

# **SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT**

## **DRAFT STAFF REPORT**

### **PROPOSED AMENDED RULE 1133.1 – CHIPPING AND GRINDING ACTIVITIES**

### **PROPOSED RULE 1133.3 – EMISSION REDUCTIONS FROM GREENWASTE COMPOSTING OPERATIONS**

**June 2011**

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## EXECUTIVE SUMMARY

The South Coast Air Quality Management District (SCAQMD or the District) adopted a series of rules (Rules 1133, 1133.1 and 1133.2) in January 2003 covering chipping and grinding activities, and co-composting operations. Composting is a biological process in which organic material is decomposed by microorganisms under controlled conditions to produce compost that can be used to reintroduce nutrients into the soils. Compost production operations have several benefits in developing a sustainable environment. To name a few, compost use enhances overall air quality by mitigating all forms of carbon and nitrogen emissions of volatile organic compounds (VOCs), methane, and renewable carbon dioxide (CO<sub>2</sub>) versus non-renewable fossil fuel CO<sub>2</sub>, and enhances waste management by turning a material often put into landfills to a beneficial use to enhance the sustainability of major industries, including agriculture, landscape and natural lands restoration and management. VOCs and ammonia emissions still occur during this process, but can be reduced cost-effectively using simple management practices. Over 400,000 tons of greenwaste is composted in the District each year. Approximately 2.7 tons per day VOC and 0.4 tons per day ammonia are emitted from greenwaste composting in the District. If not done properly, greenwaste composting can also result in odor problems.

Proposed Rule (PR) 1133.3 would reduce 0.9 tons per day of VOC and 0.1 tons per day of ammonia from greenwaste composting operations. PR 1133.3 would implement Control Measure (CM) MCS-04 of the 2007 Air Quality Management Plan (AQMP) and seeks to establish operational best management practices (BMPs) for greenwaste composting operations that produce active or finished compost from greenwaste-only or greenwaste in combination with manure or foodwaste. Amending Rule 1133.1 is proposed to better manage stockpile operations associated with chipping and grinding activities, which is to be consistent with current greenwaste material processing requirements established in Title 14 of the California Code of Regulations (CCR).

Proposed Amended Rule (PAR) 1133.1 covers approximately 70 facilities and would establish BMPs for chipping and grinding activities to produce materials other than active or finished compost. No emission reductions are quantified for this rule proposal. PAR 1133.1 would also establish maximum holding times of greenwaste material. PAR 1133.1 would apply to chipping and grinding activities not only occurring at a stand-alone chipping and grinding facility, but also occurring at a material recovery facility (MRF), a landfill using this material for alternative daily cover (ADC), a transfer station, a biomass energy production facility or a composting facility. PAR 1133.1 would establish requirements for processing greenwaste for other uses than composting. Under PAR 1133.1, greenwaste would be required to be chipped or ground and utilized or removed from the site within 48 hours of receipt, unless otherwise allowed by the Local Enforcement Agency (LEA) to be held for a longer period of time. Chipping and grinding facilities cannot take foodwaste, unless otherwise allowed by the LEA.

PR 1133.3 would affect 17 facilities and would apply to greenwaste composting operations involving organic waste materials, including greenwaste, woodwaste, manure

and foodwaste. Greenwaste composting including greater than 20 percent manure is presently subject to Rule 1133.2 for co-composting operations. PR 1133.3 has requirements for the operator to process greenwaste for on-site composting within 48 hours of receipt, unless otherwise allowed by the LEA to hold for a longer period of time. Foodwaste is also subject to the 48 hours processing time to initiate composting on-site, or would be required to be covered by finished compost until used. For composting operations of greenwaste-only or greenwaste mixed with up to 20 percent manure, by volume, or up to 5,000 tons per year of foodwaste throughput, operators would be required to cover each active phase pile with finished compost within three hours of initial pile formation, such that the top is at least six inches thick and the pile is not turned for at least the first seven days of the active phase of composting. Operations would be required to apply water to a three inch depth to the pile, prior to turning, during the first 15 days of the active phase of composting.

For greenwaste composting operations processing greater than 5,000 tons per year of foodwaste throughput, the operator would be required to install an emission control device for all active phase compost piles containing foodwaste content of 10 percent or more, by weight. An emission control device would need to be designed, operated and maintained with an overall system control efficiency of at least 80 percent, by weight, for VOC and ammonia emissions, respectively. None of the facilities are currently processing this amount of foodwaste.

PAR 1133.1 also has the 48 hours material holding time requirement which is shorter than the previous holding time requirements of Rule 1133.1. The amended 48 hours holding time requirement is to conform to that of the existing state regulation (Title 14) which is currently enforced by the county-level LEAs. As the 48 hours requirement has already been established and enforced by the LEA, no emission reductions are quantified relative to PAR 1133.1.

Costs associated with the implementation of PR 1133.3 involve operation and maintenance (O&M) costs to apply finished compost and additional watering to the compost piles before turning for the first 15 days of the active phase composting. These costs include water irrigation costs, including purchase of potable and/or reclaimed water and labor, and finished compost cover costs that do not include the capital cost of the application equipment. Costs are proportional to the amount of greenwaste processed, which ranges from less than 5,000 tons to 200,000 tons per year per facility. Total annual O&M costs range from \$700 to ~\$200,000 per facility (facility annual average of \$29,000 per year). Overall, for PR 1133.3, average cost effectiveness is estimated to be \$1,340 per ton of VOC-only and \$1,270 per ton of VOC and ammonia combined. If additional emission controls were required due to foodwaste throughput above the aforementioned thresholds, incremental cost effectiveness would be \$6,600 per ton of VOC-only and \$5,700 per ton of VOC and ammonia combined for a 50,000 tons per year operation, when compared to finished compost cover and watering application.

Several working group and other industry stakeholder meetings have been held to discuss rule concepts and draft rule language. A public workshop was held in February 2011. Numerous facility meetings have also occurred, as well as many site visits and phone

calls. As a direct result of these meetings, rule language was refined. Staff will evaluate other uses of greenwaste for potential future rulemaking.

## BACKGROUND

### AIR QUALITY

The SCAQMD is the regional government agency responsible for air quality in all of Orange County and the non-desert portions of Los Angeles, Riverside and San Bernardino counties. The District's jurisdictional boundaries include all of the South Coast Air Basin (Basin) and portions of the Salton Sea Air Basin (SSAB). Although air quality in the Basin has remarkably improved in the past decades, the air still does not meet all federal and state air quality standards. The U.S. EPA has designated the Basin as "extreme" non-attainment for 8-hour ozone standard. The Basin has been designated as non-attainment for PM<sub>2.5</sub>. The District is required to meet the federal annual PM<sub>2.5</sub> standard by 2015 and the federal 8-hour ozone standard by 2024, respectively.

Organic materials comprise about 40 percent of California's waste stream. Diverting a high percentage of these materials is key to the state achieving and maintaining the diversion goals of the California Integrated Waste Management Act (AB939, Sher, Chapter 1095, Statutes of 1989 as amended [IWMA]). Pursuant to AB939, composting has been promoted statewide to achieve waste diversion goals. Composting is a good mitigation measure for greenhouse gas (GHG) emissions reduction, as well. Much smaller quantities of methane are emitted from aerobic composting than from uncontrolled anaerobic decomposition. Good composting practices, which balance the carbon-to-nitrogen (C:N) ratio and provide adequate aeration and moisture, will minimize VOC, ammonia and GHG emissions.

Interest in foodwaste composting is also on the rise. Foodwaste, if not recycled via composting, is sent to landfills. More than six million tons of food scraps are generated each year in the state, which is about 15 percent of landfill material. Composting is a beneficial way to recycle food scraps into reusable compost and reduce emissions of methane, a potent GHG. Currently, the vast majority of food scraps are landfilled.

Greenwaste composting is a source of ammonia, a PM<sub>2.5</sub> precursor, and VOCs, an ozone precursor. Biogenic VOC also acts as a precursor gas to form secondary aerosols. Ammonia can be emitted from improperly managed composting piles and act as a precursor gas to form secondary aerosols. Annually, over 12 million tons of compostable organic materials, such as foodwaste and landscape trimmings, are sent to California landfills. In 2006, methane emissions from composting (primarily of greenwaste and food scraps from residential and commercial establishments) in the U.S. were estimated to be 75 gigagrams (Gg), which accounts for only 1.3 percent of 5,985 Gg of the landfill methane emissions<sup>1</sup>. In the South Coast, gas recovery control systems have been required to be employed for decades. These systems effectively collect VOC and methane, as a result that landfill emissions are well controlled in the SCAB. Therefore, diverting organic materials not only helps return valuable nutrients to the soil, improves

plant productivity, and helps reduce water usage, erosion, and chemical use, but it also can reduce GHG emissions from landfills not equipped with gas control systems<sup>2</sup>.

Following is a brief description of the health and environmental concerns with air contaminants emitted from anaerobic organic treatments, including greenwaste composting, that contribute to the formation of PM<sub>2.5</sub> and ozone, and climate change. The management practices proposed in PAR 1133.1 and PR 1133.3 will reduce ammonia and VOC, precursors to PM<sub>2.5</sub> and ozone, as well as minimize PM<sub>2.5</sub> emissions.

#### *Particulate Matter (PM<sub>2.5</sub>)*

Most PM<sub>2.5</sub> in the Basin's air is believed to be in the form of secondary aerosols, such as ammonium sulfate and ammonium nitrate that are formed by reactions of ammonia with acidic gases, or such as secondary organic aerosols formed from biogenic VOC. PM<sub>2.5</sub> is associated with adverse health effects. A great fraction of particles in this size range can penetrate and deposit deep in the lungs, damaging the airways of the lower respiratory tract. It should be noted that PM emissions from material movement is, in general, controlled relative to compliance with Rule 403 – Fugitive Dust.

#### *Ozone*

VOC is produced from greenwaste composting as a by-product of biological degradation of organic materials. Not only is VOC produced during aerobic composting of organic materials, but VOC is also produced in even greater quantity in anaerobic decomposition. VOC contributes to the formation of ozone and organic aerosols in the atmosphere, contributing to higher PM<sub>2.5</sub> and lower visibility levels. Ozone is formed in the atmosphere through a photochemical reaction of VOC and nitrogen oxides (NO<sub>x</sub>) by sunlight.

Ozone is a highly reactive compound and a strong oxidizing agent. When ozone comes into contact with the respiratory tract, it can react with tissues and cause damage in the airways. Ozone is a deep lung irritant, causing the lung passages to become inflamed and swollen. Exposure to ozone produces alterations in respiration, the most characteristic of which is shallow, rapid breathing and a decrease in pulmonary performance.

#### *Greenhouse Gases*

Greenhouse gases, such as CO<sub>2</sub>, methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O), are emitted to the atmosphere through natural processes and human activities. These GHGs are associated with composting. All organic materials contain carbon. When organic materials are decomposed naturally under aerobic conditions, CO<sub>2</sub> is emitted as part of the natural short-term carbon cycle. When organic materials are placed in an anaerobic environment, anaerobic decomposition will emit methane and some VOCs.

Methane is emitted from uncontrolled anaerobic decomposition of waste. Although landfill methane emissions are well controlled in the SCAB, landfills are the largest human-related source of methane in the U.S., accounting for 34 percent of all methane emissions. Methane is generated in landfills and open dumps as waste decomposes under anaerobic (without oxygen) conditions. The amount of methane created depends on the

quantity and moisture content of the waste and the design and management practices at the site. Even though methane is formed in anaerobic sections at the bottom of compost piles, it is oxidized to a large extent as it reaches more aerobic sections of the compost piles. Anaerobic sections are created in composting piles when there is excessive moisture and inadequate aeration of the piles. The estimated methane released into the atmosphere ranges from less than one percent to a few percent of the initial carbon content in the compost material<sup>1</sup>. The District has rules to capture methane and VOC emitted from landfills. Nitrogen-high organic materials, such as manure, grass clippings, and food scraps, under wet and oxygen-limited conditions, can also produce N<sub>2</sub>O during decomposition. The range of the estimated emissions varies from less than 0.5 percent to five percent of the initial nitrogen content of the material.

## **Regulatory Background**

Following is a summary of the regulatory programs that are applicable or pertinent to the greenwaste composting operations industry.

### *Federal Programs*

#### Resource Conservation and Recovery Act

In 1976, Congress enacted the Resource Conservation and Recovery Act (RCRA), an amendment to the 1965 Solid Waste Disposal Act. RCRA calls for conservation of energy and natural resources, waste reduction, and environmentally sound waste management practices. In addition, RCRA encourages states to develop plans for non-hazardous industrial solid waste and municipal solid waste (MSW) management, sets criteria for MSW landfills, as well as for other solid waste disposal facilities, and prohibits the open dumping of solid waste. Congress delegated authority to U.S. EPA to develop scientific regulations to implement the requirements of RCRA. Solid waste regulations have been promulgated in the Code of Federal Regulations under Title 40, Chapter I, Subchapter I, Parts 240-282 (40 CFR Parts 240-282).

#### Sewage Sludge Disposal Standards

U.S. EPA promulgated standards for the use or disposal of sewage sludge in Title 40, Chapter I, Subchapter O, Part 503 of the Code of Federal Regulations (40 CFR Part 503). 40 CFR Part 503 contains requirements for the control of pathogens, vectors, and heavy metal for sludge composting operations. To qualify as Class A compost, Appendix B to Part 503 – Pathogen Treatment Process, generally requires processes to further reduce pathogens (PFRP). PFRP requires that open windrow composting maintain the temperature of the compost at 131 degrees Fahrenheit or higher for 15 days or longer, and during this time there must be a minimum of five turnings of the windrows. For in-vessel or aerated static pile (ASP) composting, the RFRP requires the active pile temperature be at least 131 degrees Fahrenheit or higher for three days. This process assures that virtually all human pests and pathogens are destroyed. Since food residuals contain human pathogens, fungi and bacteria, this PFRP should be met when foodwaste is being mixed with greenwaste for composting.

## *State Programs*

### California State Legislature: California Integrated Waste Management Act

Recognizing landfill limitations (i.e., capacity and siting) and the need for integrated waste management practices, in 1989, the California state legislature passed Assembly Bill (AB) 939 – California Integrated Waste Management Act into law, which was incorporated into the California Public Resources Code, Division 30. Cities and counties were mandated to achieve a total waste diversion of 25 percent by 1995 and to meet a total waste diversion of 50 percent every year.

### California Integrated Waste Management Board

In April 2003, the CIWMB promulgated a set of regulations governing composting operations and facilities. The CIWMB currently regulates approximately 87 composting facilities operating in California in accordance with the California Code of Regulations, Title 14, Division 7, Chapter 3.1 – Composting Operations Regulatory Requirements (Chapter 3.1). The Chapter 3.1 has requirements of handling compostable materials including, but not limited to, material residence time at facilities, temperature requirement to prevent inadvertent decomposition. This Chapter also has a pathogen reduction requirement that requires open windrow composting maintain the temperature of the pile at 131 degrees Fahrenheit or higher for at least 15 days or longer during which windrows must be turned at a minimum of five times. Depending on the type of composting materials and the throughput, affected facilities are required to obtain a Registration Permit, a Standardized Composting Permit, or a Full Solid Waste Facilities Permit (Full Permit) that are issued by LEAs, such as the environmental health departments. There are also requirements for green material composting operations and facilities, as well as an Odor Impact Minimization Plan (OIMP). [Note: the CIWMB was recently put under the offices of Cal-EPA and is currently known as CalRecycle, but many of the actions referenced and discussed herein occurred before that time.]

### 2007 Strategic Directive 6.1

In 2007, the CIWMB adopted Strategic Directive 6.1, which in addition to the diversion required under AB 939, seeks an additional 50 percent of organics diverted from landfills by 2020, in accordance with the waste management hierarchy and in support of the California Global Warming Solutions Act of 2006. The CIWMB has estimated that meeting Strategic Directive 6.1 may require 50 to 100 new organics processing facilities (or equivalent expansion of existing facilities) that produce compost, biofuels, and/or bioenergy; increased development of product standards and increased procurement by private and public entities; and resolution of cross-agency regulatory issues.

### Regional Water Quality Control Board

The Regional Water Quality Control Board (RWQCB) enforces EPA-issued National Pollutant Discharge Elimination System (NPDES) permits. In addition, the RWQCB focuses on wastewater generation, water demand, the capacity of existing or planned stormwater drainage systems and potential new sources of polluted run-off, and potential depletion of groundwater supplies or interference with groundwater recharge. In the case of composting facilities, the RWQCB has required various composting sites to be graded,

paved, and surrounded by berms and other drainage-related protections to prevent run-off and the leaching of chipped and ground materials into the groundwater.

### *Local Programs*

There are several local requirements that may apply to greenwaste composting operations. Specifically, these requirements focus on air, land use and solid waste issues. The following is a summary of these requirements.

#### SCAQMD Rule Requirements

Currently, operators of chipping/grinding operations at greenwaste composting facilities are required to comply with SCAQMD Rules 402 – Nuisance, 403 – Fugitive Dust, and 203 – Permit to Operate for equipment that require permits. In addition, greenwaste composting operations are required to comply with District Rules 1133 – General Administration, 1133.1 – Chipping and Grinding, and 1133.2 – Emission Reductions from Co-Composting Operations involving more than 20 percent manure. However, none of these rules establish specific control requirements to reduce VOC and ammonia emission from greenwaste-only composting operations.

#### Local Enforcement Agency Requirements

There are several different local (i.e., city or county) enforcement agencies or LEAs that act as either the permitting or enforcement division of the CIWMB, depending on the throughput and type of compostable materials. For example, the local department of health services, on behalf of the CIWMB, issues Registration, Standardized, and Full Permits depending on the size of throughput and enforces the requirements in these permits. For either type of permit scenario, the LEAs are responsible for handling and investigating complaints from composting and chipping/grinding operations. Pursuant to Health and Safety Code Section 41705, composting operations are exempt from SCAQMD odor regulations; SCAQMD must refer odor complaints to the LEA.

#### Local Governments

Local government zoning ordinances determine where composting activities can occur. In addition, local government grant conditional use permits if the jurisdiction has determined that special conditions and approvals are necessary.

## **PUBLIC PROCESS**

Staff invited environmental and community group representatives, industry representatives, government staff, consultants and individuals from affected industry to participate in a working group. The first working group meeting was held on June 8, 2010 and a subsequent follow-up conference call was held on June 18, 2010 to accommodate people who were not able to participate in the first working group meeting due to technical difficulties with the conference call. A second working group meeting was held on August 27, 2010 with revised concepts and preliminary draft rule language. Three written comment letters were received from participants for initial concepts discussed at the first working group meeting and seven additional comment letters were received regarding the revised concepts and preliminary draft rule language. Staff has

made many site visits and has met with industry representatives on several occasions to address key issues relative to proposed rule requirements. A public workshop was held on February 9, 2011 and 15 written comments were received. The rule proposal was revised based on those comments and the third working group meeting was held on May 10, 2011 with the revised rule proposal. Nine additional written comments were received as a result of the third working group meeting. Staff further revised the rule language and has scheduled another working group meeting on June 15, 2011. The revised rule proposal is based on all the verbal and written comments that were received since the Public Workshop and are responded to in Appendix IV. A Public Hearing is scheduled for July 8, 2011.

## LEGAL AUTHORITY

The SCAQMD obtains authority to adopt, amend, or repeal rules and regulations which control air pollution from Health and Safety Code §§ 39002, 40000, 40001, and 40440.

## CONTROL METHODS

According to the District's greenwaste composting industry survey conducted in 2007, the predominant method of greenwaste composting is windrow composting. Composting is a biological process where organic material is decomposed by microorganisms under controlled conditions in the presence of oxygen to produce a compost material that can be used to reintroduce nutrients into the soils. Two composting methods are commonly conducted: static pile composting and turned windrow composting. Static pile composting is characterized by infrequent turning, which is similar to backyard composting on a larger scale. The material is placed into piles where it decomposes over an extended period of time with no or little mixing during the composting process. Therefore, it is crucial to construct the pile to the appropriate size, with the material being thoroughly blended and having a moisture content and porosity to allow adequate aeration through the composting process. In turned windrow composting, materials are moved with a front-end loader into long piles called windrows. Aeration is achieved both by natural advection and mechanically turning the piles with a front-end loader or a windrow turner, such as a Scarabs machine. Temperature, moisture content and oxygen concentration are maintained to optimize and hasten decomposition. After two to four months of composting in the piles or windrows, the material becomes finished compost.

PR 1133.3 does not require a specify type of composting, and thus any type of composting technique can be used for the process. PR 1133.3 requires two different levels of emission control methods to reduce gaseous emissions from greenwaste composting operations. The type of an emission control method required is determined based on the annual foodwaste throughput on a facility-wide basis. In order to comply with the requirements of PR 1133.3, new and existing greenwaste composting operations processing greenwaste by itself or operations with up to 20 percent manure, by volume, or with up to 5,000 tons per year of foodwaste throughput (source-separated or mixed) would require combination of finished compost cover and additional water irrigation. The operator would need to apply finished compost cover to the top of active greenwaste composting piles at least for the first seven days of the active phase of composting, and

then apply water to the pile for the remaining days of the first 15 days of the active phase period of composting. The finished compost cover and water application is considered as a best management practice (BMP), not an emission control technology per se. If more than 5,000 tons per year of foodwaste throughput is composted, an emission control device would be required for any active phase composting pile containing a foodwaste content of 10 percent or more, by weight. If existing greenwaste composting facilities determine after rule adoption to process greater than 5,000 tons per year of foodwaste throughput and a foodwaste content of 10 percent or more, by weight, an emission control technology achieving an 80 percent overall control efficiency would also be required.

### **Finished Compost Cover**

PR 1133.3 would require applying either screened or unscreened, finished compost and/or compost overs to the top of greenwaste composting piles at least during the first seven days of the active phase of composting so that the peak is six inches thick. Tests have shown that the emissions primarily escape from the top one third of the pile. The proposal requires the compost cover such that the top is covered to a depth of six inches, and tapers off as it goes down the pilesides. Thus, the application is adequate to cover the top half of the pile where most emissions emanate. Finished compost is required to be applied to the active phase piles within three hours of initial pile construction and sit for a minimum of seven days with the piles unturned. This so-called “pseudo-biofilter” approach is effective in reducing VOC emissions from composting piles. According to the recent greenwaste mitigation measure study<sup>3</sup>, the application of six inches finished compost to the surface of a greenwaste windrow resulted in a 53 percent reduction in VOC emissions for the 22-day active phase period compared to the regular greenwaste windrow without finished compost on it. In the Modesto Emissions Study<sup>4</sup>, a 75 percent reduction in VOC emissions was achieved with a six inches layer of finished compost cover for the first two weeks of the active composting phase. Another recent emissions research<sup>5</sup> using a compost cap made out of oversized materials screened from finished compost, known as “compost overs”, showed that biofilter cap made out of overs reduced average measured ozone formation by 27 percent in five days old piles and by 36 percent in 21 days old piles. Compost overs have been through the pathogen reduction process outlined in Title 14, Section 17868.3 of the California Code of Regulations. Literature<sup>6</sup> shows that finished compost has also been used as a means to oxidize methane from landfills before it is released to the atmosphere and has been used as biofilter media.

The emissions during the active phase period of composting surpass the emissions during the curing phase and accounts for the vast majority of the total emissions. Emissions for the first 15 days of the active phase period account for a majority (87 percent) of the total integrated VOC emissions. In addition, more VOC emissions occur during the first half of the 15 days period than during the last half period.

The use of screened or unscreened finished compost and/or compost overs is considered a practical application since these materials are readily available at composting facilities. Compost overs do not decompose in a typical composting cycle anyway and are recycled back into the process by using it as a cover material. If finished compost is utilized as a

cover material, it is initially recycled back into the process by using it to cover windrows and it is also not consumed in the process. It cycles back to finished compost at the end of the composting process. PR 1133.3 requires only one time application of finished compost cover and/or compost overs and thus there would be one time (temporary) loss of product sale. Use of finished compost as a pseudo-biofilter cover is a cost-effective emission mitigation measure to reduce VOC emissions from composting piles. Costs to apply finished compost cover mainly involve application time and a front-end loader operation cost.

### **Water Irrigation**

PR 1133.3 would also require applying water to the surface of the compost piles so that three inches in depth of the pile is wet. According to the mitigation measure study<sup>3</sup>, water irrigation was tested on an active phase composting windrow and showed 24 percent reductions in VOC emissions during the 22 days active phase composting period. Since most compost piles are already watered for the composting process, water irrigation would not be difficult for most of the composting facility operators. Excess moisture is also evaporated while turning the piles and will not lead to oversaturation and leaching issues. It should be noted that water is only required in amounts necessary to make the top three inches wet and does not require water application indiscriminately. The costs of water irrigation involve the use of potable and/or reclaimed, well, or canal water.

### **Emission Control Device**

An emission control device would be required only for operations having greater than 5,000 tons per year of foodwaste throughput, either on a source-separated or mixed foodwaste basis, and a foodwaste content of 10 percent or more, by weight. PR 1133.3 does not propose any specific type of emission control technology for greenwaste composting operations. However, an emission control device should be designed, constructed, maintained, and operated to achieve overall system control efficiency of at least 80 percent, by weight, for VOC and ammonia emissions, respectively. Aerated static pile (ASP) venting to biofilter is one example of an emission control device. The material is placed on top of perforated pipes that are connected to blowers that either push or pull air through the piles. ASP can be operated either under negative pressure or positive pressure. Negative-pressure ASP pulls air through the pile and vents the exhaust to an emission control device, such as a biofilter, to remove air pollution gas emissions pulled from the compost pile before they are released to the atmosphere. Wood chips and compost can be used as biofilter media. Finished compost can be layered on the surface of the negative ASP to increase capture efficiency of gas emissions from the pile.

Biofiltration is a well-established emission control technology. In the United States, biofilters have been mainly utilized for the treatment of odors and VOC emissions in wastewater treatment plants. In the Basin since District Rule 1133.2 was adopted, biofiltration technology has been an emission control technology for co-composting VOC and ammonia emissions. Based on the information collected on existing biofilter composting applications, overall control efficiencies of about 80 to 90 percent for VOC and 70 to over 90 percent for ammonia have been achieved<sup>7</sup>. Due to technology

advancement, a well-designed, well-operated, and well-maintained biofilter will be capable of achieving 80 percent control efficiency for both VOC and ammonia. Biofilter manufacturers also emphasize that regular inspection and maintenance of the biofilter are key elements to achieve such control level. Based on source tests data from existing co-composting operations (Inland Empire Regional Composting Facilities and City of Los Angeles Sanitation Bureau), properly designed and maintained biofilters have demonstrated over 90 percent destruction efficiencies for both VOC and ammonia emissions. However, because of concerns over the continuous effectiveness of biofilters in reducing emissions beyond 80 percent, a minimum of 80 percent control efficiency would be required under the PR 1133.3.

Negative-pressure ASP is operated intermittently, typically with a blower turned on for one third of the operational time. If it is operated on a continuous basis, it will lose a significant portion of moisture content in the pile because moisture will be drawn together with the exhaust gas emissions, leading to microorganisms entering a dormant stage.

There are different ASP technologies utilizing a fabric cover or a tarp. These technologies are called covered ASP systems. A covered ASP system can be aerated positively or negatively, and uses an engineered fabric cover, instead of finished compost, as a cover material. One such system is covered negative-pressure ASP with biofilter<sup>8</sup>. The compostable material is placed on a ventilation pipe and covered with a waterproof cover tarp, following the insertion of monitoring probes. The pipe is connected to a blower that produces negative air pressure, pulling air into the pile from the outside through small holes in the tarp. As air is being drawn through the piles, it is sent to a biofilter composed of moist wood chips and compost. Probes are linked to a computer to monitor temperature.

The other type of the covered ASP systems is covered positive-pressure ASP using triple layer membrane compost covers<sup>9,10</sup>. This type of technology pushes air into the pile, and does not need a biofilter. The membrane covers selectively influence the process. They protect the composting material from the penetration of rainwater and yet allow carbon dioxide produced during the composting process to escape. The compost cover keeps heat, odors, microorganisms, and some moisture contained, while releasing oxygen and some moisture. Covered piles are controlled with a blower fan, connected to either on-floor aeration pipes or in-floor aeration ducts, and controlled by means of either temperature and oxygen<sup>9</sup> or temperature only<sup>10</sup>. Further description of these covered forced ASP systems is given in Appendix II. These covered forced ASP systems would cost from two million dollars to five million dollars, depending on vendors, for an operation with 100,000 tons throughput per year.

Another possible emission control technology is a positive-pressure ASP with finished compost as a cover material. Although staff expects that such covered ASP systems will meet PR 1133.3 requirements, their overall control efficiencies will have to be demonstrated using approved source test methods and protocols. Currently, there are only a few source tests that were conducted locally using the District Test Methods protocol.

## SUMMARY OF PROPOSED RULES

This section summarizes the requirements of the proposed and amended rules in the order of the major rule subdivisions: Purpose and Applicability, Requirements, Test Methods and Protocol, Recordkeeping, and Exemptions. Each section lists major proposed requirement elements followed by detailed descriptions.

### ***Summary of Proposed Amended Rule 1133.1 – Chipping and Grinding Activities***

#### **Purpose and Applicability**

The purpose of PAR 1133.1 is to prevent inadvertent decomposition occurring during chipping and grinding activities, including stockpile operations. This proposed amended rule applies to the operators of chipping and grinding activities, including stockpile operations, to produce materials other than active or finished compost, unless otherwise exempted.

Greenwaste materials must first be chipped or ground before being further processed for composting, mulching, static pile for land application, ADC at landfills, or biofuels at biomass refuse-to-energy facilities. Air emissions may occur even at a pre-chipping and grinding stage. However, once greenwaste materials are chipped or ground, air emissions begin to occur immediately and spike within three to seven days of being chipped or ground. Tests have shown that extended stockpiling operations can cause extensive emissions of VOC and other trace air pollution gases (e.g., ammonia) to the atmosphere. In addition, chipping and grinding activities subject to Rule 1133.1 are also subject to the California Code of Regulations (CCR) Title 14 relative to compostable greenwaste material processing.

Therefore, based on the emission and Title 14, Rule 1133.1 is proposed for amendment to tighten requirements on stockpile operations and harmonize the rule with Title 14. It should also be noted that the amendments add applicability of the rule to the operators of chipping and grinding activities, including stockpile operations, to produce materials other than active or finished compost, and are regulated under Title 14. Therefore, this amended rule would apply to the operators of chipping and grinding activities occurring not only at a stand-alone chipping and grinding facility, but also at multi-operation facilities that handle multiple incoming material streams with separate operating areas for “chip and ship” operations (such as chipping to produce mulch, biofuel, ADC or woodchips) within the same facility. Chipping and grinding activities to produce compost feedstock will be separately subject to the applicable PR 1133.3 and Title 14 requirements. It should further be noted that as these facilities are already subject to Title 14, amending Rule 1133.1 to strengthen the holding requirements does not cause any additional impact to the affected facilities.

## Requirements

### Foodwaste Management

Rule 1133.1 has been amended to state foodwaste cannot be accepted at chipping and grinding facilities, unless otherwise allowed by the LEA to handle foodwaste.

### Stockpile Operations

Once greenwaste is received at the chipping and grinding facility, the operator shall chip or grind and utilize on-site or remove curbside, non-curbside or mixed greenwaste from the site within 48 hours of receipt, unless otherwise allowed by the LEA to hold for a longer period of time. This requirement harmonizes with Title 14, Division 7, Chapter 3.1, Section 17852 (a)(10)(A)(2) of the CCR. Chipped or ground materials shall not be stockpiled, but be “utilized” for other purposes, including, but not limited to, daily landfill cover, land application, mulch and erosion control, or be removed from the site, such as being sent to a landfill for ADC use or to biomass power generation facility for biofuel consumption, within the applicable allotment of time.

### Recordkeeping

All the operational records are required to be maintained for the prior five years of operation, with the most recent two years retained at the facility, which shall be immediately available upon request by the Executive Officer. The remaining three years of records shall be made available within one week of request.

### Exemptions

Existing exemptions still apply to material derived and utilized on site, provided less than 1,000 cubic yards of materials per year are either sold or given away. Portable chipping and grinding, agricultural chipping and grinding, landclearing chipping and grinding, woodwaste chipping and grinding, and palm chipping and grinding activities continue to be exempt from the provisions of the rule. In this amendment, the operator of a landfill or biomass power generation facility would be exempt from the requirements of maintaining operation-specific records on-site, provided that the operator does not perform chipping and grinding of greenwaste on-site.

A biomass power generation facility or a facility processing material as a biomass fuel for a biomass power generation facility would also be exempt from the 48 hours holding time requirement, provided that the material temperature is maintained at below 122 degrees Fahrenheit or the moisture content is less than 30% and records of the temperature or moisture measurements are maintained on-site. With this exemption, the definition of woodwaste has been modified such that the woody materials of screened or unscreened greenwaste, exceeding 2 inches in any dimension, such as tree trimmings, branches, tree trunks, stumps, and limbs, would be considered woodwaste. Rule elements pertaining to moisture content of chipped and ground curbside greenwaste remain unchanged.

## ***Summary of Proposed Rule 1133.3 – Emission Reductions from Greenwaste Composting Operations***

### **Purpose and Applicability**

The purpose of PR 1133.3 is to reduce fugitive emissions of VOC and ammonia occurring during greenwaste composting operations. This proposed rule would apply to all new and existing greenwaste composting operations that produce active or finished compost from greenwaste by itself or greenwaste in combination with manure or foodwaste. If greenwaste material is chipped or ground to produce feedstock for composting, the chipping and grinding activities and associated material holding would be subject to the PR 1133.3 requirements.

Certain exemptions may apply. Active compost means material that is in the process of being rapidly decomposed and is biologically unstable. Active compost is generating temperatures of at least 122 degrees Fahrenheit during decomposition. Pathogen-reduced mulch is included in active compost. Finished compost means a humus-like material and/or compost overs that result from the controlled biological decomposition of organic waste materials and is biologically stable. Both the active and curing phases of the greenwaste composting are required to achieve this finished compost product. Compost overs are defined as the oversized woody materials that do not decompose in a typical composting cycle and are screened out of finished product at the end of composting. Compost overs have been through the pathogen reduction process outlined in the CCR, Title 14, Section 17868.3.

New greenwaste composting operations are defined as greenwaste composting operations that have not started operations as of rule adoption. Existing greenwaste composting operations are defined as all greenwaste composting operations that have begun operations on or before rule adoption.

### **Requirements**

The proposed rule would focus on stockpile operations and composting operations of greenwaste and/or foodwaste at all new and existing composting facilities that are either registered for a Notification tier or permitted by the LEA to conduct composting operations. The level of requirements would depend on the annual foodwaste throughput on a facility-wide basis.

#### ***For all greenwaste composting operations:***

Effective upon rule adoption, the operator of greenwaste composting operation is required to chip or grind, as necessary, and use greenwaste for on-site composting within 48 hours of receipt, unless otherwise allowed by the LEA to hold for a longer period of time. This requirement is consistent with the requirement of PAR 1133.1, pursuant to paragraph (d)(2) and is conforming to the state regulation pursuant to the CCR, Title 14, Division 7, Chapter 3.1, Section 17852 (a)(10)(A)(2). In addition, foodwaste should be used for on-site composting within 48 hours of receipt or covered with screened or unscreened finished compost until used.

***For operations processing greenwaste only, greenwaste with up to 20 percent manure, by volume, or up to 5,000 tons per year of foodwaste throughput:***

Allowance of Manure or Foodwaste

For the purpose of this proposed rule, up to 20 percent manure, by volume, integrated into greenwaste is considered greenwaste composting. This percent limit has been already established in District Rule 1133.2 – Emission Reductions from Co-Composting Operations (adopted in January 2003), because it was difficult for agricultural farm composters to completely separate horse manure from horse bedding materials for composting. However, other kinds of animal manure would also be allowed up to 20 percent, by pile volume, under PR 1133.3. More than 20 percent manure, by volume, would not be considered as greenwaste composting, but would be subject to Rule 1133.2 for co-composting operations. Up to 5,000 tons per year of foodwaste throughput can be composted without the need to install an emission control device. This proposed foodwaste throughput is on a facility-wide basis, and either source-separated or mixed foodwaste is counted. Mixed foodwaste contains compostable material (e.g., compostable plastic bags, food-soiled packaging, papers, or other biodegradable material) and/or non-compostable solid waste (e.g., glass, cans, napkins, plastics including bags, containers or styrofoam).

Foodwaste means any pre- and post-consumer food residuals collected from the food service industry, grocery stores, or residential food scrap collection. Any non-food material that is not separated from food scraps is also considered foodwaste for the purpose of calculating throughput, including, but not limited to, compostable materials (e.g., plastic bags, food-soiled packaging, papers or other biodegradable material) or non-compostable solid waste (e.g., napkins, cans, glass, plastics, containers, and Styrofoam). There is no restriction on the recipes of foodwaste-to-greenwaste ratio.

Mitigation Measures: Finished Compost Cover and Watering

Every active phase pile is required to be covered with finished compost within three hours of initial pile formation such that the top is six inches thick and the pile is not turned for the first seven days of the active phase period of composting. Tests have shown the emissions primarily escape from the top one third of the pile. Having a six inch compost cover at the top ensures that the pile is adequately covered and tapers as it goes down the pilesides. Thus, the application is adequate to cover the top half of the pile where most emissions emanate.

Tests have shown that a vast majority of VOC emissions are extensively produced from during the first 15 day active phase period of composting. In particular, the emissions tend to spike within the first three to seven days of the active phase of composting and then diminish by time. According to a mitigation measure study<sup>3</sup>, about 53 percent of VOC emission reductions were achieved with six inches of finished compost layer applied upon initial pile formation and each subsequent turning during the first 22 day active phase composting. VOC is a biodegradable chemical and is adsorbed on the finished compost layer, and is further broken down

by the microbes living on the surface of the finished compost. To minimize facility impacts, the compost cover is only proposed for initial pile formation and the pile is not to be turned for seven days unless needed to manage temperature for pathogen reduction.

Additional watering is also proposed as a subsequent mitigation measure following finished compost cover to reduce VOC and ammonia emissions from turned compost piles. For the first 15 days after initial pile formation for the active phase period of composting, water is to be applied as necessary to the surface area of all active phase piles within three hours before subsequent turning such that the pile is wet to a depth of three inches. When applying water to the pile, the top one half of the pile needs to be wet down to a three inch depth. Alternatively, the operator may apply water during turning using a windrow turner equipped with water spraying technology during the entire windrow turning process.

According to the composting mitigation measure study<sup>3</sup>, the surface irrigation could help reduce VOC emissions from greenwaste compost piles by 24 percent. VOC emitted from composting of organic wastes consists of biodegradable and water-soluble light alcohols to some extent. VOC entrapped inside the pile as a result of biological decomposition of organic material is emitted to the air when the pile is turned. As water is applied to the surface area, the water layer of the pile absorbs water-soluble VOC and emission reductions occur. Because only the top three inches of the pile irrigated becomes wet, there would be no water run-off problems associated with additional watering. Staff also expects that excess moisture is evaporated while turning the piles and will not lead to oversaturation and leaching issues, as well as anaerobic condition issues.

If a rain event occurs prior to watering the pile within three hours before turning and the pile is wet to a depth of three inches, the operator may turn the pile without adding additional water. It is recommended that the operator conduct a ball test using hand pressure. At least three inches depth from the peak of a pile, if the compostable material contains enough moisture to form a ball when compressed by hand, but may break when tapped, within three hours before turning, no additional watering would be required. If the ball crumbles upon release of the hand pressure test, additional water would be required to apply to the pile until requirements are met. This may also apply to a normal operating condition. If the pile is sufficiently wet down to a three inch depth within three hours before turning during non-rain, normal operations, additional watering may not be required. If the pile needs to be turned within the first seven days for maintaining temperature at or above 131 degrees Fahrenheit for pathogen reduction pursuant to Title 14, Division 7, Chapter 3.1, Section 17868.3 of the CCR, the operator does not need to re-apply the finished compost cover and should apply additional water to the pile as described in this section.

An alternate mitigation measure may be implemented by the operator, provided that the measure will be based on a test protocol approved by the Executive Officer, California Air Resources Board, and the United States Environmental Protection Agency, and demonstrate emission reductions by at least 40 percent, by weight, for

VOC and by at least 20 percent, by weight, for ammonia for combined finished compost cover and water application.

***For operations processing greater than 5,000 tons per year of foodwaste throughput:***

Emission Control Device

For greenwaste composting incorporating greater than 5,000 tons per year of foodwaste throughput (source-separated or mixed) on a facility wide basis, the operator would be required to install an emission control device for any active phase composting pile containing foodwaste amount of 10 percent or more, by weight. The emission control device would be required to have an overall system control efficiency of at least 80 percent, by weight, each for VOC and ammonia. Such equipment is required only for the 22 day active phase period of composting and not required for the curing phase. At the end of the first 22 day active phase composting, emissions are diminished over 90 percent<sup>4, 11, 12</sup>. Thus, requiring such control device for curing phase would not add significant emission reductions but may increase operational costs. The operator may implement a control alternative, if approved by the Executive Officer, California Air Resources Board, and the U.S. EPA, to achieve VOC and ammonia emission reductions equivalent to or greater than the required reductions.

Any emission control device should be designed and operated such that an overall control efficiency of at least 80 percent is achieved for VOC and ammonia, respectively, from the baseline emission factors or alternate baseline emission factors. The overall control efficiency counts on both the capture efficiency and destruction efficiency.

Even if the actual annual facility foodwaste throughput exceeds 5,000 tons per year, but the composting mix (or recipe) is less than 10 percent foodwaste, by weight, an emission control device would not be required.

Baseline Emission Factors

For the purpose of this rule, baseline emission factors are proposed to determine an overall control efficiency of 80 percent for an emission control device. Baseline emission factors are the uncontrolled emission factors for greenwaste composting operations for VOC and ammonia. Proposed baseline emission factors are 4.25 pounds of VOC per ton of throughput and 0.46 pounds of ammonia per ton of throughput for the active phase of composting only. Staff developed the composite emission factors by using currently available emissions data measured by various agencies, including the District, state and other air districts for greenwaste composting operations typical for the South Coast jurisdiction. The proposed emission factors reflect only emissions from windrow composting operations and exclude stockpile emissions. Procedures for developing the new baseline emission factors are explained in detail in Appendix III – Emission Reductions and Cost Effectiveness.

### Permit Application

A permit would be required for an emission control device for all new and existing greenwaste composting operations processing greater than 5,000 tons per year of foodwaste throughput (source-separated or mixed) and a foodwaste content containing 10 percent or more, by weight. All new greenwaste composting operations would be required to obtain a permit for such equipment before construction. Existing greenwaste composting operations that, as of rule adoption, process or plan to process greater than the foodwaste throughput and content thresholds would also have to file a permit application for an emission control device within three months of rule adoption and fully implement such device within six months upon approval of the permit application. However, based on the information provided by the composting operation, in response to the survey conducted by staff, there are no existing operations currently that are in excess of 5,000 tons of feedstock per year.

Depending on the configuration of the emission control device, controls may be accomplished with or without the need of venting the exhaust air to a separate air pollution control device, such as a biofilter. The configuration of such equipment should be described in detail in the permit application.

Windrow composting does not require a permit, with or without food. Finished compost cover is seen more as a BMP as opposed to a control technology, and thus does not require a permit nor trigger BACT. New facilities required to obtain a permit will be subject to New Source Review including BACT requirements. This being the case, ASP composting with appropriate emission control devices may be considered BACT. If the post-control VOC emissions exceed 22 lbs per day at a facility, offsets would be required. This is part of the existing permit system. Existing facilities that are currently doing windrow composting and that modify to ASP composting solely to comply with this new rule would likely meet BACT and not require offsets, provided that they operate at the current facility throughput. Such permitting would be reviewed and evaluated on a case-by-case basis.

The AQMD permit requirements are specified in Rules 201 and 203, with permit exemptions specified in Rule 219. Generally, turning of a pile or windrow using DMV-registered motor vehicles does not require a permit. On-site equipment, such as dedicated mobile grinders and screeners, are already subject to permit from the District or ARB, but that is for the equipment or engine emissions only, not composting emissions. If a pile is aerated, the mechanical aeration system and its associated emission control device would require a separate permit for each.

### Source Testing

Under the proposed rule, all permitted emission control devices would be demonstrated through an approved source test for an overall control efficiency of at least 80 percent, by weight, for VOC and ammonia emissions, respectively. Source test needs to be conducted within three months after start-up of the device, or within nine months of permit approval, whichever occurs sooner, and every three years

thereafter. Existing device already tested would need to conduct future source tests every three years from the initial source test.

In the past, testing of biofilters has been recorded as costing several tens of thousands of dollars, but more recently there have also been full source tests performed for under \$10,000. These tests have been successfully approved by AQMD Source Testing and also successfully met the 80% requirements for VOC and ammonia. As an example of an acceptable test to demonstrate and comply with PR 1133.3, a recent test on a biofilter for ammonia, VOC, as well as speciation testing by Method TO-15 and reporting was conducted for ~\$10,000. Most of the past tests that have the higher cost were research oriented tests that involved several operating scenarios, were developing testing methods and techniques, were unique and difficult to test configurations, and/or included many samples with no compositing done of any of the samples. As the testing firms gained experience with biofilter testing, and as more testers have entered the market for competition, the testing costs have gone down. Additionally, through experience in assessing these processes, more effective methodologies have been developed for planning and executing testing.

Primary among the important factors responsible for adequate and lower cost testing is preliminary work to ensure representative samples, and the use of composite sampling. Biofilters tend, over time, to develop channeling and blockages to flow in certain areas. In order to account for these phenomena and to ensure that higher concentration areas, as well as lower, are not excluded in testing, biofilter surface area is divided into imaginary grids. The EPA "Measurement of Gaseous Emission Rates from Land Surfaces Using an Emission Isolation Flux Chamber User's Guide" provides equations that can be used to determine grid size and quantity of grid points. Using these points, screening is performed with a portable organic vapor analyzer to determine the concentration profile of the biofilter surface. Smoke testing can help to identify channeling also, though resolution is obviously more limited than organic analysis screening. With screening information, specific points can be included in the actual testing to ensure that testing is representative. Often times, this screening can be used to reduce the number of sampling locations as would otherwise be required by the EPA User's Guide requirements. Compositing several sample points into one pair of sample canisters or impingers succeeds in reducing lab testing cost. Also, in cases where biofilter inlet ducting flow rate can be determined by a routine Method 1-4 Pitot traverse, accuracy is increased while testing costs are decreased by eliminating the need for flux chamber sweep gas. These measures, taken together, ensure not only a representative sampling, but also cost efficiency.

#### Operation and Maintenance

All permitted emission control device should be installed, operated and maintained in accordance with the manufacturer's operation and maintenance manual or other similar written materials supplied by the manufacturer or distributor to ensure proper operating conditions.

Proper operation and maintenance would be required for an emission control system to ensure maximum emissions control. Installation, operation and maintenance should be in accordance with the manufacturer's operation and maintenance manual or other similar written guidelines supplied by the manufacturer or the distributor of an emission control device to ensure that the control device remains in proper operating condition.

### **Test Methods and Protocol**

For operations subject to the requirements of an air pollution control device, the operator of a greenwaste composting operation would be required to conduct all required source and laboratory tests using the Executive Officer approved test protocol developed in accordance with the guidelines provided in Attachment A of PR 1133.3. A District approved laboratory must be used for the associated tests.

### **Recordkeeping**

All operational and informational records, including operation and maintenance of the aeration and control system and source tests, should be maintained for the prior five years of operation, with the most recent two years retained at the facility, which shall be immediately available to the Executive Officer upon request. The remaining three years of records shall be made available to the Executive Officer within one week of request.

### **Exemptions**

- Composting facilities subject to Rule 1133.2 – Emission Reductions from Co-Composting Operations, are exempt from the provisions of this rule.
- If the operator of any greenwaste composting operation voluntarily installs an emission control device, the provisions of additional irrigation and the finished compost cover and associated recordkeeping requirements do not apply.
- To be consistent with exemptions in Rule 1133 – Composting and Related Operations – General Administrative Requirements, the following type of facilities and operations are exempt from the provisions of PR 1133.3, provided that the operator is not subject to the Local Enforcement Agency Notification or Permit regulations pursuant to Title 14 Division 7, Chapter 3.1, Section 17857.1 of the CCR:
  - Community composting
  - Nursery composting
  - Backyard composting
  - Recreational facility composting

## **EMISSIONS INVENTORY AND REDUCTIONS**

### **Affected Industry**

#### Chipping and Grinding Industry Sector

For the purpose of PAR 1133.1, chipping and grinding activity is defined as an activity that mechanically reduces the size of greenwaste, woodwaste, or foodwaste, using chippers and/or tub grinders. Chipping and grinding activities can be stand-alone

operations, or part of multi-operation facilities, such as a transfer station, a landfill, a material recovery operation, or a composting operation, that handle multiple incoming material streams with separate operating areas within the same facility.

Chipping and grinding facilities process greenwaste, which is mostly, collected from landscapers or from cities' curbside collection programs. Curbside greenwaste is collected from receptacles designed for residential household greenwaste, and is mainly composed of grass clippings and weeds and may also contain other putrescible wastes (e.g., foodwaste). Non-curbside greenwaste is greenwaste that is not collected from curbside programs and mainly contains tree trimmings and other landscaping greenwaste. For the purpose of PAR 1133.1, the large woody material of tree trimmings exceeding two inches in any dimension is considered woodwaste.

District staff worked closely with stakeholders and CalRecycle staff to estimate the number of facilities that have chipping and grinding operations. Table 1 shows the estimated number of chipping and grinding facilities. These facilities may be stand-alone facilities or co-located at MRFs, landfills or composting facilities.

There is a broad market for chipped or ground greenwaste where they can be used as mulch for landscaping, ADC at landfills, biofuels for energy production, feedstock for static pile or greenwaste composting operations, or bulking agents for manure and/or biosolids composting. All new and existing greenwaste chipping and grinding operations would be covered by PAR 1133.1. Agricultural chipping and grinding, woodwaste chipping and grinding, landclearing chipping and grinding, palm chipping and grinding, and portable chipping and grinding activities would continue to be exempt from PAR 1133.1 and thus would not be affected.

Table 1. Estimated Number of Chipping and Grinding Facilities

County	Number of facilities	Number of landfills (subset)	Estimated landfill ADC throughput <sup>1</sup> (subset) (tons)
Los Angeles	24	5	454,000
Orange	18	3	580,000
Riverside	17	3	103,000
San Bernardino	11	3	37,000
<b>Total</b>	<b>70</b>	<b>14</b>	<b>1,174,000</b>

<sup>1</sup> 2009 tons (source: Horowitz, CalRecycle).

Staff is appreciative of the input provided by the compost industry. Without adequate assistance from the compost industry stakeholders, staff would not be able to estimate or update the accurate greenwaste chipping and grinding throughput.

#### Greenwaste Composting Industry Sector

Staff developed an industry profile for the greenwaste composting operations based on several resources. Those resources include the SWIS database, District Rule 1133 Registration/Annual Update database, the District's Air Quality Notification Report, a District-wide composting survey (conducted in 2007), a supplemental questionnaire to

augment the 2007 survey, site visits, phone calls/emails to the facility operators, and personal communications with CalRecycle and LEA staff.

Staff conducted a survey of greenwaste composting operations in the South Coast jurisdiction in 2007. The survey was conducted as a tool to update the inventory for the greenwaste composting industry relying on the extension of Rule 1133 Facility Registration. Initially, the survey focused on the facility total incoming tonnage of green materials, along with operational practices (i.e., composting parameters). The surveyed facility total incoming throughput was 692,000 tons per year for 15 greenwaste composting facilities. The operational status of the facilities, the number of greenwaste composting facilities and actual throughput for greenwaste composting operations was refined for 2009–2010.

Currently, 17 facilities are identified as greenwaste composting facilities and their actual tons per year throughput for greenwaste composting are shown in Table 2. Actual greenwaste throughput for composting operations is about 416,300 tons for 2009–2010, which accounts for 58% of facility throughput totals for the same time period. About half of the 17 affected greenwaste composting facilities have multiple operations to produce materials other than compost, including, but not limited to, mulch, daily cover materials at landfills, biofuel for a biomass power generation facility, and palm feedstock.

Table 2. Number and Throughput of Affected Greenwaste Composting Facilities

County	Number of facilities	Facility throughput totals (tons/year)	Throughput for composting (tons/year)
Los Angeles	4	169,660	100,150
Orange	7	447,940	247,460
Riverside	4	93,220	60,830
San Bernardino	2	7,860	7,860
<b>Totals</b>	<b>17</b>	<b>718,680</b>	<b>416,300</b>

## Emissions Inventory and Reductions

The emissions inventory for greenwaste composting operations was developed based on the refined 2009–2010 activity data (i.e., actual annual throughput of greenwaste processed for composting) and baseline emission factors for windrow composting. The baseline emission factors for both VOC and ammonia were developed based on the emission tests conducted by the District, other air districts, and CalRecycle for greenwaste windrow composting operations.

Windrow composting baseline (uncontrolled) emissions are calculated for both the active and curing phases of composting, and thus emission factors used are 4.67 pounds per wet ton of throughput for VOC and 0.66 pounds per wet ton of throughput for ammonia, which includes emissions from the active and curing phases of composting. Total baseline emissions were then estimated by multiplying the total actual composting throughput by these emission factors. However, emission reductions were calculated only for the active phase of composting. Thus, emission factors for the active phase of

composting are 4.25 pounds per wet ton for VOC and 0.46 pounds per wet ton for ammonia. Emission reductions were calculated with the latter emission factors, as well as overall control efficiencies of mitigation measures.

Table 3 provides the emissions inventory for greenwaste composting operations, as well as the emission reductions anticipated with the implementation of PR 1133.3. Calculation details are explained in Appendix III. As shown in Table 3, greenwaste composting operations generate significant amount of VOC and fewer amounts of ammonia emissions in the Basin. Using the baseline VOC emission factors and assumed percent emission reductions with the use of surface irrigation and finished compost cover during the 15 day active phase period of the windrow composting process, 0.9 tons of VOC and 0.1 tons of ammonia are projected to be reduced daily.

Table 3. Emissions Inventory and Emission Reductions for Existing Greenwaste Composting Operations

	VOC	Ammonia
Emissions Inventory (tons/day)	2.66	0.38
Proposed Requirements <i>Windrow composting operations</i> (without emission control devices)	40% with compost cover and water combined	20% with compost cover and water combined
Emissions Reduction (tons/day)	0.88	0.05

**COST EFFECTIVENESS**

Cost effectiveness was analyzed, and is presented in Table 4, based on the total throughput of greenwaste processed for composting operations. Total compliance costs, being averaged per facility, are also presented. The cost effectiveness would be \$1,340 for ton of VOC-only emissions reduced and \$1,270 for ton of VOC and ammonia combined emissions reduced. This cost effectiveness was estimated based on the compliance costs calculated for finished compost cover and watering. According to the phone survey with the operators of affected composting facilities, some facilities use all potable water and the others use all reclaimed or canal or well water. The different costs of potable or reclaimed, or other water use were reflected in the cost effectiveness calculation. The total costs and assumptions used in this analysis are explained in detail in Appendix III. Costs are proportional to throughput of greenwaste processed and range from \$700 to ~\$200,000 per year depending on the facility. This figure is based on a compliance cost of \$1.15 per ton of processed throughput.

Table 4. Greenwaste Composting Average Cost Effectiveness

Composting throughput (Tons/year)	Number of facilities	Mitigation measure description	Total annual compliance costs (Avg. \$/year)	Cost effectiveness for VOC only (\$/ton)	Cost effectiveness for VOC & NH <sub>3</sub> (\$/ton)
416,300	17	Finished compost cover and watering combined	\$29,000	\$1,340	\$1,270

## INCREMENTAL COST EFFECTIVENESS

Health and Safety Code Section 40920.6 (a)(3) requires the calculation of incremental cost effectiveness for potential control options, when the District adopts “rules or regulations to meet the requirements for best available retrofit control technology (BARCT) pursuant to Sections 40918, 40919, 40920 and 40920.5, or for a feasible measure pursuant to Section 40914...” All of these referenced laws are contained in Chapter 10, which deals with district plans to “achieve and maintain state ambient air quality standards for ozone, carbon monoxide, sulfur dioxide and nitrogen dioxide...”

Incremental cost effectiveness is intended to measure the change in costs, in dollars per year, and emission reductions, in tons of VOC or ammonia reduced per year, between two progressively more effective control technologies. Incremental cost effectiveness examines additional costs and emission reductions that can be achieved by adding a second level of control to the primary control. Because the incremental reductions from the controlled source operations are typically low, incremental cost effectiveness produces a much higher cost-to-reduction ratio than the primary control and thus should not be compared to the cost effectiveness value. The use of an air pollution control device has long been conceptualized for composting involving foodwaste, but capital expenditures for low throughput facilities are cost-prohibitive. Therefore, staff proposes to require such controls for those facilities processing significant quantities of foodwaste (i.e., greater than 5,000 tons per year). No existing facility operations are expected to trigger this control requirement, although it should be noted that two facilities are known presently to be in preparation to receive foodwaste in excess of 5,000 tons per year, but those facilities are already planning on air pollution control device installation.

Incremental costs and emission reductions were examined between the windrow composting with combined mitigation measures of finished compost cover and watering, and an emission control device required if the facility receives more than 5,000 tons per year foodwaste and whose composting content exceeds 10 percent, by weight. A forced aeration system equipped with emission control is considered the typical emission control device for this comparison. The control device is assumed to have a lifetime of 10 years and an overall control efficiency of 80 percent. Incremental costs and emission reductions were calculated for an operation with 50,000 tons throughput per year. Incremental costs were calculated to be \$2,677,000 and incremental emission reductions were to be 420 tons (per 10 years) for VOC (480 tons for VOC and ammonia combined). Incremental cost effectiveness was then calculated to be \$6,600 per additional ton of VOC-only (\$5,700 per additional ton of VOC and ammonia combined). As opposed to absolute cost effectiveness of using finished compost cover and watering for this 50,000 tons throughput operation, which was \$1,340 per ton of VOC-only (\$1,270 per ton of VOC and ammonia combined), incremental cost effectiveness was more than four times higher. High increases are caused by relatively high cost increments, as opposed to the relatively small incremental emission reductions between the two control methods. Although \$6,600 per ton incremental cost effectiveness is in the range of other adopted rules, the operating margin for greenwaste composting facilities is relatively low and with the seemingly high capital expenditure required for control equipment, the use of controls

is not more widely proposed so as to not impact facility compliance/SB939 diversion goals.

## **ENVIRONMENTAL ASSESSMENT**

Pursuant to the California Environmental Quality Act (CEQA) and SCAQMD Rule 110, a Draft Environmental Assessment (DEA) has been prepared to analyze any potential adverse environmental impacts associated with PAR 1133.1 and PR 1133.3. The CEQA document was released for a 30 day public review and comment on June 2, 2011, and will be available at AQMD Headquarters, by calling the AQMD Public Information Center at (909) 396-2039, or by accessing AQMD's CEQA website at: [www.aqmd.gov/ceqa](http://www.aqmd.gov/ceqa). Close of the comment period is July 1, 2011.

## **SOCIOECONOMIC ASSESSMENT**

The Socioeconomic Analysis is being conducted and will be made available to the public at least 30 days prior to the Public Hearing.

## **COMPARATIVE ANALYSIS**

Health and Safety Code Section 40727.2 was added in 1997 as part of AB 1061 (Machado). The statute prescribes the analysis that needs to be conducted to support a statutory mandated finding of non-duplication, which must be made by the district board prior to adopting, amending, or repealing a rule. The analysis requires an identification of "all existing federal air pollution control requirements" including best available control technology (BACT) as well as "any existing or proposed [district] rules and regulations" that apply to the "same operations or source type" as proposed to be regulated by the rule. The District's analysis must also examine "all air pollution control requirements and guidelines" that the District is initially informed of by the public that also apply to the same operations or source type.

AQMD Rule 403 – Fugitive Dust establishes the amount of PM entrained in the air as a result of man-made activity capable of generating fugitive dust. While PM emissions have not been measured from composting and related operations (e.g., chipping/grinding, screening, storing, etc.), greenwaste chipping and grinding operations subject to PAR 1133.1 and greenwaste composting operations subject to PR 1133.3 will also need to comply with Rule 403.

AQMD Rule 1133 – Greenwaste and Related Operations – General Administrative Requirement, is applied to chipping/grinding and composting facilities. It establishes one-time registration, along with one-time registration fee, and annual update requirements. Therefore, PAR 1133.1 and PR 1133.3 facilities continue to comply with Rule 1133.

AQMD Rule 1133.1 – Chipping and Grinding Activities, establishes holding and processing time requirements for different types of greenwaste and foodwaste to prevent inadvertent decomposition. Current Rule 1133.1 currently allows holding times before

being chipped or ground of 3 days for curbside, 14 days for non-curbside, and 7 days for mixed. However, the rule only requires three-day retention time for curbside greenwaste after being chipped or ground, while there is no such holding time requirement for non-curbside and mixed chipped or ground greenwaste. PAR 1133.1 proposes to add the same 48 hours holding requirement all for curbside, non-curbside and mixed chipped and ground greenwaste.

AQMD Rule 1133.2 – Emission Reductions from Co-Composting Operations, is applied only to co-composting operations (biosolids and/or manure mixed with bulking agents). It establishes control requirements for new and existing co-composting facilities. Rule 1133.2 facilities and operations are exempt from the requirements of PR 1133.3.

PR 1133.3 will add new requirements, and no conflict with existing requirements is anticipated.

Other federal, state and local requirements have been summarized on pages 5–7 of this staff report. Table 5 compares PAR 1133.1 and PR 1133.3 with the most relevant requirements of CCR Title 14.

Table 5. Comparison of State Regulation and District Proposed Rules

Title 14, CCR, Chapter 3.1 – Composting Operations Regulatory Requirements			PAR 1133.1		PR 1133.3	
Article 1.	General		Subdivisions	(a) Purpose, (b) Applicability & (c) Definitions	Subdivisions	(a) Purpose, (b) Applicability & (c) Definitions
Section 17850	Scope (c)	Establishes standards and regulatory requirements for intentional and inadvertent composting resulting from the handling of compostable materials, IBNLT feedstock, compost, or chipped and ground materials	Purpose (a)	Prevent inadvertent decomposition occurring during chipping and grinding activities, <i>including stockpile operations</i>	Purpose (a)	Reduce fugitive emissions of VOC and ammonia occurring during greenwaste composting operation
			Applicability (b)	Operators of chipping and grinding activities to produce materials other than active or finished compost	Applicability (b)	Operators of all new and existing greenwaste CST operations that produce active or finished compost from greenwaste only or greenwaste in combination with manure or foodwaste
Definitions Section 17852	Active compost (a)(1)	Compost feedstock: <ul style="list-style-type: none"> <li>• Generating T at <math>\geq 122</math> deg F; or</li> <li>• Releasing CO<sub>2</sub> <math>\geq 15</math> mg/g compost/day, or the equivalent of O<sub>2</sub> uptake</li> </ul>	Definitions: Active compost (c)(1)	<ul style="list-style-type: none"> <li>• Material in the process of being rapidly decomposed and is biologically unstable</li> <li>• Generates T at <math>\geq 122</math> deg F</li> <li>• IBNLT pathogen-reduced mulch</li> </ul>	Definitions: Active compost (c)(1)	<ul style="list-style-type: none"> <li>• Material in the process of being rapidly decomposed and is biologically unstable</li> <li>• Generates T at <math>\geq 122</math> deg F</li> <li>• IBNLT pathogen-reduced mulch</li> </ul>
	Chipping and grinding operations and facilities (a)(10)	An operation or facility that: <ul style="list-style-type: none"> <li>• Do <u>not</u> produce compost; or</li> <li>• Mechanically reduces the size; or otherwise</li> <li>• Engages in the handling of compostable material</li> </ul>	Chipping and grinding (c)(3)	Any activity that mechanically reduces the size of greenwaste, woodwaste, and/or foodwaste	Active phase (c)(2)	Phase of the greenwaste CST process that: <ul style="list-style-type: none"> <li>• Begins when organic waste materials are mixed together for composting; and</li> <li>• Lasts at least 22 days under controlled conditions, or</li> <li>• Until the compost has a SMI of 5 or higher</li> </ul>
	(a)(10)(A)1.	Handles only material, excluding manure, allowed at a green material composting op. or fac. set forth in 17852(a)(22)		N/A		N/A
	(a)(10)(A)2.	<ul style="list-style-type: none"> <li>• Each load of green material is removed from the site within 48 hrs of receipt</li> <li>• The EA may allow a site to keep it on-site for up to 7 days</li> </ul>		Refer to PAR 1133.1 Requirements		Refer to PR 1133.3 Requirements
	(a)(10)(B)	If the contaminant limits in 17852(a)(21) are exceeded, shall be regulated as set forth transfer/processing requirements		N/A		N/A
	(a)(10)(C)	If green material remains on-site for >48 hrs, shall be regulated as a compostable material handling operation or facility		N/A		N/A
	Compostable material (a)(11)	Any organic material that when accumulated will become active compost			Greenwaste composting (c)(13)	<ul style="list-style-type: none"> <li>• Composting of greenwaste by itself; or</li> <li>• Mixture with foodwaste or with up to 20% manure, by volume</li> </ul>
	Compostable material handling operation or facility (a)(12)	An operation or facility that: <ul style="list-style-type: none"> <li>• Processes, transfers, or stores compostable material, resulting in controlled biological decomposition</li> <li>• Handling includes composting, screening, chipping and grinding, and storage activities related to the production of compost, compost feedstocks, and chipped and ground materials</li> </ul>			Composting (c)(6)	A process that solid organic waste materials are decomposed in the presence of oxygen through the action of bacteria and other microorganisms

Table 5. Comparison of State Regulation and District Proposed Rules (continued)

Title 14, CCR, Chapter 3.1 – Composting Operations Regulatory Requirements			PAR 1133.1		PR 1133.3	
Article 1.	General (cont'd)		Subdivision	(c) Definitions	Subdivision	(C) Definitions
Definitions Section 17852	Curing (a)(13)	Final stage of the composting process: <ul style="list-style-type: none"> <li>Occurs after compost has undergone pathogen reduction &amp; after most of the readily metabolized material has been decomposed and stabilized</li> </ul>	Finished compost (c)(7)	Humus-like material that results from the controlled biological decomposition of organic waste materials and is biologically stable	Finished compost (c)(10)	<ul style="list-style-type: none"> <li>Humus-like material that results from the controlled biological decomposition of organic waste materials and is biologically stable</li> <li>Both active and curing phases are required</li> </ul>
	Disposal (a)(15)(A)	Stockpiling of: <ul style="list-style-type: none"> <li>Compostable material onto land for a combined period of time &gt; 6 mos., or agricultural and green material for 12 mos. on prime agricultural land</li> </ul>		N/A	Curing phase (c)(7)	Phase of the greenwaste CST process that: <ul style="list-style-type: none"> <li>Begins immediately after the end of the active phase of composting; and</li> <li>Lasts at least 40 days; or</li> <li>Until the compost has a SMI of 7; or</li> <li>Product respiration rate is &lt; 10 mg of O2 consumed per g of VS per day as measured by direct respirometry</li> </ul>
	(a)(15)(B)	Does <u>not</u> include the use of compostable material for ADC at a solid waste landfill (Title 27, section 20680)		N/A		N/A
	(a)(15)(C)	Does not include land application of compostable organic material Land application – application of compostable material (excl. food or mixed solid waste) to forest, agricultural, and range land, I/A/W CDFR requirements for beneficial uses		N/A		N/A
	Feedstock (a)(19)	<ul style="list-style-type: none"> <li>Any compostable material used in the production of compost or chipped and ground material IBNLT agricultural material, green material, food material, biosolids, and mixed solid waste</li> <li>Additives or amendments are not considered feedstocks</li> </ul>	Stockpile (c)(17)	<ul style="list-style-type: none"> <li>A supply of raw material tipped and stored prior to be utilized on-site or removed from the site</li> <li>Raw materials before and after chipping and grinding are also included</li> </ul>		N/A
	Food material (a)(20)	Any material that: <ul style="list-style-type: none"> <li>Was acquired for animal or human consumption</li> <li>Is separated from the municipal solid waste stream</li> <li>Does not meet the definition of “agricultural material”</li> <li>May include material from food facilities [H&amp;SC 113785], grocery stores, institutional cafeterias or residential food scrap collection</li> </ul>	Foodwaste (c)(8)	<ul style="list-style-type: none"> <li>Any food scraps collected from the food service industry, grocery stores, or residential food scrap collection</li> <li>Includes food scraps that are chipped and ground</li> </ul>	Foodwaste (c)(11)	<ul style="list-style-type: none"> <li>Any pre- &amp; post-consumer food scraps collected from the food service industry, grocery stores, or residential food scrap collection</li> <li>Includes chipped and ground food scraps</li> <li>Non-food materials (either compostable or non-compostable) are considered foodwaste for calculating throughput, if not separated from food scraps</li> </ul>

Table 5. Comparison of State Regulation and District Proposed Rules (continued)

Title 14, CCR, Chapter 3.1 – Composting Operations Regulatory Requirements			PAR 1133.1		PR 1133.3	
Article 1.	General (cont'd)		Subdivision	(c) Definitions	Subdivision	(C) Definitions
	Green material (a)(21)	Any plant material that is: <ul style="list-style-type: none"> <li>Separated at the point of generation</li> <li>Contains no greater than 1% of physical contaminations, Wt.</li> <li>IBNLT yard trimmings, untreated wood wastes, natural fiber products, and C&amp;D wood waste</li> <li>Does <u>not</u> include food material, biosolids, mixed solid waste, material processed from commingled collection, wood containing lead-based paint or wood preservative, mixed construction or mixed demolition debris</li> </ul>	Curbside greenwaste (c)(5)	<ul style="list-style-type: none"> <li>Collected from receptacles designated for residential household greenwaste</li> <li>Screened curbside greenwaste containing only grass clippings, leaves, and/or twigs that is not considered non-curbside greenwaste as defined in paragraph (c)(11)</li> </ul>		
			Mixed greenwaste (c)(10)	Curbside greenwaste comingled with non-curbside		
			Non-curbside greenwaste (c)(11)	<ul style="list-style-type: none"> <li>Any greenwaste <u>not</u> collected from receptacles designated for residents</li> </ul>		
			Compost overs (c)(5)	<ul style="list-style-type: none"> <li>Oversized woody materials that do not decompose in a typical composting cycle and are screened out of finished product at the end of composting</li> <li>Have been through pathogen reduction process outlined in the Title 14, Section 17868.3</li> </ul>	Compost overs (c)(7)	<ul style="list-style-type: none"> <li>Oversized woody materials that do not decompose in a typical composting cycle and are screened out of finished product at the end of composting</li> <li>Have been through pathogen reduction process outlined in the Title 14, Section 17868.3</li> </ul>
	Green material composting op. or fac. (a)(22)	An operation or facility that: <ul style="list-style-type: none"> <li>Composts green material, additives, and/or amendments</li> <li>May also handle manure or paper products</li> </ul>		N/A		N/A
	Wood waste (a)(42)	Solid waste consisting of wood pieces generated from: manufacturing or production of wood products, harvesting, processing or storage of raw wood materials, or C&D activities	Woodwaste (c)(16)	Lumber, and the woody material portion (> 2 inches) of mixed demolition and construction wastes, tree trimmings, branches, tree trunks, stumps, and limbs	Woodwaste (c)(25)	Lumber, and the woody material portion (> 2 inches) of mixed demolition and construction wastes, tree trimmings, branches, tree trunks, stumps, and limbs
	Yard trimmings (a)(43)	Any wastes generated from the maintenance or alteration of public, commercial or residential landscapes IBNLT yard clippings, leaves, tree trimmings, prunings, brush, and weeds	Greenwaste (c)(7)	<ul style="list-style-type: none"> <li>Any organic waste material generated from gardening, agriculture, or landscaping activities IBNLT grass clippings, leaves, tree and shrub trimmings, and plant remains</li> <li>Includes curbside, non-curbside, and mixed greenwaste</li> </ul>	Greenwaste (c)(12)	Any organic waste material generated from gardening, agriculture, or landscaping activities IBNLT grass clippings, leaves, tree and shrub trimmings, and plant remains

Table 5. Comparison of State Regulation and District Proposed Rules (continued)

Title 14, CCR, Chapter 3.1 – Composting Operations Regulatory Requirements			PAR 1133.1		PR 1133.3	
Article 2.	Regulatory Tiers for Composting Operations and Facilities		Subdivisions	(f) Exemptions	Subdivisions	(g) Exemptions
Section 17854	Composting materials handling facility permit	All compostable materials handling activities shall obtain a Compostable Materials Handling Facility Permit		N/A		N/A
Section 17855	Excluded activities	<ul style="list-style-type: none"> <li>• Agricultural material derived on-site and used on-site</li> <li>• Vermicomposting</li> <li>• Mushroom farming</li> <li>• Handling of green material, feedstock, additives, amendments, compost, or chipped and ground material, if:                             <ul style="list-style-type: none"> <li>○ ≤ 500 cy is on-site at any one time;</li> <li>○ Compostable materials* are generated on-site; and</li> <li>○ ≤ 1,000 cy of materials are either sold or given away annually</li> </ul> </li> <li>* Compostable material may include up to 10% food, vol.</li> <li>• Handling of compostable materials, if:                             <ul style="list-style-type: none"> <li>○ The activity is co-located at a facility (i.e. landfill or transfer/processing facility) that has a tiered or full permit as defined section 18101; etc.</li> </ul> </li> <li>• Non-commercial composting with &lt; 1 cy food material generated and used on-site</li> <li>• Storage of bagged products (≤ 5 cy) from compostable material</li> <li>• Within-vessel composting process &lt; 50 cy capacity</li> <li>• Beneficial use of compostable materials IBNLT:                             <ul style="list-style-type: none"> <li>○ Slope stabilization, weed suppression, ADC, and similar uses, determined by the LEA</li> <li>○ Land application [Food &amp; Ag. Code 14501]</li> <li>○ Reclamation projects [Public Rescr. Code 2770]</li> </ul> </li> </ul>	Exemptions (f)	<ul style="list-style-type: none"> <li>• Exempt from (d)(2) through (d)(4):                             <ul style="list-style-type: none"> <li>○ C/G activities of greenwaste derived from the site and utilized on-site, provided &lt; 1,000 cy of material is sold or given away</li> <li>○ Portable, agricultural, landclearing, woodwaste, and palm C/G activities</li> </ul> </li> <li>• Chipped and ground curbside greenwaste: Exempt from the requirements of paragraph (d)(2) provided that the MC is &lt; 30%, measured I/A/W subdivision (e) and the MC measurements are maintained on-site in accordance with subparagraph (d)(4)(E)</li> <li>• The operator of a landfill or biomass power generation facility: Exempt from the requirements of paragraph (d)(6), provided that the operator does not perform C/G of greenwaste on-site</li> <li>• The operator of a biomass power generation facility or a facility to produce biofuel for a biomass power generation facility: Exempt from (d)(2), provided T is &lt; 122 deg F. or MC is &lt; 30%, measured I/A/W subdivision (e) and the MC measurements are maintained on-site in accordance with subparagraph (d)(4)(E)</li> </ul>	Exemptions (g)	<ul style="list-style-type: none"> <li>• Co-composting facilities (Rule 1133.2)</li> <li>• If the operator of any greenwaste composting operation installs a forced aeration system including an emission control device, I/A/W paragraphs (d)(3) through (d)(6), the provisions of paragraph (d)(2) do not apply</li> <li>• The following types of facilities and operations, provided that the operations are not subject to the LEA Notification or Permit regulations pursuant to Title 14 Section 17851.1:                             <ul style="list-style-type: none"> <li>○ Community composting;</li> <li>○ Nursery composting;</li> <li>○ Backyard composting; and</li> <li>○ Recreational facility composting</li> </ul> </li> </ul>

Table 5. Comparison of State Regulation and District Proposed Rules (continued)

Title 14, CCR, Chapter 3.1 – Composting Operations Regulatory Requirements			PAR 1133.1		PR 1133.3	
Article 2.	Regulatory Tiers for Composting Operations and Facilities (cont'd)		Subdivision	(d) Requirements	Subdivision	(d) Requirements
Section 17857.1	Green material composting operations and facilities	<ul style="list-style-type: none"> <li>• EA Notification requirements:                             <ul style="list-style-type: none"> <li>○ Has up to 12,500 cy feedstock, compost, or chipped and ground material on-site at any one time</li> <li>○ Inspection at least once every 3 months</li> </ul> </li> <li>• Compostable Materials Handling Facility Permit:                             <ul style="list-style-type: none"> <li>○ Has &gt; 12,500 cy of feedstock on-site at any one time</li> </ul> </li> </ul>		N/A		N/A
	Food material	Must have a composting operation or a transfer station permit to receive food material (per Horowitz, CalRecycle)		N/A		N/A
			Foodwaste (d)(1)	Cannot take it unless allowed by the LEA to handle foodwaste	Foodwaste (d)(1)(B)	<ul style="list-style-type: none"> <li>• Use foodwaste for on-site composting within 48 hours of receipt, or</li> <li>• Covered with screened or unscreened finished compos until used, unless otherwise required by the LEA</li> </ul>
Section 17862.1	Chipping and grinding operations and facilities	<ul style="list-style-type: none"> <li>• EA Notification requirements:                             <ul style="list-style-type: none"> <li>○ Receives up to 200 tpd</li> </ul> </li> <li>• Registration Permit:                             <ul style="list-style-type: none"> <li>○ Receives &gt; 200 tpd and up to 500 tpd</li> </ul> </li> <li>• Compostable Materials Handling Facility Permit:                             <ul style="list-style-type: none"> <li>○ Receives &gt; 500 tpd</li> </ul> </li> <li>• A chip/grind operation is <u>not</u> subject to 17868.1 through 3</li> <li>• If a chip/grind operation exceeds 1% contamination limits, it shall be regulated as set forth in Transfer/Processing Regulatory requirements</li> <li>• If a chip/grind operation stores material for &gt; 48 hrs, the site shall be regulated as a green material handling operation or facility</li> </ul>	Curbside, non-curbside, and mixed greenwaste (d)(2)	Chip or grind and utilize on-site, or remove from the site within 48 hours of receipt, unless otherwise allowed by the LEA to hold for a longer period of time	Greenwaste (d)(1)(A)	Chip or grind, as necessary, and use for on-site composting within 48 hours of receipt, unless otherwise allowed by the LEA to hold for a longer period of time

Table 5. Comparison of State Regulation and District Proposed Rules (continued)

Title 14, CCR, Chapter 3.1 – Composting Operations Regulatory Requirements			PAR 1133.1		PR 1133.3	
Article 8	Composting Operation and Facility Records		Subdivisions	(d) Requirements and (e) Moisture Content	Subdivision	(f) Recordkeeping
Section 17869	General record keeping requirements	<p>All compostable materials handling operations and facilities shall record the following:</p> <ul style="list-style-type: none"> <li>• Any special occurrences encountered during operation and methods used to resolve problems</li> <li>• Any public complaints, including:                             <ul style="list-style-type: none"> <li>○ The nature of the complaint;</li> <li>○ The date the complaint was received;</li> <li>○ The name, address, and ph.# of the complainer; and</li> <li>○ Any actions taken to respond to the complaint</li> </ul> </li> <li>• The quantity and type of feedstock received and quantity of compost and chipped/ground material produced</li> <li>• Keep all records in one location and accessible for 5 years and available for inspection by authorized representatives during normal working hours</li> <li>• The number of load checks and loads rejected</li> <li>• All test results IBNLT metal contaminations, fecal coliforms/Salmonella sp. Densities, T measurements, &amp; dates of windrow turnings                             <ul style="list-style-type: none"> <li>○ Retain records detailing pathogen reduction methods</li> </ul> </li> <li>• Any serious injury to the public occurring on-site and any complaint of adverse health effects to the public attributed to operations</li> </ul>	Record-keeping (d)(3)	<ul style="list-style-type: none"> <li>• Maintain all the operational records for the prior 5 yrs. of operation, with the most recent 2 yrs. retained at the facility, which shall be immediately available upon request by the EO</li> <li>• Remaining 3 yrs. of records shall be made available to the EO within 1 week of request</li> </ul>	Record-keeping (f)	<ul style="list-style-type: none"> <li>• Keep in a format approved by the EO</li> <li>• Maintain all operational records and information for the prior 5 years – the most recent 2 yrs. on-site and the remaining 3 yrs. available within 1 week of request</li> </ul>
			Records (d)(4)	<p>Maintain the following on-site for 2 years:</p> <ul style="list-style-type: none"> <li>• (A) AQMD registration and annual updates</li> <li>• (B) Date, type, and amount of greenwaste and/or foodwaste received</li> <li>• (C) Date, type, amount of greenwaste and/or foodwaste removed from the site location where they are transferred to</li> <li>• (D) Dates of rainy days and wet weather conditions and description of specific conditions that limited normal operations</li> <li>• (E) T or MC measurements</li> <li>• (F) Dates and amount of curbside greenwaste chipped and ground</li> </ul>		
			N/A	<p>Rainy days and wet weather conditions (d)(5)</p>	<p>Time requirements in paragraph (d)(2) may be extended by the number of rainy days and wet weather conditions that impede normal chipping and grinding operations provided that records are maintained in accordance with subparagraph (d)(4)(D)</p>	
	N/A	<p>Moisture content measurement (e)</p>	<ul style="list-style-type: none"> <li>• Determine by collecting at least 10 samples of chipped and ground greenwaste from various locations of the pile</li> <li>• At a depth of at least 12 inches below pile surface</li> <li>• Mix thoroughly and analyze for moisture content by ASTM method D4442, ASTM method D4444 or ASTM method E871-82</li> </ul>			

Table 5. Comparison of State Regulation and District Proposed Rules (continued)

Title 14, CCR, Chapter 3.1 – Composting Operations Regulatory Requirements			PAR 1133.1	PR 1133.3
Article 6.	Composting Operation Standards			
Section 17867	General requirements	<ul style="list-style-type: none"> <li>• Random road checks;</li> <li>• Traffic flow and human access control;</li> <li>• Post legible signs at public entrances;</li> <li>• Fire prevention and control measures;</li> <li>• Ventilation of enclosed operations and facilities;</li> <li>• Leachate control;</li> <li>• Attendant on duty during business hours/open to public;</li> <li>• Prevent human injury, etc.</li> </ul>	N/A	N/A
Article 7.	Environmental Health Standards			
Section 17868.3	Pathogen reduction	<ul style="list-style-type: none"> <li>• Operators that produce compost shall ensure the following:                             <ul style="list-style-type: none"> <li>○ Enclosed or within-vessel, active compost:                                     <ul style="list-style-type: none"> <li>– Maintain T at ≥ 131 deg F for 3 days</li> </ul> </li> <li>○ Windrow composting, active compost:                                     <ul style="list-style-type: none"> <li>– Maintain T at ≥ 131 deg F for 15 days or longer</li> <li>– Minimum of 5 turnings</li> </ul> </li> <li>○ Aerated static pile, active compost:                                     <ul style="list-style-type: none"> <li>– Cover with 6–12 inches of insulating material</li> <li>– Maintain T at ≥ 131 deg F for 3 days or longer</li> </ul> </li> </ul> </li> <li>• Alternative, equivalent pathogen reduction method</li> <li>• Monitoring during the pathogen reduction period:                             <ul style="list-style-type: none"> <li>○ Each day, at least one T reading per every 150 ft windrow, or for every 200 cy of active compost                                     <ul style="list-style-type: none"> <li>– 12–24 inches below the pile surface for windrow composting</li> <li>– 12–18 inches below the point where the insulation cover meets the active compost for aerated static pile</li> </ul> </li> </ul> </li> </ul>	N/A	N/A

**Acronyms:**

ADC: alternative daily cover

CCR: California Code of Regulations

CDFA: California Department of Food and Agriculture

C&D: construction and demolition

CDI: construction, demolition, and inert

C/G: chipping and grinding

CST: composting

EO: Executive Officer

I/A/W: in accordance with

IBNLT: includes, but is not limited to; or including, but not limited to

LEA: Local Enforcement Agency

MC: moisture content

PAR: Proposed Amended Rule

PR: Proposed Rule

SMI: Solvita Maturity Index®

T: temperature

## **DRAFT FINDINGS UNDER THE CALIFORNIA HEALTH AND SAFETY CODE**

Before adopting, amending or repealing a rule, the California Health and Safety Code requires SCAQMD to adopt written findings of necessity, authority, clarity, consistency, non-duplication, reference, and problem, as defined in Health and Safety Code §§ 40727 and to promote the attainment or maintenance of state or federal ambient air quality standards pursuant to Health and Safety Code Section 40001(c). The draft findings are as follows:

**Necessity** – The SCAQMD Governing Board has determined that a need exists to adopt Proposed Amended Rule 1133.1 – Chipping and Grinding Activities, and Proposed Rule 1133.3 – Greenwaste Composting, to ensure best management practices to prevent inadvertent decomposition during operations related to greenwaste material handling, including chipping and grinding, and to reduce emissions occurring from composting, including ozone and PM precursors.

**Authority** – The SCAQMD Governing Board obtains its authority to adopt, amend, or repeal rules and regulations from Health and Safety Code §§ 39002, 40000, 40001, 40440, 40702, 40725 through 40728.

**Clarity** – The SCAQMD Governing Board has determined that Proposed Amended Rule 1133.1 – Chipping and Grinding Activities, and Proposed Rule 1133.3 – Greenwaste Composting, is written and displayed so that the meaning can be easily understood by persons directly affected by it.

**Consistency** – The SCAQMD Governing Board has determined that Proposed Amended Rule 1133.1 – Chipping and Grinding Activities, and Proposed Rule 1133.3 – Greenwaste Composting, is in harmony with, and not in conflict with or contradictory to, existing statutes, court decisions, federal or state regulations.

**Non-duplication** – The SCAQMD Governing Board has determined that Proposed Amended Rule 1133.1 – Chipping and Grinding Activities, and Proposed Rule 1133.3 – Greenwaste Composting, does not impose the same requirements as any existing state or federal regulation, and the proposed rule is necessary and proper to execute the powers and duties granted to, and imposed upon, the SCAQMD.

**Reference** – In adopting this proposed rule, the SCAQMD Governing Board references the following statutes which the SCAQMD hereby implements, interprets or makes specific: Health and Safety Code Sections 40001 (rules to achieve ambient air quality standards); and 40440(a) (rules to carry out the AQMP); 40440(c) (cost-effectiveness).

**Problem** – The SCAQMD Governing Board has determined that, pursuant to Health and Safety Code Section 40001(c), there is a problem that Proposed Amended Rule 1133.1 – Chipping and Grinding Activities, and Proposed Rule 1133.3 – Greenwaste Composting, will alleviate, that is harmonizing greenwaste material handling with that of the California Code of Regulations, Title 14, and preventing emissions from composting operations through the use of best management practices.

## CONCLUSIONS

The proposed rules reflect reasonable, cost-effective mitigation measures for reductions in VOC and ammonia emissions from chipping and grinding, and greenwaste composting operations.

The proposed amendments to Rule 1133.1 would generate negligible compliance costs because they reflect existing requirements in Title 14 of the CCR. Although the proposed amendments are more restrictive than existing Rule 1133.1, there would be no impacts, as the changes codify what the operators are doing now to comply with CCR, Title 14 requirements as enforced by the LEA.

Compliance costs associated with the implementation of PR 1133.3 would include the O&M costs for applying one-time finished compost and additional watering to compost piles during the first 15 days of the active phase of composting. Costs for potable and reclaimed water, and labor were considered. Capital cost for the equipment to apply finished compost cover was not considered as such equipment already exists at the facilities. Total annual O&M costs range from \$700 per facility to \$200,000 per facility with a facility average of \$29,000 per year. The compliance cost per ton of throughput is \$1.15 per ton for adding an initial finished compost cover and watering before each turning.

Implementation of PR 1133.3 is estimated to reduce 0.9 tons of VOC and 0.1 tons of ammonia per day from 17 existing greenwaste composting facilities. Overall average cost effectiveness would be approximately \$1,270 per ton of VOC and ammonia combined emissions reduced (or \$1,340 per ton of VOC-only emissions reduced).

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## APPENDIX I – COMPOSTING PROCESS

This appendix describes basic steps and management requirements for greenwaste composting operations. This part of the document includes discussion on the definition of composting, the typical greenwaste composting operation, and operating parameters of composting conditions taken into consideration for efficient composting operation.

Composting is a biological process where microorganisms decompose organic materials under controlled environments. The readily available nutrients of the feedstock materials are consumed by microorganisms. Microorganisms use carbon for energy and growth while nitrogen is essential for protein and reproduction. As a result of the decomposition by the microorganisms, the feedstock is reduced to about one-half of the original volume. Figure I-1 describes the composting process. In order for the microorganisms to function properly, enough moisture and oxygen are required, as well as a balance of nutrients.

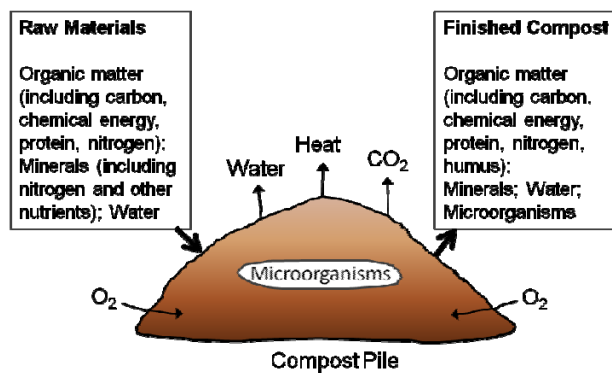


Figure I-1. Composting Process<sup>1</sup>

Greenwaste composting consists of three stages: preprocessing, processing and postprocessing. Figure I-2 presents the flow of a typical greenwaste composting process.

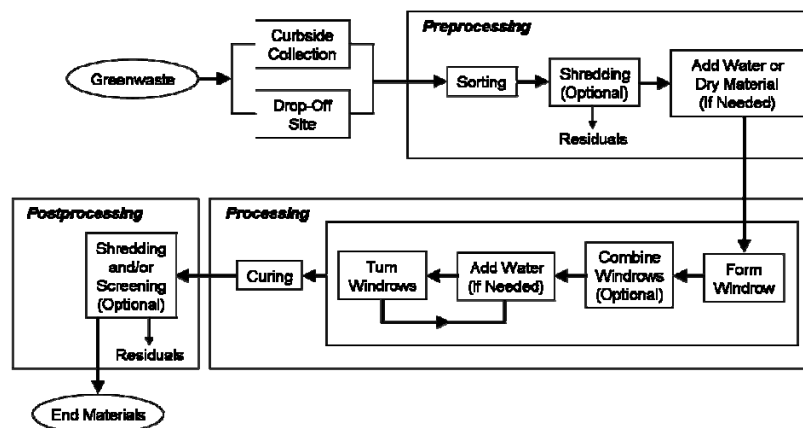


Figure I-2. Flow of Typical Greenwaste Composting Operation<sup>2</sup>

The preprocessing stage involves sorting and shredding (grinding and chipping) greenwaste collected and unloaded. After being preprocessed, greenwaste undergoes active composting during which thermophilic microorganisms (or thermophiles) decompose the readily available nutrients. The curing stage takes place when materials are stable, and the remaining nutrients are further degraded by mesophilic microorganisms (or mesophiles) that are still present. The finished compost may be screened again before use as a soil amendment or conditioner during the postprocessing stage.

### Preprocessing Stage

1. The green materials should be first screened to get rid of uncompostable materials, such as plastic bags, and shredded to allow a large surface area on which the microorganisms can consume nutrients quickly and easily. The size of the shredded materials, however, should be large enough so as not to pack the materials too tightly, which limits the movement of air through the pile and thus may result in anaerobic conditions<sup>2</sup>. Although the material size varies, it generally ranges from 0.125 inch to 3.0 inches.
2. Once screened and shredded, water is added to the greenwaste to obtain the preferred moisture content of 40% – 60%<sup>2-7</sup>. If the pile is too wet, dry materials are added to decrease the moisture content or aeration is provided to evaporate excess water that may result in anaerobic conditions.

### Processing Stage

3. The feedstock is formed into windrows (for the turned windrow system). The ideal height of the windrow is 5–6 feet to allow the composting materials to be insulated properly but to prevent the buildup of excessive heat inside the pile. Windrow heights vary, however, based on the feedstock, the season, the region where the composting operation is being conducted, the tendency of the materials to compact, and the turning equipment used<sup>2</sup>. Thus, windrows with leaves and tree trimmings tend to have larger pile dimensions than windrows of grass clippings with leaves. Windrow widths are generally twice the height of the pile.
4. Once windrows are formed, the active composting begins. Active composting is characterized by high temperature, high level of oxygen demand and high evaporation rates due to temperature. There are several factors that need to be controlled to optimize rapid, efficient microbial decomposition of greenwaste.
  - a. Temperature. During the active composting, thermophiles play a dominant role in decomposing organic materials, which results in heating within the windrow. When the internal windrow temperatures exceed above 150 degrees Fahrenheit, most thermophiles will die and the rate of decomposition decreases. Thus, it is necessary to maintain temperatures between 110 and 150 degrees Fahrenheit for microbial activities by turning the windrows to remove excess heat. Maintaining temperatures between 120 and 140 degrees Fahrenheit is generally preferred. According to literature<sup>2, 8, 9</sup>, the interior of composting windrows should be maintained at 131

degrees Fahrenheit for at least three days for pathogen destruction and to kill weed seeds. The California Integrated Waste Management Board (CIWMB) Regulations Title 14, Division 7, Chapter 3.1, Section 17868.3 (Pathogen Reduction) requires temperatures during active composting to be maintained at 131 degrees Fahrenheit or higher for 15 consecutive days for pathogen reduction.

- b. Nutrients. The balance of the nutrients should be properly maintained for optimum composting. Too much grass clippings (i.e., high nitrogen content) tend to cause an anaerobic composting condition because of its high demand for oxygen, which results in greatly reducing the composting rate. The excess nitrogen may evolve as ammonia gas, leading to odor problems and loss of nitrogen in the compost. As a result, the internal windrow temperatures do not rise high enough, composting slows down, and uncompleted compost can be produced. If there are too little grass clippings but much woody materials (i.e., high carbon content), the composting process also slows down due to lack of adequate nitrogen. Therefore, it is necessary to balance the carbon and nitrogen. A carbon to nitrogen (C:N) ratio ranging from 25:1 to 40:1 is reasonable for initial conditions, with a recommended C:N ratio of 30:1 for active composting<sup>1, 3, 5, 9, 11</sup>. C:N ratio decreases as decomposition proceeds and the ratio in the finished compost is below 20:1.

Table I-1 lists some materials commonly used in making compost. A mix of one part grass to three parts leaves by volume is generally recommended for rapid composting. A volumetric ratio of one part wood chip: two parts leaves: one part grass is also good.

Table I-1. Commonly Used Raw Compost Materials<sup>1, 8, 10-14</sup>

Material	Characteristic	C:N Ratio
<b>Bulking Agents</b>		
- Wood Chips	• Low Moisture	700:1
- Sawdust	• High Porosity	500:1
- Wheat Straw	• Low Nitrogen	100-150:1
- Corn Stalks		60:1
- Leaves (Dry), Grass Hay		80:1
<b>Energy Materials</b>		
- Grass Clippings	• High Moisture	12-20:1
- Fresh Dairy, Chicken Manure	• Low Porosity	15-18:1
- Garden Trimmings	• High Nitrogen	19:1
<b>Balanced Raw Materials</b>		
- Ground Tree and Shrub Trimmings	• Low to Medium Moisture	16-53:1
- Horse Manure and Bedding	• Medium Porosity	25-50:1
- Deciduous Leaves	• Medium Nitrogen	40:1
- Legume Hay		25:1

- c. Oxygen. The feedstock should be maintained with a reasonable oxygen concentration for optimized microbial decomposition. Volatile organic compounds (VOCs) and ammonia (NH<sub>3</sub>) are produced during the anaerobic decomposition of greenwaste. To maintain aerobic composting conditions, windrows are turned with a front-end loader or a Scarab. The frequency of turning is determined by the windrow size, feedstock composition, stage of decomposition and moisture content, and is adjusted so aerobic conditions are maintained, not providing too much aeration, which can dry out the pile and impede composting. The suggested range of oxygen content is generally above 5 percent.
  - d. Acidity/Alkalinity. It is common for the pH of the feedstock materials to become slightly acidic (i.e., down to 5.0) during the early stage of composting due to organic acid formation. The pH then begins to rise to near neutral conditions (6.5–8.0), and the composting process is relatively insensitive to pH within this range. If the pH reaches 9, nitrogen is converted to ammonia and becomes unavailable to organisms, resulting in a decomposition process that is too slow.
  - e. Moisture. According to several composting manuals<sup>2-7, 9</sup>, 40–60 percent of moisture content is reasonable for the optimum composting conditions throughout the process. If the moisture level drops below about 40%, the nutrients are no longer in an aqueous medium and are not easily available to the microorganisms. Their microbial activity then decreases, and the composting process slows. For very dry leaves, 20 gallons of water is required for each cubic yard of leaves. At a moisture level greater than 60 percent, porosity of the windrow decreases and air movement through void spaces will be impeded, which results in anaerobic conditions.
  - f. Material Size. Since decomposition occurs on material surfaces, degradability can be improved by reducing the material size (which increases surface area) as long as porosity is not a problem. Good results are usually obtained when the material sizes range from 0.5 inch to 2.0 inches on average diameter.
5. The windrows are turned as frequently as required responding to the conditions within the composting windrows, and water is added when needed. Infrequent and pre-scheduled turning can develop odor problems. Internal windrow temperatures should be monitored daily, and windrows need to be turned when temperatures reach a predetermined point. Turning the piles increases the rate of decomposition by mixing materials and exposing new surface areas. The active composting phase should last at least 22 days. Completely processing greenwaste with frequent turning may take two to four months. Based on the District staff report for Rule 1133.2<sup>9</sup>, 80 percent of VOC and 50 percent of NH<sub>3</sub> emissions are released during the 22-day active composting phase.
  6. Once the greenwaste has been composted, curing should take place and the windrow no longer heats when being turned. During the curing stage, compost is stabilized as the remaining available nutrients are metabolized by the microorganisms that are still present, and the need for oxygen and the evaporation rates decrease. While the curing stage may

take another several weeks, it should last at least 40 days during which 20 percent of VOC and 50 percent of NH<sub>3</sub> emissions are released<sup>9</sup>.

### Postprocessing Stage

- Compost may be analyzed to ensure the stabilization is complete. Compost also can be tested for chemical or pathogen contamination and tested to determine nutrient levels, cleansed of unwanted materials, sorted by size, size-reduced, blended with other materials, stored, and/or bagged.

Table I-2 summarizes troubleshooting and management guide for greenwaste composting.

Table I-2. Troubleshooting and Management Guide for Composting Conditions<sup>6</sup>

Condition	Possible reason	Other clues	Remedy
Windrow fails to heat	Materials too dry	Cannot squeeze water from material	Add water
	Materials too wet	Moisture content greater than 60%	Add dry amendment or remix
	Not enough nitrogen	C:N ratio greater than 50:1	Add high-nitrogen ingredients
	Poor structure	Pile settles quickly	Add bulking agent
	Cold weather and small pile size	Windrow height less than 3.5 feet	Enlarge or combine windrows; add highly degradable ingredients
	pH excessively low	pH less than 5.5	Add lime or wood ash and remix
Temperature falls consistently over several days	Low oxygen	Temperature declines gradually	Turn windrow
	Low moisture	Cannot squeeze water from material	Add water
Uneven temperatures or varying odors in windrow	Poorly mixed materials	Visible differences in the pile moisture	Turn or remix windrow
	Uneven airflow	Visible differences in the pile moisture	Remix windrow
	Materials at different stages of maturity	Temperature varies along the pile length	None required
Pile does not reheat after turning	Composting nearing completion	Approaching expected composting time period; adequate moisture level; C:N ratio less than 20:1	None required
	Low moisture	Cannot squeeze water from materials	Add water and remix

Table I-2. Troubleshooting and Management Guide (continued)

Condition	Possible reason	Other clues	Remedy
Pile overheating (temperature greater than 150 °F)	Insufficient aeration for heat removal	Pile is moist	Turn pile
	Moderate to low moisture	Pile feels damp	Add water
	Pile is too large	Height great than 8 feet	Decrease the pile size
Extremely high temperature (greater than 170 °F in pile)	Spontaneous combustion	Low moisture content; pile interior looks or smells charred	Decrease pile size; maintain proper moisture content; add water to charred sections; break down pile, combine with other piles
High temperature or odors in curing or storage pile	Compost is not stable	Short active composting period; temperature and odor change after mixing	Manage pile for temperature and odor control; turn piles as needed; limit pile size
	Piles are too large	Height greater than 8 feet; width greater than 20 feet	Decrease pile size
Ammonia odor coming from composting piles	High nitrogen level	C:N ratio less than 20:1	Add high carbon amendments
	High pH	pH greater than 8.0	Avoid alkaline ingredients
	Slowly available carbon source	Large woody particles; C:N ratio less than 30:1	Increase the carbon proportion
Odors generated only after turning	Odorless raw materials	High temperatures	Frequent turnings; increase porosity; add odor-adsorbing amendment
	Insufficient aeration; anaerobic interior	Falling temperatures	Shorten time interval between turnings; increase porosity
Foul odor coming from composting piles continually	Anaerobic conditions Materials too wet	Low temperature	Add dry amendments
	Poor structure		Add bulking agent
	Pile compacted		Remix pile and add bulking agent if necessary
	Insufficient aeration	High temperature	Turn pile more frequently
	Anaerobic conditions Pile too large		Decrease the pile size
	Airflow uneven or short circuiting		Remix pile; change recipe

Table I-2. Troubleshooting and Management Guide (continued)

Condition	Possible reason	Other clues	Remedy
Fly or mosquito problems	Flies breeding on compost piles	Flies hover around piles	Turn piles every 4 to 7 days
	Flies breeding in raw materials	Wet raw materials stored on site more than 4 days	Handle raw materials promptly
	Mosquito breeding in stagnant water	Standing puddles of water	Grade site properly
Compost contains clumps of materials and large particles; texture is not uniform	Poor mixing of materials or insufficient turning	Original raw materials discernible in compost	Screen compost; improve initial mixing
	Airflow uneven	Wet clumps of compost	Screen or shred compost
	Raw materials contain large particles and non-degradable or slowly degradable materials	Large, often woody, particles in compost	Screen compost; grind and/or sort raw materials
	Active composting not complete	Curing piles heat or develop odors	Lengthen composting time or improve composting conditions

## Summary

Greenwaste composting is defined by an aerobic decomposition of green material by microorganisms. Temperature, moisture content, and oxygen level are key parameters that need to be controlled throughout the composting process to prevent anaerobic decomposition, which may result in emissions of NH<sub>3</sub> and VOCs that play an important role in forming secondary particulate matter and ozone in the atmosphere.

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## APPENDIX II – EMISSION CONTROL TECHNOLOGY

This section summarizes advanced emission control technologies that are associated with requirements of PR 1133.3. Advanced emission control technologies are engineered control methods that include a covered aerated static pile (ASP) composting system. These systems are commercially available and can be deployed by vendors. Brief descriptions of each system are given below. Inclusion of these vendors in this report does not imply or serve as an endorsement of any vendor or product by the District.

### Negative ASP System with Emission Controls

One of the covered ASP systems is the AC Composter™ and CompDog™ (pipe-less aeration system)<sup>1</sup>, a covered negative-pressure ASP with biofilter provided by Engineered Compost Systems (ECS). A brief operational principle of this system follows. Once the feedstock mix is ready for placement in a windrow, an inflatable tube is laid down where middle of the pile will be located. The mixed feedstock is then placed over the tube using a wheeled front-end loader, allowed to settle around the tube for 12 to 24 hours, and covered with a waterproof tarp following the insertion of monitoring probes. The probes are linked to a computer to monitor temperature and do not have moisture sensors on them. The computer is capable of adjusting the air pressure to maintain proper aerobic composting conditions. After the compost settles, the inflatable tube is deflated and removed from the pile, creating a ventilation tunnel through the pile. The tunnel is then closed at one end by filling it with feedstock from the pile and a ventilation pipe is inserted into the other end. The pipe is connected to a blower that produces a negative air pressure, pulling air into the pile from the outside through small holes in the tarp. As air is being drawn through the piles, it is sent to a biofilter composed of moist wood chips and compost. Pulled air is mixed with ambient air to reduce the temperature of the exhaust air. As the air rises through the biofilter, it removes contaminants and odors through microbial action prior to releasing back to the atmosphere. Figure II-1 shows an enclosed negative ASP with biofilter composting system.



Figure II-1. Covered Negative-pressure ASP with Biofilter System

While the active composting process has three phases of approximately two-week period, the duration of each phase could be flexible. The first pile will compost for two weeks. At that end,

the tarp is removed and the pile is turned using a wheeled front-end loader into a new zone. Once the first pile is moved to the second zone, the tarp and probes are placed again. This action occurs every two weeks over a six-week period. When the composting process is completed at the end of the sixth week, the finished compost may be relocated to a designated area for curing, as appropriate, for an additional four to eight weeks. All phases are covered and aerated, and the exhaust air is vented to the biofilter.

### **Positive ASP System without Biofilter**

The other type of covered ASP systems is the covered positive-pressure ASP using a triple layer membrane compost cover. Since this type of technology pushes air into the pile, it does not need a biofilter. One kind of this covered, positive-pressure ASP technology is W.L. GORE & Associates' GORE® Cover composting system<sup>2</sup>. The GORE® Cover utilizes composting with forced aeration coupled with a semi permeable membrane cover over the compostable pile. The piles are the same size in each of the three Phases. GORE® Covers are used only in Phase I and II and are optional for Phase III. Each pile may have a concrete head wall to retain the material in each pile on the compost pad. Two aeration trenches are under each pile. These trenches serve as ducts to provide air to the pile and also to collect leachate coming from the pile. Each pile has a blower to provide air to the composting material via the aeration trenches. The trenches are cast in concrete to provide a solid impervious surface. The entire compost pad consists of a concrete slab or asphalt, which allows for the collection and separation of all storm water and leachate.

The total composting process takes approximately eight (8) weeks. The compost pad is divided into three sections: Phase I (high rate composting), Phase II (maturation) and Phase III (finishing). Material remains in the Phase I section for 4 weeks, followed by 2 weeks in the Phase II section and 2 weeks in the Phase III section. As the composting process proceeds, the volume of material and mass of material is reduced through composting losses.

After a pile is built, the GORE® Cover is placed over the entire pile. A mobile winding machine for installation and removal of the cover is available. Once the cover is installed and secured in place, a weighting system (sand or water filled pipes) are placed at the edge of the cover and fixed in position to make an enclosed system. Stainless steel temperature and oxygen probes are installed through the cover into the composting material. The blowers are controlled by a Programmable Logic Controller (PLC) to optimize the composting process using readings from temperature and oxygen sensors under the cover. All data is collected in real time for monitoring and reporting purposes. Figure II-2 shows the general configuration of the GORE® Cover compost system.

The GORE® Cover membrane is laminated between two polyester layers that selectively influence the treatment process. The membrane laminate technology protects the compostable material from the penetration of rainwater and yet allows naturally occurring carbon dioxide produced during the composting process to escape. In addition, a fine film of condensation develops on the inside of the tarp covers during the composting process, suppressing odors and other gaseous emissions. These gases are partly dissolved in the film of water and drop back into the compostable material where they continue to be broken down by beneficial bacteria. The micro-porous structure of the GORE® Cover prevents the final product from being too wet, yet

at the same time ensures that there is sufficient moisture retained to allow the material to be decomposed.

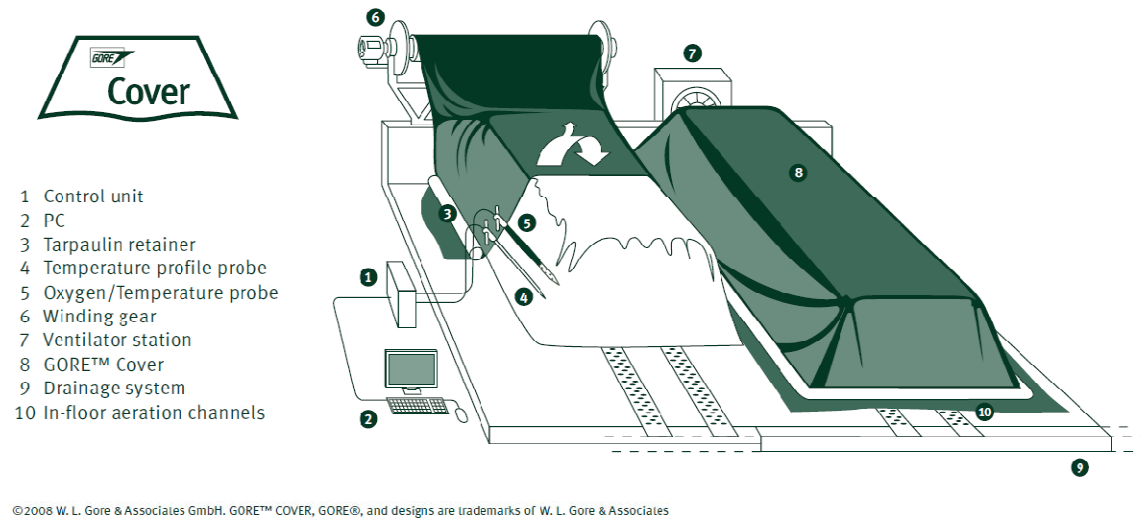


Figure II-2. GORE® Cover System Configuration

Another kind of this covered, positive-pressure ASP technologies is Managed Organic Recycling (MOR) composting cover system<sup>3</sup>. The MOR compost cover keeps odor, heat, microorganisms and some moisture contained, while releasing oxygen, bits of carbon monoxide and some moisture. This complex cover material allows the covered piles to be controlled with a blower fan, connected to a ventilated air hose snaking beneath the pile. The fan is necessary since the pile should never be cooler than 110 or warmer than 160 degrees Fahrenheit. The MOR compost cover allows airflow to be decreased if the pile is not hot enough or increased if the pile begins getting too warm. This is done by adjusting the fan output using a torque timer. A torque timer can be set so the fan blows air throughout the pile every ten minutes and then stays off for ten minutes before turning on again. The timer can be adjusted to the setting that works best for the pile. The pile size, ingredients used, weather and life of the pile will dictate the most suitable settings for a specific pile. Figure II-3 presents an example of MOR compost cover system.



Figure II-3. Covered Positive-pressurized MOR Compost Cover

## References

1. Engineered Compost Systems (ECS), [www.compostsystems.com/ac\\_composter.html](http://www.compostsystems.com/ac_composter.html), accessed in 2010.
2. GORE® Cover, [www.gore.com/en\\_xx/products/fabrics/swt/index.html](http://www.gore.com/en_xx/products/fabrics/swt/index.html), accessed in 2010.
3. Managed Organic Recycling, Inc., [www.morcompost.com](http://www.morcompost.com), accessed in 2010.

## APPENDIX III – EMISSION REDUCTIONS AND COST EFFECTIVENESS

### Emission Factors

Baseline emission factors were developed based on the emissions source tests conducted by the SCAQMD, the state and other air districts from 2001 to 2009 for greenwaste composting windrows. The following emissions test results were used in developing the baseline emission factors.

Table III-1. Emission Tests Used to Develop the Baseline Emission Factors

Test facility	Location	Season samples taken	Test year	Jurisdiction
Inland Empire Composting Facility	Colton	Fall	2001	SCAQMD
Inland Empire Composting Facility	Colton	Winter	2001	SCAQMD
Jepson Prairie Organics (JPO) Compost Facility	Vacaville	Summer	2005	Yolo-Solano (YS) AQMD
Modesto Compost Facility	Modesto	Fall	2006	CIWMB
Site X	Central Valley	Spring	2008	SJVAPCD
Zamora Compost Facility	Zamora	Spring	2009	YSAQMD

Staff reviewed the emissions source test results in Table III-1, and recommended as many of the emissions test results as possible to be included in developing the baseline composting emission factors that represent the types of composting that takes place in the South Coast jurisdiction. Prior District emission factors included emissions from stockpiles, static piles and windrow composting combined. For PR 1133.3, VOC and ammonia emissions only from static pile and windrow composting operations were considered in developing baseline emission factors to calculate the emissions inventory. Static pile composting is a composting technique that is characterized by the absence of turning. The material is placed into piles where it decomposes over an extended period of time with no or little mixing. Oxygen supply is passive; warm air leaving the pile at the top is replaced by air entering from the outside of the pile at the bottom. Composting is slow in static piles, and is often used to kill weed seeds prior to a land application, such as spreading on agricultural land.

Table III-2 shows windrow composting emission factors calculated from various emissions test data. Two Inland (SCAQMD) tests data were measured over the static and windrow phase compost piles, and other test data were measured over the active and curing phase compost piles. Note that there are differences between the Inland data and other air districts' data. The District's Inland tests data can be considered as a snap shot of emissions because the calculation is based on tests conducted on specific days of the composting period. Other air districts' test data were also measured on specific days during a full composting cycle and then total cumulative emissions were calculated for the full cycle period (days not sampled were interpolated). The Inland data has been included as it is relevant local data. Using daily composting throughput, emission factors were weighted to calculate composite emission factors.

Table III-2. Composting Emission Factors

Site	Sampling age of material	Season samples taken	Throughput (tons/day)	VOC (lbs/wet ton)	Ammonia (lbs/wet ton)
Inland	Over the static and windrow phase	Winter	307	1.56	0.26
Inland		Fall	350	2.25	0.63
Modesto	Over the active and curing phase (days not sampled were interpolated)	Fall	103	0.85	Not Available
Site X		Spring	200	6.30	2.34
JPO		Summer	163	5.65	0.24
Zamora		Spring	319	10.03	0.445
<b>Weighted average emission factors</b>				<b>4.67</b>	<b>0.66</b>

VOC emissions profiles were examined for greenwaste emission source tests conducted at Modesto, Zamora and JPO greenwaste compost facilities. Emission source tests have shown that a vast majority (~90 percent) of VOC emissions are produced during the first 22 days of greenwaste composting (i.e., active phase) and about 70 percent of ammonia emissions emanate from the active phase period of greenwaste composting. VOC emissions tend to increase immediately after greenwaste is chipped or ground, typically with peaks during three to seven days, and then decrease sharply over time. Such emissions profiles are shown in Figures III-1 and III-2. Based on the cumulative emissions of VOC and ammonia during the active phase, it is assumed that VOC emissions during the active composting phase account for 91 percent of total cumulative emissions and ammonia emissions account for 70 percent of total cumulative emissions, respectively. Overall, the District's proposed greenwaste composting operations emission factors are shown in Table III-3. For PR 1133.3, the total composting emission factors during the active and curing phase were used to refine the baseline (uncontrolled) emissions inventory. However, emission reductions and cost effectiveness were calculated using the active phase emission factors only, since the proposed mitigation measures are required only for the first 15 days of the active phase period of composting.

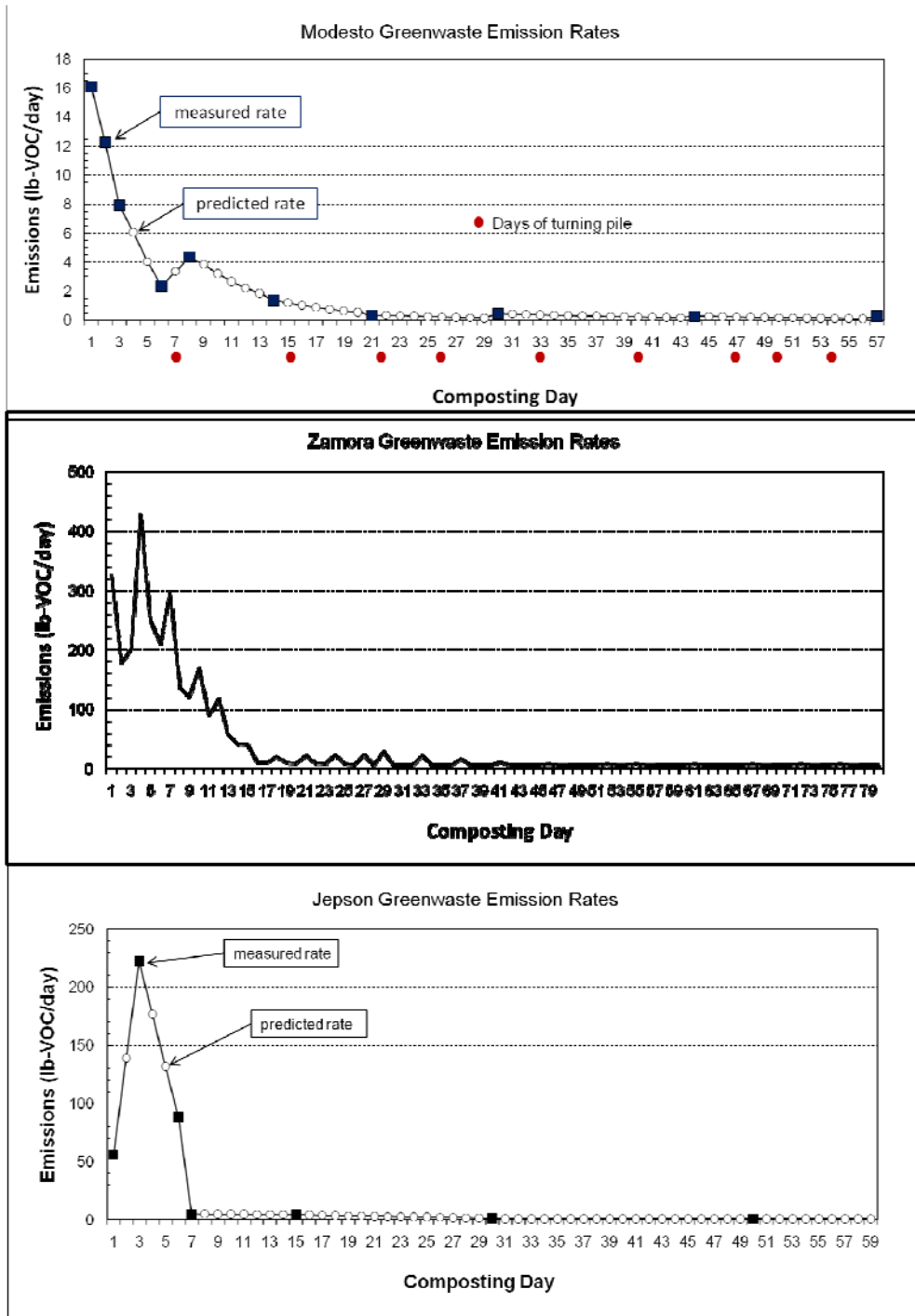


Figure III-1. VOC Emissions Profile for Greenwaste Composting.

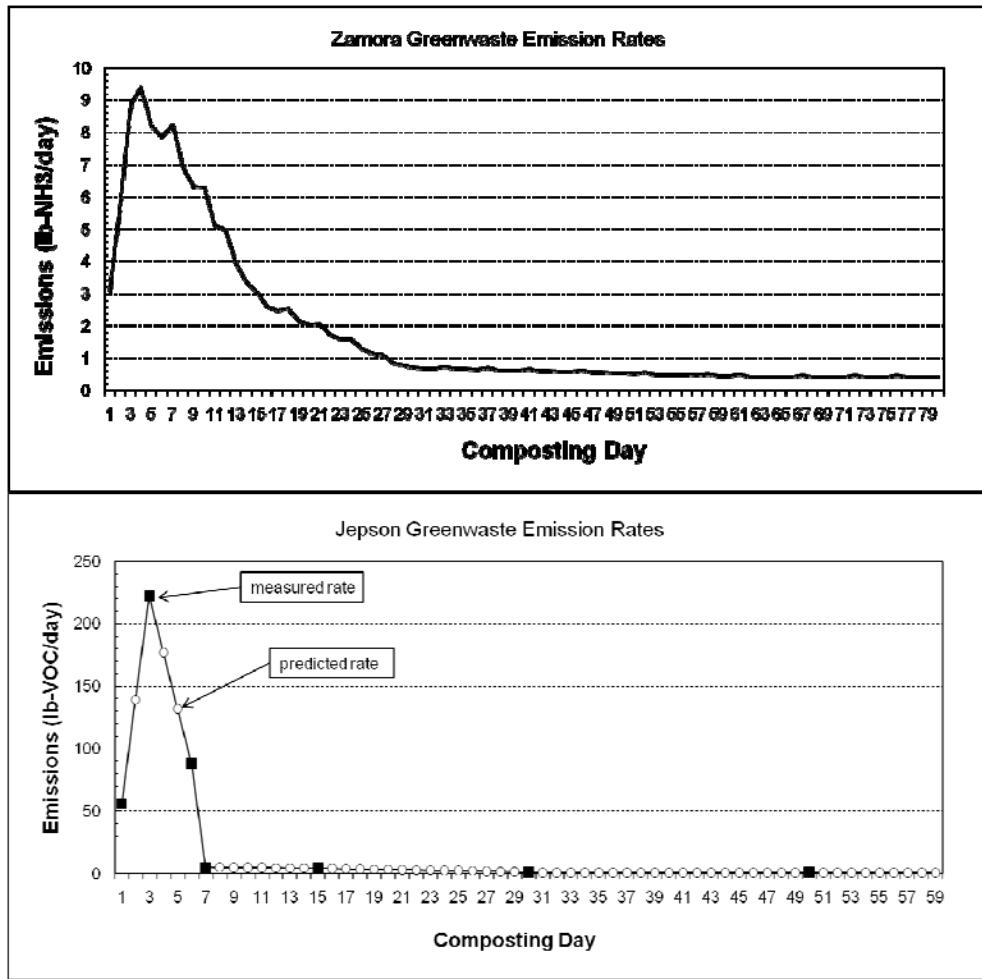


Figure III-2. Ammonia Emissions Profile for Greenwaste Composting.

Table III-3. Greenwaste Composting Baseline Emission Factors (EF)

	Windrow composting EF (lbs/wet ton)		Total composting EF (lbs/wet ton)
	Active phase	Curing phase	
VOC	4.25	0.42	<b>4.67</b>
Ammonia	0.46	0.20	<b>0.66</b>

### Emissions Inventory

Emissions can occur during chipping and grinding activities, stockpiling of chipped or ground greenwaste, and composting of chipped or ground greenwaste. Emissions during chipping and grinding have not been quantified as no data are available. Emissions during stockpiling are quantifiable, but are not quantified for the purpose of this rulemaking. PR 1133.3 requires removing the material from the site within 48 hours of receipt, unless otherwise allowed by the LEA to hold for a longer period of time, which is consistent with the Title 14 requirement. Staff determined that there would be no emission reductions from stockpiling operations because the

proposed holding time requirement has already been established in the state regulation. Composting emissions of chipped or ground greenwaste at facilities solely subject to PR 1133.3 are quantifiable using composting throughput and the composite emission factors estimated in the previous section.

Initially 15 facilities were identified from a survey for greenwaste composting industry staff conducted in 2007 in the South Coast region. Operational status has been updated for 2009–2010. Two facilities were found to be out of business and four facilities were added. Seventeen facilities have been identified as subject to PR 1133.3. Baseline emissions inventory was developed using the baseline emission factors (i.e., total composting EF in Table III-3) and actual throughput of greenwaste processed for composting operations for these 17 facilities. Table III-4 shows the baseline emissions inventory profile for these facilities.

As a whole, based on 365 days per year, the greenwaste composting operations produce approximately 2.66 tons of VOC emissions per day and 0.38 tons of ammonia emissions per day.

Table III-4. Greenwaste Composting Baseline Emissions Inventory

Total throughput (tons/year)	Composting emission factor (lbs/wet ton)		Baseline composting emissions (tons/year)	
	VOC	Ammonia	VOC	Ammonia
416,300	4.67	0.66	972	137
<b>Total emissions in tons per day</b>			<b>2.66</b>	<b>0.38</b>

Among the existing 17 greenwaste composting facilities, 12 facilities produce annual VOC emissions from windrow composting operations exceeding the ten tons per year potential-to-emit threshold for major sources as defined in District Rule 3001 relative to Clean Air Act, Title V, requirements. However, as windrow composting is not permitted and emissions are fugitive in nature, Title V does not apply in this case. The largest greenwaste composting facility is estimated to emit ~450 tons of VOC per year from windrow composting operations.

## Emission Reductions

PR 1133.3 would require mitigation measures, such as finished compost cover and water irrigation during the first 15 days of the active phase composting. The SJVAPCD contracted with San Diego State University for a study investigating mitigation measures for compost emissions reduction. The San Diego State University team conducted tests at the Tulare Composting and Biomass Facility in Tulare, CA. Mitigation measures tested included water irrigation and finished compost cover. Water irrigation was tested on an active phase composting windrow and showed 24 percent reductions in VOC emissions during the 22 days active phase composting period. Another greenwaste pile was tested with finished compost cover. Finished compost was applied to the pile such that the top is six inches thick, after initial pile formation and after each turning during the active phase composting, and showed 53 percent reductions in VOC emissions. In an earlier Modesto compost study, about 75 percent VOC reductions were achieved with six inches of finished compost cover. However, unlike the Tulare mitigation measure study in which the finished compost cover was applied repeatedly after turning during the 22 days active phase composting, finished compost cover was applied after

the initial pile formation and after the first turning only for the first 14 days of the active phase composting in the Modesto study. Therefore, District staff concluded that the SJVAPCD's test results of control efficiency (i.e., 53 percent) would be more reflective of the control over the active phase composting period involving multiple turnings.

PR 1133.3 would require the operator to apply finished compost cover to the peak of the pile so that the top is six inches thick during the first seven days after initial pile is formed, and then to apply water to the top half of the pile so that the top three inches of the pile is wet during the following eight days, which constitutes a total of the first 15 days of the active phase of composting. VOC emissions during the first 15 days of the active phase composting accounted for the majority (~87 percent) of total VOC emissions from composting. Weighted average control efficiency was calculated by multiplying cumulative emissions and control efficiencies of mitigation measures, as shown in Table III-5. The three different VOC emissions profiles shown in Figure III-1 and the two different ammonia emissions profiles shown in Figure III-2 were used in calculating the weighted average control efficiency.

Table III-5. Weighted Average Control Efficiency for VOC and Ammonia

Active phase composting	VOC emissions rate (%)				Control efficiency	
	Modesto	Zamora	JPO	Average	Mitigation measures	Composite - VOC
First 7 days	61	59	89	70	53% - compost cover	41%*
Following 8 days	24	24	4	17	24% - watering	
15 days total	85	83	93	87		
* Compost cover for the first 3 days and watering for the following 12 days yield 31% efficiency.						
Active phase composting	Ammonia emissions rate (%)				Control efficiency	
	Modesto	Zamora	JPO	Average	Mitigation measures	Composite - NH <sub>3</sub>
First 7 days	N/A	36	26	31	53% - compost cover	23%^
Following 8 days	N/A	28	28	28	24% - watering	
15 days total	N/A	64	54	59		
^ Compost cover for the first 3 days and watering for the following 12 days yield 17% efficiency.						

Staff obtained site-specific information about the pathogen reduction process from greenwaste composting facilities. About half of the composting throughput begins the pathogen reduction process immediately after the initial pile is formed. Composite control efficiency for VOC and ammonia was calculated to be 31 and 17 percent, respectively. The site-specific control efficiency data were also used in calculating emission reductions that are shown in Table III-6.

In summary, the following facts and assumptions were made to calculate emission reductions:

1. The existing facilities have open composting pile or windrow operations which have no emissions control device;
2. The VOC emissions factor for the active phase of the composting process is 4.25 lbs/ton of greenwaste throughput;
3. The VOC emissions factor for the curing phase of the composting process is 0.42 lbs/ton of greenwaste throughput;
4. The ammonia emission factor for the active phase of the composting process is 0.46 lbs/ton of greenwaste throughput;

5. The ammonia emission factor for the curing phase of the composting process is 0.20 lbs/ton of greenwaste throughput;
6. The VOC emissions during the first seven days of the active phase period of composting process account for 70 percent of total cumulative emissions during the full composting cycle;
7. The VOC emissions during the following eight days of the active phase period account for 17 percent of total cumulative emissions during the full composting cycle;
8. The ammonia emissions during the first seven days of the active phase period of composting process account for 31 percent of total cumulative emissions during the full composting cycle;
9. The ammonia emissions during the following eight days of the active phase period account for 28 percent of total cumulative emissions during the full composting cycle;
10. The control efficiency of finished compost cover applied to the top of the active phase compost pile is 53 percent for VOC emissions based on the SJVAPCD's mitigation measure study;
11. The control efficiency of water irrigation on the active phase compost pile is 24 percent for VOC emissions, based on the SJVAPCD's mitigation measure study; and
12. The same control efficiencies of 24 percent with water irrigation and 53 percent with finished compost cover as for VOC emissions can be applied for ammonia emissions.

With regard to Assumption #12, the control efficiency with water irrigation and finished compost cover was not evaluated for ammonia in the original mitigation measures study. However, historically, District biofilter emissions test results have shown greater controls in ammonia emissions than VOC emissions. Finished compost is used as an element of biofilter media. Conservatively, finished compost cover was assumed to have the same 53 percent control for ammonia as was shown for VOCs. The 24 percent control with water irrigation was achieved with multiple water irrigation. Considering ammonia is a highly water-soluble gas, it was conservatively assumed that the water irrigation had the equivalent control efficiency for ammonia.

Staff calculated reductions based on 53 and 24 percent control efficiencies with the proposed applications in PR 1133.3. Emission reductions (ER) are calculated by multiplying baseline (uncontrolled) emissions by an overall control efficiency using the following equation. Uncontrolled emissions are calculated by multiplying the amount of composting throughout by an emission factor (EF).

$$ER \text{ (tons/yr)} = \left[ \frac{\text{Throughput (tons/yr)} \times EF \text{ (lbs/ton)}}{2000 \text{ (lbs/ton)}} \right] \times \text{Control Efficiency (\%)},$$

where EF is an emission factor for VOC or ammonia and control efficiency is an overall composite control efficiency. Since PR 1133.3 requires that the finished compost cover and watering are applied only for the first 15 days of the active phase period of composting process, the reductions during the curing phase of composting are considered to be zero.

Table III-6 presents that with the implementation of PR 1133.3, 0.9 tons of VOC and 0.1 tons of ammonia are anticipated to be reduced per day from the existing 17 greenwaste composting facility operations.

Table III-6. Greenwaste Composting Emission Reductions

Mitigation measures (Active phase only)	Throughput (tons/year)	Number of facilities	Baseline emissions (tons/day)		Composite control efficiency (%)		Emission reductions (tons/day)	
			VOC	Ammonia	VOC	Ammonia	VOC	Ammonia
Finished compost cover and water <sup>1</sup>	208,300	16	1.33	0.19	41%	23%	0.50	0.03
Finished compost cover and water <sup>2</sup>	208,000	1	1.33	0.19	31%	17%	0.38	0.02
<b>Total</b>	<b>416,300</b>	<b>17</b>	<b>2.66</b>	<b>0.38</b>			<b>0.88</b>	<b>0.05</b>

<sup>1</sup> 7 day retention prior to turning.

<sup>2</sup> 3 day retention prior to turning for pathogen reduction.

### Compliance Costs

Compliance costs of PR 1133.3 were estimated based on the proposed requirements of the rule. Under PR 1133.3, the operator of any greenwaste composting operation would be required to hold greenwaste materials no longer than 48 hours of receipt at the facility, unless otherwise allowed by the LEA to hold for a longer period of time. This requirement is to harmonize the holding time requirement of the state regulation, as well as to be consistent with PAR 1133.1, to prevent inadvertent decomposition occurring during an extended period of stockpile operation. Since the 48 hours removal requirement has already been established in the state regulation, there would be no compliance costs incurred with this material holding time requirement of PR 1133.3.

Compliance costs consist of one-time purchase costs of equipment and annual operation and maintenance (O&M) costs involving water irrigation and finished compost cover. PR 1133.3 requires only one time application of finished compost cover after an initial compost pile is formed. This can be done by existing equipment, such as a front-end loader or a skid loader, at the facility. Since facilities are assumed to already have turning machines for their composting operations, such as a wheeled front-end loader, additional purchase of such equipment is unnecessary and thus this equipment costs were excluded from this estimation. Therefore, compliance costs only involve annual operational costs for water irrigation and finished compost cover. For the worst case, it was assumed that water is applied five times to the compost pile.

Annual O&M costs would be incurred with the following proposed requirements:

- Six inches of finished compost cover to the top of the active phase compost piles; and
- Three inches watering to the top half of the active phase compost piles.

To estimate the annual O&M costs for each facility, the following assumptions were made:

1. Compost pile:
  - a. Is trapezoidal in shape
  - b. Is 16 feet wide, 7 feet high and 200 feet long
  - c. Has four cubic yards per ton pile density

2. The unit cost of the potable water irrigation is assumed to be \$0.40 per ton of throughput and the unit cost of the reclaimed water irrigation is assumed to be \$0.29 per ton of throughput with the following assumptions;
  - a. Water use:
    - i. Pile management at 50 percent moisture content corresponds to 45 percent average free air space
    - ii. Wet piles assumed to be 75 percent moisture content, which corresponds to 23 percent average free air space, therefore the change in free air space of 22 percent
    - iii. Amount of water applied for the worst case day to fill the free air space for a 3 inches pile depth corresponds to 19 gallons of water per ton throughput
    - iv. Total volume of annual water use for 5 times watering is approximately 37 million gallons for 17 existing greenwaste composting facilities
  - b. Potable water for non-residential/landscape purposes at a rate of \$793 per acre-foot water (reclaimed water for irrigation is at a rate of \$427 per acre-foot water)
  - c. 20 minutes are taken to irrigate 100 tons of windrow
  - d. Five turning events during the active phase
  - e. \$10 per hour labor rate for irrigation to a depth of three inches
3. The unit cost of the finished compost cover application is assumed to be \$0.79 per ton of throughput from the Modesto/Bakersfield study with the following assumptions;
  - a. 15 minutes application time per 110 feet length of windrow
  - b. \$180 per hour for equipment and operator with 50 percent overhead
  - c. One time application during the active phase
  - d. Four cubic yards per ton density

Staff calculated the potential water use associated with the requirement for water application to windrows before turning. Using the Science of Composting (E. Epstein, CRC Press, 1997), staff was able to derive the free air space in a composting pile relative to moisture content. Based on the data provided in the reference, staff identified that average composting moisture content of 50% has an average free air space of 45%. Under PR 1133.3, the piles are to have water applied to make the piles “wet” before turning. Based on comments received, “wet” material would have a moisture content of about 75%. According to the reference, this moisture content would have a free space of 23%. Assuming the material itself is saturated, the amount of water to be applied to make the material “wet” is represented by the difference in the moisture content (22%), thereby filling the free air space. Using the prescribed compost pile parameters, the maximum amount of water to be used in one year is approximately 37 million gallons. Using site specific information obtained from the 17 affected facilities, the worst case one-day water use would be about 106,000 gallons, of which ~55,400 gallons is potable and ~50,900 gallons is reclaimed or untreated well or canal water. It should be noted that the facilities currently use more than 50 million gallons of water and the operations may very well be adjusting the application times to accommodate the rule requirements. For example, watering the piles before turning as opposed to after could be employed thereby minimize additional water use. It should also be pointed out that watering is only required to the extent the top 3 inches is wet, which may not require water application at all depending on the time of year and climatic conditions.

Using the above assumptions and actual throughput, annual compliance costs are estimated as shown in Table III-7. Annual compliance cost and total annual cost are the costs averaged over all 17 affected facilities. Total annual compliance costs range from \$700 per facility to \$215,800 per facility with a facility average of \$29,000 per year. It should be noted that the compliance cost-to-throughput ratio for each affected facility is calculated to be up to \$1.15 per ton of throughput for adding an initial finished compost cover and watering before each turning (based on weighted water source cost of \$0.36 per ton and \$0.79 per ton of throughput for adding one time finished compost cover).

Table III-7. Compliance Cost Estimates and Proposed Rule Requirement

Throughput (tons/year)	Number of facilities	Annual compliance costs (Avg. \$/year)	Proposed rule requirement	Total annual costs (Avg. \$/year)
416,300	17	\$8,400	Finished compost cover	\$29,000
		\$20,600	Water irrigation	

### Cost Effectiveness

Cost effectiveness was calculated based on both VOC and ammonia combined emission reductions, and VOC-only emission reductions for windrow composting with finished compost cover followed by water irrigation.

Table III-8 summarizes greenwaste composting average cost effectiveness for VOC-only and for VOC and ammonia combined. Average cost effectiveness was estimated to be about \$1,340 for ton of VOC-only emissions reduced and about \$1,270 for ton of VOC and ammonia combined emissions reduced.

Table III-8. Greenwaste Composting Average Cost Effectiveness (C-E)

Throughput (tons/year)	Mitigation measures (Active phase only)	Total annual costs (Avg. \$/year)	Average C-E for VOC only (\$/ton)	Average C-E for VOC & Ammonia (\$/ton)
416,300	Finished compost cover and water combined	\$29,000	\$1,340	\$1,270

## APPENDIX IV – PUBLIC COMMENTS AND RESPONSES

This section summarizes comments received during the public comment period ending February 23, 2011 associated with a Public Workshop and California Environmental Quality Act (CEQA) Scoping Session for Proposed Amended Rule (PAR) 1133.1 and Proposed Rule (PR) 1133.3 that was held on February 9, 2011. 15 comment letters were received, including U.S. EPA, CARB, and CalRecycle. These comments were reflected in the revised rule proposal for which another working group meeting was held on May 10, 2011, after which nine additional comment letters were received. Staff response to verbal and written comments, including e-mails, are summarized below by proposed rule subdivisions to which individual comments are related. Similar comments on the same rule element were integrated into one single comment.

### February 23<sup>rd</sup> Public Workshop Comments (January 25, 2011 version of the rules)

#### US EPA Comments

- Comment #1: We recommend the environmental impact analysis for the PR 1133.3 include consideration of: 1) groundwater impacts where sprinkler irrigation is used; and 2) NO<sub>x</sub> and PM emissions that result from control measures.
- Response #1: Groundwater impacts and NO<sub>x</sub> and PM emissions by proposed control measures will be considered in the environmental impact analysis. The proposed rule would require mitigation measures using water irrigation and finished compost cover. Composting facilities already apply water to their compost piles to maintain moisture level and additional watering only applies to the first three inches of the pile depth before turning. Therefore, the impact of watering on the groundwater would be negligible. The finished compost cover would only be required one time after the initial pile is formed. According to staff analysis of diesel emissions, NO<sub>x</sub> and PM emissions, as well as water use from this rule implementation are under the CEQA daily threshold.
- Comment #2: Add a definition of the undefined term “finished compost.”
- Response #2: Definition of finished compost has been added.
- Comment #3: National policy discourages State Implementation Plan (SIP) provisions that allow AQMD discretion to independently modify SIP requirements (e.g., Clean Air Act Section 110(i), the Little Bluebook and 52 FR 45109, 11/24/87). EPA recommends that the discretion be further limited by specifying the procedures that will be used to verify compliance with this section or by specifying that alternative mitigation measures will be based on a test protocol that is approved AQMD, CARB “and” EPA.
- Response #3: Staff revised the rule language as recommended.

- Comment #4: PR 1133.1 requires maintaining records on-site for two years. To improve enforceability and greater consistency with Title V requirements, EPA recommends requiring that operators maintain these records for five years.
- Response #4: Staff revised rule language that the prior two year records should be maintained on-site and the remaining three year records would be available within one week of request (i.e., five years total).
- Comment #5: Please remove or better justify the 40-day limits in the definition of the curing phase of composting in PR 1133.3. California, for example, defines curing composting only by pathogen reduction, as described in California Code of Regulations (CCR) Section 17868.3, and after most of the readily metabolized material has been decomposed and stabilized. See CCR, Title 14, Section 17852(a)(13).
- Response #5: Definitions of the 22-day active composting and 40-day curing have already been established in District Rule 1133.2. These limits were supported by information found in EPA 503 regulations and other studies found in the literature of the Technology Assessment Report for Proposed Rule 1133 (dated March 22, 2002). Specifically, the 22- and 40-day limits are based on the source test conducted for odor emissions.
- Comment #6: In paragraph (c)(9) of PR 1133.3, foodwaste mixed with greenwaste is considered foodwaste. This seems to conflict with the meaning of foodwaste in (d)(1) and (d)(2). For example, if any mixture of greenwaste and foodwaste is considered foodwaste as indicated in (c)(9), then theoretically, “10% foodwaste, by weight” in (d)(1) and/or (d)(2) could contain up to 99% greenwaste. It may be helpful to distinguish between foodwaste (as defined in this section) and waste from food material.
- Response #6: The definition of foodwaste has been modified. The sentence that “Foodwaste mixed with greenwaste is considered foodwaste.” has been deleted.
- Comment #7: Please consider clarifying the term “periodic basis.” Also, per California state law, it would appear that the minimum turns needed during the composting cycle is five. Please consider including this requirement in the rule.
- Response #7: The term “turned windrow” has been removed from this rule and thus clarification is not needed. This rule no longer requires a specific type of composting system as a minimum requirement. The five times turning in the CCR is relative to pathogen reduction and may occur any time during the active or curing phase.
- Comment #8: Please specify in the rule the specific temperature parameters that will be used.
- Response #8: Temperature measurement is no longer required in this proposed rule. Rather, reference is made to temperature monitoring per CCR, Title 14.
- Comment #9: Please clarify the basis of source testing every two years in lieu of more frequent testing that is required of many other sources.
- Response #9: Although the cost of source testing is not as expensive as commented from the public, considering those comments on the source testing frequency, staff

revised the frequency from every two years to every three years. This would be consistent with existing permitting practice.

Comment #10: Please clarify whether Attachment A of Rule 1133.2 is to be included in the State Implementation Plan (SIP). We believe it is appropriate to include this attachment in Rule 1133.3.

Response #10: Attachment A of existing Rule 1133.2 has been previously approved into the SIP. However, this attachment has been modified specific to PR 1133.3 and is included within the rule. The attachment will be part of the SIP submittal.

Comment #11: Please list the applicable dates of those TMECC test methods for PR 1133.3. Please clarify the number of replicate samples needed for these test methods. We recommend averaging the results of three samples.

Response #11: The applicable dates of those TMECC test methods are listed as recommended in the revised rule language. Staff added the requirement of triplicate samples needed for the TMECC test methods.

Comment #12: Please consider adding size thresholds to the exemptions of Rule 1133.3, specifically community composting. It may be appropriate to apply some or all of PR 1133.3 to facilities addressed here that are very large.

Response #12: Staff added conditions to the exemption for the community composting – provided that the operation is not subject to the Local Enforcement Agency Notification or Permit regulations pursuant to the CCR Title 14 Division 7, Chapter 3.1, Section 17857.1.

Comment #13: It is not clear why moisture content measurement requirements are needed relative to Rule 1133.1, except to exempt sources pursuant to paragraph (f)(3). Please clarify whether there are additional instances that moisture content measurements are needed. Please clarify the frequency and time during the composting cycle when composting measurements will be taken.

Response #13: Moisture content measurement requirements are also presented as a monitoring parameter to exempt a biomass power generation facility or a facility processing material as a biomass fuel for a biomass power generation facility from the 48 hours holding time. The alternative parameter that the material temperature is below 122 degrees Fahrenheit is also provided. Composting monitoring measurements are not taken into consideration in PAR 1133.1. When moisture content measurements are taken, at least 10 samples of chipped and ground greenwaste shall be taken from various locations of the pile on a given day.

Comment #14: Please indicate the rule version, by year, of ASTM methods D4442 and D4444 that are cited in PAR 1133.1(e), and how the District would handle a situation where the two moisture content test methods produce different results.

Response #14: The rule version of ASTM methods was indicated in the rule as recommended. ASTM method D4442 (Standard Test Method for Direct Moisture Content Measurement of Wood and Wood-Base Materials) is the method that is used as the reference for calibrating and standardizing a hand-held moisture meter (with D4444). A hand-held moisture meter can be used to measure moisture content,

but since the meter produces relative readings, it should be calibrated by the method D4442. This being the case, if the two methods differ in their results, D4442 takes precedence.

### CARB Comments

- Comment #1: Table IV-2 of Appendix IV to the Preliminary Draft Staff Report mentioned that the average emission factors were determined by weighting the values based on greenwaste throughput. However, upon further evaluation of the document, the throughput values used to weigh the data are not included in the Appendix. We suggest including the throughputs for each composting operation so the reader can follow the calculation more clearly.
- Response #1: As staff attempted to harmonize the material holding time with the Title 14 requirement (i.e., to remove within 48 hours of receipt), there would be no emission reductions quantified from the PAR 1133.1 requirements. Thus, staff decided to remove sections for stockpile baseline emissions and stockpile emission reductions from the staff report.
- Comment #2: In Table IV-2, it is not clear how the composite emission factor was calculated based on the average lbs/wet ton/day factor. We recommend more calculations be added to improve clarity.
- Response #2: The reader is referred to Response #1 of this section.
- Comment #3: The five facilities averaged together to obtain the stockpile and windrow emission factors are from throughout the state. Using the statewide average may artificially inflate the baseline for the South Coast because the South Coast values used in the average are on the low end for both the stockpiles and greenwaste. Is the assumption that the other greenwaste facilities in the South Coast region are less clean (from a VOC perspective) than the Inland Empire Composting Facility? We recommend that you explain the logic behind using a statewide average emission factor rather than the only data from the South Coast region.
- Response #3: The emission factor from the Inland Empire Composting Facility does not represent typical greenwaste composting operations currently being conducted in the South Coast region. Other air districts also did not consider using this emission factor because they thought that the emissions test was lacking in representing full life cycle emissions of VOC. The emission factors for the four (except Inland Empire) facilities are the currently available set of data that are considered to represent greenwaste composting operations in the South Coast District. Therefore, the weighted emission factor considers these four tests, along with the Inland Empire results.

### CalRecycle Comments

- Comment #1: PAR 1133.1(d)(1)(A): Under existing state regulation, chip and grind sites which are not associated with a permitted composting operation or transfer station may not accept foodwaste. Foodwaste is not an acceptable material for landfill alternative cover or erosion control. Therefore, please delete this section or clarify that the chip or grind facility must have a transfer station permit in order to receive foodwaste.
- Response #1: The rule language has been revised such that foodwaste cannot be accepted at chipping and grinding facilities, unless otherwise allowed by the LEA.
- Comment #2: PAR 1133.1(d)(1)(E): This section conflicts with state regulation. Please delete.
- Response #2: Staff deleted this subparagraph as suggested.
- Comment #3: PAR 1133.1(d)(3)(D): Records of rainy days and wet weather conditions should only pertain to composting facilities.
- Response #3: Although chipping and grinding operations can occur on rainy days, the original intention of this requirement was to allow additional time for chipping operations, if the normal operations are impeded by rain events and the operator cannot effectively remove the material within 48 hours of receipt. However, as written in the revised proposed rule, the operator may hold the material for a longer period of time, if allowed by the LEA.
- Comment #4: PAR 1133.1(d)(3)(E): Records of moisture content should only pertain to biomass power generation facility stockpiles, as those facilities are exempt from Title 14 Division 4 Chapter 3.1 Section 17852 of the CCR. For stand-alone chip and grind facilities, there is no exemption for moisture content in existing state regulations. For CDI facilities, the materials must remain under 122 degrees Fahrenheit at all times.
- Response #4: An exclusion from material holding requirements has been added for biomass fuel material. The existing moisture content exemption relative to curbside greenwaste (i.e., grass and leaves) is not proposed for or within the scope of the amendment.
- Comment #5: PAR 1133.1(d)(4): Wet weather conditions should not apply to non-compost facilities, as Title 14 Division 7 Chapter 3.1 Section 17852(a)(10(ii) of the CCR does not contain an exemption beyond 7 days for wet weather.
- Response #5: This element is necessary for landfill operations.
- Comment #6: PAR 1133.1(e): Moisture content measurement section should only apply to biomass power generation facility stockpiles.
- Response #6: The reader is referred to Response #4 of this section.
- Comment #7: Why is foodwaste measured by weight but manure measured by volume? It would make sense to use the same standard. Weight is straightforward to measure and less subjective.

- Response #7: Manure measured by volume has been established in District Rule 1133.2 relative to co-composting. The definition should be on a consistent basis with that in Rule 1133.2 and Rule 1133.3.
- Comment #8: There may be circumstances where a passively aerated static pile, such as one that has large pipes embedded in it, could provide sufficient aeration to avoid anaerobic conditions. Please consider allowing passively aerated static piles when covered a pseudo-biofilter and pursuant to the approval of the APCO.
- Response #8: Staff revised the proposed rule language such that a minimum requirement for composting system design is no longer included. That is, there is no limitation in the composting system. Operators can continue with their respective techniques for composting.
- Comment #9: While 5% oxygen content is considered ideal, it is difficult to achieve in practice, particularly in actively decomposing piles, where microbes consume oxygen rapidly. 5% oxygen will be nearly impossible to maintain without very frequent turning which probably result in huge increases in diesel and particulate matter (PM) emissions, and costs from the turning operation. More likely, achieving 5% oxygen content will be impossible when a pile is covered with a 6 inch layer of finished compost. At a minimum, please remove the oxygen requirement during the time when a compost cap is applied. We prefer you make the oxygen testing for informational purpose only, until such as time as we can be certain the instruments are reliable and an applicable standard can be deduced.
- Response #9: Staff agrees and has removed this requirement from the proposed rule.
- Comment #10: Please make an exception for operators who apply water during turning using a turner which is equipped with water spraying technology. This best management practice wets the composting feedstock evenly and is expected to reduce emissions during turning. It also represents efficient water and diesel fuel use.
- Response #10: Staff added this suggestion to the rule.
- Comment #11: Too many re-applications of the compost cap are impractical. Regulation does not mandate Process to Further Reduce Pathogens (PFRP) occur during the first 22 days, but many operators prefer to document their pathogen reduction early in the process, because the materials may not get hot enough later on. Applications of a thick blanket of material could compromise operators' ability to maintain sufficient temperatures during the legally required pathogen reduction period. Therefore, we recommend the following scheme:
- 1) Applying a 6 inch cap of overs if available and finished compost if overs are not available to initial windrow;
  - 2) At the first turn, applying water for the next five turns, if operator has begun pathogen reduction. If the operator turns but has not begun pathogen reduction, then they should re-apply the cap. Operators are already required to maintain a log of when pathogen reduction begins and ends; and

3) When pathogen reduction is finished, the operator may apply one more cap of unscreened finished materials for additional clean air benefits.

Response #11: Staff is proposing to place the finished compost cover on the top of initial pile for the first seven days of the active phase composting, during which the pile is to not be turned, and watering afterward to the surface of the pile within three hours before the initial and subsequent turnings during the remaining active phase period of composting. Please refer to subparagraph (d)(2)(B) of the revised PR 1133.3.

Comment #12: Please add a requirement which suspends capping during the ozone season (from May 1 to October 1). The capping operations are substantial, and the diesel equipment needed for these operations will result in NOx emissions. The ozone season coincides with periods of intense sunlight, hence ozone exceedences are very rare during the winter months.

Response #12: The revised rule no longer requires repeated capping of finished compost. Therefore, the requirement suggested for the ozone season is not needed.

Comment #13: Source testing for a large biofilter costs around \$100,000 per occurrence; a two-year frequency is not cost effective for an engineered system. Two reasonable methods for ensuring the efficacy of an installed biofilter are to place a limit on the shrinkage of the filter medium, or to conduct a smoke test every two years. With these suggestions in place, it would be reasonable to extend the time frame between source tests to 5 years or more.

Response #13: While there have been tests that have cost as much as the amounts stated, most of the tests conducted that cost that much were research oriented tests that involved several operating scenarios, developing site-specific testing methods and techniques, or were unique and difficult to test configurations. As the testers gained experience with biofilter testing, and as more testers have entered the market for competition, testing costs have gone down. A test that recently took place on a greenwaste and foodwaste composting facility with a biofilter, was conducted for ~\$10,000, including source testing and reporting. It is likely that this lower testing cost is more representative of those that will be available in the future, unless further competition drives that cost lower. In the PR 1133.3, staff revised the source testing frequency from every two years to every three years.

### **Public Comments on PAR 1133.1**

#### **(a) Purpose**

Comment #1: The primary goal of PAR 1133.1 should match with that of PR 1133.3, which is reducing VOC and ammonia emissions from the regulated facilities. Activities permitted in this rule that do not promote emission reductions include the continuation of alternative daily cover (ADC) without restrictions, and other practices in conflict with PR 1133.3 and other regulations.

Response #1: At landfills located in the South Coast jurisdiction, ADC is placed as a cover material onto the surface of a landfill each day, and is generally not stockpiled for longer than 48 hours. Their material holding time is consistent with the holding time required in PAR 1133.1 and state regulation, Title 14.

**(c) Definitions**

Comment #1: Please add a definition of the undetermined term “finished compost.”

Response #1: Staff added a definition of finished compost as suggested.

Comment #2: Chipping and grinding definitions, holding times, and foodwaste parameters need to be consistent with PR 1133.3 and Title 14.

Response #2: Staff made some of the definitions and requirements consistent with PR 1133.3 and Title 14, such as “active compost” and “material holding time.”

Comment #3: Definition of “static pile” has no meaning relative to “active compost” (in Title 14) which is defined by temperature in the pile, not processing method.

Response #3: Staff removed the term “static pile” from the rule and refers to composting generically.

**(d) Requirements**

Holding Times

Comment #1: Stand alone chipping and grinding facilities (those not co-located at MRFs, transfer stations and/or landfills) are not allowed to handle source-separated food scraps without additional permitting. The requirements in PAR 1133.1 need to be consistent with, and at a minimum, not contradict with existing requirements for these types of facilities under Title 14.

Response #1: Staff modified the requirement such that foodwaste cannot be accepted at chipping and grinding facilities, unless otherwise allowed by the LEA.

Comment #2: Holding time requirements should be made consistent between PAR 1133.1 and PR 1133.3.

Response #2: Staff made holding time requirements consistent as recommended.

Comment #3: Holding time requirement differs based on the source of greenwaste. It should be based on actual material moisture and nitrogen rather than on “source.”

Response #3: The rule no longer requires different holding times based on the source of greenwaste, rather it requires the same 48 hours holding time on any type of greenwaste, unless otherwise allowed by the LEA.

Comment #4: Rule should better define “used on site.” It should be clearly defined to mean “utilized on site” and not “stockpiled.” If this rule is to reduce VOC emissions, the District should regulate how the material is handled once it arrives at its destination within the District.

Response #4: Staff changed the rule language from “used on site” to “utilized on site.”

- Comment #5: Under existing state regulation, chip and grind sites which are not associated with a permitted composting operation or transfer station may not accept foodwaste. Foodwaste is not an acceptable material for landfill ADC or erosion control. Therefore, please delete this section or clarify that the chip and grind must have a transfer station permit in order to receive foodwaste.
- Response #5: Staff made changes to the rule so that chip and grind sites cannot take foodwaste, unless otherwise allowed by the LEA.
- Comment #6: The current rule allows various holding times based on the origin of green materials, which conflicts with existing state regulation requiring removal of materials from the site within 48 hours of receipt.
- Response #6: Revised rule language is now harmonized with state regulation Title 14. Regardless of origin, greenwaste needs to be processed and removed within 48 hours of receipt, unless otherwise allowed by the LEA to hold for a longer period of time.
- Comment #7: Holding time for composters should be listed in PR 1133.3 for ease of understanding.
- Response #7: Staff has specified the holding time requirement for composters as suggested.

#### Static Piles/Stockpile Operations

- Comment #8: Under the current proposed rule, stockpiling green material effectively allows static pile composting at a non-permitted chipping and grinding facility, which conflicts with state regulations. Under Title 14, static pile composting would require a composting permit. Chipping and grinding operations are required to keep materials below 122 degrees Fahrenheit. Any green material achieving this temperature at a facility is considered active composting and thus the facility would be required to obtain a composting facility permit.
- Response #8: Specification of stockpiling and static pile requirements were removed from the proposed rule provisions. This revised proposed rule essentially applies to chipping and grinding activities to produce materials other than active or finished compost by means of any type of composting methods.
- Comment #9: Static pile is a legitimate composting method, as decomposition of organic materials in the piles can reach the temperature of composting allowed for under Title 14, Section 17868.3. Therefore, it should be part of Rule 1133.3 and not Rule 1133.1. PR 1133.3 should allow it to be used as a “partial composting” process with a broader range of retention times (for example, from 14-21 days) without the regulatory burdens of the full composting process.
- Response #9: Static pile composting requirement was removed from PAR 1133.1. The PR 1133.3 no longer requires specific type of composting method and specifies BMPs for the active phase only.
- Comment #10: Adding finished compost to a pile of freshly ground material will assuredly cause the pile temperature to rise above 122 degrees Fahrenheit as the compost will inoculate the new materials with additional microbes.

Response #10: Adding finished compost to a freshly ground green material is no longer required under PAR 1133.1. Mitigation measure requirements were deleted.

Comment #11: Stockpile operations for composters should be moved to PR 1133.3.

Response #11: The reader is referred to Response #7 of this section.

Comment #12: The finished compost cover on chipped or ground greenwaste should be deleted and compost that is cured (low moisture) should be allowed to remain on-site for as long as necessary.

Response #12: The finished compost cover requirement was deleted and is no longer proposed in the revised PAR 1133.1. Stockpiling cured compost on-site is out of scope for PAR 1133.1 and PR 1133.3 does not limit storage of finished (cured) compost as the process is complete.

### Recordkeeping

Comment #13: Assuming that the landfill does not perform the chipping and grinding or composting onsite, rather the chipped greenwaste is brought to the landfill:

- Will landfills be required to register and provide annual updates per Rule 1133? The intent of Rule 1133 reads to establish a registration process and database for composting and chipping and grinding facilities that are in the business of producing compost. It is suggested that landfills are exempt from this requirement since we are simply the end users of a product that is manufactured by other entities.
- The greenwaste is applied to the working face the day it is received. We do not take moisture content measurements. If the greenwaste is applied the day it is received, we are not sure what value these measurements would have. We suggest exempting this requirement for landfills that do not exceed the 3 day maximum storage time.
- At landfills, we are simply the customers receiving shipments of chipped greenwaste. We do not have information as to whether the shipment of greenwaste originated from curbside, non-curbside, or mixed greenwaste sources. That information would need to come from the product manufacturer.

Response #13: Staff revised the language such that the operator of a landfill or biomass power generation facility would be exempt from the requirements of recordkeeping, provided that the operator does not perform chipping and grinding operations on-site.

### Wet Weather Conditions

Comment #14: Wet weather exclusions should be removed because chipping and grinding can be and is conducted during rainy periods, and Title 14 does not contain an exemption for wet weather.

Response #14: The reader is referred to Response #5 of the CalRecycle Comments section.

### Moisture Content Measurement

Comment #15: Instead of ASTM tests of moisture content, please allow in-situ monitoring of moisture in the chipped and ground greenwaste pile using a soil moisture monitor probe.

Response #15: ASTM methods D4444 is the standard test method for standardizing and calibrating hand-held moisture meter. A hand-held moisture meter should be calibrated by the method D4442. Therefore, hand-held moisture meters are already allowed for use in the rule. The reader is also referred to Response #14 of the US EPA Comments section.

Comment #16: Further studies should be performed to determine if 30% is an appropriate value to retard decomposition and is achievable under current operation.

Response #16: The 30% level of moisture content has already been established in the previous rulemaking based on staff research. Decomposition of chipped green material is retarded at below 30% moisture content. As an example, the moisture content of chipped green materials used as biomass fuel is maintained at less than 30 percent to avoid decomposition.

### Miscellaneous

Comment #17: What if the chipping/grinding operation is conducted on-site by an outside contractor that brings the equipment on site as needed; does the rule apply to the contractor operating the equipment or the facility operator at the site receiving the greenwaste?

Response #17: The facility operator is responsible for compliance with the rule holding time and processing requirements as they are receiving the material, contracting with those that bring the chipping/grinding equipment on-site, and are therefore responsible for handling of the chipped and/or ground material. The only exception is if the equipment meets the definition of portable equipment, that is equipment with a manufacturer's rating of 170 brake hp or less, which is exempt under the rule.

## **Public Comments on PR 1133.3**

### **General Comments**

Comment #1: Explain the physical and time boundaries that were assumed when determining the centralized organics processing adverse impacts to the atmosphere, including all the transformations and exchanges that take place in the soil, terrestrial vegetation, and atmosphere over the life of the materials.

Response #1: Relative to the rule proposal, emissions baseline and reductions factored in emission profiles developed were based on full cycle composting. Conducting a life cycle analysis, as suggested, is outside the scope of analysis for this rule development effort.

- Comment #2: Evaluate the impact of this regulation on the carbon cycle. One benefit of composting is that it enriches the soil with carbon, increase the soil's carbon reserve, decreasing carbon available in the atmosphere.
- Response #2: Evaluating the impact of this regulation on the carbon cycle is beyond the purpose and scope of this regulation. Although composting is an environmentally favorable treatment method of recycling organic waste, it is also true that composting operations emit VOCs and ammonia that partake in the formation of ozone and fine particulates.
- Comment #3: The District should promote alternative organic residual processes such as backyard composting since it conserves and reduces energy and emissions by eliminating transportation and processing operations.
- Response #3: The proposal does not alter existing exemptions for backyard composting.
- Comment #4: We expect to see, in the socio-economic analysis, a comprehensive whole systems analysis of costs and benefits, which includes economic assessments of soil amendment, fertilizer, energy production and landfill uses of organics, using competitive tipping fees, competitive prices of products, and all current and proposed rule requirements affecting: processing, operational, analytical testing, storage and marketing costs.
- Response #4: The suggested micro systemic analysis requires tedious and costly construction of individual elements, which is beyond the scope of analysis the District staff performs in support of rule development. That being said, the data necessary or economic model for such micro analysis is not available and the suggested level of analysis cannot be done. Additional costs and benefits associated with the proposed rule relative to the existing four-county economy are assessed through the Regional Economy Modeling Inc. (REMI) PI<sup>+</sup> model for the total socioeconomic impacts of the proposed rule on affected facilities and the entire economy in the four-county region.
- Comment #5: Consider composting as a VOC reduction technology for non-composted material.
- Response #5: The reader is referred to Response #2 of this section.

**(c) Definitions**

- Comment #1: Greenwaste mixed with up to 20% manure is still defined as greenwaste.
- Response #1: Staff disagrees. Greenwaste means organic waste material generated from gardening, agriculture, or landscaping activities. Manure means excrement of animals, such as barnyard or stable dung, often with discarded animal bedding, and cannot be defined as green material. Up to 20 percent manure, by volume, is allowed to be composted with greenwaste for the purpose of greenwaste composting because it is difficult to completely separate manure from animal bedding. This 20 percent allowance was already established in existing Rule 1133.2 – Emission Reductions from Co-Composting Operations.

Comment #2: Increase percent manure to 49 percent for the greenwaste composting operations to be more flexible.

Response #2: Requirements for greater than 20 percent manure, by volume, are already established as co-composting under Rule 1133.2.

#### **(d) Requirements**

##### Composting System

Comment #1: Static pile is another composting technique, just like a windrow. It must meet the same time and temperature requirements to make a compost product. The rule should allow both static pile and windrow composters to continue with their respective techniques as there are few enough of both in the South Coast.

Response #1: The reader is referred to Response #2 of the CalRecycle Comments section.

Comment #2: There is no basis for the exclusion of “passive pile” composting (which is more commonly referred to as “static pile”). Static pile composting (which has limited turning) would not include these VOC releases and may in fact have lower VOC emissions overall. Unless the District can provide research that shows that passive pile composting (not stockpiling) has larger uncontrolled emissions than windrows, passive pile or static pile composting should be allowed under PR 1133.3.

Response #2: The reader is referred to Response #2 of the CalRecycle Comments section.

##### Windrow Management

Comment #3: PR 1133.3 should not refer back to requirements in PAR 1133.1. If there are required holding times for composting facilities, they can be listed in PR 1133.3.

Response #3: Staff revised rule language to list required holding times for composting facilities in PR 1133.3, not referring to PAR 1133.1.

Comment #4: Moisture meters currently on the market are generally developed for soil moisture and have limited utility with compost. The Rule should allow flexibility in how moisture is measured, such as the “squeeze test” used by SJVAPCD in their Proposed Rule 4566 or using a Koster Moisture Tester without separate Executive Officer approval.

Response #4: Staff has concluded there is a lack of evidence that emissions will be negatively impacted if moisture falls below 40%. Thus, the moisture measurement is removed and no longer required in PR 1133.3.

Comment #5: Effective windrow compost operations have a track record of turning frequently enough to maintain adequate oxygen levels and to avoid anaerobic conditions. In fact, operators have an incentive to do so, since failing to do so would slow production and waste money. In addition, having a 5% oxygen level has not been shown to reduce emissions and may be impractical to

maintain without very frequent turning. Therefore, it seems unnecessary to add an oxygen monitoring requirement.

Response #5: The requirement has been deleted from PR 1133.3.

Mitigation Measures: Water Irrigation and Finished Compost Cover

Comment #6: The whole composting process should be perceived as mitigation and the basis of reduction should be from non-composted material processes.

Response #6: Staff agrees that composting is a process turning organic waste into a useful product. However, composting is still an emissive process. Those emissions may be inevitable, but staff believes such emissions could be reduced further with appropriate mitigation measures. Therefore, the reductions are measured from an uncontrolled composting pile as opposed to natural degradation.

Comment #7: The use of a finished compost cap should be encouraged when the material is available, but at the minimum both chippers and composters should be required to use water irrigation on the pile in the initial period after the greenwaste is first ground. This will lead to a “level playing field” for both chippers and composters and also control emissions at their most critical period.

Response #7: Requirements for both chippers and grinders will be handled separately in Rule 1133.1. The revised rule proposal has more stringent requirements for material holding time than the earlier version of the rule and conforms to the Title 14 state regulation.

Comment #8: There is no discussion present of the requirements for water application following rain events. Oversaturation of the materials has been previously identified as a poor management practice, potentially leading to anaerobic conditions. Additionally, conformance with Water Board regulations may preclude or limit over application of water at compost sites.

Response #8: Staff added an exception for water application relative to a rain event in which the aim is to ensure wet material before turning without indiscriminant water application.

Comment #9: We support the surface water application as mitigation, but are concerned that the basis for the threshold being applied (that is, based on throughput) is inappropriate. Please explain.

Response #9: Staff revised the rule language so that no threshold is imposed for the surface water application and water applies to every facility regardless of size.

Comment #10: By requiring the compost cap throughout the active phase process, the District Rule will necessitate the multiple handling of the same material. This will require an operator to emit more criteria pollutants from mobile sources. This practice could also have significant GHG impacts from the increased use of diesel fuel. We suggest the compost cap be removed from this rule until such time as the District can demonstrate its cost-effectiveness as mitigation and that its use will not have an additive emission impact in other criteria pollutants such as particulate, GHG, and/or NOx.

- Response #10: Staff revised the rule such that the finished compost cover is required to apply to initial active piles only for the first seven days of the active phase, and watering is required thereafter for the remaining duration of the first 15 days of active phase composting.
- Comment #11: Because there are relatively few emissions to control after the first two weeks, there should be no further reason to cap the pile, and this will also lead the composters to believe that they are not being put at an economic disadvantage to the shredders.
- Response #11: The reader is referred to Response #10 of this section.
- Comment #12: Records already include pile moisture content for water. By adding “applications of water” makes the recordkeeping redundant.
- Response #12: Revised rule language no longer requires pile moisture content measurement. Applications of water to the active phase piles would be required the recordkeeping.

#### Forced Aeration System

- Comment #13: We agree with the use of the forced aeration system in regards to the 10% foodwaste, by weight.
- Response #13: Staff appreciates your support to the amount of foodwaste, by weight, to be composted with addition of an air pollution control device. However, staff decided to pursue a modified threshold that combines the percent limit of foodwaste with a facility-wide annual throughput.
- Comment #14: It is not clear why the aerated static pile composting process is required for 10% or more of foodwaste in the system. It would be helpful to equate this to the amount of VOCs are increased by the addition of foodwaste.
- Response #14: Since food scraps contain a larger fraction of easily biodegradable and volatile material than greenwaste, composting foodwaste emits more VOC than composting greenwaste alone. In the Modesto study published by the CalRecycle in 2007, composting of 15% foodwaste windrow emitted as two-to-three times higher VOC emissions as composting of a greenwaste windrow without foodwaste. In addition to VOC emissions, decomposing putrescible foodwaste can cause odor problems.

Staff carefully investigated the current foodwaste composting operations and decided to augment the 10 percent, by weight, foodwaste limit with actual annual foodwaste threshold. Therefore, in the revised rule language, an emission control technology meeting 80 percent control would be required for any active phase pile containing foodwaste of 10 percent or more, if an operator intends to (or does) process greater than 5,000 tons per year of foodwaste throughput (source-separated or mixed). Up to this throughput threshold, there is no percent restriction of containing foodwaste in the greenwaste composting operations.

- Comment #15: Compost emission factors are operation specific, and thus inappropriate to apply a universal emission factor to all operations.
- Response #15: Staff agrees that emissions can vary. However, consistent testing on like operations can be conducted. Compost emissions can vary by conditions (e.g., feedstock) even for the same operation. This is why composite emission factors are developed from currently available emission tests conducted at respective composting facilities with similar operations in the South Coast District.
- Comment #16: The mandated emission factor is set so high that virtually all of the 16 affected composting facilities' and, particularly, future new composting facilities' composting VOC emissions will certainly exceed the District's significance threshold of 55 lbs/day. For instance, using the 55 lbs/day threshold as the maximum mitigated VOC emissions, 80% mitigation efficiency of the required forced aeration system, and the mandated uncontrolled baseline emission factor of 4.67 lbs/ton, virtually no greenwaste composting facility will be able to have a throughput of greater than 60 tons per day without preparing an Environmental Impact Report under CEQA.
- Response #16: The baseline emission factor of 4.67 lbs/ton for VOC is determined from emissions test data that are currently available from respective greenwaste composting operations that are representative of local operations. For the purpose of this rule effort, an emission factor of 4.25 lbs VOC/ton throughput for the active phase only of composting would be considered. It should be noted that this factor is for uncontrolled emissions in the absence of site-specific source tests. Source testing under the rule relative to the emission control device will provide a more site-specific emission characterization.
- Comment #17: The control efficiency of 80% by weight for VOC and ammonia emissions is not viable for biosolids composting operations. Since these operations have the potential to emit lower VOC and ammonia emissions, a more reasonable and achievable control efficiency is 75%.
- Response #17: Greenwaste composting operations have the potential to emit higher VOC emissions and lower ammonia emissions than biosolids composting operations. Recent source tests conducted for biosolids composting operations showed much higher control efficiencies than the required 80%.
- Comment #18: The requirement of an 80% overall system control efficiency for VOC and ammonia seems high given the lack of operational data on the performance of aerated static pile (ASP) and biofilter systems for green material with more than 10% food scraps. Please provide more evidence that this is achievable in commercial application on the proposed regulated feedstocks (i.e., not biosolids).
- Response #18: Emissions test data on the performance of ASP and biofilter system for green material with food scraps is available. A commercial application<sup>1</sup> achieved 90% reduction in VOC emissions (as total hydrocarbon) for ASP and biofilter

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<sup>1</sup> ECS, 2011. Comparison of Air Emissions from the ECS AC Composter™ and Turned Windrow during Composting of a Food Waste and Green Waste Mixture. White Paper ACC-2.

system composting 25% food scrap and 75% greenwaste. A different commercial application<sup>2</sup> of a forced aeration system using a fabric membrane cover has multiple data sets from demonstration projects and existing facilities showing more than 95% reduction in VOC and ammonia emissions from mix recipes up to 45% foodwaste by weight compost pile without the need for a biofilter. As public and regulatory interest on foodwaste composting is on the rise, staff expects additional emissions data to be collected on the performance of an emission control system for foodwaste windrow mixed with greenwaste in the future.

### Source Testing

Comment #19: The current methodology for source testing, flux chamber testing, is very expensive and not warranted for aerated static pile composting biofilters. The test costs between \$50,000 and \$100,000 per test. Testing at the initial construction of the biofilter in addition to every two years is cost prohibitive. If an operator is adhering to best management practices as required in paragraph (d)(2)(H), and the equipment installation, maintenance and best management practices are documented, the testing will be redundant. Our recommendation is that the District conduct a test with a portable flux chamber on the surface of the biofilter within three months of the start of operation. If at this time, or at any other time that a portable flux chamber is given, the TNMNEHC is over 100 ppmv, a source test will be required. The portable flux chamber test can be required if nuisance complaints demonstrate obvious neglect or negligence by not adhering to best management practices.

Response #19: The reader is referred to Response #13 of the CalRecycle Comments section.

Comment #20: Provide new source test method for compost operations.

Response #20: The flux chamber test method, modified by the District, has been used to determine emissions from compost piles and biofilter controls. A new source test method is not required for compost operations, but staff will work with the industry if there are suggestions for new methods in the future.

### **(g) Exemptions**

Comment #1: “Municipal composting” or “centralized composting” should be exempted. We believe that the benefit of centralized composting to soil, water, and air are much more preferable to the alternatives. Our mulch give-away program recycles organic residuals (25% of the City green residuals and 75% by contractors) through giveaways to residents and farms. We operate at a fiscal deficit and any additional costs would make it more difficult to maintain our operations. Our vision is to increase our give-away program and recycle more residuals back into the local communities.

Response #1: Municipal composting or centralized composting collects curbside and non-curbside greenwaste which are main components of greenwaste composting

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<sup>2</sup> Data available for GORE® Cover can be requested by contacting W. L. Gore & Associates.

feedstock. Although the compost product is given away to the local communities for free, the magnitude of the centralized composting would typically be large. Thus, staff did not add an exemption for centralized composting to PR 1133.3.

Comment #2: The type of community composting needs to be more fully defined in order to determine at what volume level they should be exempted from in this rulemaking.

Response #2: The proposed rule has been revised such that composting facilities as listed in paragraph (g)(3) are exempt, provided that the operation is not subject to the Local Enforcement Agency Notification or Permit regulations pursuant to Title 14 Division 7, Chapter 3.1, Section 17857.1 of the California Code of Regulations.

### Miscellaneous

Comment #1: It is recommended that high solids anaerobic digestion (HSAD) would be classified as a pre-processing step for composting facilities. The organic material waste is digested in an enclosed unit. The resulting material (a combination of green and food) can be transferred to a compost facility. These units are enclosed, and are also designed to include enclosure for the delivery of undigested materials.

Response #1: Under this proposed rule, composting is limited to be aerobic decomposition of organic waste material. Currently, anaerobic digestion (AD) is not being considered as an option of composting organic materials. Considering growing interest to the AD system, however, staff may examine the AD system as a pre-processing technology for composting processes.

### **Comments on Preliminary Draft Staff Report**

Comment #1: Landfill gas recovery systems (in the remaining states) have little impact on VOC emissions from ADC or beneficial reuse, mainly due to the lag time between the disposal time and their installation. Additionally, the lengthy residence time allowed for processed organic materials at landfills in this draft rule is inadequate given that over twice as much material is used for ADC as is composted in the Basin.

Response #1: The statement of the landfill gas recovery systems in the remaining states was deleted. Landfills in South Coast have been controlled for VOCs and methane for decades. In addition, ADC materials must be applied to the landfill surface at the end of the operating day pursuant to Title 27 of California Code of Regulations.

Comment #2: Recycled water is not available in all places, and many composters may be reluctant to use it because it generally contains higher levels of salt. Salt build up is a concern, particularly in foodwaste and manure composting, but also with greenwaste. Furthermore, once compost has passed the pathogen reduction stage, untreated surface water cannot be used for irrigation of piles.

- Response #2: According to the existing composting facility operators, some facilities use all potable water and others use all reclaimed or canal water. Salt content has not been raised as a relevant local issue, as it pertains the watering BMP.
- Comment #3: CalRecycle recently completed emissions research using “overs” (by-product of finished compost screening) as a pseudo-biofilter compost cap. Overs are similar to biofilter material, and were effective in reducing ozone formation from composting emissions.
- Response #3: The definition of “finished compost” has been revised so that “compost overs” are included. Finished compost can be screened or unscreened, humus-like material and/or compost overs that have gone through pathogen-reduction period.
- Comment #4: Both the finished compost cap and irrigation measures proposed will impact the potential air movement and moisture content and increase the potential for anaerobic sections to exist, thus generating increased GHGs.
- Response #4: A finished compost cap is now required to be applied only one time after initial pile formation for the first seven days of the active phase. Irrigation is only required so that the three inches in depth of piles are wet. Staff expects excess moisture is also evaporated while turning the piles and will not lead to oversaturation and leaching issues. Thus, both measures would not increase the potential for anaerobic sections to develop.
- Comment #5: The application of finished compost was evaluated to the top surface of the windrow only. A more robust description of the compost cover requirement is needed to evaluate the proper application and amount of materials and labor needed to apply it.
- Response #5: The proposal requires the compost cover such that the top is covered to a depth of six inches, and tapers off as it goes down the pilesides. Thus, the application is adequate to cover the top half of the pile where most emissions emanate.
- Comment #6: The highest costs to apply the cover involve the lost sales of materials used for the compost cover and the potential loss of operating space between windrows in order to allow the use of a front-end loader to access the windrows. Windrow composting operations generally have 8 to 10 feet spacing between windrows; a loader would need more than twice that spacing in order to effectively maneuver between windrows in order to apply a compost cover. The amount of increased loader activity – in addition to other equipment to handle the compost cover application materials – will produce significant increase NOx emissions. These increased NOx emissions have not been assessed.
- Response #6: The proposed rule has been revised in response to this comment. The revised rule language only requires one-time finished compost cover application which, based on the staff assessment, would not produce significant increased NOx emissions, loss of production, or loss of operating space.
- Comment #7: In the Modesto Compost Study completed in 2006 by the CIWMB, the use of two compost inoculants reduced VOC emissions by 42% in the first week and 14% for the first two weeks, but one of the additives was not re-applied in the

second week. The specific products used in the Modesto study were GOC technologies formulas ASC 2500 and ASC 2600. The former is a topical spray applied to windrows. The latter is mixed into a new batch of materials. Because there are many makers of inoculants and other compost “starters,” and because rapid composting is beneficial for air quality, we urge you to include additives as a potential mitigation measure in your rule, and to allow additive manufacturers to submit research demonstrating the efficacy of their products.

Response #7: Studies of the control efficiency of the chemical additives are limited and thus more research is needed for the efficacy prior to being considered as a VOC emissions mitigation measure under PR 1133.3.

Comment #8: Data from SWIS is often misinterpreted, and Table 1 is misleading. The most recent CIWMB survey of the compost and mulch infrastructure statewide estimates about 9.3 million tons of compostable materials are handled statewide. Significant portions of these materials are handled in the Central Valley and in the Bay Area. 17 million tons in the four-county SCAQMD area is not plausible. We believe the District has the data, through Rule 1133, to formulate a more reasonable estimate.

Response #8: Staff agrees that the initial estimated chipping and grinding throughput needs more work and attempted to update the throughput number. Furthermore, staff requested industry stakeholders and CalRecycle assistance to provide county-level aggregated chipping and grinding throughput data. Although CalRecycle approved sharing county-specific data, confidentiality concerns prevented transmittal of the information. Staff will continue to work to refine this information.

Comment #9: The Preliminary Draft Staff Report fails to adequately analyzed the importance of the chip and grind process as a first step in quantifying air pollutants and reducing emissions during the initial first few days of organics processing. About 10% of the greenwaste processed is used for compost, and remaining 90% is used for mulches, boiler-fuel, ADC, and other end product application. It seems important for the District staff to first consider focusing on chip and grind processing to achieve the highest level of emission reductions before any attempt is made to reduce air quality emissions from composting. We would like to assist the District staff by having meetings with staff to discuss an accurate baseline inventory, appropriate emission reduction measures and strategies, permitting, source testing, etc.

Response #9: Staff appreciated the opportunity to meet with industry stakeholders to discuss the above-mentioned issues. With input from the stakeholders, staff was able to improve rule language and data, but even industry representative had difficulty obtaining facility throughput data. Staff’s efforts in this area will continue after Board consideration of the existing proposal.

Comment #10: All facilities receiving greenwaste should be included within PAR 1133.1, even where woodwaste is the dominant share. The greenwaste fraction at these chipping and grinding facilities should be managed according to the adopted rules, while the woodwaste could continue to be exempted.

- Response #10: The operator of any greenwaste chipping and grinding would be subject to PAR 1133.1. If chipping and grinding takes place at a composting facility or co-located landfill or material recovery facility, the operator would be subject to PAR 1133.1, provided that the chipped materials are used for purposes other than composting. Woodwaste chipping and grinding continues to be exempt from PAR 1133.1.
- Comment #11: The throughput numbers of landfills are inaccurate and should be revised. CalRecycle website reports show that less than 1,000,000 tons were used as ADC at landfills within the District. We estimate that quite a bit less than one-half of that amount is being composted.
- Response #11: Staff revised the throughput numbers for landfills.
- Comment #12: Throughput numbers of greenwaste composting should be revised to reflect accurate totals.
- Response #12: Throughput numbers of greenwaste composting have been revised based on a supplemental questionnaire to reflect more current information. Staff appreciates all the greenwaste composting operators who participated in the supplemental survey.
- Comment #13: Greenwaste being composted is a minor source of VOC emissions versus the vast majority of VOC resulting from green materials being processed in the District. VOC emissions from green material have peaks immediately after grinding, trailing off over time. It is unfair putting the bulk of the compliance burden on greenwaste composters.
- Response #13: PAR 1133.1 has been revised such that the operator of chipping and grinding needs to move material within 48 hours of receipt, which harmonizes with state regulation Title 14. This 48 hours removal requirement intends to prevent inadvertent decomposition of green material during stockpiling that may result in VOC peaks after chipping. PR 1133.3 would require the same holding time, unless otherwise allowed by the LEA to hold for a longer period of time, and finished compost cover and water application to reduce emissions for the first 15 days of active phase composting. The compliance costs have been revised with additional information staff received from greenwaste composting operators.
- Comment #14: This cost effectiveness appears to be underestimated by a significant measure. There is no accounting for the loss of sales and the potential volume reductions at the compost sites due to the logistics of applying the compost cover. Even at these low estimates, a 10,000 ton facility could not afford to stay in business adding \$5.30 per ton to product cost, based on the \$53,000 annual cost.
- Response #14: The compliance costs and cost effectiveness have been revised to reflect the current proposed mitigation measures, based on the revised composting throughput, emission reductions, and cost data. The revised dollar amount of compliance cost per ton for adding a finished compost cover initially and watering before each turning would be approximately \$1.15 per ton of

throughput (as compared to \$0.79 per ton of throughput for adding one time finished compost cover).

- Comment #15: The staff report indicates a facility cost of \$0.62 per ton for the compost cover system to be used, based on the Modesto Study. However, a review of that study indicates that the study windrow was not turned and re-covered repeatedly, as a real production scenario would require. The draft rule defines the active compost phase as the first 22 days. Normal compost windrow operations do five turnings in the first 15 days. Therefore, one would expect five cover applications. Using the Modesto Study's numbers, we calculated the cost to be \$2.76 per ton for applying five sets of compost covers. However, this is too optimistic, because the Modesto example further lacks resemblance to a real life production scenario. The loader was able to maneuver freely in open space next to the test windrow, without other windrows cramping the operation. This is important, because almost all facilities have narrow drive aisles between windrows.
- Response #15: Staff revised the cost estimates for compost cover using the Bakersfield experiment data the commenter provided. With only one time application of compost cover, \$0.79 per ton is the revised calculated cost (as compared to \$1.15 per ton of throughput for adding an initial compost cover and watering before turning). If there is enough space for a loader to turn the windrow, there should be little problem to maneuver the loader to apply finished compost cover on the initial pile for that cycle.
- Comment #16: Using an average diesel consumption rate of five gallons per hour per truck or machine, our Bakersfield exercise indicates it will take one gallon of diesel fuel to apply every 100 feet of compost cover (each time). If our facility had to apply five covers to each of the 132,000 linear feet of windrow we handle each year, it would take 6,600 extra gallons of diesel fuel per year.
- Response #16: Compost cover cost was calculated using an average diesel consumption rate of five gallons per hour per machine using the same data as provided in the Bakersfield exercise. The proposed rule now requires only one time covering of the pile with finished compost and the calculated diesel use has been revised accordingly.
- Comment #17: The largest source of emissions in the industry sector was ignored by disproportionately placing the burden of emission reductions on composters.
- Response #17: PAR 1133.1 (chipping and grinding rule) is tightening a green material holding time in existing Rule 1133.1 such that the material must be processed or removed within 48 hours of receipt to reduce inadvertent decomposition during stockpiling. This amended requirement is to harmonize with the state regulation that has already been required under Title 14. Therefore, the proposed amendment would minimize unnecessary emissions, but no emission reductions would be quantified for the chipping and grinding industry sector.
- Comment #18: Appendix I of the Preliminary Draft Staff Report does not provide enough information about the establishment of 5% oxygen concentration is important to

the emission rates. The accuracy of annual composting throughput is also doubtful.

Response #18: Appendix I of the Preliminary Draft Staff Report summarizes results from a 2007 survey that the District staff conducted to understand greenwaste composting operations in the South Coast. Although the information in the Appendix I still informative, some of the data (e.g., the list of existing facilities and annual composting throughput) have been updated elsewhere in the staff report. To avoid unnecessary confusion, staff has removed the 2007 survey results in the Draft Staff Report.

#### Miscellaneous

Comment #19: It would be helpful if copies of all comments were included with the information provided at the public meetings.

Response #19: All comments received in regard to rules and staff report are summarized in this appendix of this staff report. Copies of all comments to the CEQA document will be included in the respective assessment documents. Those comments are public information and available on request.

### May 10<sup>th</sup> Working Group Comments (May 3, 2011 version of the rules)

#### **US EPA Comments**

Comment #1: In order for EPA to approve a PAR 1133.1 amendment to the SIP, the District's staff report should demonstrate that any relaxation of current SIP requirements is consistent with Clean Air Act (CAA) Section 110(l) requirements.

Response #1: PAR 1133.1 tightens material holding requirements of the existing Rule 1133.1 and thus would not relax the current SIP requirements.

Comment #2: Under the PAR 1133.1, facilities that chip and grind greenwaste and foodwaste would be no longer subject to Rule 1133.1, unless they are permitted by the LEA to handle foodwaste. The District's staff report should explain how this is consistent with CAA Section 110(l) if: (a) the LEA permit requirements are less stringent than the current rule requirements for foodwaste, and (b) there are chipping and grinding facilities in the District that are allowed to chip foodwaste without an LEA permit.

Response #2: Under Title 14, the LEA permit for chipping and grinding facilities does not allow receiving food material at the facility and PAR 1133.1 is to harmonize with Title 14 regulation for foodwaste. Staff understands that a chipping and grinding permit is issued by the LEA and thus, there is no chipping and grinding facility in the District that is allowed to chip foodwaste without an LEA permit, which has been more stringent in general than existing Rule 1133.1.

Comment #3: The rule requirements of PR 1133.3 have been changed since the January 25, 2011 Workshop version. The District's staff report should include the expected emission reductions based on the latest proposed version of the rule.

Response #3: The expected emission reductions with the latest proposed version of the PR 1133.3 are included in the staff report.

### CalRecycle Comments

Comment #1: PAR 1133.1 (c)(1): The new term “composted mulch derived from partially composted greenwaste” is puzzling. Finished compost may be used as mulch, and oversized materials may be screened out of finished compost and used as mulch. If you are attempting to describe as partially composted mulch product which has been through a complete pathogen reduction process, the term “pathogen-reduced mulch” is preferred.

Response #1: Staff revised the definition of “active compost” by deleting the term, and by adding the preferred term “pathogen-reduced mulch” as recommended.

Comment #2: PAR 1133.1 (c)(7): We recommend that the term “finished compost” includes unscreened finished compost which still includes oversized materials that will be screened out in final processing. Adding a new definition of “overs” is also recommended.

Response #2: Staff revised the definition of “finished compost” by including “compost overs” as part of finished compost. The new term “compost overs” has been defined in the rule.

Comment #3: PAR 1133.1 (c)(19): The definition of “woodwaste” is overly restrictive. Might woodwaste also include tree trunks, stumps, and limbs exceeding 2 inches in diameter?

Response #3: The definition of “woodwaste” has been modified as recommended. Woodwaste now includes large wood materials of curbside or mixed greenwaste that is screened or unscreened, such as tree trimmings, branches, tree trunks, stumps, and limbs exceeding 2 inches in any dimension.

Comment #4: PAR 1133.1 (d)(2): There is no provision in Title 14 that would prohibit the LEA from allowing an operator to hold materials up to 7 days “provided that the materials are not chipped or ground.” We believe that clause can be removed without changing the intent of the section.

Response #4: That particular clause was removed. To effectively harmonize with Title 14, paragraph (d)(2) was modified to “... remove from the site within 48 hours of receipt, unless otherwise allowed by the Local Enforcement Agency to hold materials for a longer period of time.”

Comment #5: PAR 1133.1 (d)(3): The 24 hour holding time proposed to a biomass power generation facility might cause biomass plant operators to stop accepting greenwaste completely, further reducing markets for these materials. Biomass plants are currently exempt from Title 14 feedstock holding times. Might biomass power plants be permitted to hold chipped greenwaste longer than 24 hours so long as the moisture content is below 30%?

- Response #5: Due to changes to paragraph (d)(2), this requirement is no longer needed and has been removed.
- Comment #6: PAR 1133.1 (d)(4): Although Construction, Demolition, and Inert (CDI) facilities primarily handle woodwaste, some do handle greenwaste. This section appears to open a loophole in the rule. In the interests of a level playing field, you may wish to require these facilities to handle greenwaste the same as other chip and grind facilities. You may also wish to expand the definition of woodwaste, per our Comment #3 of this section.
- Response #6: Paragraph (d)(4) was completely removed from the rule to avoid confusion and as it is already required by paragraph (d)(2) of the revised PAR 1133.1. For the definition of woodwaste, the reader is referred to Response #3 of this section.
- Comment #7: PAR 1133.1 (d)(6)(B) & (C): Strike the words “foodwaste” from here, as these facilities are not permitted to handle foodwaste unless they are also a permitted transfer station.
- Response #7: Staff removed the words as recommended.
- Comment #8: PAR 1133.1 (f)(3): We do not believe your intent is to limit this provision to curbside materials only. Please strike the word “curbside” from the first line.
- Response #8: This exemption is existing rule language and its modification is outside the scope of these amendments. Staff plans to continue to work on this chipping and grinding sector in the near future and may revisit this issue.
- Comment #9: PR 1133.3 (c)(7): The term defined here is no longer used in the rule. Is the definition needed? If so, is the reference to direct respirometry really a reference to the Solvita test? Since Solvita is already referenced, why change now?
- Response #9: This definition of “curing phase” has already been established in the District’s earlier Rule 1133.2 (co-composting rule). This term is still needed and used in the definition of “finished compost.”
- Comment #10: PR 1133.3 (d)(2)(A): Recent research by CalRecycle showed that overs were effective as a compost cap. When blended into the compost pile, overs reduce bulk density and increase penetration of air deep into the pile, helping maintain aerobic conditions. Overs typically contain beneficial microbes left over from the composting process, which helps inoculate the pile with and speeds decomposition. Please strongly consider allowing the use of overs as a compost cap material or provide your rationale as to why this should not be allowed.
- Response #10: The rule has been modified to allow the use of overs as a compost cap material by adding it to the new definition of “finished compost” (PR 1133.3 (c)(10)). Furthermore, the rule is now allowing screened or unscreened finished compost (including compost overs) as a cover material.
- Comment #11: PR 1133.3 (d)(2)(B): The word “subsequent” is confusing and probably unnecessary.
- Response #11: Staff removed the word as recommended.

Comment #12: PR 1133.3 (d)(3): It would be helpful to define the method for calculating foodwaste percentage. What is the source of the 10% foodwaste figure? Foodwaste, even when source separated and not mixed with greenwaste, typically contains a high percentage of non-food materials, such as cardboard. This is recognized by entities such as the Climate Action Reserve, which requires foodwaste composters to actually measure the percentage of food in their waste streams in order to claim GHG credits. Even when collected separately from restaurants and institutions, the percentage of actual food in foodwaste is less than 100%.

Response #12: Staff has revised the rule requirements with regard to foodwaste composting operations. The definition of “foodwaste” has been modified to address non-food materials, and a threshold of annual foodwaste throughput on a facility basis is proposed.

Some greenwaste composting facilities in the South Coast region currently accept foodwaste less than 10%, by weight, on a facility throughput basis, but actually more than 10% food scraps, by weight, are being composted in windrow recipes without the need of an add-on emission control device. There are only a few facilities handling this food material in the South Coast, but significant interest increases on this activity. Existing composting facilities use foodwaste recipes of 1 part foodwaste to 2 or 4 parts greenwaste. Therefore, staff has set a new threshold of 5,000 tons per year of foodwaste throughput, above which an emission control device meeting at least 80% control efficiency for VOC and ammonia would be required for active phase piles or windrows containing foodwaste of 10 percent or more, by weight. By this revision, the rule proposes that up to 5,000 tons per year of foodwaste throughput, either on a source-separated or mixed basis, be decomposed without an add-on control device.

## Public Comments

### Applicability

Comment #1: Please clarify applicability of PAR 1133.1 to chipping and grinding activities at multi-operation facilities that handle multiple incoming material streams with separate operating areas for chip and ship and composting operations within the same facility.

Response #1: Staff clarified applicability of PAR 1133.1 to “chipping and grinding activities to produce materials other than active or finished compost, unless otherwise exempted.” Separate operations for chip and ship or chipping to produce biofuel or ADC within the same facility would be subject to the provisions of PAR 1133.1. However, chipping and grinding activities as part of composting operations to produce active or finished compost within the same facility would be subject to the provision of PR 1133.3(d)(1)(A).

Comment #2: PAR 1133.1 does not list landfills or power plants for applicability, but they are given a time limit for utilization of materials in PAR 1133.1(d)(3). The new

utilization time limits may cause power plants to delay acceptance of materials from greenwaste facilities, causing a backlog that would shut down operations.

Response #2: The reader is referred to Response #4 of the CalRecycle Comments section and Response #9 of this section.

### Definitions

Comment #3: PR 1133.3(c)(12) adds a “per pile” requirement to the definition. We currently operate one of our greenwaste facilities with less than 20% manure, but may go over this minimum amount on a pile by pile basis. By changing the definition to a “per facility” basis allows greater flexibility in absorbing fluctuating input streams and lessens the need for stockpiling that will lower emissions. We feel that the “per pile” term should be changed to “per facility” in the definition of greenwaste composting and the word “waste” should be taken out of all the rule language altogether.

Response #3: The definition of greenwaste composting with up to 20% manure, by volume, is to be consistent with District’s co-composting Rule 1133.2. Changing the definition to a “per facility” basis would conflict with Rule 1133.2. Under Rule 1133.2, composting of greater than 20% manure, by volume would no longer be defined as greenwaste composting, but defined as co-composting and thus the operator would need to meet the requirements of Rule 1133.2.

Comment #4: Residuals derived from food production and storage enterprises are typically not exclusively food waste. They typically include a lot of non-food, wrapping and container material (paper & plastic). For this reason when the rule says 10% foodwaste (e.g., 1133.3(d)(2)), it contains a significant portion (greater than 50% by weight, depending on the source) of non-putrescible material. It is suggested that PR 1133.3 should delete “foodwaste” and define “food material” as the portion of the compostable material feedstock that is directly derived from vegetable or animal matter, which is consistent with the Title 14 term. The percent of food material will be determined for feedstock coming into the entire facility, not just one pile or windrow.

Response #4: Staff re-defined the term “foodwaste” to be “any pre- or post-consumer food scraps collected from the food service industry, grocery stores, or residential food scrap collection. Any non-food material that is not separated from food scraps is considered foodwaste for the purpose of calculating throughput, which includes both compostable and non-compostable waste.” The proposed threshold that would require installation of an emission control device has been modified to 5,000 tons per year of foodwaste throughput per facility.

Comment #5: PAR 1133.1(c)(8) should exclude compostable food packaging materials which, being derived from plant fibers, are more like greenwaste than food.

Response #5: As it pertains to chipping and grinding operations, staff does not feel that any modification is needed to this definition as the suggestion would require separation and characterization of the material which would be unnecessarily burdensome.

- Comment #6: Under PAR 1133.1, so-called “greenwaste” is not entirely composted of “leafy green” material, the putrescible portion, and the primary VOC producing component. For this reason, for the purpose of this rule, green material should be specifically defined as the VOC-producing portion of those materials as per Title 14.
- Response #6: Staff disagrees. The definition of greenwaste has been established in earlier District’s rules and modifying this definition could cause confusion to the readers. The large woody materials of greenwaste exceeding 2 inches in diameter are now considered woodwaste for the purpose of PAR 1133.1.
- Comment #7: Woody material, while compostable, typically is used in chipped or ground fashion to provide a very slow degrading “bulking agent” to more putrescible materials. Alternatively, it is used for “wood chips” or sent to biomass burn facilities for fuel. It is recommended that woody material portion of green material is considered wood material.
- Response #7: The reader is referred to Response #3 of the CalRecycle Comments section.
- Comment #8: Composting and compost are already defined in other regulations as time and temperature for pathogen reduction. It is recommended that the rule defines “active compost” as in Title 14, and includes “compost overs” in the definition of “finished compost.”
- Response #8: Staff included temperature requirement as part of definition of “active compost” and included “compost overs” in the definition of “finished compost” as recommended.

#### Greenwaste Processing and Stockpiling

- Comment #9: PAR 1133.1(d)(3) requires a landfill or “biomass power generation facility” to utilize the chipped or ground greenwaste within 24 hours of receipt. It appears that the rule considers a landfill application of ADC or erosion control the same as stockpiling greenwaste for fuel to produce energy. The applications are entirely different and the greenwaste at the plant does not remain on site or get buried, but is consumed in a timely manner. Attempting to operate with 24 hours or less of inventory is not feasible or practiced anywhere in the biomass industry. In addition, the definition of “greenwaste” includes any organic material whereas Colmac’s greenwaste definition does not include grass, palm or succulents such as found at a landfill.
- Response #9: Staff removed that paragraph from the rule, and the same 48 hours removal requirement would be applied to all facilities, unless otherwise allowed by the LEA to hold for a longer period of time. Staff also proposes an exemption for a biomass power generation facility or a facility processing material as a biomass fuel for a biomass power generation facility from the requirement of material removal within 48 hours of receipt, provided that the material temperature is maintained at below 122 degrees Fahrenheit or the moisture content is less than 30%. In addition, the definition of “non-curbside greenwaste” has been modified to include the large (exceeding 2 inches) woody material of greenwaste into the definition of “woodwaste.”

- Comment #10: PAR 1133.1(d)(4) should be revised to allow greater storage time for woody materials.
- Response #10: The reader is referred to Response #6 of the CalRecycle Comment section under the May 10<sup>th</sup> Working Group Comments.
- Comment #11: PAR 1133.1(d)(2) and (d)(3) should be revised to mimic Title 14, Section 17852(a)(10), which requires greenwaste to be "...removed from the site within 48 hours of receipt." Such a provision will allow facilities that do not operate 24/7 adequate time to manage greenwaste, especially for materials received at the end of the regular business week.
- Response #11: Staff revised this requirement as recommended.
- Comment #12: For consistency, PAR 1133.1(d)(2)/(d)(3) and PR 1133.3(d)(1)(C) should contain the same processing and storage requirements.
- Response #12: Staff revised the processing and storage requirements such that they are consistent between the two rules.

#### Foodwaste Limit

- Comment #13: While I understand foodwaste can be a big contributor to VOCs, it is important to understand the foodwaste collection programs that are currently in place in various municipalities and institutions. 10% foodwaste by weight can be very deceiving. Foodwaste typically arrives in packages on pallets. As long as the packaging is organic and bio-degradable, no additional processing is required to remove contaminants from compost. In most cases, it is rare to receive clean pure foodwaste. Depending on the source (either pre- or post-consumer foodwaste), the percentage of non-food packaging can vary. A flat 10% maximum by weight is not conducive to the much needed foodwaste programs currently in effect.
- Response #13: The reader is referred to Response #12 of the CalRecycle Comments section.

#### Emissions Control and Alternative

- Comment #14: Forced aeration systems and windrow composting are two very different forms of composting and will require specifically defined language for each. While there are many common requirements, there are many differing methods in production that need to be considered.
- Response #14: Staff revised the rule language such that a specific composting technology (such as a force aeration system) is no longer required. However, the rule would still require an emission control device meeting at least 80% reductions in VOC and ammonia emissions if greater than 5,000 tons per year of foodwaste throughput is decomposed. This revision is to allow various technologies that may achieve the overall system control efficiency of at least 80%.
- Comment #15: PR 1133.3 should be revised to allow various technologies to achieve the overall system control efficiency of at least 80%. For example, Rule 1133.2 provides a similar condition without specifying the control technology to be

used employed. It is our experience that positive aeration systems and other technologies or approaches (e.g., ASP with pseudo-biofilter) could also be utilized to achieve the desired control efficiency.

Response #15: The language has been revised to reflect this suggestion.

Comment #16: PR 1133.3 would require approvals from the AQMD, CARB, as well as the US EPA to allow for adoption of alternative best management practices (BMPs) for emission reduction and alternative emission control methods by greenwaste composting operators. This will involve three levels of time-consuming government review. It is our opinion that the Executive Officer (EO) of the AQMD is sufficiently qualified to consider and approve alternative BMPs and alternative emission control methods. Therefore, it is our recommendation that the EO of the AQMD be the sole authority in the consideration and approval of alternative BMPs for emission reduction and alternative emission control methods proposed by greenwaste composting operators.

Response #16: The reader is referred to Response #3 of the US EPA Comments section under the February 23<sup>rd</sup> Public Workshop Comments. As the rule will be submitted to CARB and US EPA as a part of SIP, approval by all agencies is required to limit agency-specific discretion. In addition, this requirement is typical of other AQMD rules that include compliance alternatives. Staff will work to expedite such requests.

#### Permitting/Offsets/BACT

Comment #17: Compost producers need to have a better understanding of how the District staff plans to address Best Available Control Technology (BACT) for windrow composting vs. aerated static pile (ASP) composting for food material. Additionally, the percentage targets for BACT are not clearly defined.

Response #17: Windrow composting does not require a permit, with or without food. Finished compost cover is seen more as a BMP as opposed to a control technology, and thus does not require a permit nor trigger BACT. New facilities required to obtain a permit will be subject to New Source Review including BACT requirements. This being the case, ASP composting with appropriate emission control devices may be considered BACT. If the post-control VOC emissions exceed 22 lbs per day at a facility, offsets would be required. This is part of the existing permit system. Existing facilities that are currently doing windrow composting and that modify to ASP composting solely to comply with this new rule would likely meet BACT and not require offsets, provided that they operate at the current facility throughput.

Comment #18: It is not clear if permitting would be required if you have a trammel screen or other pieces of equipment or control device that is listed in the permitting rules. Please clarify what constitutes triggering of an 1133.1 permit, based on equipment on any given site.

Response #18: The AQMD permit requirements are specified in Rules 201 and 203, with permit exemptions specified in Rule 219. Generally, turning of a pile or windrow using DMV-registered motor vehicles does not require a permit. On-

site equipment, such as dedicated mobile grinders and screeners, are already subject to permit from the District or ARB, but that is for the equipment or engine emissions only, not composting emissions. If a pile is aerated, the mechanical aeration system and its associated emission control device would require a separate permit for each.

### Exemptions

Comment #19: PAR 1133.1(f)(3) should apply to all greenwaste, instead of curbside greenwaste as drafted.

Response #19: The reader is referred to Response #8 of the CalRecycle Comments section.

Comment #20: As waste conversion technologies rapidly advance, greenwaste by itself or in combination with other organic materials may be composted at landfill sites via anaerobic processes in the near future. These landfill-based greenwaste composting operations will clearly not fit well with the regulatory framework of PR 1133.3. It is recommended that landfill-based anaerobic greenwaste composting operations be specifically exempt from PR 1133.3.

Response #20: If anaerobic digestion is applied to greenwaste composting on its own (i.e., voluntarily by the facility operator), the composting would be exempt pursuant to PR 1133.3(g)(2), provided that an overall 80% control efficiency is demonstrated.

### Miscellaneous

Comment #21: We want to be sure that we set a new precedent of socio-economic analysis for our industry, which is fundamentally based on the new sustainable economies-of-scope as applied to renewable carbon management. While we understand that this is beyond the scope of the current, prescribed methods of the District's socio-economic analysis, we believe that we have a unique opportunity to use this rulemaking process to introduce an evolutionary change in this process.

Response #21: As discussed at the working group meeting, such an analysis is beyond the scope of these proposed rules.

Comment #22: We believe that the compost industry is unique, and strategically positioned, compared to any other industry, in helping society move to a sustainable, renewable carbon society. Since carbon is central to all life and economics, this industry is core to the emerging sustainable economy. For these reasons, the compost industry should be given new, and unique, analysis considerations. We suggest the District staff work with the compost industry closely to craft a new socio-economic analysis that adequately articulates and demonstrates the importance of this relatively small industry within the larger context of renewable carbon management.

Response #22: Staff appreciates the environmental benefits that composting provides. However, the analysis requested is beyond the scope of this rule proposal.

**Written comments were submitted by:**

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Matt Cotton, Integrated Waste Management Consulting, LLC and on behalf of:

Agromin;

Aguinaga Green;

Alameda County Waste Management Authority and Alameda County Source Reduction and Recycling Board as one Public Agency – StopWaste.org;

Association of Compost Producers;

Athens Services;

American Organics;

Burrtec Waste Industries;

California Bio-Mass;

California Against Waste;

City of Bakersfield Solid Waste Division;

Community Recycling and Resource Recovery;

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Solid Waste Association of Orange County

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