

# **APPENDIX B**

## **EMISSION REDUCTION ANALYSIS FOR PROPOSED NEW RULE 4565 (BIOSOLIDS, ANIMAL MANURE, AND POULTRY LITTER OPERATIONS)**

**February 15, 2007**

# SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT

## I. SUMMARY

This appendix details the estimated VOC emissions and emission reductions for Proposed New Rule 4565 (Biosolids, Animal Manure, and Poultry Litter). These estimates are based on the best available information at the time that this report was written. Table 1 summarizes the results of the detailed calculations, which are shown in Section III. Based on this data, District staff estimates emission reductions of approximately 1,440 tons per year (tpy) or a reduction of 41% of the baseline VOC emissions.

TABLE 1 – Summary of Emissions and Emission Reductions

	Estimated Current Emissions (tpy)	Estimated Emissions After Control (tpy)	Estimated VOC Emission Reductions (tpy)
Landfill	0.0	0.0	0.0
Land Application	847.8	56.5	791.3
Compost	2,682.6	2,044.7	637.9
TOTAL	3,530.5	2,101.2	1,429.2

## II. INTRODUCTION

The purpose of Proposed New Rule 4565 is to control VOC emissions from biosolids, animal manure and poultry litter. The rule applies to facilities that landfill, land apply, or compost these materials. Operators would have a menu of choices to meet the rule requirements. The menu provides operators with the flexibility to find the most cost-effective compliance option for their processes. For this emission reduction analysis, the breakdown of carbon-based chemicals by microorganisms in the biosolid, manure, or litter is the source of VOC emissions. Section III of this appendix details the assumptions and calculations for the estimated emissions and emission reductions. Section IV lists the references used in performing this analysis.

## III. EMISSION REDUCTION ANALYSIS

### A. Throughput Calculations

The rule applies to three types of operations: landfill, land application, and compost/co-composting. Of the three, composting/co-composting operations have at least some information about throughput. The California Integrated Waste Management Board (CIWMB) Solid Waste Information System (SWIS) is a database that tracks the maximum throughput of all types of solid waste handling facilities required to report operational data to CIWMB and the database is updated at least weekly. This database was queried on May 9, 2006 for composting facilities. Facilities within the

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District that list biosolids, manure, or “agricultural” as an accepted waste were included in the calculations. The term “agricultural” could include animal bedding with manure or litter mixed in. Maximum throughput in units other than tpy was converted, as needed. When more than one waste stream was listed, District staff assumed that 50% of the throughput was green waste with a bulk density of 0.38 tons per cubic yard and the balance was biosolid, manure, or poultry litter with bulk density of 0.78 tons per cubic yard. There was one facility listed as accepting biosolids exclusively. Additionally, facilities were assumed to be open five days per week and closed for ten holidays per year, meaning that wastes were delivered 250 days per year. Unless specified otherwise, all throughputs are in wet tons.

The amount of biosolids, manure, or litter either disposed of in landfills or applied to land could not be determined directly. The California Association of Sanitation Agencies (CASA) did a survey in 1998. According to the survey, biosolids in California were managed in the following ways:

- 4% surface disposed
- 5% incinerated or stored in temporary storage
- 6% disposed of in landfills
- 12% used as alternative daily cover (ADC) at landfills
- 54% land applied
- 16% composted

The amount of biosolids being composted in the District was calculated by assuming that, for facilities that specifically list that they accept biosolids in addition to other materials, 50% of the facility’s throughput was biosolids. The quantity of composted biosolids was then adjusted using the percentages above to determine the quantity land applied. The quantity of manure or litter applied to land could not be determined, so District staff assumed that the calculated amount of biosolids represents the total amount of biosolids, manure, and litter that is land-applied.

This rule does not address surface disposal, storage, or incineration, so these categories were ignored in the emissions calculations. Landfills are required, by state regulations, to cover the solid waste at the end of each working day, so no emission reductions would be expected from requirements imposed by Proposed New Rule 4565. However, the use of biosolids as ADC would be eliminated, because Proposed New Rule 4565 would require that biosolids be covered by six inches of soil, which is the same depth required for ADC. With intense demands by the public to get as much solid waste as possible into a landfill, operators would not choose to put twelve inches of ADC on the working face. Therefore, operators would not use biosolids as ADC. Since no landfill in the District currently uses biosolids as ADC, no emission reductions are expected as part of this rule. By putting the requirements in place, however, prevents future use of biosolids as ADC.

**B. Emission Factors Used**

Currently there is research proposed to further refine the emission factors for various types of composting facilities. However, due to the District's Extreme Ozone Plan commitment to adopt a rule regulating VOC emissions from composting facilities by the first quarter of 2007 and the significant quantity of research conducted by the South Coast Air Quality Management District (SCAQMD), staff believes there is sufficient information to proceed with the rule development process. District staff will incorporate new research findings as they become peer-reviewed and finalized, as the rule-making schedule allows.

For purposes of this analysis, two different emission factors were used. For composting/co-composting facilities, the factor from SCAQMD Rule 1133.2 (Emission Reductions from Co-Composting Operations) of 1.78 pounds VOC per ton of processed material was used. This factor was developed for passive windrow composting. It was assumed that all composting facilities mixed biosolids, manure, or litter with bulking agent before composting, meaning that all composting operations that use these materials were co-composting operations.

The second emission factor was also taken from SCAQMD. This emission factor was for active composting only. Based on operator comments, the active composting phase was assumed to be 20 days long and the total emissions for the 20-day period would be 1.42 pounds VOC per ton of processed material. With the lack of data, it was assumed that while biosolids/manure/litter was exposed to the air, it would emit VOC at the same rate as active composting. In the case of land application, the factor was adjusted to take into account that the biosolids/manure/litter would emit VOCs at the rate of 1/20<sup>th</sup> of 1.42 pounds VOC per ton each day that it was not land incorporated.

**C. Control Efficiencies Used**

For purposes of this analysis, the handling of biosolids is assumed to be similar to animal manure. In 2002, Iowa State University and The University of Iowa Study Group compiled information about air quality issues related to "concentrated animal feeding operations." In the study group's report, the documented control efficiency of various emission-reducing strategies was tabulated. The final report is titled "Concentrated Animal Feeding Operations Air Quality Study" and is available on-line at <http://www.ehsrca.uiowa.edu/CAFStudy.htm>. For purposes of this analysis, small composting facilities were assumed to have an emission reduction of 10% overall and facilities with throughputs from 20,000 wet tons per year but less than 100,000 tons per year were assumed to have a 20% overall reduction. For large composting facilities, the capture efficiency was assumed to be 33%, taken from the SCAQMD technical assessment of SCAQMD Rule 1133.2. Rule provisions require a VOC control efficiency of at least 80%, therefore, overall control efficiency is 33% times 80%, or 26.4% overall.

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## D. Emissions and Reductions Calculations

In performing the analysis, several assumptions were made to conservatively estimate emission reductions. These include:

- Landfill operators are not currently using biosolids as alternative daily cover and, therefore, have no emissions reductions associated with the draft rule provisions.
- Incorporation of biosolids/animal manure/poultry litter into soil at facilities that land apply these materials typically takes 15 days from spreading of the biosolids/animal manure/poultry litter onto the ground until the material is incorporated.
- It was assumed that none of the existing composting facilities with throughputs at least 100,000 tpy are implementing any of the mitigation measures.
- For composting facilities with maximum throughputs less than 100,000 tpy, approximately 50% of the facilities are in compliance with draft rule management practice requirements, based on conversations with facility owners, operators, inspectors, and employees (with percentage weighting for facilities that only implement some of the practices). This means that all of the emission reductions will occur at the remaining 50% of composting facilities. The percent of facilities already implementing controls is based on contact with industry and review of the Districts permits. The VOC emissions are estimated actual emissions, considering controls currently utilized by facilities.

Table 2 shows the calculation for estimated emission reductions from land application of biosolids, animal manure, and poultry litter. Table 3 outlines the same things for existing composting/co-composting facilities.

Table 2 – Emissions and Emission Reductions from Land Application

	Throughput (tpy)	Emission Factor	Number of days	Estimated Emissions (tpy)
Estimated current	1,592,170	1.42 lb/20 days	15	847.8
Estimated after control	1,592,170	1.42 lb/20 days	1	56.5
Estimated Emission Reduction (tpy) (Estimated current emissions minus estimated after-control emissions)				791.3

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Appendix B: Emissions and Emission Reductions

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Table 3 – Emissions and Emission Reductions from Composting/Co-Composting

Facility Permitted Throughput (tpy)	Number Facilities	Estimated Total Throughput (tpy)	Emission Factor (lb/ton throughput)	Estimated Emissions (tpy)
<b>Estimated Current Emissions</b>				
Between 100 & 20,000	12	97,787	1.78	82.7
Between 20,000 & 100,000	9	431,149	1.78	345.4
At least 100,000	8	2,533,250	1.78	2,254.6
<i>Total Estimated Current</i>		<i>3,062,186</i>		<i>2,682.6</i>
<b>Emissions After Rule Implementation</b>				
Between 100 & 20,000	12	97,787	Overall 10% reduction	78.3
Between 20,000 & 100,000	9	431,149	Overall 20% reduction	307.0
At least 100,000	8	2,533,250	33% capture/ 80% control	1,659.4
<i>Estimated Total After Control</i>		<i>3,062,186</i>		<i>2,044.7</i>
<b>Estimated Composting Emission Reduction (= Total Estimated Current – Estimated Total after Controls)</b>				<b>637.9</b>

Table 4 summarizes the results of the emissions and emission reduction calculations of Tables 2 and 3. District staff estimates that current VOC emissions from the management of biosolids, animal manure, and poultry litter are about 3,500 tons per year. After full rule implementation, the current facilities will emit about 2,100 tons per year of VOCs for an estimated VOC emission reduction of about 1,430 tons per year. Table 4 is a duplicate of Table 1 above.

TABLE 4 – Summary of VOC Emissions and VOC Emission Reductions

	Estimated Current Emissions (tpy)	Estimated Emissions After Control (tpy)	Estimated VOC Emission Reductions (tpy)
Landfill	0.0	0.0	0.0
Land Application	847.8	56.5	791.3
Compost	2,682.6	2,044.7	637.9
<b>TOTAL</b>	<b>3,530.5</b>	<b>2,101.2</b>	<b>1,429.2</b>