CE Schmidt, Ph.D.
Environmental Consultant

November 7, 2008

Mr. Mike Harding
Biosolids Recycling, Inc.
1116 Hastings Ct.
Antioch, CA 94509

Dear Mr. Harding:

Enclosed please find a copy of the complete draft, Technical Memorandum for the testing on the Odour Stop cover system conducted at the composting facility located in western Arizona. Tom Card will be preparing an emissions report and forwarding to you as soon as it is available.

If you have any questions, please feel free to call.

Sincerely,

CE Schmidt, Ph.D.

Attachments - Draft Technical Memorandum

CE Schmidt, Ph.D.
Environmental Consultant

TECHNICAL MEMORANDUM

FLUX CHAMBER SOURCE TESTING OF FUGITIVE AIR EMISSIONS FROM THE ODOUR STOP MICROPORE COVER SYSTEM FOR COMPOST OPERATIONS

Prepared For:

Mr. Mike Harding
Biosolids Recycling, Inc.
1116 Hastings Ct.
Antioch, CA 94509

Prepared By:

Mr. Tom Card
Environmental Management Consulting
41125 278th Way SE
Enumclaw, WA 98022

Dr. C.E. Schmidt
Environmental Consultant
19200 Live Oak Road
Red Bluff, California 96080

November 7, 2008

CE Schmidt, Ph.D.
Environmental Consultant

TABLE OF CONTENTS

		Page
Executive Summary		ii
I.	Introduction	1
II.	Test Methodology	2
III.	Quality Control	4
IV.	Results and Discussions	6
V.	Summary	7

Attachments

A- Emissions Measurement Data Sheets

B- Chain of Custody Forms

C- Lab Reports

References

CE Schmidt, Ph.D.
Environmental Consultant

EXECUTIVE SUMMARY

Field measurements were conducted at a compost facility located in western Arizona for Biosolids Recycling, Inc. Testing was conducted on the Odour Stop cover system for windrow composting for the purpose of assessing total volatile organic compound (VOC- expressed as total non-methane non-ethane organic compounds by SCAQMD Method 25.3) emissions and ammonia emissions from the composting of biosolid waste (greenwaste bulking agent). The testing was conducted on October 9, 2008. A blend of horse stable bedding and biosolids was mixed to typical proportions and a windrow was built three days prior to testing. Two flux chambers were set in the windrow (top location and side location) and the pile was covered with an Odour Stop micropore fabric cover. The chambers under the cover provide the uncontrolled flux of study compounds that can be compared to the fugitive air emissions of study compounds through the cover. These data can be used to calculate cover control efficiency of study compounds.

The goal of the project was to collect direct-measured, flux rate data that can be used to develop control efficiency for the cover system on a time period of the composting process that is considered to be a 'worst case' air emissions conditions. This was done in order to provide test data that would best describe the control efficiency of the cover system. The cover that was used had been in service for a time period of approximately three-to-four months and appeared to be in good repair.

The field data collected will be used to estimate baseline emissions of VOCs and ammonia in order to qualify the Odour Stop cover systems for site operations that require the control of fugitive air emissions.

The data collection approach included using the USEPA-recommended flux chamber modified as per the SCAQMD Rule 1133 as approved by recent method improvements (10% helium trace gas, 6" exhaust port modified to 2", diffusive-type sweep air addition system), and standard, regulatory approved air sample collection methods for VOCs or reactive organic gases, and ammonia. This approach provided data of high quality (accuracy and precision) representative of air emissions of study compounds from the organic composting process and the greenwaste static pile windrow composting process. The testing was scheduled so that fugitive air emissions could be measured at key time in the composting processes studied (e.g., first few days of windrow building or the start of the compost cycle).

Testing was conducted using the USEPA surface emission isolation flux chamber, and volatile organic compounds (VOCs) were measured using SCAQMD Method 25.3 for total VOCs, and ammonia was measured with SCAQMD Method 207.1. Advective flow from the windrow composting (gas production and added blower source) was assessed by using a tracer gas (10% helium) in the flux chamber, gas collection in evacuated stainless steel canisters, and analysis off site by gas chromatography/thermal conductivity detection and flame ionization detection (GC/TCD; GC/FID). The dilution of helium was used to calculate advective flow, and these data were used in the calculation of compound emissions from the test sources.

Note that the recommended SCAQMD method bias factor correction of 1.086 was not applied to these data. There is no scientific justification for applying a specific bias correction factor generated from one laboratory to another laboratory, since a given analytical method bias is unique to that laboratory and not intrinsic to the method.

CE Schmidt, Ph.D.
Environmental Consultant

I. INTRODUCTION

This technical memorandum describes the field testing that was conducted in order to assess air emissions of ammonia and VOC or TNMNEOC air emissions from the Biosolids Recycling Odour Stop micropore cover system for solid waste (biosolids) composting operations. Testing was conducted at a compost site located in western Arizona. Testing was conducted by Dr. C.E. Schmidt and Mr. Tom Card on October 9, 2008 with representatives of Biosolids Recycling, Inc. Site preparation was conducted by Biosolids Recycling, Inc., which included arranging for the field test, constructing the test windrow, and providing access to the facility.

The objective of the study was to provide representative, fugitive air emissions of study compounds for the purpose of generating ammonia and TNMNEOC air emission estimates so that control efficiency for the Odour Stop cover could be calculated. This was accomplished by staging a biosolids compost windrow and conducting quantitative analysis of air emissions producing representative average air emissions data from the covered windrow.

This memorandum includes a discussion of the testing methodology, quality control procedures, results, discussion of the results, and summary statements.

II. TEST METHODOLOGY

Testing for surface flux was conducted using the USEPA recommended Surface Isolation Flux Chamber (USEPA. Radian Corporation, February 1986). Flux chamber sampling was performed on piles of green waste materials and green waste mulch/compost as found on these sites the day of testing.

The operation of the surface flux chamber is given below:

1. Flux chamber, sweep air, sample collection equipment, and field documents were located on-site.

2. The site information, location information, equipment information, date, and proposed time of testing were documented on the Emissions Measurement Field Data Sheet.

3. The exact test location was selected and the flux chamber was interfaced to the test surface.

4. The sweep air flow rate (ultra high purity air with a 10% helium tracer gas additive) was initiated and the rotometer, which stabilizes the flow rate, was set at 5.0 liters per minute. A constant sweep air flow rate was maintained throughout the measurement for each sampling location.

5. Flux chamber data were recorded every residence interval (6 minutes) for five intervals, or 30 minutes.

6. At steady-state (assumed to be greater than 5 residence intervals), the screening by colorimetric tube and real-time instrument was performed. After screening, sample collection was performed by interfacing the sample container (acid impinger, trap and canister, and tedlar bag (if scheduled) sequentially) to the purged, sample line and filling the container with sample gas or collecting the desired sample following sample collection protocols as per the work plan.

7. After sample collection (impinger solution, trap and evacuated canister, and tedlar bag) all sample media was sealed, labeled, and stored as per protocol, and sample collection information was documented on the data sheet.

8. After sampling, the flux measurement was discontinued by shutting off the sweep air, removing the chamber, and securing the equipment. The chamber was cleaned by dry wipe

with a clean paper towel and the sample lines were purged with UHP air.

9. Sampling locations were recorded on the field data sheet. The equipment was then relocated to the next test location and steps 1) through 8) were repeated.

III. QUALITY CONTROL

Control procedures that were used to assure that data of sufficient quality resulted from the flux chamber study are listed and described below. The application and frequency of these procedures were developed to meet the program data quality objectives as described in the project source test protocol (Card, T. and Schmidt, C.E., October 2008).

Field Documentation -- A field notebook containing data forms, including sample chain-of-custody (COC) forms, was maintained for the testing program. Attachment A contains the Emission Measurement Data Sheets.

Chain-of-Custody -- COC forms were not used for field data collection. Field data were recorded on the Chain-of-Custody forms provided in Attachment B.

Ammonia Analysis by SCAQMD Method 207.1

Calibration – A five-point calibration curve was performed for the ammonia method, and the correlation curves reported a range that was within the method specification. These data indicate acceptable method performance.

Laboratory Spike Recovery- The laboratory performed a spike recovery analysis. The recovery of the spike was 107% indicating acceptable method performance.

Relative Percent Accuracy- A calibration standard was analyzed twice and the relative percent accuracy was computed using the known standard and the average of the standard runs; the relative percent accuracy (RPA) is reported as 1.02 % (QC standard of 10%). These data indicate acceptable method performance.

Trip Blank—One trip blank sample was conducted and the blank level reported was 0.014 mg per sample (MDL 0.004 mg). This blank level represents a baseline concentration of 0.47 mg/m3 or a flux of 0.018 mg/m2, min-1. These data indicate acceptable blank levels for the method and adequate method performance.

Field Replicate Sample Analysis -- One field sample/replicate pair was collected and analyzed for the project. The relative percent difference (RPD) value for sample/replicate pair was 1.1 (QC criteria 50 RPD). These data indicate acceptable method performance.

Total Non-Methane and Non-Ethane Organic Compound Analysis by SCAQMD Method 25.3

Method Quality Control –Method quality control included method blank determinations and method

response to four-point calibration curves. All method QC testing was with method specifications, and these data indicate acceptable method performance.

Field System Blank –One field blank sample was analyzed as blind QC sample. TNMNEO level in the blank samples was 6.37 ppmvC which is six times higher than expected. The extenuating circumstances that lead to this blank level were the windy and dusty environment where the samples were collected. Given the field conditions and the level of field samples (the sample value closest to the blank level was 100 times greater indicating no need for blank subtraction), the blank level for the method is acceptable. Further, the laboratory conducted a blank test with pure water and the detector response was 0.322 ppmvC, which is well below the method detection limit of 1 ppmvC. These data establish sensitivity for the method (project QC criteria), and acceptable method performance.

Field Replicate Sample – One field sample was collected and analyzed in replicate. The RPD for the sample/replicate pair was 1.8 RPD (QC criteria of 50). These data indicate acceptable method precision and performance.

Tracer Helium Analysis by GC/TCD

Method Quality Control –Method quality control included method blank determinations, and method response to four-point calibration curves. All method QC testing was with method specifications, and these data indicate acceptable method performance.

Tracer Recovery Sample- One media blank sample was collected in the field by filling a canister for analysis in order to determine tracer recovery apart from the flux measurement technology or the advective flow from sources. The tracer was recovered from the media blank sample at 106% (QC criteria ±50%). These data indicate acceptable method performance.

Field Replicate Sample – One field sample was collected in replicate. The precision (relative percent difference) for the field replicate sample pair was 8.8, which is less than the QC criteria of 50 RPD. These data indicate acceptable method performance.

IV. RESULTS AND DISCUSSIONS

A summary of the field sample collection for the field-testing is shown in Table 1. All field data for the on site surface flux chamber testing (screening for ammonia, temperature), and sample identification information are presented in Table 1. All laboratory data including quality control data are presented in Table 2. These flux data include measured advective flow rate in the flux calculation. Surface flux data are shown in flux units for hydrocarbon emissions (mg/m2,min-1 as methane, ppmvC) and for ammonia (mg/m2, min-1) as ammonia.

Surface flux data for a surface area source are calculated using measured target compound concentrations and flux chamber operating parameter data (sweep air flow rate of 5.0 liters per minute [or 0.005 m3/min] plus advective flow [m3/min], surface area of 0.13 square meters [m^2]). The site emissions can be calculated by multiplying the flux by the surface area of the source. The flux is calculated from the sweep air flow rate plus advective flow Q (cubic meters per minute [m^3/min]), the species concentration Yi (micrograms per cubic meter [mg/m^3)], and exposure to the chamber surface area A (square meters [m^2]), as follows:

$$Fi = (Q)\ (Yi) / (A)$$

Emission rate of from the test pile can be calculated by multiplying unit or average flux data per compound by surface area and reported as a function of area source.

Note that the recommended SCAQMD method bias factor correction of 1.086 was not applied to these data. There is no scientific justification for applying a specific bias correction factor generated from one laboratory to another laboratory, since a given analytical method bias is unique to that laboratory and not intrinsic to the method.

V. SUMMARY

Emission testing was performed on the Odour Stop micropore cover system in order to generate an estimate of control efficiency for TNMNEOC and ammonia. Testing was conducted on a biosolids compost pile that was three days old. This time in the compost cycle was selected because it likely represents on of the high air emissions days in the composting cycle. The following is a summary of activities and results associated with this objective:

- Surface flux measurements of study compounds were measured on biosolids windrow pile covered with the micropore fabric Odour Stop on Day 3 of the compost cycle. Testing was performed using the USEPA recommended surface flux chamber technology. This technology quantitatively measures flux at the test surface of study compounds, including below the cover (uncontrolled fugitive air emissions) and on the cover (controlled fugitive air emissions).

- Field quality control data indicate acceptable data quality for the field analyzers. Field and laboratory quality control data indicate acceptable data quality for SCAQMD Method 207.1 (ammonia) and SCAQMD Method 25.3 (organic gases). System blank levels were acceptable, and precision between replicate field samples were within the RPD criteria of 50. The recovery of the helium tracer and the performance of the method, which is used to assess advective flow from the test source into the flux chamber, showed acceptable method performance.

- Note that the recommended SCAQMD method bias factor correction of 1.086 was not applied to these data. There is no scientific justification for applying a specific bias correction factor generated from one laboratory to another laboratory, since a given analytical method bias is unique to that laboratory and not intrinsic to the method.

- The flux data can be used to estimate the control efficiency of the Odor Stop cover by comparing the fugitive emissions for target species on the cover surface to the uncontrolled air emissions potential of air emissions below the cover.

CE Schmidt, Ph.D.
Environmental Consultant

REFERENCES

USEPA. 1986. "Measurement of Gaseous Emission Rates From Land Surfaces Using an Emission Isolation Flux Chamber, Users Guide." EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada, EPA Contract No. 68-02-3889, Work Assignment No. 18, Radian Corporation, February 1986. NTIS # PB 86-223161.

CE Schmidt, Ph.D.
Environmental Consultant

ATTACHMENT A

EMISSION MEASUREMENT DATA SHEETS

CE Schmidt, Ph.D.
Environmental Consultant

ATTACHMENT B

CHAIN OF CUSTODY FORMS

CE Schmidt, Ph.D.
Environmental Consultant

ATTACHMENT C

LABORATORY REPORTS