Bay Area Air Quality Management District

939 Ellis Street

San Francisco, CA 94109

Staff Report

Proposed

Regulation 8, Rule 53: VACUUM TRUCK OPERATIONS, and

Amendments to Regulation 2, Rule 1: Permits

February 2012

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ACKNOWLEDGEMENTS

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STAFF REPORT
Regulation 8, Rule 53: Vacuum Truck Operations

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I. Executive Summary

This staff report summarizes information regarding a proposed new Bay Area Air Quality Management District (District) Regulation 8, Rule 53: *Vacuum Truck Operations*, which is intended to limit emissions of total organic compounds (TOC) from vacuum trucks. A vacuum truck is an industrial vacuum on wheels used to collect materials, primarily liquids and semi-solids, and transfer them, typically to another part of an industrial facility. Vacuum trucks are widely used to remove trash from parking lots, clean out sewers and water mains for maintenance work, and remove waste from septic tanks and portable toilets. However, if the materials transferred contain petroleum, petroleum products, or other hydrocarbon liquids, vacuum truck operations have potential to release significant ozone-forming compounds into the ambient atmosphere.[1]

Regulation 8, Rule 53 would apply only to vacuum truck operations at certain types of facilities and only to operations that involve specific organic materials, defined in the rule as "regulated materials." These are materials that have been identified through District source tests as likely to produce significant ozone-forming emissions during the loading process. The proposed rule would reduce organic emissions by establishing an emission limit that would apply at the vapor exhaust outlet of the vacuum truck or associated equipment. In addition, the rule would establish a limit for vapor leaks and for liquid leaks from vacuum truck equipment. The proposed rule would also reduce toxic air contaminant (TAC) emissions that are part of the organics, such as benzene, toluene, xylene and hexane.

The rule is intended primarily as an ozone control measure. Organic compounds contribute to the formation of ground-level ozone, which is the primary ingredient in smog. Ozone is formed from the photochemical reaction of oxides of nitrogen (NOx) and organic compounds. Ozone can result in reduced lung function, increased respiratory symptoms, increased airway hyper-reactivity, and increased airway inflammation. In addition, organic compounds can contribute to the secondary formation of particulate matter (PM). Currently, the San Francisco Bay Area is not in attainment of the State air quality standards for ozone and PM. As a result, the California Clean Air Act requires the District to implement all feasible measures to reduce emissions of ozone precursors, including organic compounds. The proposed rule's emission standard is consistent with the only current emissions standard for vacuum truck organic vapor emissions in California.[2]

The District committed to examining potential reduction of organic compound emissions from vacuum truck operations in Control Measure SSM-5 of the District's Bay Area 2010 Clean Air Plan, which sets forth a plan to achieve the California ozone standards as well as other air quality objectives. Because virtually no work had been done by any regulatory agency to quantify vacuum truck emissions, District staff conducted 32 emissions tests of vacuum truck operations, mainly at Bay Area refineries. The tests showed that emissions vary widely, depending primarily on the volatility of the material moved, but also on other variables that cannot be readily identified. Based on the tests, District staff were able to identify certain very volatile materials – gasoline, aviation gasoline, gasoline blending stock, naphtha, and mixtures involving any of these materials – that consistently produced relatively high emissions when moved by vacuum truck. These highly volatile materials are the "regulated materials" to which the proposed rule would apply.

Because of the wide variation in test results and because most facilities do not closely track quantities of materials moved by vacuum truck, estimates of emissions and emission reductions for the proposed rule involve significant uncertainty. However, District staff was able to group test results for several broad categories of materials and average the results to obtain emission factors for each category. To determine quantities of materials moved in each category, staff relied on data available for one refinery and scaled the data for other facilities to arrive at totals in each category. Based on this approach, staff estimates that total emissions from Bay Area vacuum truck operations at the facilities to be regulated by the rule are 1.50 tons per day (TPD). Staff estimates that emissions from operations involving regulated materials at these facilities are 1.24 TPD. Appendix A details the derivation of emission estimates from vacuum truck operations.

Staff estimates that Regulation 8, Rule 53 would reduce TOC emissions by 1.05 TPD. TAC emissions from vacuum truck operations would also be reduced.

The rule would take effect on January 1, 2013. Facilities would comply with the rule by using vacuum trucks equipped with on-board emission controls or by coupling emission control technology to an uncontrolled truck. As an alternative, facilities could also comply by using a positive displacement pump (PD pump) to load materials into the truck instead of relying on suction from the vacuum truck's blower. Facilities would be required to monitor compliance with the rule's emission standard during loading operations and keep records regarding vacuum truck operations.

In order to ensure that the proposed rule is cost effective, it has been structured so that control requirements only apply to high-volatility materials. Most vacuum truck operations are relatively brief. The average duration of the operations for which the District conducted source tests was 26 minutes. The cost of requiring controls for such brief operations can only be justified when emissions are significant. For example, for the 20 lowest-emitting operations tested (mostly involving wastewater or oils), average total organic emissions were 0.42 lbs. By contrast, for the three highest-emitting operations tested (all involving gasoline), average total organic emissions were 129 lbs. The actual costs of control are expected to be roughly $3000 per ton, consistent with other District regulatory requirements. In addition, a socio-economic analysis by a District consultant has determined that Regulation 8, Rule 53 can be implemented without significant economic dislocation or loss of jobs.

As required by the California Environmental Quality Act (CEQA), the District has prepared an initial study to analyze potential environmental impacts of the proposed rule. The initial study concludes that there would be no significant adverse impacts associated with adoption of the rule.

II. Background

A. Introduction

Vacuum truck services are used throughout the Bay Area by a variety of industries. They are used to remove materials from storage tanks, vessels, sumps, boxes, and pipelines; to transfer materials from one container to another; and to transport materials from one location to another within the same facility. Occasionally, vacuum trucks transfer materials to an offsite location, such as a landfill. Vacuum trucks are also used in the cleaning of equipment such as tanks, vessels, and barges. The types of industries that utilize vacuum truck services include petroleum refineries, marine terminals, industrial wharfs, gasoline dispensing facilities, gasoline bulk terminals, gasoline bulk plants, gasoline cargo tanks, gas well and oil well fields, pipelines, railcar loading facilities, soil remediation projects, truck loading racks, auto dismantlers, and pipelines that deliver gasoline, natural gas, crude oil, petroleum products, and ethanol.

In addition to servicing industrial facilities, vacuum trucks are also used by many other entities in the Bay Area. Vacuum trucks are used to transport waste from restaurants, dairies, septic systems, and portable toilets. Government agencies, including cities and towns, the San Francisco Public Utilities Commission, and CalTrans, use vacuum trucks to service spills on streets, highways, bodies of water, sewers, catch basins, lift station wet-wells, wastewater treatment plants, septic tanks, waterlines, drainage systems, and other projects.

Vacuum truck services have been used throughout the Bay Area for over fifty years. When they are used to transport volatile organic liquids such as in refineries and terminals, the operations emit organic vapors into the ambient air. In some cases, vacuum truck operations in refineries and terminals have been controlled, to reduce odors or reduce the potential to form a flammable vapor cloud. Approximately 40 facilities in the Bay Area will be subject to the provisions of Regulation 8, Rule 53. They include petroleum refineries, bulk plants, bulk terminals, marine terminals, and organic liquid pipeline facilities.

The total number of vacuum trucks that operate in the Bay Area varies from day to day. A few facilities own and operate their own vacuum trucks, while most facilities contract the services of vacuum truck companies. Industry sources, including vacuum truck operators and control equipment suppliers, have informed staff that the total number of vacuum trucks operating daily in the Bay Area generally fluctuates between 125 and 150 trucks.[3] The total number of trucks that operate on a given day depends on the specific needs of Bay Area companies. Some vacuum truck operations are routine and are scheduled to load specific materials virtually daily, while other vacuum truck operations load various types of materials on an intermittent or as-needed basis. When several vacuum trucks are required for a major job such as a refinery turnaround, or to respond to a major event, such as a crude oil spill in the San Francisco Bay for example, some vacuum truck companies may mobilize additional vacuum trucks from other parts of the state or, if necessary, from nearby states.

B. Vacuum Truck Operations Overview

A vacuum truck is a transportable, truck-mounted, industrial vacuum system designed to load materials into the truck's containment vessel which is called a barrel or tank. Vacuum trucks are commonly referred to by a variety of other names including "super-suckers", "vac-jets", and "air-movers". Vacuum trucks are manufactured to load materials at different flow rates and capacities. They must be capable of loading different types of materials into their barrels under a variety of conditions.

Blower

A vacuum truck's pump or "blower" is used to create a vacuum to extract materials and load them into the vacuum truck's barrel. Pumps and blowers are usually powered by the vehicle's engine through an auxiliary drive and universal shaft. Vacuum pumps can also be driven by an auxiliary on-board engine. In some instances, an on-board engine can be the vacuum source (pump) as well as the vapor abatement device. Pumps, engines and blowers typically come in one of three design types: a sliding vane pump, a liquid ring pump, or rotary lobe blower. Each type is designed to operate under specific applications and operational parameters. The maximum vacuum and flow that is attainable for any given pump is dependent on barometric pressure and elevation above sea level as well as the pump's design limitations.

Extraction & Emissions

Materials are typically drawn into a vacuum truck through suction lines, and sometimes with a device called a "stinger" attached to the suction line (a non-flexible extension on a flexible suction line). Suction lines usually range in size from 2 inches to 4 inches in diameter and are of various lengths. Figure 1 is an image of hoses used for a vacuum truck loading event that was extracting slop from a tank.

Figure 1
Image of Vacuum Truck Hoses

Image Source: BAAQMD Staff

Emissions come from loading of materials containing hydrocarbons contained in sludge, recovered oil, slop oil, crude oil, gasoline, petroleum distillates, feed stock, blending stock, water used to clean tanks and vessels, wastewater, and various mixtures and slurries.

During some loading events, vacuum truck operators may completely submerge the suction nozzle into the material during the loading process, while other events may require that the suction line (hose) be directly connected to tanks, vessels, or containers, thus eliminating or minimizing the introduction of air (and vapors) into the truck's barrel. In some instances, the suction nozzle at the end of the suction line is partially submerged into the material that is being loaded, consequently bringing a combination of air and material (liquids/solids) into the barrel. Sometimes, this is done to increase the velocity of incoming air which can help lift the liquid/solid material more so than the vacuum alone. The same technique is used when a spill is cleaned up.

The significance of the introduction of air into the loading event is that the extra turbulence generates additional vapors within the barrel and ultimately more TOC emissions. This turbulence increases a liquid's surface area, thus allowing more liquid to change into a vapor state until the saturation point is reached and "evaporation" can no longer take place.

The fill capacity for a standard vacuum truck can range anywhere from 2520 gallons (60 barrels) to 5040 gallons (120 barrels) or more. District staff has observed total fill times that range from 3 minutes to 131 minutes. Figure 2 is a basic diagram of a vacuum truck that highlights critical components. Figure 3 shows a vacuum truck servicing a sewer. Figure 4 is an image of a large vacuum truck trailer which has a fill capacity capable of 9,000 gallons.

Figure 2
Illustration of a Typical Vacuum Truck

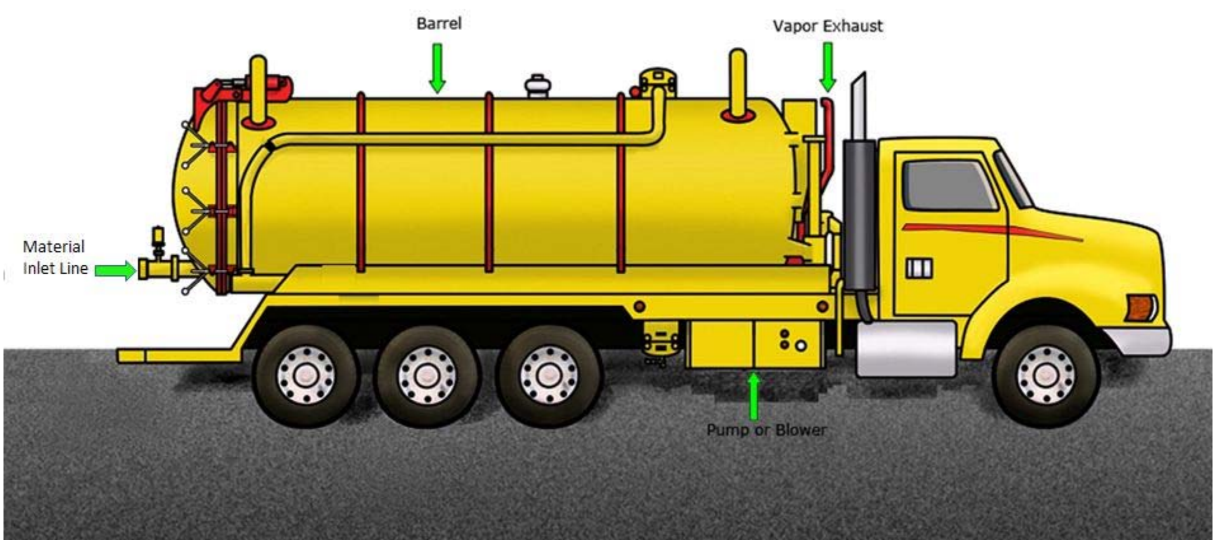

Image Source: thevactrukboy.com

Figure 3
Vacuum Truck Servicing a Municipal Sewer

Image Source: Google.com/teamelmers.com

Figure 4
Vacuum Truck Trailer with a
Fill Capacity of 9,000 Gallons

Image Source: Clean Harbors Facility in Martinez

Emissions occur when hydrocarbon vapors in the barrel's headspace – the air trapped above the material in the bottom portion of the barrel – are displaced into the ambient air. As material is loaded into the barrel, the volume of the incoming material displaces an equal volume of vapor in the headspace, which is typically vented out of the vacuum device's exhaust uncontrolled. Different operational factors affect the rates of emissions. They can include: the volumetric flow rate of the material being loaded into the vacuum truck, the vapor pressure of the material, the temperature within the vacuum truck's barrel, and the extent to which the material is being agitated while being loaded into the vacuum truck.

In addition to the vapors that are emitted from a vacuum truck's exhaust outlet or from the control devices connected to vacuum trucks, organic emissions can occur during transport of materials, during unloading, and during cleaning of vacuum barrels.

C. Controlling Vacuum Truck Emissions

A variety of technologies are available to limit organic emissions from vacuum truck operations. Most of them can achieve capture and control efficiencies that are greater than 95 percent. Technologies include carbon adsorption systems, internal combustion engines, thermal oxidizers, refrigerated condensers and liquid scrubbers. Sometimes control technologies are combined. For example an internal combustion engine can be combined with a chiller, or carbon adsorption can be combined with a scrubber.

Some controls can be integrated into vacuum trucks, but most vacuum trucks in the Bay Area are not equipped with control equipment. However, vacuum truck operations do commonly use outboard carbon adsorption systems, thermal oxidation, or internal combustion engine technologies. Such control technologies are typically connected as a "skid-mount" or "portable trailer unit". Control equipment is generally used for safety reasons, to control odors, or to comply with requirements in the Code of Federal Regulations.

The following is a brief discussion of each technology available for controlling vacuum truck emissions.

Carbon Adsorption Systems

A carbon adsorption system is a system that is composed of a tank or vessel containing a specific amount of activated carbon onto which organic gases or vapors molecularly adhere as they flow through the particles. Activated carbon is a form of carbon that has been processed to make it extremely porous. Its porosity results in a very large internal surface which enables it to adsorb gases within its structure. The degree to which activated carbon adsorbs organic vapors is affected by the temperature, humidity, flow-rate, concentration, and molecular structure of the gas. High vacuum truck blower discharge temperatures may actually release previously adsorbed compounds, thus allowing emissions to vent into the ambient air. According to various industry sources, it may take anywhere from 2 to 10 pounds of carbon to control 1 pound of TOC.[4] Figure 5 is an image of a pile of activated carbon. The carbon has the physical consistency of small pieces of gravel. It is also available in a more granulated form. The image in Figure 6 is a microscopic cross-section of a single particle of activated carbon that illustrates the molecule's large surface area. This image depicts the flow of organic molecules into the finger-like cavity of a carbon particle where they adhere to the cavity's walls.

Figure 5
Activated Carbon Material

Image Source: www.water.siemens.com

Figure 6
Cross-Section of Activated Carbon

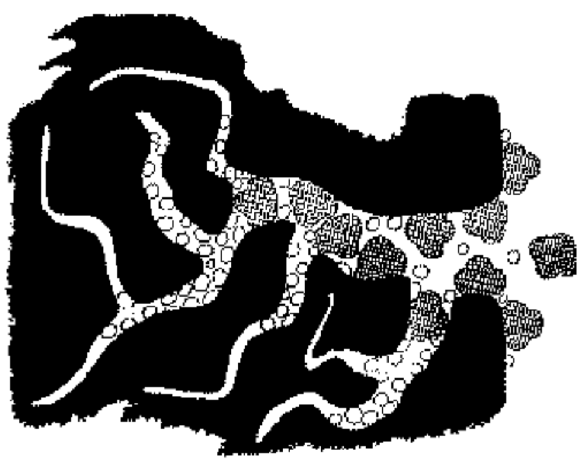

Image Source: www.carbtrol.com/voc

When observing Bay Area vacuum truck operations that used activated carbon to control organic emissions, staff normally observed two types of carbon adsorption systems. One type was a small-to-intermediate sized container integrated into the vacuum truck that contained 200 - 300 pounds of carbon. It was typically used to control two types of loading events: 1) those that lasted a short duration because a small amount of material containing hydrocarbon were loaded into the vacuum truck barrels; and 2) those that included hydrocarbon-containing materials that were loaded into the vacuum truck barrel at relatively low flow rates. In each case, the carbon adsorption system was used to reduce odors.

A second type of carbon adsorption is a larger, portable system that includes two or three vessels, each containing 1,000 lbs of activated carbon. This type of system can control larger volumes with high organic concentrations compared to the smaller vessels. When staff observed this type of system in operation, it was being used to comply with federal requirements for hazardous air pollutants (NESHAP).

Portable carbon adsorption is best used for the control of emissions from small cleanup operations like spills. Emissions from large operations like the degassing and cleaning of a large crude oil tank would quickly overwhelm the capacity of most portable carbon adsorption units. Once a carbon adsorption unit has reached its holding limit, "breakthrough" occurs, and emissions pass through unabated. Changing out carbon vessels on a frequent basis can become cost prohibitive.

Carbon adsorption units should be monitored for breakthrough. On more than one occasion, staff observed breakthrough that occurred when carbon adsorption controls were used on vacuum truck loading events. In such situations, the organic vapor exhaust streams were not being monitored frequently enough to detect breakthrough before it occurred. In one case, in spite of an unusually low exhaust flow-rate (3-4 scfm), the organic emission concentrations were determined to be approximately 80,000 ppmv after the carbon adsorption unit reached breakthrough. Thus the emissions that should have been abated went straight through the carbon vessel and into the ambient air uncontrolled. This could have been avoided had the operator monitored the emissions from the carbon adsorption unit more frequently and been able to replace the carbon before breakthrough.

Figure 7 is an image of a portable carbon adsorption system. The two carbon vessels, each containing 1,000 lbs. of activated carbon, can be transported to locations where vacuum truck operations occur.

Figure 7
Portable Carbon Adsorption Unit

Image Source: http://www.vocpollutioncontrol.com

Under certain circumstances, carbon adsorption can be a less expensive technology compared to other control methods, primarily when it is used to control vapor emissions from materials containing relatively low organic compound concentrations. However, carbon adsorption is limited by virtue of the dimensions of portable carbon vessels because they must be sized to allow for sufficient residence time to maximize adsorption efficiency. Temperature and humidity also affect carbon's ability to adsorb. When carbon adsorption systems are used to control emissions from loading events with materials that have high organic concentrations, there is some risk of spontaneous combustion due to temperature increase.

Internal Combustion Engines

Internal combustion engine technology is currently available to control organic vapor emissions. The equipment contains the vacuum source and vapor control device in one unit mounted on a truck. Internal combustion engines that are utilized to control organic vapors from vacuum trucks have a large cubic inch displacement and are able to run on compressed gas such as propane. When an internal combustion engine is used to control organic vapor emissions, it initially runs on propane and then switches to the incoming organic vapors as the primary fuel source. In some applications, the engines can power a refrigerated condenser (or "chiller") to condense a portion of the organic vapor stream back to liquid.

In a Southern California demonstration observed by District staff, the refrigerated condenser was powered by the truck's engine using the extracted organic vapors as the primary fuel source. Emissions were monitored from the control device's exhaust with a portable engine analyzer that was previously source-tested, as required by the South Coast Air Quality Management District (SCAQMD), to confirm the accuracy of the instrument readings. While loading transmix (a material blend containing primarily gasoline and diesel fuels) into a vacuum truck, emissions were reduced by over 99.6%. The engine/chiller vapor control equipment abated approximately 33 lbs. of potential organic vapor emissions for this 10 minute loading event.[5] Figure 8 is a diagram of an engine/chiller combination unit integrated into a vacuum truck. The small reddish-orange circles depict the flow of organic vapors as they flow from right to left in the vacuum truck's barrel. Some of the vapors are captured by the chiller (see #3 in the diagram) while the majority of the remaining vapors are combusted by the internal combustion engine (see #4 in the diagram).

Figure 8
Vacuum Truck with a Combination
Internal Combustion Engine-Refrigerated Condenser
Control Device

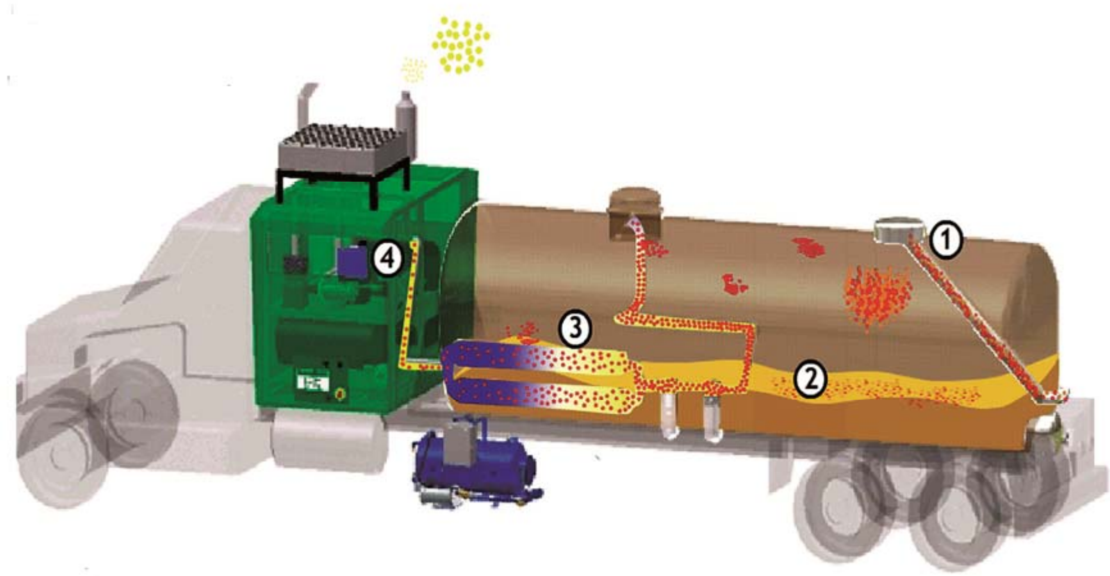

Image Source: http://www.fieldspecialtiesinc.com/projects-equipment-media/

① **Stream of liquid, solids and vapors are drawn into vacuum truck tank.**

② **Liquids and solids drop out of stream. Vapors flow upward toward vacuum pump intake and are then exhausted downward into chiller vapor destruction system.**

③ **Vapor stream is drawn through chiller where some vapors are condensed back into a liquid state.**

④ **Remaining vapors flow to truck engine where they are combusted by more than 99.6%.**

Thermal Oxidizers

Portable or "skid-mounted" thermal oxidizers are used to control emissions in vapor streams containing hydrocarbons diluted down to less than 50% of the lower explosive limit (LEL) at controlled flow rates to meet National Fire Protection Association (NFPA 86) Safety Guidelines. Thermal oxidizers are sometimes referred to as "afterburners." Thermal oxidizers are a type of incinerator that destroys emissions by raising the temperature of the organic materials in the vapor stream above their auto–ignition point in the presence of oxygen, and maintains the high temperature for a sufficient amount of time to complete the combustion of the materials to carbon dioxide and water. Time, temperature, turbulence (for mixing), and the availability of oxygen are all factors that affect the rate and efficiency of the combustion process. Organic vapor destruction efficiency depends upon design criteria which include chamber temperature, residence time, inlet concentration, compound type, and degree of mixing. Typical design efficiencies range from 98% and above depending on system requirements and characteristics of the vapor stream. Figure 9 is an image of a portable thermal oxidizer.

Figure 9
Portable Thermal Oxidizer

Image Source: ENVENT Corporation

<u>Refrigerated Condenser Systems</u>

A refrigerated condenser system can be effective in reducing organic vapor discharge. It is a device that cools a vapor emission stream containing hydrocarbons by changing it from a vapor state to a liquid state. The condensed organic vapors can be recovered for transportation or refining, preventing their release to the ambient air. A refrigerated condenser works best on emission streams containing high concentrations of volatile organic emissions. They are less effective on dilute streams (i.e., where the air flow is much greater than organic vapor flow).

A refrigerated condenser functions by exposing influent organic vapor streams to a chilled heat exchanger surface, causing the organic vapors to condense on the cold heat exchanger (or heat transfer) surface. As the organic vapor stream condenses, it loses volume, which produces a lower vapor concentration near the heat exchanger surface. The condensation process is assisted by turbulence in the emission stream that also brings the emission stream close enough for heat transfer and subsequent condensation of the organic vapors. Figure 10 is an image of a refrigerated condenser system, which includes a blower, compressor and after-cooler.

Figure 10
Portable Refrigerated Condenser

Image Source: geoinc.org

Liquid Scrubbers

Organic emissions can be controlled effectively by liquid scrubbing technology via a chemical process known as absorption. A variety of wet scrubber designs are used to extract gaseous pollutants from vacuum truck vapor streams: packed towers, bubble tray towers, sparging scrubbers, and a new wet scrubber process called hydraulic amalgamation. Usually, the exhaust stream from a vacuum truck is introduced at the bottom of the scrubber tower. The gas stream flows upward through the tower where the organic compounds come into contact with the absorptive chemicals. Packed towers and bubble tray towers are designed to introduce the waste gas into the tower chamber where a liquid absorption chemical is introduced through a series of spray nozzles that emit liquid droplets downward in a counter direction to the stream. The interaction between the upward flowing waste gas and the downward flowing liquid absorption chemical creates an environment for the absorption process. Sparging scrubbers and hydraulic amalgamation scrubbers introduce the waste gas through a submerged reaction chamber. The interaction between the waste gas and the absorption liquid within the reaction chamber creates an environment in which the organics are absorbed.

A high hydrocarbon-to-liquid contact ratio is essential to maximize the efficiency of the absorption process. Physical absorption depends on properties of the exhaust stream and the liquid such as density and viscosity, as well as specific characteristics of the hydrocarbons in the exhaust stream. These properties are temperature dependent: lower temperatures generally favor absorption of hydrocarbons by solvent. Absorption is also enhanced by higher liquid-gas ratios and higher concentrations in the hydrocarbon stream. Chemical absorption may be limited by the rate of reaction, although the rate-limiting factor is typically the physical absorption rate, not the chemical reaction rate. Figure 11 is an image of a vacuum truck that has a combination of liquid scrubbing and carbon adsorption control technologies designed into the truck.

Figure 11
Vacuum Truck Containing a Combination of a
Liquid Scrubber and Carbon Adsorption Control Device

Image Source: PSC Industrial Outsourcing, LLP

To achieve desired hydrocarbon control objectives, some companies provide custom designed systems that utilize combinations of control technologies discussed above. The control technologies referenced in Figure 11 are an example of such an approach. In order to comply with the proposed 500 ppmv TOC emission limit in Regulation 8, Rule 53, client-specific configurations may sometimes be necessary.

Alternative Methods for Reducing TOC Emissions

Two alternative loading methods can result in significant emission reductions from vacuum truck loading and at lower cost than using the control technologies discussed above. The two methods are loading with a positive displacement pump and gravity loading, both of which produce less agitation of the loaded material than loading with the vacuum truck blower.

The first method involves use of an external positive displacement pump, a submersible pump, or a diaphragm pump. In this staff report, all three types of pumps are referred to as a positive displacement pump (PD pump). A PD pump can introduce material into a vacuum truck barrel with significantly less agitation than is generated by a vacuum truck blower.

Different PD pumps are manufactured with different types of parts for different performance standards, depending on specific material loading requirements. Thus, the cost to purchase or rent PD pumps can vary. For instance, if gasoline is going to be loaded into a vacuum truck, the PD pump must be fitted with more expensive parts that are resistant to the corrosive nature of that chemical. A material known as viton – a special polymer – is typically used for PD pump diaphragms used for gasoline loading events.

PD pumps may not be appropriate for all vacuum truck operations for a variety of reasons:

- They take longer to complete loading events, which is a disadvantage if a job is large enough to require the loading of several vacuum trucks or more in succession;
- PD pumps are not powerful enough to load very viscous materials under certain situations;
- PD pumps require more set up time (typically 30 min - hour); and,
- Diaphragm ruptures will result in leaks or spills. Sometimes compressors fail which result in downtime for the PD pump.

Research did not identify any test data comparing vacuum truck emissions when using the blower to emissions when using a PD pump for loading. In order to determine the extent of emission reductions likely to result from use of a PD pump, staff examined the United States Environmental Protection Agency loading loss equations and emission factors for loading into tank trucks. This information is found in EPA's AP-42, *Compilation of Air Pollutant Emission Factors*, Chapter 5.2. Using the equations in AP-42, gasoline with a Reid vapor pressure of 7 psia (typical for California gasoline), would be expected to emit approximately 10 pounds per thousand gallons (0.42 pounds per barrel) when loaded into a vacuum truck using a PD pump. By contrast, District source tests conducted to develop the emissions inventory for this rule (see Appendix A) showed that vacuum truck loading of gasoline and naphtha produced average emissions of 2.41 pounds per barrel. If these results are representative, a PD pump would be expected to reduce emissions by 83%. To determine whether actual measurements would show similar results, staff conducted one vacuum truck source test involving gasoline loading in which 20 barrels of gasoline were loaded using the vacuum truck's blower and 20 barrels were loaded with a PD pump. With the blower in operation, emissions were 0.45 pounds per barrel. Using the PD pump, emissions were 0.10 pounds per barrel, a reduction of 78%.

A second alternative for reducing emissions is to use a gravity feed method in which liquid moves from a higher elevation into a vacuum truck through the force of gravity. This method can be employed, for example, when material must be moved from an elevated tank or vessel. This method is expected to result in emission reductions equal to those achievable through use of a positive displacement pump.

For both the positive displacement and gravity feed methods, District staff considered whether restrictions on flow rate might be necessary. This concern was based on the idea that higher flow rates might produce greater agitation and greater emissions. However, calculations and research suggest that emissions are typically lower at higher flow rates because quicker loading allows less time for vapor growth.[6] As a result, the proposed rule does not limit flow rates when these methods are used.

Another alternative method of loading materials into a vacuum truck involves the creation of vacuum pressure inside a vacuum truck barrel and then shutting off the blower prior to opening the inlet valve to draw in the material. The blower is turned on for less than 1 minute one additional time partway through the loading event. Although this method is promising, additional testing would be necessary for the loading of a variety of materials under a variety of conditions before staff could conclude that the method reduces vacuum truck emissions.

Lastly, for certain vacuum truck operations, a vapor line (hose) could be used to return organic vapors to the tanks the materials originated from. This method is called a vapor balancing. In order for this method to comply with the rule, the tank that is receiving the rerouted vapors must be connected to a control device that is actively controlling the vapors. This method is not common.

III. Regulatory Proposal

Currently, the District does not regulate vacuum truck emissions. Regulation 2, Rule 1, Section 103.1 exempts vacuum truck operations from permitting requirements. However, permits may be required for control equipment used to limit organic vapor emissions from a vacuum truck. Regulation 8, Rule 53, is a new rule.

A. Proposed Regulation 8, Rule 53: Vacuum Truck Operations

The proposed emission limits in Regulation, Rule 53 would be consistent with the only current air quality regulation in California that limits organic vapor emissions from vacuum truck operations — SCAQMD Rule 1149. Whereas Rule 1149 exclusively limits VOC emissions from vacuum trucks that are utilized during the cleaning or degassing of storage tanks and pipelines, Regulation 8, Rule 53 would limit organic vapor emissions, including methane, from five types of industrial facilities that utilize vacuum truck service for a variety of operations and equipment types.

The emission limits in Regulation 8, Rule 53 are also consistent with Texas Commission on Environmental Quality (TCEQ) permitting requirements for vacuum truck operations associated with maintenance, startup and shutdown operations at refineries.[7] In addition, the federal National Emission Standard for Benzene Waste Operations found in 40 C.F.R., Part 61, Subpart FF includes a similar emission limit that applies to vacuum truck operations used for waste disposal.[8]

The proposed rule for vacuum truck operations, Regulation 8, Rule 53, would apply in petroleum refineries, gasoline bulk terminals, gasoline bulk plants, marine terminals and organic liquid pipeline facilities. These facilities are responsible for the majority of organic liquid transfers using vacuum trucks.

Regulation 8, Rule 53 is a new rule that will reduce TOC and TAC emissions in three ways: (1) by limiting organic vapor emissions from vacuum truck blower exhaust, (2) by limiting organic vapor emissions from vacuum truck equipment vapor leaks, and (3) by limiting liquid leaks from vacuum truck equipment. Table 1 lists the proposed emission limits for vacuum truck loading events. The rule will exempt vacuum truck operations that respond to emergency situations.

Table 1
Proposed TOC Emission Limits for Vacuum Truck Loading Events

Standard Type	Current Standard	Emission Standard Effective January 1, 2013
Emission Leak Limit—from blower exhaust or connected equipment	None	500 ppmv
Liquid Leak Limit—from equipment such as hoses and connectors	None	3 Drops Per Minute (no more than)
Vapor Leak Limit—from equipment such as stingers, hoses, and connectors	None	500 ppmv

The emission limit requirements in the proposed rule would apply to the specified facilities that use vacuum trucks to load regulated materials. Regulated materials are defined as gasoline, aviation gas, gasoline blending stock, naphtha, and any mixture that includes any of these materials. Crude oil is not a regulated material at this time.

Other materials moved by vacuum trucks in refineries may be cost effective to control. For that reason, record keeping requirements for some additional materials (crude oil and recycled oil) have been included in rule requirements. If data developed in response to these record keeping requirements and through further source tests show that emissions from other materials may be cost-effectively controlled, further amendments may be considered.

Additional requirements for vacuum truck operations include the following:

- Reporting requirements for scheduled loading events upon request by the APCO;
- Monitoring requirements for emissions from vacuum trucks or control technologies when applicable;
- Recordkeeping requirements to assist staff in assuring compliance with the rule;
- Use of District-approved measurement methods.

Under the rule, the facilities that use or contract for use of vacuum trucks would be responsible for complying with the provisions of Regulation 8, Rule 53. Regulation 8, Rule 53 is proposed to become effective on January 1, 2013.

B. Amendments to Regulation 2, Rule 1: Permits, General Requirements

Vacuum truck operations currently do not require permits. Amendments are proposed to Regulation 2: Permits, Rule 1: General Requirements so that vacuum trucks will not be required to be permitted with the adoption of Rule 53. Vacuum trucks are temporary contractors in the regulated facilities, used temporarily at any one location, and, so are not appropriate for permits. The current exemption is based on Regulation 2, Rule 1, Section 103 that exempts sources for which a Regulation 8 rule does not exist. Exceptions exist for sources only subject to some general standards found in Regulation 8, Rules 1 and 2 and for Regulation 8, Rule 3: Architectural Coatings. However, with the adoption of proposed Regulation 8, Rule 53, this exemption will no longer apply. Staff has proposed minor amendment to Regulation 2, Rule 1 to continue to exempt these vacuum truck operations from requiring District permits.

IV. Emissions and Emission Reductions

A. Emissions Inventory

The development of an emissions inventory requires information on emission rates for an activity (i.e., the expected emissions for a given unit or volume of the activity) combined with information on the frequency or volume of the activity. Neither type of information was readily available for vacuum truck operations at the beginning of this rule development effort. In order to estimate vacuum truck emissions and potential reductions for the proposed rule, staff developed emission factors and estimates of vacuum truck activity.

To develop emission factors, District staff conducted thirty-two source tests on vacuum trucks moving various petroleum products. Some tests found low emissions, particularly for those products that contain high amounts of water. Other tests found significant emissions, particularly for those products that contain high vapor pressure petroleum products such as gasoline. Despite significant variation in results, even among similar materials, staff was able to group the results into general material categories and develop emission factors.

To develop activity data, staff relied on data from one refinery that was more detailed than data available from other sources and scaled the data to derive estimates of total activity. Using the emission factors and this activity data, the District developed emissions estimates for vacuum truck operations in the facilities that would be subject to the proposed rule. Total organic emissions from those facilities subject to the rule are **1.50 TPD**. The emissions inventory is explained in greater detail in Appendix A.

B. Emission Reductions

Organic emissions from vacuum truck operations at facilities that the rule would regulate are 1.50 TPD. These emission estimates include throughput that is already controlled or minimized through use of external abatement equipment, PD pumps, or gravity feed (approximately 20% is already controlled). Total emissions from moving materials to be regulated by the rule that are currently uncontrolled are **1.24 TPD**.

Based on discussions with facilities that will become subject to the rule, staff estimates that 50% of vacuum truck operations that will be subject to the proposed rule will be controlled with external abatement equipment such as carbon adsorption or thermal oxidization. These devices have an efficiency of at least 95%. The other half of vacuum truck operations subject to the proposed rule will be minimized by the use of PD pumps or gravity feed. For these operations, staff used an efficiency of 75% to calculate the emission reductions. Emission reductions are calculated as follows:

(Uncontrolled emissions) x (% to be controlled by abatement equipment) x (abatement efficiency) +
(Uncontrolled emissions) x (% to be controlled by PD pumps) x (PD pump control efficiency) =

(1.24) x (50%) x (.95) + (1.24) x (50%) x (.75) = **1.05 TPD**

Emissions reductions of 1.05 ton per day represents an 85% reduction in emissions from moving regulated materials and a 70% reduction of overall organic emissions from vacuum truck operations at the regulated facilities. Emissions for TACs, such as benzene, toluene, xylene, hexane, and possibly GHG emissions will also be reduced.

V. Economic Impacts

A. Compliance Costs and Cost Effectiveness

The rule as proposed has been structured to be cost effective. Highly volatile liquids, such as gasoline, emit high rates of organic emissions when moved into vacuum trucks. However, source testing has found that many materials moved by vacuum trucks in petroleum refineries, such as wastewater, emit at a very low rate and are thus not cost effective to control. The rule defines those materials that source tests have shown to have high emissions so that they can be clearly identified within the context of refinery, bulk plant, bulk terminal, marine terminal and pipeline facility operations. An analysis of cost effectiveness follows.

Costs

Control Costs

Staff estimates that 24 vacuum trucks operate in the affected facilities daily. This number is derived from discussions with facility representatives, vacuum truck and vacuum truck control equipment operators and field observations. Of these 24 vacuum trucks, 22 operate in refineries. The remaining 2 operate in gasoline bulk terminals, bulk plants, marine terminals and organic liquid pipeline facilities. Much of the vacuum truck activity in refineries, however, is not conducted on materials that the rule would regulate.

As detailed in Appendix A: Emissions Inventory, 13.5% of the vacuum truck throughput in refineries is of regulated material and about 75% of the throughput in other facilities is of regulated material. Staff used these figures to estimate costs for refineries and other facilities.

Consequently, the number of vacuum truck operations in refineries that will be subject to the rule per day is 22 x 13.5% = 2.97 (3 trucks per day). The number of vacuum truck operations in other facilities that will be subject to the rule is 2 x 75% = 1.5 trucks per day. The total number of vacuum trucks that will be loading regulated materials on a daily basis at all facilities subject to Regulation 8, Rule 53 is 3 + 1.5 = 4.5 trucks/day. As discussed under Emissions and Emissions Reductions, above, the percentage of trucks that are already controlled or that use positive displacement pumps is 20%. Therefore, additional costs will be incurred by 4.5 – (0.20 x 4.5) = 3.6 vacuum trucks on a daily basis.

Staff obtained cost estimates from representatives of several companies that supply abatement equipment that is currently used at Bay Area, South Coast Air Basin and Texas refineries. Table 2 reflects the range of typical daily costs to rent abatement equipment that is most commonly used in the Bay Area as well as the daily cost to rent PD pumps. Gravity feed, an alternative to use of a PD pump, will be used in some applications, when material is at a higher elevation than the vacuum truck barrel. Because gravity feed does not use any extra equipment, there is no associated cost. For the purpose of this analysis, any use of gravity feed is not considered.

Table 2
Daily Compliance Costs

Control Technology	Cost – Equipment Rental
Positive Displacement pump	$80 – $105 /day
Thermal incineration	$4900 – $5780 /day
Carbon adsorption	$400 – $515 /day

As previously indicated, 50% of the time PD pumps or gravity feed will be used and 50% of the time abatement equipment will be used to comply with the provisions of the rule. Industry currently uses thermal oxidation to control emissions about 10% of the time. So, staff estimates that carbon adsorption will be used the remaining 40% of the time.

Given the range of costs, a high and a low cost have been estimated on a daily basis as follows:

(Trucks / day that will need to be controlled) x (% control equipment) x (costs of control) = Costs / day

Low Costs of Control Equipment

(3.6 trucks /day)(50% PD pumps)($80) + (3.6 trucks/day)(10% thermal incineration)($4900) + (3.6 trucks/day)(40% carbon adsorption)($400) = $144 + $1764 + $576 = $2,484/day.

High Costs of Control Equipment

(3.6 trucks /day)(50% PD pumps)($105) + (3.6 trucks/day)(10% thermal incineration)($5780) + (3.6 trucks/day)(40% carbon adsorption)($515) = $189 + $2,081 + $742 = $3,012/day.

<u>Monitoring Costs</u>

In addition to the costs of control, there are costs associated with the monitoring requirements. Although some facilities have environmental personnel available to conduct monitoring, others do not. Monitoring is only required when abatement equipment is used, not when a PD pump or gravity feed is used. Staff has allocated a daily cost of $85 to assist with emissions monitoring, but it will be required on all loads of regulated materials, not just the additional loads that are currently uncontrolled. If PD pumps or gravity feed is used on 50% of 4.5 trucks per day, costs for personnel are:

(4.5 trucks per day) x (50%) x ($85) = $191/day

Emissions monitoring will also require the use of a handheld monitoring device. Some facilities such as refineries and gasoline bulk terminals already own this type of equipment because it is used to measure emissions for compliance with organic vapor emission limits in other District regulations. Staff estimates that at least 4 to 5 additional handheld monitoring devices, and possibly up to a maximum of 14 units will have to be purchased, although they can be rented, or monitoring can be performed under the contract to provide the vacuum truck service. The monitoring devices cost from $2,000 to $3,000 per unit. For the cost analysis, staff used a median cost of $2,500. The cost for 14 facilities to purchase handheld monitoring devices to comply with Section 8-53-501 is $35,000. The cost of the monitoring devices has been amortized over 5 years, the minimum life expectancy. Consequently, the daily cost for monitoring is $19 per day.

Total Costs

Total costs are the sum of control costs, personnel costs and monitoring costs:

Low Cost
$2484 + $191 + $19 = $2694 per day

High Cost
$3012 + $191 + $19 = $3222 per day

Yearly Costs

The daily costs have been multiplied by 365 to derive the yearly costs.

Low Cost
($2964) x (365) = $983,310

High Cost
($3222) x (365) = $1,176,030

Refineries will incur 91.6% of the costs. Terminals, bulk plants, and organic liquid pipeline facilities will incur 8.4% of the costs. These are based on the throughput information that was used to calculate emissions and activity costs. Of the 8.4%, 8.38% of the total costs are expected to be incurred in bulk terminals and marine terminals. Bulk plants, with two tenths of a percent of the gasoline throughput that bulk terminals have, and organic liquid pipeline facilities, will incur 0.02% of the total costs. Bulk plants are typically small businesses, and analyzed as such in the socioeconomic analysis.

Cost Effectiveness

Cost effectiveness is the sum of costs to comply with the proposed rule on a daily basis divided by the expected emissions reduction on a daily basis. Cost effectiveness (C.E.) is expressed by the following equation:

C.E. = Costs / emissions reductions

Low Cost = $2694 / 1.05 ton = $2566 / ton

High Cost = $3222 / 1.05 ton = $3069 / ton

The rule is very cost effective. District organic compound control rules typically range from several thousand to over fifteen thousand dollars per ton of emissions reductions, and rules to reduce oxides of nitrogen, NOx, typically range from about seven to around twenty thousand dollars per ton of emissions reduced.

B. Socioeconomic Impact Analysis

Section 40728.5 of the California Health and Safety Code requires an air district to assess the socioeconomic impacts of the adoption, amendment or repeal of a rule if the rule is one that "will significantly affect air quality or emissions limitations." Bay Area Economics of Emeryville, California has prepared a socioeconomic analysis of the proposed amendments to Regulation 8, Rule 53.

The analysis concludes that the proposed rule would not have a significant economic impact or cause regional job loss. District staff has reviewed and accepted this analysis. The socioeconomic analysis is attached as Appendix B.

C. Incremental Cost Analysis

Health and Safety Code Section 40920.6 requires an air district to assess the incremental cost-effectiveness for a regulation that identifies more than one control option to meet the same emission reduction objectives. Incremental cost-effectiveness is defined as the difference in costs divided by the difference in emission reductions between one level of control and the next. As discussed above, the cost-effectiveness for the requirement to use control technology to comply with emission limits for vacuum truck operations that load only regulated materials is estimated to be from $2566 to $3069 per ton of emissions reduced.

To calculate the incremental cost effectiveness, the cost of controlling all organic liquids (including non-regulated materials such as wastewater with some organic content and diesel fuel and oils with a low vapor pressure) was calculated.

The throughput information, detailed in Appendix A, provides an estimate of 3,229,799 barrels per year of all materials moved by vacuum trucks in refineries in a year. Refineries represent 91.6% of the vacuum truck activity among the regulated facilities. Other facilities have much less vacuum truck activity and a lower percentage of vacuum truck operations that would not be hauling regulated materials, so they are not included in the calculations. The regulated materials in refineries constitute 436,022 barrels, so the non-regulated materials represent the remaining 2,793,777 barrels. Utilizing the emission factor of 0.082 lbs / barrel, the emissions from non-regulated materials are 0.31 tons per day.

To control this material, all vacuum trucks used in the refineries would need to utilize abatement equipment, or PD pumps or gravity feed, and be monitored, as explained above. Costs to control 3,229,799 barrels of material per day would increase proportionally, to a range from $19,954 to $23,865 per day. The emissions reductions, calculated as before, would total 1.26 tons per day. Consequently, the cost effectiveness of controlling all vacuum truck material in refineries would be from $15,836 per ton to $18,940 per ton of emissions reduced. This is still within the range of cost effectiveness of other District rule adoptions.

However, the cost effectiveness of the additional increment controlled is significantly higher. The calculation of incremental cost effectiveness is expressed as follows:

Total Costs – Recommended Costs = Incremental Costs

($19,954 to $23,865) – ($2566 to $3069) = $17,428 to $20,796

Total emissions reductions (E.R.) – Recommended E.R. = Incremental E.R.

1.26 tons per day – 1.05 ton per day = 0.21 tons per day

Incremental Costs / Incremental Emissions Reductions = Incremental Cost Effectiveness

$17,428 / 0.21 tons per day = $82,990 per ton of emissions reduced

$20,796 / 0.21 tons per day = $99,029 per ton of emissions reduced

Given the range of incremental cost effectiveness from $82,990 to $99,029 per ton of emissions reduced, only the defined "regulated materials" are recommended for control at this time.

VI. Environmental Impacts

A. California Environmental Quality Act

Pursuant to the California Environmental Quality Act, the District has caused an initial study for proposed Regulation 8, Rule 53 to be prepared by Environmental Audits of Placentia, CA. The assessment concludes that the proposed rule would not result in adverse environmental impacts. A copy of the study and draft Negative Declaration is attached as Appendix C.

B. Greenhouse Gas Emissions

In June, 2005, the District's Board of Directors adopted a resolution that recognizes the link between global climate change and localized air pollution impacts. Climate change, or global warming, is the process whereby emissions of anthropogenic pollutants, together with other naturally-occurring gases, absorb infrared radiation in the atmosphere, leading to increases in the overall average global temperature.

While carbon dioxide (CO2) is the largest contributor to global warming, methane, halogenated carbon compounds, nitrous oxide, and other greenhouse gas (GHG) species also contribute to climate change. Gases in the atmosphere can contribute to the greenhouse effect both directly and indirectly. Direct effects occur when the gas itself is a GHG. While there is relative agreement on how to account for these direct effects of GHG emissions, accounting for indirect effects is more problematic. Indirect effects occur when chemical transformations of the original compound produce other GHGs, when a gas influences the atmospheric lifetimes of methane, and/or when a gas affects atmospheric processes that alter the radiative balance of the Earth (e.g., affect cloud formation).

Organic compounds have some direct global warming effects; however, they may also be considered greenhouse gases due to their indirect effects. Organic compounds react chemically in the atmosphere to increase concentrations of ozone and may prolong the life of methane. The magnitude of the indirect effect of organic compounds is not well quantified and depends on local air quality. Global warming not only exacerbates ozone formation, but ozone formation exacerbates global warming because ozone absorbs infrared radiation. Consequently, reducing organic compounds to make progress towards meeting California air quality standards for ozone will help reduce global warming.

Adoption of Regulation 8, Rule 53 will not result in any adverse impact on the emissions of greenhouse gases. The proposed methods of control include technologies such as carbon adsorption, thermal oxidizers, refrigerated condensers, absorption, and internal combustion engines; also by minimizing emissions via the use of an alternative method of loading materials into vacuum trucks with a positive displacement pump.

On average, control equipment or PD pumps are currently used 20% of the time to minimize emissions. Facilities have indicated that they would prefer to utilize PD pumps instead of control technology to comply with the emission requirements in the proposed rule. There would be a minimal increase in energy demand to implement these amendments and, therefore, the proposal will not generate additional greenhouse gases.

VII. Regulatory Impacts

A. California Health and Safety Code 40727.2 Impacts

Section 40727.2 of the Health and Safety Code requires an air district, in adopting, amending, or repealing an air district regulation, to identify existing federal and district air pollution control requirements for the equipment or source type affected by the proposed change in district rules. The district must then note any differences between these existing requirements and the requirements imposed by the proposed change.

Adoption of Regulation 8, Rule 53, would not conflict with any existing federal or District requirement. In some cases, materials moved by vacuum trucks in petroleum refineries may be subject to the federal National Emission Standard for Benzene Waste Operations, 40 C.F.R., Part 61, Subpart FF. The federal rule requires emission from waste transfer of petroleum products containing benzene to be controlled to 500 ppm, which is consistent with the proposed limit in Regulation 8, Rule 53.

In addition, District Regulation 8, Rule 5: Storage of Organic Liquids, requires controls of vapor space emissions in floating roof tanks to be controlled when tanks are being degassed for cleaning and maintenance. The portable controls used for this operation are the same as those used for vacuum trucks. The emission standard in Regulation 8, Rule 5 is also 500 ppm.

B. Senate Bill 288 Conformity

Senate Bill (SB) 288, later codified in the California Health and Safety Code commencing at §42500, prohibits air districts from making changes to their new source review rules that would make the rule less stringent than it was on December 30, 2002, unless certain conditions were met. Currently, District Regulation 2, Rule 1: Permits, General Requirements exempts sources that are not regulated by a Regulation 8 rule, provided that the emissions from these sources do not exceed 10 pounds per day or 150 pounds per year. Regulation 8, Rule 53 is a new rule and its adoption will mean that this exemption no longer applies to vacuum trucks operations. To maintain consistency with current permitting requirements, staff has proposed an exemption in Regulation 2, Rule 1, Section 113 to exempt vacuum truck operations that will be subject to the requirements of Regulation 8, Rule 53. Section 113 exempts specified sources and operations from having to obtain a permit. To the existing exempt sources, staff has added, "Vacuum trucks subject to Regulation 8, Rule 53 and processing regulated material as defined in that rule." In addition, staff has proposed an exemption for portable abatement equipment used to control emissions from vacuum trucks, consistent with the existing exemption for abatement equipment used for tank degassing.

These exemptions are not in conflict with SB 288 provisions. Vacuum truck operations are currently exempt. Moreover, the exemption is narrowly tailored so that only those trucks subject to the control requirements will be specifically exempted. Other trucks used outside of Regulation 8, Rule 53 facilities and not subject to the control requirements will still be subject to permitting if emissions exceed the thresholds. Emissions from vacuum trucks subject to Regulation 8, Rule 53 will decrease. Consequently, no sources will escape permitting and new source review with the addition of these exemptions to Regulation 2, Rule 1.

VIII. Rule Development Process

Air District staff from the Planning, Legal, Technical, Engineering, and Compliance and Enforcement Divisions developed Regulation 8, Rule 53 through a rule development process that began in 2010. In June 2010, staff requested through the Western States Petroleum Association (WSPA) that Bay Area refineries provide vacuum truck material throughput information as well as technical information regarding vacuum truck operations. From February 2011 until October 2011, the District conducted thirty-two source tests on vacuum truck operations involving a variety of materials, equipment, and processes.

District staff met with representatives from various Bay Area facilities that would be subject to the rule and conducted site visits. Staff reviewed and discussed regulatory language with staff at the other agencies that have regulated vacuum trucks: the South Coast Air District, the Texas Commission of Environmental Quality, and the New Jersey Department of Environmental Protection. Staff also discussed vacuum trucks with vacuum truck manufacturers and organic vapor control equipment service providers.

Staff met with WSPA on June 14, 2011 to discuss basic rule concepts. A draft rule, a workshop report, and workshop notice were posted on the District's web site on July 7, 2011, and the notice was mailed to 68 businesses, facilities, vacuum truck service providers, interested persons, and companies that provide control technologies for vacuum truck VOC emissions. A public workshop was conducted at the City of Martinez City Hall on July 21, 2011, and a second was held at the District offices on July 25, 2011 to solicit comments on the draft proposal. Thirty-five parties attended the first workshop and twenty-one parties attended the second workshop.

Comments on the draft addressed:

- Cost information for the proposed rule;
- Vacuum truck loading of materials containing high water content and/or low vapor pressure that result in low organic vapor emissions;
- Reporting requirements for vacuum truck loading events; and,
- The effective date for the rule.

After reviewing workshop comments and the District source test results, staff developed a revised draft of the rule that applies only to those materials that result in the most significant emissions when loaded into vacuum trucks. Reporting requirements for scheduled loading events have been modified to address stated concerns. The proposed rule's effective date, January 1, 2013, will give industry sufficient time to implement control technologies and train staff to familiarize themselves with the new rule.

On September 29, 2011, and January 9, 2012 staff gave presentations to the District's Stationary Source Committee regarding the status of the rule.

Staff has analyzed the cost effectiveness of the rule and has determined that a cost range of $2964 per ton to $3222 per ton of emissions reduced is cost effective. Staff has re-examined the issue of whether the responsibility to comply with the provisions of the rule should be with the facility or the vacuum truck operator. Staff has confirmed that consistent with BAAQMD fugitive emission rules, and, consistent with Title V permitting requirements, the requirement for facilities to comply with the requirements in Regulation 8, Rule 53 is appropriate.

Staff reviewed and considered all comments received at the public workshops and subsequent to workshops and made revisions to the proposal as appropriate. Staff continued discussions with industry representatives and other regulatory agencies and again met with WSPA on December 20, 2011 to discuss applicability, timing and definitions for the draft rule.

IX. Conclusions

Pursuant to Section 40727 of the California Health and Safety Code, the proposed rule amendments must meet findings of necessity, authority, clarity, consistency, non-duplication, and reference before the Board of Directors adopt, amend, or repeal a rule. The proposed Rule is:

- Necessary to protect public health by reducing ozone precursors to meet the commitment of Control Measure SSM5 of the Bay Area 2010 Clean Air Plan;
- Authorized by California Health and Safety Code Sections 40000, 40001, 40702, and 40725 through 40728;
- Clear, in that the rule specifically delineates the affected industry, compliance options, and administrative requirements for industry subject to this rule, so that its meaning can be easily understood by the persons directly affected by it;
- Consistent with other California air district rules, and not in conflict with state or federal law:

- Non-duplicative of other statutes, rules, or regulations; and,
- Implementing, interpreting and making specific and the provisions of the California Health and Safety sections 40000 and 40702.

A socioeconomic analysis prepared by Bay Area Economics has found that the proposed amendments would not have a significant economic impact or cause regional job loss. District staff have reviewed and accepted this analysis. A California Environmental Quality Act analysis prepared by Environmental Audit, Inc., concludes that the proposed amendments would not result in adverse environmental impacts. District staff have reviewed and accepted this analysis as well. The CEQA document will be available for public comments prior to the public hearing.

The proposed Rule has met all legal noticing requirements, have been discussed with the regulated community and other interested parties, and reflect the input and comments of many affected and interested parties. District staff recommends adoption of proposed Regulation 8, Rule 53: *Vacuum Truck Operations*; and adoption of the CEQA Negative Declaration.

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Appendices

A. Emissions Inventory

B. Socioeconomic Analysis

C. CEQA Analysis