SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT

FINAL DRAFT STAFF REPORT

Proposed New Rule 4566
(Organic Material Composting Operations)

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I. SUMMARY

Under their regulatory authority to assess the health impact of air pollutants and to establish air quality requirements, the California Air Resources Board (ARB) and United States Environmental Protection Agency (EPA) have established standards for ozone levels that impact public health. The San Joaquin Valley Unified Air Pollution Control District (District) adopted the *2007 Ozone Plan* to establish the strategy for attaining the eight-hour ozone standards through regulatory and incentive-based measures to reduce emissions of nitrogen oxides (NOx) and volatile organic compounds (VOC).

Conversion of organic material to compost (composting) emits VOC but provides benefits by reducing odors, eliminating pathogens, and reducing the bulk of organic material. In comparison to natural decay, bacterial activity in the conversion of material to compost provides a benefit for reduction of global warming emissions by keeping carbon in the bacterial cell structure thereby reducing the total amount of carbon escaping into the air. EPA evaluated composting and determined that the thirty year (life cycle analysis) retention by carbon sequestration results in reduction of global warming that far outweighs the other composting emissions of carbon and nitrous oxide. Further discussion of this topic is included in the Climate Change section of this staff

report. Composting converts material into a form that makes nutrients available for plant growth, resulting in material that is a rich soil amendment. Composting also eases the burden on landfills by helping cities and counties meet landfill diversion targets.

Throughout the development of the District's Proposed New Rule 4566 (Organic Material Composting Operations), which would apply to the Valley's composting operations that compost and stockpile organic material, the District has sought to balance requiring reduction of composting VOC emissions with allowing for the continued benefits achieved by composting. The District's goal in Proposed New Rule 4566 is to reduce VOC emissions through requirements that can be feasibly implemented without resulting in operational expenses or finished product costs that would render composting operations economically inoperable.

District efforts to develop a regulation that would reduce emissions from organic material composting operations began in 2007. After extensive review and collaboration with stakeholders, the District rescheduled the rule adoption in 2009 to allow for additional research and analysis. In 2009, the District collaborated with numerous stakeholders and agencies to direct a field study designed to measure the effectiveness of four candidate best management practices: finished compost cover, watering system, interactive management, and smaller piles. Based on the results of this field study, which was successfully completed in 2010, the Proposed New Rule 4566 would focus on the finished compost cover and the watering system. The District will continue to work with the affected industry to address any items regarding control costs, technical feasibility, economic impacts, and other limitations or benefits to this regulatory approach.

A. Reasons for Rule Development and Implementation

The San Joaquin Valley Air Basin (SJVAB) is nonattainment for the National Ambient Air Quality Standard (NAAQS) for 8-hour ozone. The Valley is also nonattainment for the California ozone standards. The District's *2007 Ozone Plan* included a green material composting control measure (S-GOV-5, Rule 4566) to reduce VOCs from this source category. Although VOC emissions contribute to ozone, VOC reductions are generally less important to the Valley's long-term attainment goals as compared to reductions in NOx. However, since the District proposed to develop a rule as part of the *2007 Ozone Plan* commitment, the rule seeks to obtain as much VOC reductions as expeditiously practical, technologically feasible, and as economically reasonable as determined by the Governing Board.

In the *2007 Ozone Plan*, District staff estimated that the total VOC emissions from composting operations would be about 62 tons per day (tpd) in 2014, based on the best data available at that time. Staff noted that research was being conducted to refine the emission factors for this source category, since the Air Resources Board (ARB) inventories did not yet account for green material composting. Through collaboration with the composting stakeholders, current information indicates that the total VOC emission, based

on actual throughput levels, is about 14 tpd. The revised emission estimate is less than previously expected, but still a significant portion of the total VOC inventory.

Development of Proposed New Rule 4566 is intended to obtain as much VOC emissions reduction from the source category as is technologically and economically feasible, as determined by the District's Governing Board.

B. Description of the Project

Consistent with the *2007 Ozone Plan* commitments, Proposed New Rule 4566 would establish VOC limits, including operational and administrative requirements, for organic material composting operations. Specific composting operations that would be subject to the proposed rule requirements include stockpiling and composting of organic material. Organic material is defined in the rule as food material, green material, or a mixture thereof, and may include wood material and a total of less than 100 wet tons per year of biosolids, animal manure, or poultry litter. Composting operations with more than 100 wet tons of biosolids, animal manure, or poultry litter are subject to District Rule 4565 (Biosolids, Animal Manure, and Poultry Litter Operations) for that portion of the organic material.

The District recognizes stakeholders' efforts to comply with regulations from various agencies involving the disposal and recycling of organic material, particularly for composting. While composting of organic material is one of the desired alternative methods to divert reusable material from landfills, there are potential impacts to the air quality within the SJVAB. However, the District also recognizes that several composting operations are already taking measures to help reduce emissions through responsible composting practices.

During composting operations, the active phase of composting is a significant part of the process in which the compost feedstock is rapidly decomposing. VOC emissions occur in the highest amounts during the active phase. Following that, the curing phase is characterized by lower VOC emission rates. Proposed New Rule 4566 utilizes the significant difference in emissions between the active phase and curing phase as a means to focus the VOC reduction efforts to a shorter period of the compost development process. This focus reduces the cost of implementation of the rule while ensuring sufficient VOC reduction effectiveness.

Proposed New Rule 4566 would establish VOC emission reduction requirements on the basis of actual throughputs, rather than the maximum allowable capacity limits, for the composting operations, which is representative of the current baseline emissions for this source category. The proposed requirements are as follows:

- Composting operations with an organic material receiving volume of less than 200,000 wet tons per year of organic material would be subject to the watering

system requirements or alternative mitigation measures that demonstrate at least a 19% reduction, by weight, in VOC emissions.

- Composting operations with an organic material receiving volume of greater than or equal to 200,000 tons per year and less than 750,000 tons per year would be subject to both the watering system and the finished compost cover requirements or alternative mitigation measures that demonstrate at least a 60% reduction, by weight, in VOC emissions.
- Composting operations with total throughput of 750,000 tons per year or more would be subject to mitigation measures that demonstrate at least 80% reduction, by weight, in VOC emissions for organic material.

The proposed rule further reduces VOC emissions from composting operations by limiting the number of days that the organic material could be stockpiled. Please refer to Section III (Current and Proposed Regulations) of this report for additional information.

- Composting operations with less than 100,000 tons per year of organic material would be subject to a 10-day stockpile requirement.
- Composting operations with 100,000 tons per year or more of the material would be subject to a three-day stockpile requirement.

Table 1 shows the summary of the proposed rule requirements for composting operations, based on the total throughput of the composting operation.

Table 1 – Summary of Proposed New Rule 4566 Requirements

Throughput Classification	Proposed Requirements	
	Remove or Cover the stockpile	**Composting Controls during Active Composting**
Throughput < 100K tpy	Within **10** days	Watering system or an equivalent VOC reduction mitigation measure
100K tpy ≤ Throughput < 200K tpy	Within **3** days	Watering system or an equivalent VOC reduction mitigation measure
200K tpy ≤ Throughput < 750K tpy	Within **3** days	Watering System and Compost Cover or an equivalent VOC reduction mitigation measure
Throughput ≥ 750K tpy	Within **3** days	Mitigation measure that demonstrates at least 80% reduction, by weight, in VOC emissions

C. Rule Development Process

District staff began the rule development process with extensive research in 2007, which was followed by a public scoping meeting on January 10, 2008. Based on the research conducted and information obtained with the best available data, the District created a draft version of Rule 4566 that proposed to adopt a menu based approach and require the implementation of various management practices (such as monitoring carbon to nitrogen ratios, moisture content measurements, temperature, etc.), including installation of engineered control systems. To obtain comments on the draft rule, the District held a public workshop in April 2008 and convened several site visits and technical workgroup meetings during 2008 and 2009 to work with various stakeholders to address costs, technical feasibility, economic impacts, and other limitations or benefits to this regulatory approach.

Although the meetings and visits in 2008 were intended to culminate in the Governing Board adoption of Rule 4566 in the first quarter of 2009, information that came to light during those meetings showed that more time would be needed to increase the scientific justification behind proposed rule requirements which would allow the District to develop an effective composting rule. District staff had determined that emissions from this source category were much lower than previously estimated in the *2007 Ozone Plan*. There was also insufficient information available, at that time, on the effectiveness of reducing VOCs from potential mitigation measures. For these reasons, District staff determined that additional time was needed to study the effectiveness of various control methods. District staff therefore requested an extension to the rule development schedule, and the District Governing Board amended the *2007 Ozone Plan* on December 18, 2008 to extend the Rule 4566 adoption schedule from the first quarter of 2009 to the fourth quarter of 2010.

In 2009, multiple agencies contributed $200,000 for the composting field study, which was conducted at Tulare County Composting by the San Diego State University Research Foundation. The District engaged in extensive stakeholder involvement and numerous technical workgroup meetings to help define the parameters of the field study. Participants of these meetings included composting operators, ARB, California Department of Resources Recycling and Recovery (CalRecycle), agricultural groups, environmental advocates, other air districts, and city and county agencies. The results of this study were successfully completed in 2010 and formed the basis for the Proposed New Rule 4566. The compost study identified two promising mitigation measures, watering system and finished compost covers.

In September 2010, the District held a workshop to present and discuss the proposed rule concepts. Based on the results of the study, the District drafted rule requirements that would require facilities with annual throughputs of more than 10,000 tons year and less than 25,000 tons per year to implement the watering system requirements, whereas, composting facilities with throughputs greater than 25,000 tons per year would have been required to implement the finished compost cover. Based on the industry

reaction to the proposed rule requirements, District staff worked closely with the affected stakeholders to refine the rule requirements and address the cost impacts to affected facilities and address feasibility concerns for the watering system and finished compost cover requirements. The District convened additional technical working group meetings to discuss potential applicability thresholds greater than the 10,000 ton per year limit and refine other proposed rule requirements.

Approaching the extension deadline with a number of questions still remaining regarding the feasibility and cost of actually implementing these various potential emission reduction strategies; in December 2010, District staff provided an update to the District's Governing Board on the status of this project with plans to bring forth a proposed rule for Governing Board consideration in 2011.

Following the December 2010 Governing Board update, District staff continued to work closely with stakeholders to address these remaining issues. District staff conducted weekly discussions with affected operators and composting representatives to obtain cost estimates and devise solutions to overcome feasibility questions. Staff and management have conducted additional site visits throughout the Valley to discuss stakeholder concerns in person and in order to better understand the implications of proposed rule requirements to the operations. Based on the collaboration with the interested stakeholders, the District was able to refine the rule requirements and minimize the overall impacts associated with the proposed rule.

During this time period, District staff also collaborated with South Coast Air Quality Management District (SCAQMD) staff to share information as they concurrently work to develop a rule impacting similar sources in their region. Outreach efforts have also led to discussions with CalRecycle and Local Enforcement Agency (LEA) staff to discuss chipping and grinding regulations and the state's Title 14 requirements.

Based on several discussions and additional information from stakeholders, District staff was able to refine the draft rule concepts to include detailed information on the watering system requirements for composting operations with less than 200,000 tons per year of organic material and finished compost cover requirements for composting operations with 200,000 tons per year of organic material. To further solicit input from affected stakeholders, the District held a technical working group meeting in March 2010 and presented the revised rule concepts to the workgroup. The rule concepts would allow operators the ability to comply with the requirements with minimal impact to the composting operations. District staff also addressed operators concerns with rain events and water run off issues with implementing the watering system. After the meeting, District staff continued to work with the operators to address the costs of implementing the mitigation measures, update the facility throughput information, and gather information on the feasibility of implementing the finished compost cover.

While feasibility concerns were no longer a primary concern, costs of implementing the proposed rule requirements was still a concern for one operator. Staff has worked closely with this operator to understand and refine their cost estimates to develop the best information possible for evaluation of potential rule requirements.

District staff conducted a public workshop on June 23, 2011 to present, discuss and receive comments on the draft rule, staff report, and a socioeconomic analysis report. As with previous workshops, the District provided a two week commenting period after the workshop for any additional public comments. During the commenting period, District staff continued to work with the affected stakeholders to resolve any remaining concerns, specifically on industry's costs of implementing the watering system and the feasibility of implementing the finished compost cover for one facility. District staff has incorporated the additional information received from stakeholders into the staff report and proposed rule, as appropriate. To address the remaining operator's concern with implementing the finished compost cover requirements, the proposed rule would extend the schedule for the finished compost cover to five years. District staff recognizes the potential implications that the proposed requirements may have on the remaining operator's facility and will continue to work with the operator to evaluate ways to comply with the rule. The schedule would allow the operator to determine and develop effective control strategies specific to the facility's operation. The additional time would also allow for any incremental absorption of costs or increase in tipping fees/sales.

The proposed rule, staff report with appendices, and final draft socioeconomic analysis report will be published on July 19, 2011. The publication will allow affected sources and interested parties an additional opportunity to review and comment on the proposal prior to a public hearing before the District Governing Board on August 18, 2011, who will consider adoption of the Proposed New Rule 4566.

To gain first-hand knowledge of these operations, District staff conducted several visits to the following composting facilities since 2008:

- City of Modesto
- Community Recycling Lamont Composting Facility
- Highway 59 Compost Facility
- Mariposa County Solid Waste Composting Facility
- South Kern Compost Manufacturing Facility
- Tulare County Composting & Biomass, Inc.
- Recology Grover Environmental Products (Vernalis)

II. BACKGROUND

Composting material can enrich the soil, replace fertilizer, divert waste from landfills, and serve other purposes. Composting is often advantageous for bulk reduction, pathogen reduction, and odor reduction. It also produces a material with various

beneficial uses, such as landscape, soil amendment, road use, and alternative daily covers (ADC) at landfills. Composting also helps local government agencies meet state solid waste diversion goals to preserve landfill capacity by reducing the amount of organic waste sent to landfills for disposal.

The composting industry has been expanding and will continue to expand. CalRecycle's Strategic Directive 6.1 aims to reduce the amount of organics in the waste stream by 50% by 2020. Diversion of half of CalRecycle's 2006 baseline of 29.7 million tons would require the development of 50 to 100 new composting operations in California. While diversion of materials from landfill disposal to composting will help ease the burden on landfills and achieve associated environmental benefits, the increase in composting will also increase VOC emissions associated with the operations and possibly NOx emissions from increased trucking of organic materials from outside of the SJVAB. Implementation of the proposed mitigation measures can help minimize impacts in the Valley. Air quality goals must be balanced with diversion goals. The primary objective of Proposed New Rule 4566 will be to reduce VOC emissions from organic material composting operations, including stockpiling at composting operations, as required in the *2007 Ozone Plan,* without making composting cost prohibitive.

A. The Composting Process

Organic material naturally decomposes by both bacterial (biotic) and nonbacterial (abiotic) natural processes. Organic waste decomposes naturally in the presence of water, warmth, and oxygen. Composting accelerates the process of decomposition by adding moisture and creating a physical arrangement (such as windrows) that maintain an elevated temperature and provide an ideal environment to facilitate biotic decomposition to transform the stock material into nutrient-rich humus like material commonly referred to as compost. The composition and density of stock material affect the rate of decomposition.

The composting process typically involves six major steps:

1. **Recovery and Preparation**. Operators receive the organic material from either private or public industries and may screen the material for physical contaminants, pursuant to Title 14, Div. 7, Chapter 3.1, Article 7, Section 17868.5. The feedstock may also need to undergo chipping or shredding to obtain the appropriate size material for the composting process.

2. **Mixing**. Feedstock may be mixed with additives or amendments to adjust the bulk weight, carbon to nitrogen ratio, moisture content, and porosity of the material. The mix enhances the composting process, provides structural support for the compost piles, or produces compost with specific characteristics. Operators often select additives and amendments based on availability, cost, and degradable content. Some additives and amendments include overs, peanut hulls, rice hulls, sawdust, straw, shredded tires, and wood chips. However,

shredded tires and wood chips do not readily compost and may be recycled through multiple composting cycles.

3. **Piling**. The compost material is typically placed into piles on open fields or enclosed in an in-vessel system. The piles can stretch up to a few hundred yards in length.

4. **Active Composting**. Microorganisms break down the material and consume the most easily degradable organic matter. These microorganisms give off significant heat, raising the temperature of the compost and destroying pathogens. The material is aerated by turning or by forcing air through the piles to provide oxygen for the microorganisms. Most of the VOC emissions generated by composting are expected to occur during the active stage.

5. **Curing Composting**. The microbial populations shift to bacteria and fungi, which break down the less degradable organic matter like chitin, cellulose, and lignin. The curing process stabilizes the compost by transforming it to a material that cannot be further easily decomposed. Heat and VOC emissions are more stable during the curing phase, as compared to the active compost phase.

6. **Finished Composting**. During the final stage, compost may be stored to complete the maturing process and to ensure that the compost material is resistant to further microbial breakdown, which could potentially harm living plants. Once the maturing process is complete, the finished compost undergoes screening for sale or use.

B. Composting Parameters for Windrow Composting

Operators maintain their windrows within specific parameter ranges to efficiently convert the incoming materials to finished compost. The parameters discussed in this section are oxygen, temperature, moisture, pH, and carbon-to-nitrogen ratio. The parameters affect the immediate environment and interact with each other. As an example, readily-available carbon can increase the microbial activity which increases the temperature of the windrow. The increased activity decreases the oxygen level within the pore space because the microbes utilize the oxygen as part of the degradation process. The increased temperature may cause the water to evaporate faster, reducing the moisture in the vicinity of the increased microbial activity. Decreased moisture can mean that the temperature increases even more because there is less water to absorb the heat generated by the composting reactions. Or, if too dry, the microbes can go dormant or die from lack of water.

Although the parameters described below are measurable characteristics of effective composting operations, District staff is not considering a prescribed range of values for the parameters as part of the proposed rule requirements because there is little scientific information to link a specific range of parameters to a reduction of VOC

emissions from composting. For this reason, the provisions of Rule 4566 will focus on other compost emission control strategies.

Oxygen

Aerobic processes utilize oxygen acquired from the environment, namely through the diffusion of oxygen from air into the water film where the aerobes (microorganisms that utilize oxygen in their life processes) reside. Maintaining a healthy oxygen level within the pore space promotes aerobic respiration—which in turn, increases biological breakdown of the composting materials and reduces odors As the oxygen level in the area decreases, anaerobic microorganisms increase at the expense of the aerobes because the aerobes have less oxygen available for their life processes.

In order to reduce the amount of anaerobic degradation, the pore-space's air needs to be "refreshed" from time to time as the aerobes use up the available oxygen in the enclosed space. The simplest way to get more oxygen to the aerobes is to break up the windrow and re-mix the partially-composted material. The pore-space is broken up and exposed to fresh air and re-formed into a windrow in a "turning event." In an ideal turning event, the windrow material is completely rearranged where all of the pore-spaces are broken open, exposed to fresh air, and then reformed into new pore spaces.

Moisture

Water plays an essential role in composting. It serves as the medium for the microorganisms that perform the decomposition. Water is also an extraction solvent to remove organic molecules from the substrate and from the air. Because of its fluidity, water serves to circulate oxygen and extracted compounds to the aerobes as well as circulating expelled compounds to other microorganisms in the water film. Water also absorbs heat from the chemical breakdown of the organic molecules.

In composting, there must be enough water to perform all the necessary functions, but not so much water that the aerobes drown, meaning that there is not enough oxygen diffusing into the water film where the biological activity is taking place to allow aerobic decomposition. On the other extreme, there should not be so much air passing through that the water film evaporates. As a rule of thumb, windrow moisture content between 40% and 70% is ideal for composting. Below 40%, microbial activity becomes very limited. Above 70% moisture content, the pore is so filled with water that there is little air in the pore space, and therefore, the aerobes use up the available oxygen in a short time. A windrow's overall moisture content can be maintained by turning the windrow to break up pockets of too wet or too dry material and more evenly distribute the moisture within the windrow.

Temperature

Temperature can be an indication of biological activity for composting operations and is

fairly easy to measure. However, the temperature does not necessarily indicate that there is biological activity in the windrow, especially on certain summer days, between high air temperature and a sunny location.

Assuming that there are other indications of microbial activity, the temperature increase in a composting windrow is due to the chemical reactions performed by the microbes, which liberate heat as a by-product of the reaction. In general, windrow temperatures between 20°C and 60°C (72°F and 140°F) are ideal since it is indication of desirable on-going biological processes. Above about 65°C (150°F), microbial activity is hindered. Additionally, piles may burn at high temperatures; so many operators have a maximum temperature that they use to trigger a turning event.

The temperature in an active windrow can affect compost operations in variety of ways. Since higher temperatures indicate high microbial activity; the oxygen level in the pore space would be depleted quickly causing anaerobic conditions discussed above. For this reason, some operators turn composting windrows more frequently during the early stage of composting to dissipate heat generated by intense microbial activity.

pH

In any biological process, pH is an important factor since it affects the microbial activity. Most organisms require a growth media with a near-neutral pH, meaning pH in the vicinity of 7.0.

Carbon to Nitrogen (C:N) Ratio

All organic matter is made up of substantial amounts of carbon (C) combined with lesser amounts of nitrogen (N). The balance of these two elements in an organism is called the carbon-to-nitrogen ratio (C:N ratio). For best performance, the compost microorganisms require the correct proportion of carbon for energy and nitrogen for protein production. Composting organisms use about 30 times more C than N. However, the carbon and nitrogen must be in a form that the microorganisms can process. Woody materials, for example, have carbon that is difficult for the composting microorganisms to extract, so even though there is high amounts of carbon in woody material, it cannot be used directly by most microbes. In a compost windrow with a 30:1 carbon-to-nitrogen ratio that utilized only wood chips as the carbon source, composting may not actually occur because the carbon in wood chips is not readily available to the microorganisms and the organisms might starve for lack of an energy source.

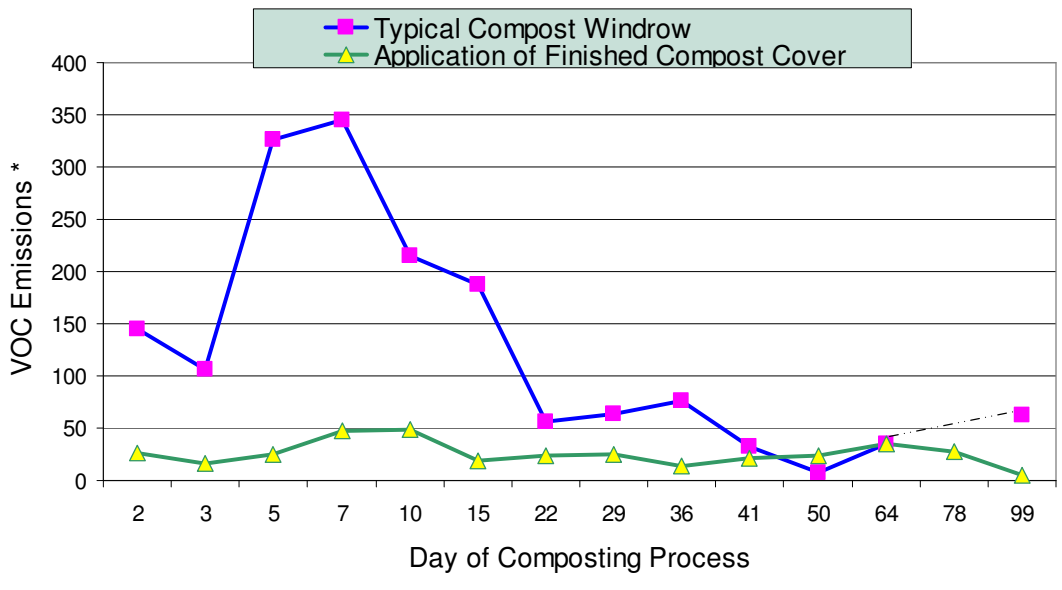
In addition, operators may not be able to choose the composition of their feed stock. Municipalities with curbside recycling, for example, must accept and process the material brought to the composting operation through the curbside program, regardless of the gathered materials' makeup. The type of organic material accepted at the compost operations could also vary from season to season.

C. Locally Studied VOC Emission Control Technologies for Composting

District staff obtained an understanding of composting factors through discussions with stakeholders and scientists who have researched compost emissions. Some factors that affect the process of composting require professional judgment by the operator during the composting process, while other factors provide a more routine and quantifiable response that was determined to be more suitable for research on possible mitigation approaches. District staff, in discussion with stakeholders, set up a research evaluation of composting in 2009, designating one windrow as a scientific "control" with standard procedures to compare to other windrows with application of water prior to turning; application of finished compost cover to act as a passive biofilter; alternative interactive management; and a small windrow reducing the height and volume compared to the control. During the composting process, the compost pile is turned every few days to prevent compaction and maintain air space within the pile material. The finished compost cover was reapplied after each turn during the composting process for one windrow.

Based on the study results (SJVAPSA, Draft 2011), both the practices of applying water before turning and of applying a finished compost cover after turning were found to reduce VOC emission. The following figure provides a comparison of the control windrow to the windrow with application of finished compost applied as a cover. Figure 1 show that most of the VOC reduction is accomplished in the first 22 days which was the time period of the active phase of composting for the control windrow.

Figure 1 - Compost Emission Comparison



* VOC measurements are comparison values, not converted to per compost ton or per windrow units

Source: Appendix I to study results report (SJVAPSA, Draft 2011)

Reducing volume of the windrow was found to actually increase VOC emissions. Interactive management was determined to be a difficult process to quantify. In addition to the research results, staff learned from stakeholder and researcher communications about other factors that have been found to negatively impact the composting process. For example, stacking materials too high or compacting materials too tightly causes areas of the pile to have low oxygen levels, resulting in anaerobic decomposition, which increases odor emissions. Odor emissions include some VOC compounds, therefore, proper management to control odor may also reduce VOC emissions.

D. Potential VOC Emission Control Measures for Composting

In addition to the methods examined in the District's composting study, available technologies for collecting and controlling VOC emissions are described below. Several of these control technologies are currently operated by a few co-composting operations, which handle primarily biosolids, animal manure, and poultry litter. These facilities are relatively new and designed their facilities to include these controls to satisfy Best Available Control Technologies (BACT) and other permitting requirements. At this time, District staff is not aware of any composting operations in the SJVAB that operate these controls for organic material.

Aerated Static Pile (ASP) system

For the ASP method, operators pile the feedstock over a base of porous materials. Perforated pipes or plates are connected to a blower that either pulls (negative pressure) or pushes (positive pressure) air through the pile. Several operations in California and other parts of the country use ASP vented to controls, such a biofilter, with control efficiencies of at least 80%. Additional information on these controls can be found on the following page.

There are two forms of ASP systems. The first form generally uses long triangular piles with a base width that is two times as long as the height. Aeration pipes run lengthwise beneath the ridge of each pile and serve the entire pile. Each pile contains feedstock of roughly the same mixture and age.

The second form uses extended piles consisting of individual cells that are stacked against each other. Cells of new feedstock are constructed in one pile, and cells of nearly mature compost are placed in another pile. The space between the piles allows for the removal of old cells from one pile and the addition of new cells to another pile. Generally, there is also an individual blower and timer during the aeration process of each cell. The captured VOC emissions from the ASP system may be transferred to a control, such as a biofilter, for VOC reductions.

Enclosed Aerated Systems

In enclosed aerated systems, the material is placed in a bag, container, or other enclosure, and then the material is aerated. The aeration method controls moisture, temperature, and airflow; however, it does not vent the air in the enclosure to a control device. The system achieves VOC emission reductions by increasing the percent of aerobic composting and decreasing the percent of anaerobic composting by providing oxygen to promote aerobic activities.

Within-Vessel and In-Vessel Composting

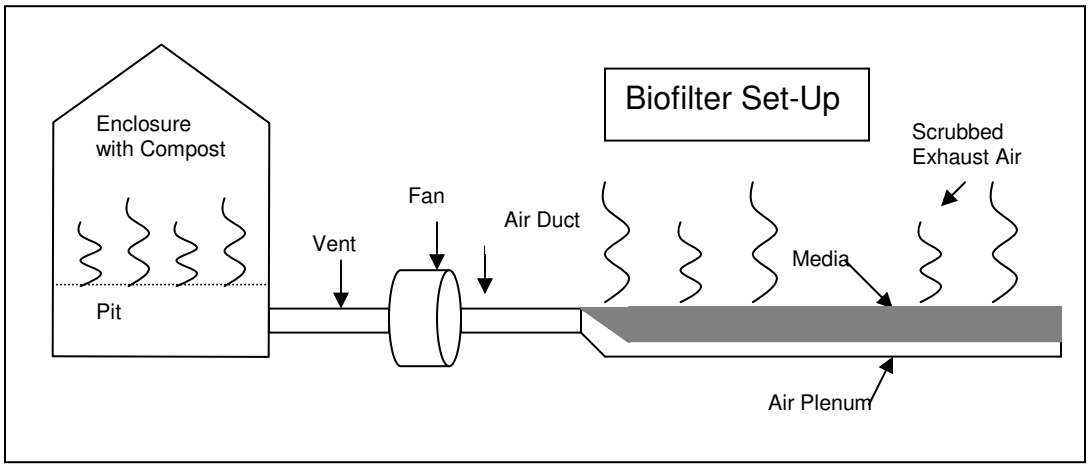
The within-vessel and in-vessel composting methods allow the operator to control the moisture, temperature, and airflow to a more exact science and to capture most of the emissions. The VOC capture efficiency for in-vessel systems ranges from 90% to 99%, while the VOC capture efficiency for within-vessel systems ranges from 70% to 90%. Within-vessel composting operations are performed by processing the feedstock material and loading it into bags or containers. In-vessel composting operations occur in a permanent enclosure under negative pressure. An electric blower system controls airflow and temperature for both systems. A secondary control receives and further reduces the captured VOC emissions. The secondary control includes, but is not limited to, a biofilter or a liquid capture and control system.

VOC Controls, including biofilters

VOC controls can reduce VOC emissions captured from collection systems, such as ASPs. Typical VOC controls include biofilters, carbon adsorption systems, and packed tower scrubbers. Biofiliters are the most commonly-used controls at composting operations. Currently, biofilters are used at over 200 composting operations in Europe, over twenty composting operations in the U.S., and at least five composting operations in California.

The typical biofilter design consists of fans, ducts, media support (a bed liner), an air plenum, and the media (often a blend of finished compost or soil, and wood chips). Wall ventilation and pit fans blow air from the building and pit through ducts, then into an air plenum below the biofilter media. The air passes through the media, where microorganisms treat the air before it escapes to the atmosphere. Figure 2 shows a schematic of an enclosed biofilter system. Recent District BACT determinations indicate that biolfilters have a VOC destruction efficiency of at least 80%.

Figure 2 - Sample Biofilter Design



Aside from biofilters, stakeholders have also indicated the possibility of applying pseudobiofilters (or finished compost covers) on top of static piles or aerated static piles as a viable emission reductions technology. The application has been used in many situations to reduce odors from composting facilities. District staff is currently not aware of studies that show actual reduction in VOC when applying the finished compost cover on top of static piles or aerated static piles. However, based on recent field studies, the use of finished compost cover on top of windrows has shown to be an effective mitigation measure in reducing VOC. The actual VOC reduction from the finished compost cover application could vary between windrow composting and static piles or aerated static piles, which operate differently. The District will consider any future studies and information on the effectiveness using finished compost on top of static piles and aerated static piles for organic materials.

III. CURRENT AND PROPOSED REGULATIONS

A. Current Regulations

District staff has reviewed applicable regulations from the District, other air districts, and other agencies to assist in the development of Proposed New Rule 4566. District Rule 4565 (Biosolids, Animal Manure, and Poultry Litter Operations), which was adopted in March of 2007, regulates the composting and co-composting of biosolids, animal manure, and poultry litter. Currently, the District does not have any prohibitory rules that specifically regulate VOC emissions from composting and stockpiling of organic material.

The development of Proposed New Rule 4566 is not intended to replace any more stringent local, state, federal, or other governmental agency requirements. Where multiple rules apply to a facility, the operator must comply with all applicable rules. Composting operations in the Valley may also be subject to regulations from other agencies:

- Title 14, Div. 7, Chapter 3.1 Article 6, Section 17867, along with other California Code of Regulations;

- Waste discharge requirements of the Porter-Cologne Water Quality Act (California Code of Regulations Section 13020), as administered by the Regional Water Quality Control Board (RWQCB). Based on discussion with RWQCB, composting of organic material, specifically green material, is not currently regulated by the agency.

B. Review of Other Air District Related Regulations

The South Coast Air Quality Management District (SCAQMD) and Antelope Valley AQMD have adopted regulations for co-composting (composting that involves animal manure or poultry litter). Green material composting operations is not currently regulated by Antelope Valley AQMD. SCAQMD recently adopted Rule 1133.3 (Emission Reductions from Greenwaste Composting Operations) for composting of green material and food material. As previously mentioned, District staff collaborated with SCAQMD staff to share information as they concurrently work to develop a rule impacting similar sources in their region. Please refer to the Reasonable Available Control Technology section for further discussion on SCAQMD's Rule 1133.3.

C. Proposed Regulation

1. Section 1.0 Purpose / Section 2.0 Applicability

Proposed New Rule 4566 would limit VOC emissions from composting operations, which include composting and stockpiling of organic material at composting operations. Proposed New Rule 4566 would regulate organic material, which is defined as food material, green material, or a mixture thereof, and may include wood material and a total of less than 100 wet tons per year of biosolids, animal manure, or poultry litter. Other than recordkeeping, wood material that is source separated and is not mixed with other organic material is exempt from the proposed rule requirements. Proposed New Rule 4566 would allow operators to compost a total of less than 100 wet tons per year of biosolids, animal manure, or poultry litter to address materials that operators may inadvertently receive at the facility for composting.

2. Section 3.0 Definitions

Several definitions presented in this rule are from existing regulations from the District, other air districts, and state and local agencies. District staff also included additional definitions to further clarify the intent of the proposed rule requirements.

The definitions for the active phase and curing phase are intended to provide operators the flexibility to choose from several methods to comply with the rule requirements. As

explained in Section II.C., Figure 1, most of the VOC emissions occur in the first 22 days for a typical windrow, which is the time period of the active phase. The curing phase begins immediately after the active phase and typically last for a period of 40 days. The number of consecutive days for both active phase and curing phase would be considered the lower time limit, unless operators determine a shorter time limit through other test methods. The test methods in the proposed rule include: Specific Oxygen Uptake Rate, Carbon Dioxide Evolution Rate, and the Solvita® Maturity Index. However, operators may use an alternative test method to satisfy the rule requirements for which a written approval from the APCO has been obtained. The test methods would typically be used in cases where operators implement other alternative mitigation measures that result in shorter time periods. The number of days and various test methods for the active phase and curing phase are currently used in practice and are similar to the definitions from the following air districts' rules:

- San Joaquin Valley Unified APCD - Rule 4565 (Biosolids, Animal Manure, and Poultry Litter)
- South Coast AQMD - Rule 1133.2 (Emission Reductions from Co-composting Operations)
- Antelope Valley AQMD - Rule 1133 (Composting and Related Operations)

The limits for the test methods above are from the Compost Stability Index (Table 05.08-1), which can be found in the Test Methods for the Examination of Composting and Compost (TMECC) manual by the US Composting Council Research and Educational Foundation.

3. Section 4.0 Exemptions

Stockpile and composting operations that are subject to Rule 4565 (Biosolids, Animal Manure, and Poultry Litter Operations) would be exempted from Proposed New Rule 4566. However, a facility could have two operations on site where both Rule 4565 and Proposed New Rule 4566 would apply. Composting operations claiming exemption under Rule 4565 must handle biosolids, animal manure, or poultry litter as part of the operation but would only be exempted for the materials that are co-composted. If the operator also had a composting operation that did not include co-composted material, then that part of the facility would fall under Rule 4566.

Other Stockpile Operations

Operations that stockpile organic material and are not required to obtain a composting permit from the District or a Compostable Materials Handling Facility Permit in accordance with Title 14 would be exempt from Proposed New Rule 4566 requirements. An example of when a facility would have one permit and not the other is a facility that does not compost organic material but has a Compostable Materials Handling Facility Permit. Title 14 has more stringent stockpile requirements for chipping and grinding operations; however, there are currently no stockpile requirements for a site that is regulated as a compostable material handling operation or facility.

There are several small-scale operations that typically generate and process the organic material on site, where immediate access to daily covers or other resources are not available. Other examples include small community-operated residential/neighborhood organic material drop-off sites where small residential communities do not have access to truck collections and have a designated location to drop off organic materials, such as yard clippings. These sites typically have roll-off containers for the incoming organic materials. Small community drop off sites, that use containers and manage the site, encourage trip reduction and is an economically viable option for many small residential communities. The operations above do not compost and do not have a Compostable Materials Handling Facility Permit.

Proposed New Rule 4566 would exempt stockpiling of wood material, finished compost, overs, and organic material that is used specifically for animal feed or nutritional products, provided that the material is not mixed with other organic material and the operator maintains records. Wood material is typically a dry material, which has a low moisture level and is slow to compost. Wood material that is separated from green material prior to complying with the stockpile requirements would also be exempt from the proposed rule. For finished compost, the material has already gone through the composting process and has minimal emissions. Overs have also gone through the composting process and primarily consist of woody material; therefore, overs would be treated the same as wood material and finished compost. As explained in Section II.B., the low level of moisture content or lack of nitrogen in these materials would limit their biological breakdown.

In addition to recordkeeping and not mixing the organic material that is stored for animal feed or nutritional products with other materials at a composting facility, the proposed rule would not allow operators to conduct pathogen reduction on the organic material. Organic material that is used for animal feed or nutritional products would not be subject to the stockpile requirements for composting operations as the organic materials are treated differently from typical composting operations.

Other Composting Operations

The proposed rule would exempt small-scale composting and composting of organic material that is generated and used onsite. Specific composting operations that would be exempt from the proposed rule includes agricultural composting, community composting, household composting, nursery composting and recreational facilities composting.

Other Operations

Also exempt are facilities and operations that handle organic material as part of their operations and are already subject to similar requirements from other District rules. Facilities and operations that would be exempt under Section 4.0 include the following:

- Facilities subject to Rule 4204 (Cotton Gins) and cotton ginning facilities that are specifically exempt from Rule 4204.

- Agricultural operations subject to Rule 4550 (Conservation Management Practices) and agricultural operations that are specifically exempt from Rule 4550.
- Facilities subject to Rule 4570 (Confined Animal Facilities) and facilities that are specifically exempt from Rule 4570.

4. Section 5.0 Requirements

Section 5.0 addresses requirements for stockpiling and composting operations.

Stockpile Requirements

The proposed rule would reduce VOC emissions from composting facilities that stockpile organic material. Organic material that would be exempt under Section 4.0 would not be subject to the requirements under this section. For operations that do not compost but stockpile the organic material on site and have a compostable materials handling facility permit in accordance with Title 14, operators would be required to comply with all applicable stockpile requirements. As previously mentioned in the Exemptions section, Title 14 does not have stockpile provisions for a site that is regulated as a compostable material handling operation or facility.

Operators that receive organic material at a composting facility typically stockpile the material until there is enough material onsite to chip or grind and put into windrows. The organic material may be stockpiled up to several days, depending on the amount of materials that a facility receives. For example, a facility that receives fewer amounts of materials on a daily basis may require more days to generate enough materials to form a windrow for composting. To reduce emissions from stockpiles, operators of composting operations, with throughputs less than 100,000 wet tons of organic material per year, would be required to remove the materials from the facility or compost the material within ten days of receipt. Composting operations with throughputs of 100,000 wet tons of organic materials or more per year would be required to remove the materials within three days of receipt.

According to information received from composting operators that handle less than 100,000 wet tons of organic material per year, the number of days that the materials are stockpiled onsite can vary up to 21 days, depending on the facility. Day one of the stockpile begins on the first day that organic material is received and placed into a newly formed pile. The day the same stockpile is removed or covered, regardless of whether new organic material is added to the stockpile, is the end date.

Based on information received from the operators, District staff has determined that 10 days is reasonable for operators that have less than 100,000 wet tons per year of organic materials to remove the stockpile. The 10 day limit was determined as follows:

- Up to 3 business days to receive enough organic material for a windrow
- Up to 2 business days to chip and grind organic material
- Up to 2 business days to move the chipped or ground material for composting
- Up to 3 non-working days to compensate for weekends and holidays

The breakdown of the days above is based on discussion with operators. However, the chipping and grinding process could occur at anytime within the 10-day limit. District staff does not expect the chipping and grinding process to have a significant impact on the stockpile holding times because the stockpile emission factor takes into account emissions from stockpiles that have been chipped and ground and stockpiles that have not been chipped or ground. Composting operators subject to this requirement have indicated that they either already satisfy or would be able to satisfy the requirements.

For composting operations with throughput of 100,000 tons per year or more, operators would have up to three days (of receipt) to remove or cover the organic material. Based on information received from composting operators that process 100,000 tons per year or more of organic materials, the operations already satisfy the requirements.

While many operators already satisfy the stockpile holding times above, establishing the requirements not only help capture emissions from some operations that currently stockpile the materials longer, but would help minimize stagnant piles.

The District will not address operations from land application, land incorporation, and other operations that stockpile organic material as part of the proposed rule since there is not enough information at this time to obtain additional VOC reductions from these operations. Additional information includes the number of operations in the SJVAB, the number of stockpiling days, and the actual throughput. Land application and land incorporation are generally excluded under Title 14 regulations. While District staff intends to obtain as much reductions as possible from this source category, additional reductions from other operations would be difficult to achieve without sufficient data. In addition, the control measure for Proposed New Rule 4566 was intended for composting operations that process green materials and therefore, District staff will address those operations at this time. District staff will address any additional reductions from other source categories as part of future projects.

Table 2 – Summary of Stockpile Requirements

Operations Subject to Control	Proposed Rule Requirements	Minimum Number of Stockpile Days
Throughput < 100,000 tpy	• Remove organic material from the facility, or • Start the active phase of composting, or • Cover the material, or • Implement an alternative	10 days of Receipt
Throughput ≥ 100,000 tpy	• Remove organic material from the facility, or • Start the active phase of composting, or • Cover the material, or • Implement an alternative	3 days of Receipt

*tpy: tons per year

Composting Requirements

Since moisture content and oxygen concentration were not tested as potential mitigation measures during the field study or as part of the watering system and the finished compost cover controls, operators would not be required to monitor the windrows for moisture content, oxygen concentration, or other composting parameters. While these parameters would be considered good composting practices, there are no data to correlate the emissions between the parameters and the recommended controls.

Data from the San Joaquin Valley Air Pollution Study Agency's (Study Agency) field study showed that the watering system would provide a 19% reduction in VOC emissions during the active phase. In addition, application of finished compost as a cover (acting as a passive biofilter) during the active phase can achieve a 56% reduction in VOC in comparison to standard operations of windrow composting without the finished compost cover. The field study demonstrated that these methods are effective in reducing VOC emission from composting of organic material and are feasible to implement. District staff has also considered combining both the watering system and finished compost cover requirements, since both mitigation measures have been achieved in practice at one composting facility in the Valley. By requiring both the watering system and finished compost cover application, operators would be able to achieve 60% reduction in VOC. Please refer to Appendix B for further discussion on the reduction limit.

Composting procedures, equipment, and resources typically vary among the composting operations in the SJVAB. The rule concepts for the selected mitigation measures below takes into account the processes conducted as part of the field study and the processes that would be feasible for operators to implement. Operators would have the flexibility to implement the control options using equipment and resources that are available and appropriate for the facility's composting operation. The mitigation measures described below are for the active phase of composting only. For windrow composting, the proposed rule would require a minimum of three turns during the first

22 consecutive days, for both mitigation measures. Based on discussion with the operators, District staff has found that three turns is the minimum number that could be achieved as part of a facility's typical composting operation during the active phase. The throughput threshold for the composting operations was determined based on the District's feasibility and economic analyses, which are further explained in Appendix C of this staff report.

Table 3 – Summary of Composting Requirements during Active Composting

Operations Subject to Control	Proposed Rule Requirements	Minimum % Reduction, by Weight, in VOC Emissions
Throughput < 200K tpy	• Implement a watering system[2], or • Implement an alternative	At least 19%
200K tpy ≤ Throughput < 750K tpy	• Implement a watering system[2] and finished compost cover[3], or • Implement and alternative	At least 60%
Throughput ≥ 750K tpy	• Implement an engineered control system, or • Implement an alternative	At least 80%

1. tpy: tons per year
2. Watering system requires a minimum of three turns during active composting and would be implemented after one year of rule adoption.
3. Finished compost cover requires a minimum of four covers for initial windrow formation and three turns and would be implemented after five years of rule adoption.

Composting Operations with Total Throughput less than 200,000 Tons Per Year

Proposed New Rule 4566 would require operators of composting operations with total throughput less than 200,000 tons per year of organic material to implement the watering system requirements during the active phase. Operators would use a watering system to apply water to the windrow before turning, or use an alternate mitigation measure that provides equivalent VOC reductions.

The purpose of applying water to the surface of the windrow before turning during active composting is to capture the VOC emissions during turning, similar to a wet scrubber effect, which helps capture water soluble pollutants. According to the field study, most VOCs from the composting process are water soluble.

The proposed rule would also require the ball test, or squeeze test, as part of the watering system requirements to ensure that adequate water is applied to the compost pile before a turn and to address concerns with water run off and rain events. Although the ball test could also help operators determine the moisture level in a windrow, the

purpose of the test is to show whether adequate amount of water has been applied prior to turning.

According to the compost study and site visits to several facilities, a sprinkler system covers the top half of the pile and a water truck typically covers the entire pile. The proposed requirements would allow operators to conduct the ball test at least three inches in depth of the windrow and anywhere above the vertical midpoint to the peak of the windrow.

District staff recognizes the different type of watering systems that could be applied at each of the composting operations and has provided two flexible categories for operators to satisfy rule requirements. The watering system is differentiated by two types of setup: one that is connected to a mechanical turner (integrated) and one that is separate from a mechanical turner (independent).

Operators would be required to apply water to the windrow and test for adequate water within three hours of turning. If there is a rain event, operators would be able to test the windrow prior to watering. District staff has worked closely with the affected industry to gain firsthand knowledge and understanding of the different types of watering system and operations on site. Based on discussion with the operators, all of them would be able to comply with the proposed watering system requirements.

Composting Operations with Total Throughput of 200,000 TPY or More and Less than 750,000 TPY

Proposed New Rule 4566 would require operators of composting operations with total throughput of 200,000 wet tons per year or more and less than 750,000 wet tons per year of organic material to comply with both the watering system and the finished compost cover requirements for each windrow during the active phase of composting, or use an alternate mitigation measure which provides equivalent VOC reductions. The requirements for the watering system and finished compost cover would be implemented in a two-phase approach. The watering system requirements for this category would be the same as composting operations with total throughput below 200,000 tpy and operators would be required to comply with the requirements after one year of rule adoption. For the finished compost cover requirements, the compliance schedule would be five years after rule adoption to allow time for operators to develop and implement an effective control strategy. Operators would be required to cover the windrow after formation and after the first three turns. The finished compost cover should be applied with at least six inches at the peak of the pile. This will create a natural fall with some materials tapering over the upper third of the windrow, similar to the study. According to demonstrations at two facilities, the finished compost cover could taper over the upper half of the windrow; however, the draft rule requirements would require at least the top third to be covered to be more closely aligned with the compost study. Based on the study, the proposed rule would require that the entire length of the windrow be covered with a minimum of six inches at the peak.

The finished compost cover is made up of pre-screened finished compost and may include a mixture of screened finished compost or overs. According to the field study, the finished compost cover can be used to control emissions effectively and yielded the highest amount of reductions in VOC compared to other mitigations measures that were studied.

District staff has also worked with the composting industry to address feasibility and costs of implementing of the finished compost cover requirements, which are further explained in Appendix C of this staff report. Based on District's analysis and information received from the operators, it is not feasible for composting operations with less than 200,000 tpy to implement the finished compost cover due to the size of the operation in relation to the cost of the equipment. However, District staff has found that one composting facility that has more than 200,000 tpy has been successfully implementing both the watering system and finished compost cover mitigation measures for several years. There are currently two operations above this limit, which make up over half of the total inventory for this source category. At this time, the second facility only has a watering system in place and is expected to increase its actual throughput in the next few years. As mentioned, the schedule for implementing the finished compost cover would allow this facility more time to develop and implement an effective control strategy.

Composting Operations with Total Throughput of 750,000 TPY or More

Proposed New Rule 4566 would require the operator of a composting operation with a total throughput of greater than or equal to 750,000 wet tons per year of organic material to implement an APCO approved mitigation measure that demonstrates at least 80% reduction, by weight, in VOC emissions for organic material undergoing the active phase of composting. At this time, there are no composting operations in the SJVAB that are above this limit. However, the District would recommend more stringent controls should composting operations exceed such limit in the future. For example, there is one facility that could potentially exceed this limit in the future based on permitted throughput information.

Given the various emissions control technologies that are available and technologies that may become available in the future, operators would comply with the 80% reduction requirements through working with the District after rule adoption on an APCO approved mitigation measure. As a result, this rule would not specify any additional requirements for this category.

5. Section 6.0 Administrative Requirements

Section 6.0 includes administrative requirements for implementing the mitigation measures, administrative requirements for an alternative mitigation measures compliance plan, recordkeeping requirements, and information on test methods. District

staff also included TMECC Method 05-08-A (SOUR: Specific Oxygen Uptake Rate) for testing the compost maturity/stability of the composting phase, which would be consistent with other air district's requirement for a direct respirometry.

Section 6.1 for the facility emission mitigation plan also requires that operators submit an Authority-to-Construct (ATC) application. The requirements to obtain an ATC are governed by District Rule 2010, where the District has always required the submittal of an ATC application if there are changes to permit conditions even though no physical changes are warranted with the modification. However, the District will look into determining ways to expedite the permitting processing that fits the permit modifications for composting operations subject to this rule.

6. Section 7.0 Compliance Schedule

Table 4 and Table 5 shows the compliance schedule for composting operations subject to this rule.

Table 4: Compliance Schedule for Facility Emission Mitigation Plan (FEMP) and Authority-to-Construct (ATC) Application

Requirements	Compliance Schedule
Watering system requirements or an APCO approved alternative mitigation measure that demonstrates at least 19% reduction, by weight, in VOC emissions.	(six (6) months prior to full compliance)
Finished compost cover requirements, along with the watering system requirements. In lieu of complying with both of the finished compost cover and watering system requirements, implement an APCO approved alternative mitigation measure that demonstrates at least 60% reduction, by weight, in VOC emissions.	(one (1) year prior to full compliance)
APCO approved mitigation measure that demonstrates at least 80% reduction, by weight, in VOC emissions for organic material during the active phase.	(one (1) year prior to full compliance)

Table 5 – Compliance Schedule

Facility Size	Proposed Rule Requirements	Compliance Period (Year After Rule Adoption Date)
Composting Requirements During Active Composting		
Throughput < 200K tpy	• Implement a watering system, or • Implement an alternative	One Year
200K tpy ≤ Throughput < 750K tpy	• Implement a watering system and finished compost cover, or • Implement an alternative	One Year for the watering system and Five Years for the finished compost Cover
Throughput ≥ 750K tpy	• Implement an engineered control system, or • Implement an alternative	Five Years
Stockpile Requirements		
Throughputs < 100,000 tpy	Within 10 days, • Remove organic material from the facility or • Compost the organic material, or • Cover the material or • Implement an alternative	One Year
Throughputs ≥ 100,000 tpy	Within 3 days, • Remove organic material from the facility or • Compost the organic material or • Cover the material or • Implement an alternative	One Year

IV. BASELINE INVENTORY AND EMISSION REDUCTIONS

Based on data, District staff estimates emission reductions of approximately 4.2 tons per day (1,518 tons per year) or a total reduction of 30% of the baseline VOC emissions after full implementation of the rule requirements. When the revised emission inventory baseline reductions (overall of 30%) are applied to the 2017 Ozone Plan baseline emissions, the equivalent reduction is 19 tons per day by the time that this rule is fully implemented, which equates to achieving an additional reduction of 9 tons per day of VOC emissions from the source category. The VOC emission reduction analysis is included in Appendix B of the Final Draft Staff Report.

V. COSTS AND COST EFFECTIVENESS ANALYSIS

The purpose of conducting a cost effectiveness analysis is to evaluate the economic reasonableness of the pollution control measure or rule. The analysis also serves as a

guideline in developing the control requirements. District staff has evaluated costs and cost effectiveness for composting operations affected by Proposed New Rule 4566.

District staff has conducted several discussions and meetings with affected operators and composting representatives to refine the cost estimates. For composting operations that are subject to the watering system requirements, the cost effectiveness is about $390 per ton VOC reduced. For composting operations subject to both the watering system and finished compost cover requirements, the cost effectiveness ranges from about $2,393 to $2,525/ton of VOC reduced.

Please see Appendix C of the final draft staff report for District staff's analysis of the costs and cost effectiveness of the mitigation measures.

VI. SOCIOECONOMIC ANALYSIS

Pursuant to CH&SC 40728.5, District staff is required to analyze the socioeconomic impacts of any proposed rule or rule amendment that significantly affects air quality or strengthens an emission limitation. District staff held a socioeconomic focus group meeting for this rule development project in September 2010. District staff has worked with the stakeholders to determine direct compliance costs of the mitigation measures. A final draft socioeconomic analysis report is available as part of Appendix D for public review and has been updated to incorporate stakeholder's comments. District staff will use the socioeconomic analysis to refine the rule concepts as appropriate and mitigate any adverse effects to the extent feasible and reasonable. District staff plans to present the final socioeconomic report to the District Governing Board at the public hearing in August, along with the proposed rule package, in order to disclose any expected economic impacts.

VII. GLOBAL CLIMATE CHANGE

Briefly stated, global climate change (GCC) is the cumulative change in the average weather of the earth that may be measured by changes in temperature, precipitation, storms, or wind. Global Climate Change is now generally accepted by the scientific community to be occurring and caused by "greenhouse gases" (GHG). Greenhouse gases are gases which allow direct sunlight (relative shortwave energy) to reach the Earth's surface unimpeded. As the shortwave energy (that in the visible and ultraviolet portion of the spectra) heats the surface, longer-wave (infrared) energy (heat) is reradiated to the atmosphere. Greenhouse gases absorb this energy, thereby allowing less heat to escape back to space, and 'trapping' it in the lower atmosphere.

The scientific and political communities in the State of California have collectively concluded that a significant and growing scientific body of evidence supports the need for regulating GHG emissions. The California Global Warming Solutions Act of 2006

(AB 32) created a comprehensive, multi-year program to reduce GHG emissions in California, to 1990 levels by the year 2020.

The District believes that the evidence and the rationale that climate change is occurring is compelling and convincing. In addition to the long-term consequences of climate change, the District is concerned with the potential ramifications of more moderate but imminent changes in weather patterns. The Valley depends heavily on agriculture for its economy and has developed agricultural practices based on the last several decades of weather patterns. Unanticipated and large fluctuations in these patterns could have a devastating effect on the Valley's economy.

While there are many win-win strategies that can reduce both GHG and criteria/toxic pollutant emissions, when faced with situations that involve tradeoffs between the two, District staff believes that the more immediate public health concerns that may arise from an increase in criteria or toxic pollutant emissions should take precedence.

A. Greenhouse Gases and Atmospheric Chemistry

Some greenhouse gases such as water vapor occur naturally and are emitted to the atmosphere through natural processes as well as through human activities. The most common GHG that results from human activity is carbon dioxide, followed by methane and nitrous oxide. GHGs can include: water vapor, ozone, aerosols, chlorofluorocarbons, carbon dioxide, methane, nitrous oxide, and fluorinated gases (such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride).

Recent studies support a conclusion that global warming is also affected by changes in tropospheric ozone (O_3). Tropospheric ozone is both generated and destroyed by photochemistry within the atmosphere. Volatile organic compounds (VOC) and nitrogen oxides (NOx) are two pollutants which form tropospheric ozone through photochemical reactions. Decreasing these pollutants within the atmosphere reduces formation of tropospheric ozone and thus, has an indirect, positive influence on global climate change.

B. Composting Impacts

Natural decomposition of organic matter occurs from both nonbacterial (abiotic) and bacterial (biotic) processes. Biotic processes transform carbon into cellular mass but result in waste gas emissions of carbon dioxide, methane and nitrous oxide. Composting accelerates the biotic process which results in more rapid emission of VOC, CO and methane. The speed of emission is not significant as a global warming issue since the material will break down with or without composting. The speed is important for ozone formation as this could potentially result in higher daily concentrations of tropospheric ozone.

Composting is viewed as having an environmental benefit as compared to natural decomposition. Natural decomposition of materials left in place to decay is relatively inefficient and releases more gaseous emissions into the air. The effect of piling the material in the composting process delays release of gases into the air and allows more bacterial activity that turns these gaseous emissions into stored carbon. As a global warming issue, the total amount of carbon released is to be considered. The amount of carbon in different forms is decreased by the amount processed by bacteria into cell matter. The United States Environmental Protection Agency (USEPA) has assessed the balance between the cellular uptake and the amount of carbon emissions and nitrous oxide emissions. USEPA determined that the thirty year retention of carbon far outweighed the combined emissions of carbon and nitrous oxide converted into equivalents of carbon.

VII. ENVIRONMENTAL IMPACTS

A. Effects of Proposed New Rule 4566

Implementation of Proposed New Rule 4566 is not expected to either increase or decrease the amount of composting activity that currently occurs within the San Joaquin Valley air basin. In that regard, the impact of rule implementation is environmentally neutral.

As presented in the *Emission Reduction Analysis,* implementation of Proposed New Rule 4566 is expected to reduce VOC emissions from composting by 1,518 tons/year (4.2 tons/day). Reducing VOC emissions reduces formation of tropospheric ozone. Thus, implementation of the proposed VOC control measures would have an indirect, positive influence on global climate change.

Implementation of certain control measures could result in increased fossil fuel use. The District estimates that increased fossil fuel use could result in a 1.4 tons/year increase in oxides of nitrogen (NOx), a 0.2 tons/year increase in VOC, a 0.1 tons/year increase in particulate matter 10 microns (PM10), and a 183 tons/year increase in CO_2 emissions.

B. Cumulative Impacts on Global Climate Change

On February 16, 2010, the California Office of Administrative Law approved amendments to the California Code of Regulations, emphasizing that the effects of GHG are cumulative impacts and should be analyzed in the cumulative impacts analysis. To assist lead agencies in determining the significance of project related greenhouse gas emissions a new subdivision was added to the CEQA Guidelines; Section 15064.4 (Determining The Significance of Impacts From Greenhouse Gas). This section provides that when assessing cumulative significance of project specific GHG emissions on global climate change, a lead agency should consider, among other

factors, the extent to which the project may increase or reduce greenhouse gas emissions as compared to the existing environmental setting.

Quantification of potential changes in global climate change that may result from implementation of Proposed New Rule 4566 requires a degree of speculation and conjecture that is inappropriate and discouraged under CEQA (CCR §15187(d)). From a qualitative perspective, the District concludes that overall reductions in VOC emissions and the concomitant reduction in tropospheric ozone formation outweigh potential increases in NOx emissions and CO_2 emissions associated with increased fossil fuel consumption.

The District finds that there is no substantial evidence, in light of the whole record before the District, that the project could have a cumulatively significant impact on global climate change.

IX. RULE CONSISTENCY ANALYSIS

Pursuant to California Health & Safety Code Section 40727.2, District staff has prepared a rule consistency analysis that identifies and compares the air pollution control elements of the Proposed New Rule 4566 with the corresponding elements of other District, state, and federal regulations and guidelines that apply to the same source category. Staff found that facilities could comply with Rule 4566 and all existing District Rules. Furthermore, staff found that none of the requirements of Rule 4566 would conflict with local, state, or federal rules, regulations, or policies. Please refer to Appendix E for further discussion on the analysis.

X. REASONABLE AVAILABLE CONTROL TECHNOLOGY (RACT)

Section 172(c)(1) of the federal Clean Air Act requires air quality plans for nonattainment areas to "provide for the implementation of all reasonable available control measures as expeditiously as practicable (including such reductions in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of reasonably available control technology (RACT)) and shall provide for attainment of the national primary ambient air quality standards." RACT is also defined in the *2007 Ozone Plan* as devices, systems, process modifications, or other apparatus or techniques that are reasonably available taking into account the necessity of imposing such controls in order to attain and maintain a national ambient air quality standard; the social, environmental, and economic impact of such controls; and alternative means of providing for attainment and maintenance of such standard.

In the greater context of air pollution control levels, RACT is understood as the "floor-level" of air pollution controls, not the "ceiling-level." More effective levels of emissions control are termed Best Available Control Technology (BACT) and Lowest Achievable

Emission Rate (LAER). BACT and LAER are required for new sources, and for existing sources undergoing modification. Under state and federal air pollution programs, new facilities face more stringent pollution control requirements than existing facilities, with the understanding that better controls can be more easily implemented before a facility is built, than after it is built. New sources must generally implement BACT[1] and existing sources must implement a less stringent level of control such as Reasonably Available Control Technology (RACT). Additionally, California law establishes an intermediate level of control that is the "best available" for "retrofit" to existing sources (entitled Best Available Retrofit Control Technology – BARCT[2]), recognizing that the state's worst ozone problems demands more effective pollution control than what is usually considered "reasonably available."

The following section evaluates the requirements of Proposed New Rule 4566 in light of the above RACT definition.

How does District Rule 4566 compare with federal rules and regulations?

A. EPA – Control Technique Guidelines (CTG)

There is no EPA CTG guidance document for organic material composting operations.

B. EPA - Alternative Control Technology (ACT)

There is no EPA ACT guidance document for organic material composting operations.

C. Standards of Performance for New Stationary Sources (NSPS)

There is no NSPS guidance document for organic material composting operations.

D. National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technologies (MACTs)

There is no NSPS guidance document for organic material composting operations.

How does District Rule 4566 compare to rules in other air districts?

District staff compared VOC limits, optional control requirements, and work practice

[1] Federal regulations for permitting new facilities require Best Available Control Technology (BACT) for new sources in attainment areas, and Lowest Achievable Emission Rate (LAER) – a generally more stringent level –for new sources in nonattainment areas. LAER differs from BACT in that economic costs are **not** considered for candidate LAER controls that are considered "Achieved in Practice." Under California state law, the District is required to apply "BACT" for new sources under essentially the same requirements as federal LAER. The District's "BACT" determinations thus fulfill the federal LAER requirements.

[2] California Health and Safety Code (CH&SC) 40406: … "best available retrofit control technology" means an emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy, and economic impacts by each class or category of source.

standards in District Rule 4566 to comparable requirements in rules from the following California nonattainment areas:

- South Coast AQMD Rule 1133.3 – Emission Reductions from Greenwaste Composting Operations
- Bay Area AQMD, Sacramento Metropolitan AQMD and Ventura County APCD do not have rules that apply to organic material composting operations.

South Coast Air Quality Management District (SCAQMD) Rule 1133.3 (Emission Reductions from Greenwaste Composting Operations)

South Coast AQMD recently adopted Rule 1133.3 on July 8, 2011. District staff has worked closely with SCAQMD staff to share information and rule concepts. Staff notes that there may be differences between District Rule 4566 and SCAQMD Rule 1133.3. This should not be interpreted to mean that one rule is more stringent than the other, but due instead to additional factors:

1. South Coast AQMD is a VOC limited area and VOC emissions reductions have a greater impact towards Ozone attainment, whereas the San Joaquin Valley is a NOx limited area;
2. The socioeconomic climate of the SCAQMD is significantly different from that of the District.

District has also worked closely with the affected stakeholders to evaluate the available controls and determine the additional costs of implementing the controls. Based on the District's cost-effectiveness analysis in Appendix C, it would not be economically feasible for operators to implement more stringent controls than what is already proposed in the rule. The cost to implement more stringent controls, such as engineered systems, would more than triple the cost for these operators. In addition, the results from the District's socioeconomic report shows that the proposed requirements, specifically the finished compost cover, would have an economic impact on at least one of the composting facility. Please refer to Appendix C and Appendix D for further discussion on the cost-effectiveness and socioeconomic analyses.

After careful evaluation of federal and California regulations and the technological and economical feasibility of potential mitigation measures, District staff concludes that new Rule 4566 would satisfy, if not go beyond, RACT requirements for this source category.

XI. CURRENT VOC REGULATION BY MASS AND ALTERNATIVE REGULATION BY OZONE CONTRIBUTION

EPA requires compliance efforts for the ozone standard to be established in terms of the mass of emissions reduced. The District has recommended to EPA that flexibility be provided to consider and prioritize reductions that have the most benefit in reducing

ozone emissions and subsequently reduce population exposure, with greater credit provided for reductions in Environmental Justice communities. Until such time as EPA considers and makes regulatory adjustments in response to this District request, the mass based approach remains the regulatory requirement.

A. Explanation of the Regulatory Approach

The District regulates on a mass, or weight, basis all volatile organic compound (VOC) emissions that have been determined by EPA to have more than a minimal contribution to harmful ozone in the air we breathe. District permits, regulations and compliance tests establish limits for VOC emissions that are based on the mass of emissions emitted, excluding only those compounds that EPA accepts as having little or no impact on formation of harmful ozone. The value of excluding the minimal contributing compounds is to encourage source types which have the ability to reformulate their materials or emissions to use minimal ozone forming compounds in replacement of compounds that form greater amounts of ozone.

B. Alternative to Current Regulatory Approach

EPA acknowledges that assessing the amount of ozone formed by each compound (defined as atmospheric reactivity) could be used as an alternative basis for regulation instead of using just the amount of emissions (by weight or mass); however, if this approach were to be adopted, associated with the alternative approach there are additional requirements, proofs, and evaluations required for the District and the state, and different compliance requirements for operators.

The alternative regulatory approach is referred to as a “reactivity” approach because the method is based on assessing how much a specific VOC compound reacts in the atmosphere either to form ozone or increase the amount of ozone formed by other compounds. The “reactivity” value is multiplied by the amount (by mass or weight) to determine the full impact of the emitted material on a basis that accounts for both the amount of emission and the different relative contribution to formation of ozone.

There are thousands of different VOC compounds and each has a different contribution to the harmful ozone, either directly or by influencing the amount of ozone formed by other compounds. The difficulty in establishing the appropriate value for each compound, changing regulations to require measurement and permitting by compound, and required supporting evaluations and approvals by EPA and ARB preclude this as a viable approach for the District at this time.

ARB has established reactivity values for the reformulation of architectural coatings and has received approval for this regulatory approach for that category of emissions. Approval to regulate the specific source category with the reactivity approach required removal of the exemption for minimally ozone forming compounds for these sources.

The requirements for the District to pursue a similar approach for a specific regulation or for all District regulations are extensive.

C. Value of VOC Specific Compound Data

The District recognizes the value of measuring emissions from each source type as accurately as possible, including the identification of specific VOC compounds and amounts. The current use for this information is to update the emission inventory identification of compounds emitted by a source type, referred to as the speciation signature for a source. Speciation signatures are used in regional modeling for photochemical assessment of the effect of growth trends and emission controls. The modeling projections predict future ozone levels and assist in developing plans designed to achieve the health based federal ozone standards. Speciated measurement of emissions is not routinely required for most sources due to the technical difficulty and expense for obtaining data at this level of detail.

The additional potential value of the speciation data and assessment of ozone reactivity is to identify compounds that have minimal ozone contribution and may be considered for de-listing by EPA. De-listing would remove the requirement for the compound to be limited and regulated. Such assessments must be done carefully and in accordance with nationally recognized protocols. Not only must the contribution to ozone be considered, but also the potential for the VOC compound to contribute to formation of fine particulate matter (PM2.5). Particulate formed in the atmosphere from VOC emission is called secondary organic aerosol (SOA). SOA is PM2.5 that must be regulated to achieve the federal health based standard for fine particulate matter.

D. Applicability to Compost Emission Regulation

District rule development for regulation of VOC from composting operations will rely on the current mass basis used for all District regulations. While information on the relative ozone forming contribution of different VOC compounds emitted by compost operations is of interest and value for proper characterization of the impact of these emissions on regional ozone levels, such data would not constitute a sufficient basis for the District to establish regulatory requirements to focus on specific emitted compounds. Even if a specific compound was identified as more reactive than other compounds emitted in the composting operation, the District lacks sufficient technical foundation to establish a specific change to composting procedures that would eliminate or reduce any specific VOC compound.

XII. REFERENCES

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4. SCAQMD Rule 1133, staff report, and technology assessment.
5. SJVUAPCD 2007 Ozone Plan
6. California Department of Resources Recycling and Recovery, Strategic Directive 6 , available at: http://www.calrecycle.ca.gov/AboutUs/StrategicPlan/2009/SD06.htm
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15. California Air Resources Board "PROPOSED METHOD FOR ESTIMATING GREENHOUSE GAS EMISSION REDUCTIONS FROM COMPOST FROM COMMERCIAL ORGANIC WASTE," August 31, 2010
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