "the ratio relating emissions of a specific pollutant to an activity or material throughput level." 40 C.F.R. § 51.50.

24. EPA has also defined "emission factor" as "a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant." Office of Air Quality Planning & Standards, Office of Air and Radiation, EPA, AP-42, Compilation of Air Pollutant Emission Factors Volume I: Stationary

Point and Area Sources 1 (5th ed. 1995), *available at* www.epa.gov/ttn/chief/ap42/index.html [hereinafter AP-42]. EPA guidance documents define emission factors as "a tool that is used to estimate air pollutant emissions to the atmosphere." Office of Air Quality Planning & Standards, Office of Air and Radiation, EPA, EPA-454/R-95-015, Procedures for Preparing Emission Factor Documents, 2-1 (1997), *available at* www.epa.gov/ttnchie1/efdocs/procedur.pdf.

25. The Compilation of Air Pollutant Emission Factors, or AP-42 as it is commonly referred to, is the official compilation of emission factors and contains more than 1,700 emission factors for over 200 air pollutants. AP-42, *supra*. The AP-42 emission factors are used by major stationary sources to determine emissions from various pollution producing process units, including flares, tanks, and wastewater treatment systems.

26. The EPA Locating and Estimating Air Toxics Emissions ("L&E") report series compiles available information on source categories of toxic air emissions and identifies potential release points and emission factors. Office of Air Quality Planning & Standards, Office of Air and Radiation, EPA, Locating and Estimating Air Toxics Emissions from Sources of (source category or substance) (2010), *available at* www.epa.gov/ttnchie1/le/. The emission factors in the L&E report series cover toxic pollutants that are also VOCs, such as benzene and toluene. Whereas AP-42 emission factors sometimes do not differentiate between different types of VOCs, the emission factors in the L&E report series can be used to estimate emissions of specific toxics that are also VOCs and create an inventory of toxic air emissions.

27. Industry uses emission factors to report air pollution to EPA and state regulatory agencies. EPA and state agencies rely on this data to develop national, regional, state, and local emissions inventories. These emission inventories are the primary tool that EPA and state agencies use to develop emissions control strategies and make air quality management and

permitting decisions. *Basic Emissions Factors Information*, Envtl. Prot. Agency, www.epa.gov/ttn/chief/efpac/abefpac.html (last updated July 17, 2012).

28. "Emissions factors have long been the fundamental tool in developing national, regional, state, and local emissions inventories for air quality management decisions and in developing emissions control strategies. More recently, emissions factors have been applied in determining site-specific applicability and emissions limitations in operating permits by federal, state, local, and tribal agencies, consultants, and industry." *Id.* For example, emission factors are used to calculate pollutant loadings used in the development of federally mandated air quality plans designed to reduce smog and other pollutants. Emission factors may also be used to determine compliance; EPA relies on the emission inventories—based on self-reported industry emissions calculated using emission factors—to set an emission limit that industry then demonstrates compliance with using emission factors. In addition, regulated industries often use emission factors to determine if new or modified facilities will emit air pollution at levels that require a CAA permit and best available pollution control technologies. Because poor quality emission factors can significantly underestimate pollution emissions, the use of inaccurate emission factors can result in the public being exposed to more air pollution than the law allows.

29. Petroleum refineries and petrochemical plants utilize flares, tanks, and wastewater treatment systems—all of which emit significant quantities of harmful VOCs—in their operations. Low income and minority communities suffer disproportionate health and environmental impacts due to their proximity to these industrial sources, raising environmental justice concerns.

30. Flares are used to control VOC releases from industrial operations, including petroleum refineries and petrochemical plants by combusting excess gases—mostly

hydrocarbons—to convert them into inert compounds. VOCs and other toxic pollutants are released from flares as a result of incomplete combustion.

31. Liquid storage tanks are used in many industries that consume or produce organic liquid, including petroleum refining and petrochemical manufacturing. Tanks emit significant quantities of VOCs, some of which are toxic, such as benzene, toluene, and xylene.

32. Many industrial facilities, including petroleum refineries and petrochemical plants, generate wastewater streams containing organic compounds. Emissions from wastewater treatment systems are mostly fugitive VOCs and dissolved gases that evaporate from wastewater surfaces left open to the air during some of the treatment processes.

33. VOC emissions endanger human health and the environment. VOCs are substances that readily vaporize into the air, and include gaseous hydrocarbons and partially oxidized hydrocarbons. VOCs and nitrogen oxides combine in a light-induced chemical reaction to produce photochemical smog, an air pollution event that is characterized by high levels of ground-level ozone. Ozone is a criteria pollutant known to endanger public health and the environment.

> At elevated levels, ozone has been shown in human laboratory and/or community studies to be responsible for the reduction of lung function, respiratory symptoms (e.g. cough, chest pain, throat and nose irritation), increased hospital admissions for respiratory causes, and increased lung inflammation. Animal studies have shown increased susceptibility to respiratory infection and lung structure changes. Ambient ozone has been linked to adverse effects on agricultural crops and forests.

National Emission Standards for Hazardous Air Pollutants for Source Categories; National Emission Standards for Hazardous Air Pollutants from Petroleum Refineries—Catalytic Cracking (Fluid and Other) Units, Catalytic Reforming Units, and Sulfur Plant Units, 63 Fed.

Reg. 48,890, 48,893 (proposed Sept. 11, 1998). Some VOCs are also toxic pollutants, such as 1,3-butadiene, toluene, and benzene—a known carcinogen.

34. The existing emission factors used to estimate VOC emissions from flares, tanks, and wastewater treatment systems either significantly underestimate emissions or are rated poor quality by EPA, potentially exposing communities to high levels of VOCs that are prohibited by law and can have significant adverse health effects and pose grave risks to nearby communities.

35. The EPA has acknowledged, and scientific studies show, that the AP-42 emission factors for flares, tanks, and wastewater treatment systems significantly underestimate VOC emissions from these processes. *See, e.g.*, Office of Inspector Gen., EPA, 2006-P-00017, EPA Can Improve Emissions Factors Development and Management 11-12 (2006) (explaining that for refineries "[t]he under-reporting was caused largely due to the use of poor quality emissions factors"); Memorandum from Brenda Shine, EPA, to EPA (July 27, 2007) at 1, Docket ID No. EPA-HQ-OAR-2003-0146-0010 ("This document provides the basis for our hypothesis that there is a systematic low bias in reported emissions of VOC and air toxics from petroleum refineries.").

36. Scientific studies conducted using remote sensing technology, including Differential Absorption Lidar (DIAL) and Passive Fourier Transform Infrared (PFTIR), show that VOC emissions from flares, tanks and wastewater treatment systems can be several orders of magnitude higher than AP-42 emission factor estimates. *See, e.g.*, David T. Allen and Vincent M. Torres, Univ. of Tex. at Austin, Ctr. Energy & Envtl. Res., *TCEQ 2010 Flare Study Final Report* (2011), *available at* www.tceq.texas.gov/assets/public/implementation/air/rules/Flare/2010flarestudy/2010-flare-study-final-report.pdf; David Randall & Jeff Coburn, EPA, EPA 453/R-10-002, Critical Review

of DIAL Emission Test Data for BP Petroleum Refinery in Texas City, Texas, at ES-2 tbl. 1 (2010), *available at* www.epa.gov/airtoxics/bp_dial_review_report_12-3-10.pdf (finding that VOC emissions from several units exceeded emission estimates based on AP-42 emission factors); Loren Raun & Dan W. Hoyt, Bur. Pollution Control & Prevention, City of Houston, Measurement and Analysis of Benzene and VOC Emissions in the Houston Ship Channel Area and Select Major Stationary Sources Using DIAL (Differential Absorption Light Detection and Ranging) Technology to Support Ambient HAP Concentrations Reductions in the Community (DIAL Project) (2011), *available at* www.greenhoustontx.gov/dial20110720.pdf (finding that VOC and benzene emissions from tanks and wastewater treatment systems far exceeded emission estimates based on unidentified emission factors that are presumed to be from AP-42); Marathon Petroleum Co., LL.C., *Performance Test of a Steam-Assisted Flare with Passive FTIR* (May 2010), *available at* www.tceq.texas.gov/assets/public/implementation/air/rules/Flare/2010flarestudy/mpc-txc.pdf; Marathon Petroleum Co., LL.C., *Performance Test of a Steam-Assisted Elevated Flare with Passive FTIR –Detroit* (2010), *available at* www.tceq.texas.gov/assets/public/implementation/air/rules/Flare/2010flarestudy/mpc-detroit.pdf; Flint Hills resources Port Arthur, LL.C., *PFTIR Test of Steam-Assisted Elevated Flares–Port Arthur* (2011), *available at* www.epa.gov/compliance/resources/publications/civil/programs/caa/portarthur-report.pdf; Allan Chambers & Mel Strosher, Alberta Research Council, Inc., *Refinery Demonstration of Optical Technologies for Measurement of Fugitive Emissions and for Leak Detection* (2006), *available at* www.environmentalintegrity.org/pdf/publications/EIP_Att_D_Total_Upset.pdf.

37. The L&E emission factors used to estimate air emissions of certain toxics, including those that are also VOCs, from tanks and waste water treatment systems have been rated poor or below average quality by EPA. EPA assigns each emission factor a rating of A through E, with E being the poorest quality, based on certain data quality criteria. The emission factors in the L&E report series for estimating emissions of 1,3 butadiene, benzene, chlorobenzenes, toluene, methyl ethyl ketone, and xylene emissions from storage tanks and wastewater treatment systems are either unrated or are rated D—below average, or E—poor.

38. In 2008, the City of Houston filed a Data Quality Act petition asking EPA to correct the emission factors in AP-42 and the L&E report series that are used to estimate emissions from petroleum refineries and petrochemical manufacturing plants.

39. In response to the petition, EPA committed to developing a comprehensive protocol for the estimation of petroleum refinery emissions, providing a draft analysis of the DIAL study conducted at the BP Amoco facility in Texas City, evaluating data from any future remote sensing studies, and undertaking a review, and improvement, of existing emission factors and methodologies for specific emission sources, including tanks and flares. While EPA has completed several of these tasks, the Agency has not completed a Section 130 review of the VOC emission factors for flares, tanks, and wastewater treatment systems, and either made a formal determination that revision is not warranted or revised the emission factors.

40. The existing emission factors used to estimate VOC emissions from flares are included in section 13.5 of AP-42. The Administrator has not completed a review, and either made a formal determination that revision is not appropriate or revised these emission factors since September 1991. The existing emission factors for flares in AP-42 significantly underestimate actual VOC emissions from flares.

41. The existing emission factors in AP-42 used to estimate VOC emissions from flares are based primarily on a thirty-year old flare efficiency study conducted by EPA in 1983. Despite the availability of more recent test data demonstrating that emission factors underestimate VOC emissions from flares by overestimating flare efficiency by as much as 28%, EPA has not completed the requisite review. In addition to EPA's own report on operating parameters that affect flare combustion efficiency and performance, eleven studies on flare efficiency have been conducted since 2006 that EPA can use to update the emission factors for flares in AP-42. EPA's own report, published in 2012, found that certain operating parameters can reduce flare efficiency, and established certain parameters that flares must operate within to achieve and maintain combustion efficiency above 98%. At some facilities, EPA is already requiring installation of remote sensing technologies that directly measure combustion efficiency, and continuous monitoring of operating parameters that affect combustion efficiency. *See* Consent Decree, *United States v. BP Products N. A.*, Inc., Civil No. 2:12 CV 207, at app. D (N.D. Ind. Sept. 28, 2012), *available at* www.epa.gov/compliance/resources/decrees/civil/caa/whiting-cd.pdf; Consent Decree, *United States v. Marathon Petroleum Co.*, Civ. Action No. 2:12-cv-11544, at 41-51 (E.D. Mich. April 5, 2012), *available at* www.epa.gov/compliance/resources/decrees/civil/caa/marathonrefining-cd.pdf. EPA's delay in completing the requisite review of the emission factors for flares is inexcusable in light of the available information documenting the extent to which existing emission factors undercount toxic VOC emissions from flares that nearby communities are continually exposed to.

42. The emission factors used to estimate VOC emissions from tanks are included in section 7.1 of AP-42 and the L&E report series. The Administrator has not completed a review,

and either made a formal determination that revision is not appropriate or revised the emission factors for tanks in AP-42 since at least 2006, and for the emission factors in the L&E report series in over fourteen years. EPA last completed a review of the existing L&E emission factors used to estimate benzene emissions from tanks in 1998; last reviewed the existing L&E emission factors used to estimate emissions of chlorobenzenes, methyl eythyl ketone, toluene, and xylene from tanks in 1994; last reviewed the existing L&E emission factors used to estimate emissions of trichloroethylene in 1989; last reviewed the existing L&E emission factors used to estimate emissions of ethylene oxide in 1986; and last reviewed the existing L&E emission factors used to estimate emissions of acrylonitrile and chloroform in 1984. The existing emission factors for tanks in AP-42 significantly underestimate actual VOC emissions, and the existing emission factors in the L&E report series for estimating acrylonitrile, benzene, chlorobenzenes, chloroform, ethylene oxide, methyl ethyl ketone, toluene, trichloroethylene, and xylene emissions from tanks are either unrated or are rated D—below average, or E—poor.

43. At least three scientific studies conducted since 2006 shows that existing emission factors significantly underestimate toxic VOC emissions from tanks. EPA's failure to complete the requisite review of emission factors for tanks is inexcusable in light of the information available to EPA, the significant amounts of toxic VOC emissions from tanks that are unaccounted for by emission factors, and the danger these emissions pose to nearby communities.

44. The existing emission factors used to estimate VOC emissions from wastewater treatment systems are included in section 4.3 of AP-42 and the L&E report series. The Administrator has not completed a review, and either made a formal determination that revision is not appropriate or revised the emission factors for wastewater treatment systems in AP-42

since at least 2006, and for the emission factors in the L&E report series in over fourteen years. EPA last completed a review of the existing L&E emission factors used to estimate benzene emissions from wastewater treatment systems in 1998; last reviewed the existing L&E emission factors used to estimate 1,3 butadiene emissions from wastewater treatment systems in 1996; last reviewed the existing L&E emission factors used to estimate emissions of chlorobenzenes and xylene emissions from wastewater treatment systems in 1994; and last reviewed the existing L&E emission factors used to estimate emissions of chloroform, epichlorohydrin and ethylene dichloride from wastewater treatment systems in 1984. The existing emission factors for wastewater treatment systems in AP-42 significantly underestimate actual VOC emissions, and the existing emission factors in the L&E report series for estimating benzene, 1,3 butadiene, chlorobenzenes, chloroform, epichlorohydrin, ethylene dichloride, and xylene emissions from wastewater treatment systems are either unrated or are rated D—below average, or E—poor.

45. Notwithstanding the poor quality of these emission factors and EPA's own acknowledgments and scientific data that makes clear that these emission factors can significantly undercount the emissions nearby communities are exposed to, the Administrator has failed to complete a review and make necessary revisions of these emission factors within the statutory timeframe in accordance with section 130 of the CAA. In light of EPA's continued failure to act, Plaintiffs issued a notice of intent to sue EPA for failure to comply with its statutory duties under section 130 of the CAA on July 18, 2012. *See* Ex. A.

CAUSES OF ACTION

46. Plaintiffs re-allege and incorporate the allegations of all foregoing paragraphs.

47. The Administrator has failed to review and, if necessary, revise the existing emission factors for flares in AP-42 since 1991. The Administrator's ongoing failure to

complete a Section 130 review, and either make a final determination that revision is not appropriate or revise the VOC emission factors for flares in AP-42 within the statutory timeframe constitutes a "failure of the Administrator to perform any act or duty under this chapter which is not discretionary with the Administrator" within the meaning of section 304(a)(2) of the CAA, 42 U.S.C. § 7604(a)(2).

48. The Administrator has failed to review and, if necessary, revise the existing emission factors for tanks in AP-42 and L&E since at least 2006. The Administrator's ongoing failure to complete a Section 130 review, and either make a final determination that revision is not appropriate or revise the VOC and other emission factors for tanks in AP-42 and L&E within the statutory timeframe constitutes a "failure of the Administrator to perform any act or duty under this chapter which is not discretionary with the Administrator" within the meaning of section 304(a)(2) of the CAA, 42 U.S.C. § 7604(a)(2).

49. The Administrator has failed to review and, if necessary, revise the existing emission factors for wastewater treatment systems in AP-42 and L&E since at least 2006. The Administrator's ongoing failure to complete a Section 130 review, and either make a final determination that revision is not appropriate or revise the VOC and other emission factors for tanks in AP-42 and L&E within the statutory timeframe constitutes a "failure of the Administrator to perform any act or duty under this chapter which is not discretionary with the Administrator" within the meaning of section 304(a)(2) of the CAA, 42 U.S.C. § 7604(a)(2).

PRAYER FOR RELIEF

WHEREFORE, Plaintiffs respectfully request that this Court:

A. Declare that the Administrator's failure to complete a review of the VOC emission factors for flares in AP-42, and either make a final determination that revision is not

appropriate or revise the emission factors within the statutory timeframe, constitutes a "failure of the Administrator to perform any act or duty under this chapter which is not discretionary with the Administrator" within the meaning of section 304(a)(2) of the CAA, 42 U.S.C. § 7604(a)(2);

B. Declare that the Administrator's failure to complete a review of the VOC emission factors for tanks in AP-42 and L&E, and either make a final determination that revision is not appropriate or revise the emission factors within the statutory timeframe, constitutes a "failure of the Administrator to perform any act or duty under this chapter which is not discretionary with the Administrator" within the meaning of section 304(a)(2) of the CAA, 42 U.S.C. § 7604(a)(2);

C. Declare that the Administrator's failure to complete a review of the VOC emission factors for wastewater treatment systems in AP-42 and L&E, and either make a final determination that revision is not appropriate or revise the emission factors within the statutory timeframe, constitutes a "failure of the Administrator to perform any act or duty under this chapter which is not discretionary with the Administrator" within the meaning of section 304(a)(2) of the CAA, 42 U.S.C. § 7604(a)(2);

D. Order the Administrator to complete the required Section 130 reviews and to either revise the VOC emissions factors for flares, tanks, and wastewater treatment systems in AP-42 and L&E, or make a final determination that such revision is not appropriate, pursuant to section 130 of the CAA, 42 U.S.C. § 7430, in accordance with expeditious deadlines specified by this Court;

E. Retain jurisdiction of this action to ensure compliance with this Court's decree;

F. Award Plaintiffs the costs of this action, including attorney's fees; and

G. Grant such other relief as the Court deems just and proper.

DATED: May 1, 2013

Respectfully submitted,

/s/ Jennifer Peterson
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**Motion to appear pro hac vice pending*

Counsel for Air Alliance Houston, Community In-Power and Development Association, Louisiana Bucket Brigade, and Texas Environmental Justice Advocacy Services

CIVIL COVER SHEET

JS-44 (Rev. 3/13 DC)

I. (a) PLAINTIFFS

Air Alliance Houston
Community In-Power and Development Association, Inc.
Louisiana Bucket Brigade
Texas Environmental Justice Advocacy Services

(b) COUNTY OF RESIDENCE OF FIRST LISTED PLAINTIFF 88888
(EXCEPT IN U.S. PLAINTIFF CASES)

DEFENDANTS

Bob Perciasepe, in his official capacity as Acting Administrator, United States Environmental Protection Agency

COUNTY OF RESIDENCE OF FIRST LISTED DEFENDANT 11001
(IN U.S. PLAINTIFF CASES ONLY)
NOTE: IN LAND CONDEMNATION CASES, USE THE LOCATION OF THE TRACT OF LAND INVOLVED

(c) ATTORNEYS (FIRM NAME, ADDRESS, AND TELEPHONE NUMBER)

Environmental Integrity Project
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Washington, D.C. 20005
(202) 263-4456

ATTORNEYS (IF KNOWN)

Jennifer Peterson, D.C. Bar No. 978352
Whitney Ferrell, D.C. Bar No. 1013459 (pending motion to appear pro hac vice)

II. BASIS OF JURISDICTION
(PLACE AN x IN ONE BOX ONLY)

- ○ 1 U.S. Government Plaintiff
- ○ 3 Federal Question (U.S. Government Not a Party)
- ◉ 2 U.S. Government Defendant
- ○ 4 Diversity (Indicate Citizenship of Parties in item III)

III. CITIZENSHIP OF PRINCIPAL PARTIES (PLACE AN x IN ONE BOX FOR PLAINTIFF AND ONE BOX FOR DEFENDANT) **FOR DIVERSITY CASES ONLY!**

	PTF	DFT		PTF	DFT
Citizen of this State	○ 1	○ 1	Incorporated or Principal Place of Business in This State	○ 4	○ 4
Citizen of Another State	○ 2	○ 2	Incorporated and Principal Place of Business in Another State	○ 5	○ 5
Citizen or Subject of a Foreign Country	○ 3	○ 3	Foreign Nation	○ 6	○ 6

IV. CASE ASSIGNMENT AND NATURE OF SUIT
(Place an X in one category, A-N, that best represents your Cause of Action and one in a corresponding Nature of Suit)

○ **A.** *Antitrust*

- ☐ 410 Antitrust

○ **B.** *Personal Injury/ Malpractice*

- ☐ 310 Airplane
- ☐ 315 Airplane Product Liability
- ☐ 320 Assault, Libel & Slander
- ☐ 330 Federal Employers Liability
- ☐ 340 Marine
- ☐ 345 Marine Product Liability
- ☐ 350 Motor Vehicle
- ☐ 355 Motor Vehicle Product Liability
- ☐ 360 Other Personal Injury
- ☐ 362 Medical Malpractice
- ☐ 365 Product Liability
- ☐ 367 Health Care/Pharmaceutical Personal Injury Product Liability
- ☐ 368 Asbestos Product Liability

◉ **C.** *Administrative Agency Review*

- ☐ 151 Medicare Act

Social Security
- ☐ 861 HIA (1395ff)
- ☐ 862 Black Lung (923)
- ☐ 863 DIWC/DIWW (405(g))
- ☐ 864 SSID Title XVI
- ☐ 865 RSI (405(g))

Other Statutes
- ☐ 891 Agricultural Acts
- ☒ 893 Environmental Matters
- ☐ 890 Other Statutory Actions (If Administrative Agency is Involved)

○ **D.** *Temporary Restraining Order/Preliminary Injunction*

Any nature of suit from any category may be selected for this category of case assignment.

(If Antitrust, then A governs)

○ **E.** *General Civil (Other)* **OR** ○ **F.** *Pro Se General Civil*

Real Property
- ☐ 210 Land Condemnation
- ☐ 220 Foreclosure
- ☐ 230 Rent, Lease & Ejectment
- ☐ 240 Torts to Land
- ☐ 245 Tort Product Liability
- ☐ 290 All Other Real Property

Personal Property
- ☐ 370 Other Fraud
- ☐ 371 Truth in Lending
- ☐ 380 Other Personal Property Damage
- ☐ 385 Property Damage Product Liability

Bankruptcy
- ☐ 422 Appeal 27 USC 158
- ☐ 423 Withdrawal 28 USC 157

Prisoner Petitions
- ☐ 535 Death Penalty
- ☐ 540 Mandamus & Other
- ☐ 550 Civil Rights
- ☐ 555 Prison Conditions
- ☐ 560 Civil Detainee – Conditions of Confinement

Property Rights
- ☐ 820 Copyrights
- ☐ 830 Patent
- ☐ 840 Trademark

Federal Tax Suits
- ☐ 870 Taxes (US plaintiff or defendant)
- ☐ 871 IRS-Third Party 26 USC 7609

Forfeiture/Penalty
- ☐ 625 Drug Related Seizure of Property 21 USC 881
- ☐ 690 Other

Other Statutes
- ☐ 375 False Claims Act
- ☐ 400 State Reapportionment
- ☐ 430 Banks & Banking
- ☐ 450 Commerce/ICC Rates/etc.
- ☐ 460 Deportation
- ☐ 462 Naturalization Application
- ☐ 465 Other Immigration Actions
- ☐ 470 Racketeer Influenced & Corrupt Organization

- ☐ 480 Consumer Credit
- ☐ 490 Cable/Satellite TV
- ☐ 850 Securities/Commodities/ Exchange
- ☐ 896 Arbitration
- ☐ 899 Administrative Procedure Act/Review or Appeal of Agency Decision
- ☐ 950 Constitutionality of State Statutes
- ☐ 890 Other Statutory Actions (if not administrative agency review or Privacy Act)

○ G. *Habeas Corpus/ 2255* ☐ 530 Habeas Corpus – General ☐ 510 Motion/Vacate Sentence ☐ 463 Habeas Corpus – Alien Detainee	○ H. *Employment Discrimination* ☐ 442 Civil Rights – Employment (criteria: race, gender/sex, national origin, discrimination, disability, age, religion, retaliation) *(If pro se, select this deck)*	○ I. *FOIA/Privacy Act* ☐ 895 Freedom of Information Act ☐ 890 Other Statutory Actions (if Privacy Act) *(If pro se, select this deck)*	○ J. *Student Loan* ☐ 152 Recovery of Defaulted Student Loan (excluding veterans)
○ K. *Labor/ERISA (non-employment)* ☐ 710 Fair Labor Standards Act ☐ 720 Labor/Mgmt. Relations ☐ 740 Labor Railway Act ☐ 751 Family and Medical Leave Act ☐ 790 Other Labor Litigation ☐ 791 Empl. Ret. Inc. Security Act	○ L. *Other Civil Rights (non-employment)* ☐ 441 Voting (if not Voting Rights Act) ☐ 443 Housing/Accommodations ☐ 440 Other Civil Rights ☐ 445 Americans w/Disabilities – Employment ☐ 446 Americans w/Disabilities – Other ☐ 448 Education	○ M. *Contract* ☐ 110 Insurance ☐ 120 Marine ☐ 130 Miller Act ☐ 140 Negotiable Instrument ☐ 150 Recovery of Overpayment & Enforcement of Judgment ☐ 153 Recovery of Overpayment of Veteran's Benefits ☐ 160 Stockholder's Suits ☐ 190 Other Contracts ☐ 195 Contract Product Liability ☐ 196 Franchise	○ N. *Three-Judge Court* ☐ 441 Civil Rights – Voting (if Voting Rights Act)

V. ORIGIN

◉ 1 Original Proceeding ○ 2 Remand from State Court ○ 3 Remanded from Appellate Court ○ 4 Reinstated or Reopened ○ 5 Transferred from another district (specify) ○ 6 Multi-district Litigation ○ 7 Appeal to District Judge from Mag. Judge

VI. CAUSE OF ACTION (CITE THE U.S. CIVIL STATUTE UNDER WHICH YOU ARE FILING AND WRITE A BRIEF STATEMENT OF CAUSE.)

Action brought under 42 U.S.C. 7604(a)(2) against defendant for failure to review VOC emission factors for flares, tanks,

VII. REQUESTED IN COMPLAINT CHECK IF THIS IS A CLASS ACTION UNDER F.R.C.P. 23 **DEMAND $** **JURY DEMAND:** Check YES only if demanded in complaint YES ☐ NO ☒

VIII. RELATED CASE(S) IF ANY (See instruction) YES ☐ NO ☒ If yes, please complete related case form

DATE: May 1, 2013 **SIGNATURE OF ATTORNEY OF RECORD**

INSTRUCTIONS FOR COMPLETING CIVIL COVER SHEET JS-44
Authority for Civil Cover Sheet

The JS-44 civil cover sheet and the information contained herein neither replaces nor supplements the filings and services of pleadings or other papers as required by law, except as provided by local rules of court. This form, approved by the Judicial Conference of the United States in September 1974, is required for the use of the Clerk of Court for the purpose of initiating the civil docket sheet. Consequently, a civil cover sheet is submitted to the Clerk of Court for each civil complaint filed. Listed below are tips for completing the civil cover sheet. These tips coincide with the Roman Numerals on the cover sheet.

I. COUNTY OF RESIDENCE OF FIRST LISTED PLAINTIFF/DEFENDANT (b) County of residence: Use 11001 to indicate plaintiff if resident of Washington, DC, 88888 if plaintiff is resident of United States but not Washington, DC, and 99999 if plaintiff is outside the United States.

III. CITIZENSHIP OF PRINCIPAL PARTIES: This section is completed only if diversity of citizenship was selected as the Basis of Jurisdiction under Section II.

IV. CASE ASSIGNMENT AND NATURE OF SUIT: The assignment of a judge to your case will depend on the category you select that best represents the primary cause of action found in your complaint. You may select only one category. You must also select one corresponding nature of suit found under the category of the case.

VI. CAUSE OF ACTION: Cite the U.S. Civil Statute under which you are filing and write a brief statement of the primary cause.

VIII. RELATED CASE(S), IF ANY: If you indicated that there is a related case, you must complete a related case form, which may be obtained from the Clerk's Office.

Because of the need for accurate and complete information, you should ensure the accuracy of the information provided prior to signing the form.

AO 440 (Rev. 12/09; DC 03.10) Summons in a Civil Action

UNITED STATES DISTRICT COURT

for the

District of Columbia

Air Alliance Houston, et. al.

Plaintiff

v.

Bob Perciasepe, in his official capacity as Acting Administrator, U.S. Environmental Protection Agency

Defendant

Civil Action No.

SUMMONS IN A CIVIL ACTION

To: *(Defendant's name and address)* Bob Perciasepe, in his official capacity as
Acting Administrator, United States
Environmental Protection Agency,
1101A EPA Headquarters, Ariel Rios Building
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460

A lawsuit has been filed against you.

Within 21 days after service of this summons on you (not counting the day you received it) — or 60 days if you are the United States or a United States agency, or an officer or employee of the United States described in Fed. R. Civ. P. 12 (a)(2) or (3) — you must serve on the plaintiff an answer to the attached complaint or a motion under Rule 12 of the Federal Rules of Civil Procedure. The answer or motion must be served on the plaintiff or plaintiff's attorney, whose name and address are: Jennifer Peterson
Environmental Integrity Project
One Thomas Circle, Suite 900
Washington, DC 20005

If you fail to respond, judgment by default will be entered against you for the relief demanded in the complaint. You also must file your answer or motion with the court.

ANGELA D. CAESAR, CLERK OF COURT

Date: _____

_____
Signature of Clerk or Deputy Clerk

Exhibit A

ENVIRONMENTAL INTEGRITY PROJECT
1 Thomas Circle, Suite 900
Washington, DC 20005
main: 202-296-8800
fax: 202-296-8822
www.environmentalintegrity.org

July 18, 2012

Via Certified Mail

Ms. Lisa P. Jackson
Administrator
U.S. Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Avenue, NW
Washington, DC 20406
jackson.lisa@epa.gov

Re: Notice of Intent to Sue for Violations of Nondiscretionary Duties to Review and Revise Emission Factors under Section 130 of the Clean Air Act Every Three Years

Dear Administrator Jackson,

We are writing on behalf of Air Alliance Houston, Texas Environmental Advocacy Services ("TEJAS"), Community In-power and Development Association, Inc. ("CIDA"), and Louisiana Bucket Brigade ("Plaintiffs") to provide you with notice of our intent to file suit against Administrator Jackson, in her official capacity as Administrator of the U.S. Environmental Protection Agency (EPA), for failure to perform nondiscretionary duties under section 130 of the Clean Air Act (CAA), 42 U.S.C. § 7430, which requires the Administrator to review and, if necessary, revise emission factors for industrial flares (AP-42, section 13.5), liquid storage tanks (AP-42, section 7.1; L&E documents), and wastewater collection, treatment, and storage systems (AP-42, section 4.3; L&E documents) at least once every three years.

Under section 130 of the CAA, 42 U.S.C. § 7430, the Administrator has a mandatory duty to review and, if necessary, revise, the emission factors used to estimate emissions of carbon monoxide (CO), volatile organic compounds (VOCs), and oxides of nitrogen (NOx) from emission sources at least once every three years. The Administrator has failed to perform the nondiscretionary duty to review and, if necessary, revise, at least once every three years, emission factors used to estimate emissions of CO, VOCs, and NOx from flares, tanks, and wastewater treatment systems. EPA has not reviewed emission factors for flares since 1991, emission factors for wastewater treatment systems have not been reviewed since 1998, and emission equations for tanks have not been reviewed since 2006.[1]

Accurate accounting of air pollutant emissions is the linchpin of the CAA. Air emissions data is used to: design regulations, develop emission reduction control strategies, determine emission limits and applicable permit requirements for major sources, guide enforcement

[1] *See* EPA, Compilation of Air Pollutant Emission Factors: Stationary Point and Area Sources (1995), *available at* www.epa.gov/ttn/chief/ap42/index.html [hereinafter AP-42].

decisions, achieve air quality goals, and protect communities from toxic exposure.[2] Outdated emission factors can grossly underestimate emissions of air pollutants from petroleum refineries, chemical plants, and other industrial sources.[3] Emissions from petroleum refineries pose grave risks to nearby communities, many of which are low income and minority communities, because refinery emissions contain hazardous air pollutants such as benzene, which is a known carcinogen.[4] While the City of Houston filed a Data Quality Act petition in 2008 asking EPA to correct data quality errors in emission factors for petroleum refineries and chemical manufacturing plants, the EPA has yet to do so.[5] The lack of data means that cost-effective opportunities to reduce pollution are hidden in plain sight, which may force reliance on more expensive alternatives. The duty to timely review and revise section 130 emission factors is critical to EPA's ability to implement the CAA in a manner that is protective of public health.

Section 304 of the CAA, 42 U.S.C. § 7604(a)(2), authorizes citizen actions "against the Administrator where there is an alleged failure of the Administrator to perform any act or duty under this chapter which is not discretionary with the Administrator." Citizens must provide notice to the Administrator at least sixty days before filing a civil suit under section 130. 42 U.S.C. § 7604(b)(1)(A); 40 C.F.R. § 54.2. In accordance with Section 304 of the CAA, this letter serves to notify you that Plaintiffs intend to file suit in federal district court any time beginning sixty days from the postmarked date of this letter. 42 U.S.C. § 7604; 40 C.F.R. § 54.2(d).

I. Background: Section 130 Emission Factors

Emission factors are used to estimate pollutant emissions when source-specific test data is not available.[6] Emission factors and emission inventories are fundamental tools of air quality management used by EPA to plan and implement air pollution control programs under the CAA.[7] Emission factors are used to calculate around eighty percent of national emissions from virtually all sources of air pollution.[8] Thus, reliable emission factors that accurately estimate

[2] Office of Inspector General, EPA, 2006-P-00017, EPA Can Improve Emissions Factors Development and Management 1 (2006), *available at* www.epa.gov/oig/reports/2006/20060322-2006-P-00017.pdf [hereinafter EPA, 2006 Inspector General Report] ("Quantifying air emissions is a vital aspect of air pollution programs. Regulatory authorities and others use emissions values in: (1) developing emissions inventories, (2) identifying and evaluating control strategies, (3) determining applicability of permit and regulatory requirements, and (4) assessing risks.").
[3] *Id.* at 8 ("EPA officials have identified the inappropriate use of emissions factors for key environmental decisions, such as permit limits and the level of air pollution control equipment installed at specific facilities, resulting in the release of significant amounts of unidentified and uncontrolled emissions.").
[4] *See* EPA, Toxics Release Inventory Explorer, *available at* www.epa.gov/triexplorer (last visited July 17, 2012).
[5] Letter from Bill White, Mayor, City of Houston, Tex., to Information Quality Guidelines Staff, EPA, Request for Correction of Information under the Data Quality Act and EPA's Information Quality Guidelines (July 9, 2008), *available at* www.greenhoustontx.gov/reports/epaletter20080709.pdf.
[6] *See* AP-42, *supra* note 1, at 1.
[7] EPA, 2006 Inspector General Report, *supra* note 2, at 4 ("Emission factors are used to develop the emissions data that are the cornerstone of a host of important environmental decisions made by EPA . . . . includ[ing] . . . facility permitting, development of control strategies, and compliance and enforcement decisions.").
[8] *Id.* (*citing* U.S. Gov't Accountability Office (GAO), GAO-01-46, EPA Should Improve Oversight of Emissions Reporting by Large Facilities 3 (2001), *available at* www.gao.gov/new.items/d0146.pdf ("In preparing emissions reports, . . . large facilities rely primarily on estimates and extrapolation instead of directly measuring their pollutant emissions. To estimate their annual emissions of each pollutant, most facilities use industry- and pollutant specific

emissions are imperative to EPA's ability to make air quality management decisions that are protective of public health.

AP-42 is the EPA's official compilation of air pollutant emission factors and contains more than 1,700 rated emission factors for over 200 air pollutants.[9] AP-42 emission factors represent long-term average emissions and testing is generally done under normal operating conditions that do not account for conditions that may cause short-term fluctuations in emissions.[10] In addition, the EPA Locating and Estimating (L&E) documents compile available information on source categories of toxic air emissions and identify potential release points and emission factors.[11]

Although the CAA does not define "emission factor," the EPA has defined it as a "representative value" or "tool" used to estimate emissions of a specific pollutant from an air pollution source.[12] EPA regulations define "emission factor" as "the ratio relating emissions of a specific pollutant to an activity or material throughput level." 40 C.F.R. § 51.50; *see also* Air Emissions Reporting Requirements, 73 Fed. Reg. 76,539-01, 76,554 (Dec. 17, 2008). The AP-42 defines "emission factor" as "a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant."[13] EPA guidance documents broadly define "emission factor" as "a *tool* that is used to estimate air pollutant emissions to the *atmosphere*."[14] Thus, "emission factor" includes emission estimation tools or equations that are used to estimate emissions from liquid storage tanks and wastewater treatment systems.

II. Section 130 Emission Factors for Flares, Tanks, and Wastewater Treatment Systems

The Administrator has not timely reviewed or revised emission factors used for estimating emissions from flares, tanks, and wastewater treatment systems. The EPA recognizes that the timely review and revision of emission factors is critical because there is a "moving target" aspect to emission factor development in that new information and processes can render existing emission factors obsolete or prove them to be unreliable.[15] The current AP-42 emission

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emissions factors . . . . EPA's data show that, nationally, emissions factors are used for about 80 percent of emissions determinations.").

[9] AP-42, *supra* note 1, at 1.

[10] *See id.* at 4 ("emission factors essentially represent an average of a range of emission rates"); Letter from Elizabeth Craig, Acting Assistant Administrator, U.S. EPA, to Bill White, Mayor, Houston, Tex. 3 (Apr. 7, 2009) ("These factors are designed to be representative values relating the quantity of a pollutant released to the atmosphere *under normal operating conditions* with an activity associated with the release of that pollutant.") (emphasis added).

[11] EPA, Locating & Estimating (L&E) Documents, *available at* www.epa.gov/ttnchie1/le/ (last visited July 17, 2012) [hereinafter L&E Documents].

[12] *Id.* at 1; EPA, EPA-454/R-95-015,,Procedures for Preparing Emission Factor Documents, 2-1 (1997) [hereinafter EPA, Procedures for Preparing Emission Factor Documents], *available at* www.epa.gov/ttnchie1/efdocs/procedur.pdf (emphasis added).

[13] AP-42, *supra* note 1, at 1.

[14] EPA, Procedures for Preparing Emission Factor Documents, *supra* note 12, at 2-1.

[15] Office of Inspector General, EPA, No. 6100306, Emission Factor Development 12-13 () (1996), *available at* www.epa.gov/oig/reports/1996/emisrept.pdf [hereinafter EPA, 1996 Inspector General Report]

factors used to estimate emissions from flares, tanks, and wastewater treatment systems can significantly undercount emissions of CO, VOCs, and NOx from refineries and petrochemical plants.[16] The EPA has acknowledged, and scientific studies conducted using remote sensing technology, including Differential Absorption Lidar (DIAL) and Passive Fourier Transform Infrared (PFTIR), have consistently shown that actual emissions from these sources can be several orders of magnitude higher than emission factor estimates.[17] *See* Attachment A.

Three separate DIAL studies at refineries in North America have shown that emission factors for flares, tanks, wastewater treatment systems, and several other processes significantly underestimate emissions. An EPA review of a 2008 DIAL test at the BP Texas City petroleum refinery found that actual emissions from several units exceeded emission factor estimates for emissions from tanks and flares.[18] For flares, EPA found that actual average emissions were six times higher than the average hourly emissions in the emissions inventory report.[19] For storage tanks, EPA found that actual emissions were, in some cases, at least three to seven times higher than emission factor estimates.[20] A 2006 DIAL test at a refinery in Alberta Canada found that actual emissions from storage tanks exceeded emission factor estimates for benzene and VOCs.[21] A 2011 DIAL test at Shell Deer Park measured emission concentrations of benzene and VOCs that far exceeded emission factor estimates.[22] The DIAL test results found: actual VOC emissions from tanks were underestimated by a factor of 132; actual benzene emissions from tanks were underestimated by a factor of 93; actual VOC emissions from wastewater treatment systems were underestimated by a factor of 108; and actual benzene emissions from wastewater treatment systems were underestimated by a factor of 67.[23]

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[16] Alan Chambers & Mel Strosher, Refinery Demonstration of Optical Technologies for Measurement of Fugitive Emissions and for Leak Detection (2006) [hereinafter Alberta DIAL Study]; Rod Robinson, Tom Gardiner & Bob Lipscombe, National Physical Laboratory, Measurements Of VOC Emissions From Petrochemical Industry Sites In The Houston Area Using Differential Absorption Lidar (DIAL) During Summer 2007: DRAFT FOR COMMENT, 27-28 (2008) [hereinafter BP Texas City DIAL Study]; David Randall & Jeff Coburn, EPA, EPA 453/R-10-002, Critical Review of DIAL Emission Test Data for BP Petroleum Refinery in Texas City, Texas, ES-1 (2010) [hereinafter EPA, Review of BP Texas City DIAL Emissions Test Data]; Dan Hoyt et. al., City of Houston Bureau of Pollution Control and Prevention, Measurement and Analysis of Benzene and VOC Emissions in the Houston Ship Channel Area and Select Major Stationary Sources Using DIAL (Differential Absorption Light Detection and Ranging) Technology to Support Ambient HAP Concentrations Reductions in the Community (DIAL Project) 92 (2011) [hereinafter Shell Deer Park DIAL Study].

[17] *See e.g.*, Shell Deer Park DIAL Study, at 92 ("Based on the current data and associated statistics, the true emissions may be underestimated by a factor of as much as 132 for VOCs"); National Emission Standards for Hazardous Air Pollutants from Petroleum Refineries, 72 Fed. Reg. 50,716, 50,725-26 (Sept. 4, 2007) (stating that EPA review of the data indicates "inherent uncertainty in the development and use of emission factors"); Memorandum from Brenda Shine, EPA, to EPA Docket No. EPA-HQ-OAR-2003-0146, Potential Low Bias of Reported VOC Emissions from the Petroleum Refining Industry, (July 27, 2007) [hereinafter EPA, Memorandum from Brenda Shine], *available at* http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2003-0146-0010; EPA, 2006 Inspector General Report, *supra* note 2, at 11-12.

[18] EPA, Review of BP Texas City DIAL Emissions Test Data, *supra* note 16, at ES-2 & tbl. 1.

[19] *Id.* at ES-5.

[20] *Id.* at ES-1, ES-4 ("On average, the DIAL results for external floating roof tanks storing crude oil were at least 3 to 7 times higher than estimates that used conditions at the time of the DIAL testing.").

[21] Alberta DIAL Study, *supra* note 16, at 27.

[22] Shell Deer Park DIAL Study, *supra* note 16, at 1, 92.

[23] *Id.*

A. Flares

The emission factors used to estimate emissions from flares in section 13.5 of AP-42 were last revised in September 1991.[24] According to the EPA website, the most recent flare efficiency study was conducted in July 1983.[25] The emission factor for VOCs from flares is 0.14 lb/MMBtu; the emission factor for CO from flares is 0.37 lb/MMBtu; and the emission factor for NOx from flares is 0.068 lb/MMBtu.[26] Pollutants of concern from flaring include carbon particles (soot), unburned hydrocarbons, CO, other partially burned and altered hydrocarbons, NO_x, and SO_2.[27] Because it has been over twenty years since EPA last revised emission factors for flares, the Administrator has failed perform the nondiscretionary duty required by section 130 of the CAA, 42 U.S.C. § 7430.

B. Tanks

The emission equations in section 7.1 of AP-42 are the only emissions estimating tool EPA has for tanks.[28] The major pollutant of concern from Liquid Storage Tanks are VOCs.[29] The emission estimation equations in section 7.1 of AP-42 were developed by the American Petroleum Institute (API).[30] These emission equations are the basis of the software program TANKS that is used to generate site-specific emission factors and estimate emissions from liquid storage tanks.[31] EPA recognizes that industry has an interest in developing conservative emission equations because "there is a financial benefit to industries to use emission factors that produce low emission estimates."[32] Yet, despite the increased risk of generating biased or unrepresentative emission estimates,[33] the EPA has only reviewed emission equations for tanks once since they were first developed by API fifteen years ago.[34] The emission equations used to

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[24] AP-42, *supra* note 1, at ch. 13: Miscellaneous Sources, *available at* www.epa.gov/ttn/chief/ap42/ch13/index.html (last visited July 17, 2012).
[25] *Id.*
[26] *Id.* at 13.5-4.
[27] *Id.* at 13.5-3.
[28] AP-42, *supra* note 1, at ch. 7, *available at* www.epa.gov/ttn/chief/ap42/ch07/final/c07s01.pdf.
[29] *Id.*
[30] *Id.* at 7.1-9 ("These procedures are valid for all petroleum liquids, pure volatile organic liquids, and chemical mixtures with similar true vapor pressures").
[31] *Id.*; *see also* TANKS Emission Estimation Software, *available at* www.epa.gov/ttn/chief/software/tanks/ (last visited July 17, 2012).
[32] *See, e.g.* EPA, Memorandum from Brenda Shine, *supra* note 17; EPA, 1996 Inspector General Report, *supra* note 2, at 21 ("Industries may be more inclined to participate in a partnership that would result in lower emission factors because of the uses of these factors. Emission factors are sometimes used to determine whether a source needs to obtain a construction or Title V operating permit, and estimate annual emissions for the purpose of determining annual permit fees under the Title V permit program. These uses of emission factors provide industry with a financial incentive to use emission factors that produce low emission estimates. Emission factors that produce low emission estimates may allow a source to avoid obtaining a permit and implementing required emission controls. In addition, sources that obtain Title V permits would pay lower annual fees when these fees are based on emission factors that result in lower emission estimates.").
[33] Shell Deer Park DIAL Study, *supra* note 16, at 1 ("Emission factors used to estimate emissions from the Southwest Tanks VOCs produced the most potential underestimated emissions compared to the DIAL measured emissions, off by a factor of 132."); *see also id.*at 92, 99.
[34] *See* EPA, Emission Factor Documentation for AP-42 Section 7.1: Organic Liquid Storage Tanks Final Report (2006), *available at* www.epa.gov/ttn/chief/ap42/ch07/bgdocs/b07s01.pdf.

estimate emissions from tanks in section 7.1 AP-42 were last reviewed in November 2006.[35] While the review falls outside of the statutory three year timetable, it is also unclear whether the 2006 review satisfies the substantive requirements of section 130.[36] In addition, it has been over fourteen years since EPA last reviewed L&E emission factors for VOC emissions from storage tanks.[37] EPA last reviewed L&E emission factors for benzene emissions from storage tanks in 1998, and L&E emission factors for methyl ethyl ketone, toluene, and xylene emissions from storage tanks in 1994.[38] Because it has been over five years since EPA last reviewed AP-42 emission equations for tanks, and over fourteen years since EPA last reviewed L&E emission factors for tanks, the Administrator has failed to perform the nondiscretionary duty required by section 130 of the CAA, 42 U.S.C. § 7430.

C. Wastewater Treatment Systems

Methodologies for estimating emissions from wastewater treatment systems were last reviewed in February 1998.[39] Section 4.3 of AP-42 provides emission calculation methodologies for estimating air emissions from wastewater treatment systems. The Surface Impoundment Modeling System (SIMS) is a computer program that can be used to estimate emissions of organic compounds from wastewater treatment systems.[40] SIMS uses mass transfer correlations to predict VOC emissions from industrial waste water.[41] EPA recognizes that "in some cases, [] orders-of-magnitude differences may result between actual and estimated emissions, depending on differences in source configurations, control equipment, and operating practices."[42]

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[35] *Id.*

[36] *See id.* at 1-1, 6-1 (While EPA states that the 2006 document is a background report, clarifying that the "purpose of this report is to provide background information to support revisions to AP-42 Section 7.1, Organic Liquid Storage Tanks," the document also "summarize[s] the major changes made since the previous version of Section 7.1--Organic Liquid Storage Tanks (September 1997) of AP-42.").

[37] The following pollutants are VOCs: benzene, methyl ethyl ketone, toluene, and xylene.

[38] EPA, EPA-454/R-98-011, Locating and Estimating Air Emissions from Sources of Benzene, 6-41 (1998) [hereinafter L&E Benzene Documents], *available at* www.epa.gov/ttn/chief/le/benzene_pt1.pdf. www.epa.gov/ttn/chief/le/benzene_pt2.pdf; EPA, EPA-454/R-93-046, Locating and Estimating Air Emissions from Sources of Methyl Ethyl Ketone, (1994), *available at* http://www.epa.gov/ttn/chief/le/mek_l&e.pdf; EPA, EPA-454/R-93-047, Locating and Estimating Air Emissions from Sources of Toluene, 6-20 (1994), *available at* http://www.epa.gov/ttn/chief/le/toluene.pdf; EPA, EPA-454/R-93-048, Locating and Estimating Air Emissions from Sources of Xylene (1994) [hereinafter L&E Xylene Documents], *available at* http://www.epa.gov/ttn/chief/le/xylene.pdf.

[39] AP-42, *supra* note 1, at ch. 4: Evaporation Loss Sources, *available at* www.epa.gov/ttn/chief/ap42/ch04/index.html.

[40] *Id.* at 4.3-17 (SIMS program and user manual can be downloaded from EPA's CHIEF electronic bulletin board).

[41] *Id.* (SIMS requires, at a minimum, waste water flow rate and component surface area. Default values are provided for all other inputs, however where site-specific information is available it should be entered in place of default values for a more accurate emissions estimate).

[42] L&E Benzene Documents, *supra* note 38, at 1-3; *see also id.*, at 6-25 – 6-26 (providing that wastewater emissions from petroleum refinery process units can be estimated by multiplying the average flow factor, the volatile HAP concentrations, and the fraction emitted for the specific process unit capacity); *see also id.* at 6-27 (providing non-AP42 wastewater emission factors for oil/water separators, air flotation systems, and sludge dewatering units at petroleum refineries).

In addition, it has been over fourteen years since EPA last reviewed L&E emission factors for VOC emissions from wastewater treatment systems.[43] EPA last reviewed L&E emission factors for benzene emissions from wastewater treatment systems in 1998; L&E emission factors for xylene emissions from wastewater treatment systems in 1994; and L&E emission factors for carbon tetrachloride, epichlorohydrin, and ethylene dichloride emissions from wastewater treatment systems in 1984.[44] Because EPA has not reviewed AP-42 SIMS or L&E emission factors for wastewater treatment systems in over fourteen years, the Administrator has failed perform the nondiscretionary duty required by section 130 of the CAA, 42 U.S.C. § 7430.

III. Failure of the Administrator to Perform a Nondiscretionary Duty

Section 130 of the CAA, 42 U.S.C. § 7430, requires the Administrator to "at least every 3 years . . . review and, if necessary, revise, the methods ("emission factors") used for purposes of [the CAA] to estimate the quantity of emissions of carbon monoxide, volatile organic compounds, and oxides of nitrogen from sources of such air pollutants." This nondiscretionary duty to "review and, if necessary, revise" emission factors under section 130 includes a duty to make a determination – yes or no – as to whether revision of the emission factor is appropriate.[45]

The Administrator has not completed a review of emission factors for flares, tanks, or wastewater treatment systems within three years of the prior review, as required by section 130 of the CAA, 42 U.S.C. § 7430.[46] Specifically, the emission factors for tanks have not been reviewed since 2006, the emission factors for flares have not been reviewed since 1991, and emission factors for wastewater treatment systems have not been reviewed since 1998. Therefore, EPA is in violation of the Act for its failure to comply with the mandatory duties imposed by section 130 of the Act.

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[43] The following pollutants are VOCs: benzene, carbon tetrachloride, epichlorohydrin, ethylene dichloride, and xylene.

[44] L&E Benzene Documents, *supra* note 38, at 6-27; L&E Xylene Documents, *supra* note 38; EPA, EPA-450/4-84-007b, Locating and Estimating Air Emissions from Sources of Carbon Tetrachloride, (1984), *available at* http://www.epa.gov/ttn/chief/le/carbtet.pdf; EPA, EPA-450/4-84-007j, Locating and Estimating Air Emissions from Sources of Epichlorohydrin, (1984), *available at* http://www.epa.gov/ttn/chief/le/epichlor.pdf; EPA, EPA-450/4-84-007d, Locating and Estimating Air Emissions from Sources of Ethylene Dichloride 82 (1984), *available at* http://www.epa.gov/ttn/chief/le/ethyldi.pdf.

[45] *See Envtl Def. Fund v. Thomas*, 870 F.2d 892, 894-95 (2d Cir. 1989) (holding that "the Administrator has a non-discretionary duty to make *some* formal decision whether to revise [] NAAQS" under section 109 of the CAA, 42 U.S.C. § 7409(d), which requires the Administrator to "complete a thorough review of the criteria published under Section 108 ... and promulgate such new standards as may be appropriate" every 5 years); *Our Children's Earth Found. v. U.S. Envtl. Prot. Agency*, 527 F.3d 842, 849 (9th Cir. 2008) (holding that the duty to determine whether revision is appropriate is implicit in EPA's non-discretionary duty to review and "if appropriate, revise" effluent limitation guidelines once every five years under section 304 of the CWA, 33 U.S.C. 1311(d)).

[46] EPA issued an emission estimation protocol for petroleum refineries in 2011 that outlines methodologies for estimating emissions from flares, tanks, and wastewater treatment systems. EPA, Emission Estimation Protocol for Petroleum Refineries (2011), *available at* www.epa.gov/ttn/chief/efpac/protocol/Emission_Estimation_Protocol_for_Petroleum_Refinerie_052011.pdf. However, the protocol does not discharge EPA of its obligations under section 130; EPA has neither conducted a review to determine whether revisions to the emission factors are necessary, nor revised any emission factors. *See id.*at ch.1, ch.3, ch.6, ch.7.

Conclusion

The Administrator is required to review and, if necessary, revise section 130 emission factors at least once every three years. However, EPA has failed to review emission factors for tanks since 2006, for flares since 1991, and for wastewater collection, treatment and storage since 1998. Plaintiffs intend to sue the Administrator for failure to perform the nondiscretionary duty under section 130 of the CAA and seek to compel EPA to review and revise the AP-42 emission factors used to estimate emissions of VOCs, NOx, and CO from flares, tanks, and wastewater treatment systems to accurately reflect emissions from refineries, petrochemical plants, and other industries. If you have any questions regarding the allegations in this notice or would like to discuss this matter further, please contact us at the number or email below.

Respectfully submitted,

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CC (*Via Certified Mail*):

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Administrator
U.S. EPA
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Washington, DC 20406

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Attorney General of the United States
U.S. DOJ
950 Pennsylvania Ave, NW
Washington, DC 20530-0001

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Gina McCarthy
Assistant Administrator, Office of Air & Radiation
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1200 Pennsylvania Ave, NW
Washington, DC 20406

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US EPA

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