ENVIRONMENTALLY-FRIENDLY DAIRY COW MANURE & ORGANIC WASTE COMPOSTING TECHNOLOGY & EMISSIONS CONTROL DEMONSTRATION PROJECT

FINAL IMPLEMENTATION PLAN

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1.0 EXECUTIVE SUMMARY

Inland Empire Utilities Agency (IEUA) processes about 50,000 tons per year of biosolids and 200,000 tons per year of local dairy manure. IEUA will be relocating from this facility consistent with an agreement to sell the land. The biosolids portion of the feedstock to this facility will be delivered to the new Inland Empire Regional Composting Facility. At present the manure does not have a new home.

Regulatory restrictions from the Santa Ana Regional Water Quality Control Board (SARWQCB) and South Coast Air Quality Management District (SC AQMD) will soon eliminate manure recycling on croplands throughout much of Southern California. These regulatory provisions will take effect over the next 18 to 24-months. That means as much as 800,000 tons per year of manure will need to find a new home in addition to the 200,000 tons per year currently composted at the IEUA Co-Composting Facility. Water and air quality considerations are driving the need for this upgraded level of organic material management.

Regulatory compliance for any new composting facility for the manure portion of the feedstock will need to comply with SC AQMD rules- specifically Proposed Rule 1127 and Rule 1133.2. The key features of these rules are as follows:

- Manure disposed after January 1, 2006 must go into either an approved processing operation or approved land application. Local approved land for application amounts to less than 10% of the needed capacity. This land base is continuously shrinking.

- Approved processing operations such as composting must comply with Rule 1133.2 which demands either total enclosure for the active composting or an approved alternative that demonstrates overall emission reduction of 80% for VOC and ammonia. At present there are no approved alternative technologies although there are several that appear promising in achieving the criteria set forth by the SC AQMD.

- Anaerobic digesters are likely to prove too expensive to provide a significant capacity for the local dairy industry.

- Enclosed composting facilities are likely to be economically out of reach for local dairy producers.

The purpose of the Pilot Demonstration Project is to demonstrate to SC AQMD that alternative composting technologies will achieve the needed VOC and ammonia emission reductions. Five (5) alternative composting technologies were selected for evaluation. These five technologies in alphabetical order include the following:

1. Ag-Bag Environmental System
2. Gore Laminate Membrane System by Sheremeta Environmental Consultants
3. NaturTech Composting System
4. Open aerated static pile composting with negative aeration to biofilters
5. Passive aerated static pile composting with Laminate Cover

Each of these technologies must be pilot tested with rigorous quality control and testing protocols to satisfy the data requirements of SC AQMD. The Air District has indicated a willingness to lead

in the collection and processing of air quality samples as a part of their support to the local dairy industry as the industry works to cope with the impact of new air quality regulations. Additionally, the pilot testing will provide essential data to determine the overall cost-effectiveness of the technology as it is applied to the various feedstocks.

2.0 INTRODUCTION

2.1 Project Setting

IEUA processes about 50,000 tons per year of biosolids and 200,000 tons per year of local dairy manure. IEUA will be relocating from this facility consistent with an agreement to sell the land. The biosolids portion of the feedstock to this facility will be delivered to the new Inland Empire Regional Composting Facility. At present the manure does not have a new home.

Regulatory restrictions from the Santa Ana Regional Water Quality Control Board and South Coast Air Quality Management District will soon eliminate manure recycling on croplands throughout much of Southern California. These regulatory provisions will take effect over the next 18 to 24-months. That means as much as 800,000 tons per year of manure will need to find a new home in addition to the 200,000 tons per year currently composted at the Inland Empire Utilities Agency (IEUA) Co-Composting Facility. Water and air quality considerations are driving the need for this upgraded level of organic material management.

Regulatory compliance for any new composting facility for the manure portion of the feedstock will need to comply with South Coast Air Quality Management District (SC AQMD) rules-specifically Proposed Rule 1127 and Rule 1133.2. The key features of these rules are as follows:

- Manure disposed after January 1, 2006 must go into either an approved processing operation or approved land application. Local approved land for application amounts to less than 10% of the needed capacity. This land base is continuously shrinking.
- Approved processing operations such as composting must comply with Rule 1133.2 which demands either total enclosure for the active composting or an approved alternative that demonstrates overall emission reduction of 80% for VOC and ammonia. At present there are no approved alternative technologies although there are several that appear promising in achieving the criteria set forth by the SC AQMD.
- Anaerobic digesters are likely to prove too expensive to provide a significant capacity for the local dairy industry.
- Enclosed composting facilities are likely to be economically out of reach for local dairy producers.

Alternative inexpensive and compliant composting processing methods need to be evaluated. With proper pilot testing and effective partnering with various interested agencies and stakeholders, we should be able to identify suitable technologies that will meet the SC AQMD emission reduction criteria and be economically implementable within the Chino Dairy Area.

2.2 Project Overview

The overall goal of the Pilot Demonstration Project is to demonstrate to SC AQMD that alternative composting technologies will achieve the needed VOC and ammonia emission reductions. Five (5) alternative composting technologies were selected for evaluation. These five technologies in alphabetical order include the following:

1. Ag-Bag Environmental System
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Each of these technologies must be pilot tested with rigorous quality control and testing protocols to satisfy the data requirements of SC AQMD. The Air District has indicated a willingness to lead in the collection and processing of air quality samples as a part of their support to the local dairy industry as the industry works to cope with the impact of new air quality regulations. Additionally, the pilot testing will provide essential data to determine the overall cost-effectiveness of the technology as it is applied to the various feedstocks.

The purpose of this document is to provide a comprehensive operating plan for Environmentally-Friendly Dairy Cow Manure/Green Waste Composting Technology Pilot Demonstration Project (Pilot Demonstration Project). During the course of the Pilot Demonstration Project this document will provide guidance in specific operating procedures. In general this document will explain when and why a particular task is to be performed.

2.3 Schedule and Budget

The implementation schedule for the project is summarized in the following list.

Action	Date of Implementation
1. Implementation Plan Finalization & Approval	September 16, 2004
2. Final Design Completion- Phase 1 AgBag	October 11, 2004
3. Site Availability	October 11, 2004
4. Regulatory Approval	November 11, 2004
5. AgBag Setup, Installation, & Startup	December 10, 2004
6. Monitoring Implementation	December 10, 2004
7. First Bi-Monthly Report	March 10, 2005*
8. Second Bi-Monthly Report	May 10, 2005*
9. Third Bi-Monthly Report	July 11, 2005*
10. First Annual Report & Project Review	September 13, 2005*
*Reports are supplied thirty days after the completion of the quarter due to data availability and the requirement to process, analyze and develop the report.	

The cost estimate for the Project is summarized in Table 2-1.

Table 2-1
Project Costs

TASK	YEAR 1	YEAR 2	TOTAL
Labor Costs			
Task 1- Project Design & Layout	$15,000	-	$15,000
Task 2- Technology Acquisition & Installation	$10,000	-	$10,000
Task 3- Flare & Other Equipment Acquisition & Installation	$10,000	-	$10,000
Task 4- Regulatory Approval	$5,000	-	$5,000
Task 5- Field Monitoring & Sampling	$25,000	$15,000	$40,000
Task 6- Analytical Laboratory Testing above AQMD in kind services	$4,500	$4,500	$9,000
Task 7- Data Reduction, Validation, Analysis & Reporting	$15,000	$15,000	$30,000
Labor Subtotal	$84,500	$34,500	$119,000
Direct Material Costs			
Supplies	$15,000	$5,000	$20,000
Technology Specific Requirements	$18,600	-	$18,600
Travel	$5,000	$2,400	$7,400
Analytical Laboratory Testing above AQMD in kind services	$71,000	$56,000	$127,000
Other Direct Costs	$4,000	$4,000	$8,000
Direct Material Subtotal	$113,600	$67,400	$181,000
Total Project Estimate	$198,100	$101,900	$300,000

3.0 COMPOSTING STUDY EVALUATION CRITERIA

3.1 Primary Objectives

3.1.1 Emissions Performance

Emission performance for the five (5) alternative composting technologies will be evaluated based upon VOCs and ammonia emissions testing. The emissions testing program will obtain data to estimate the life-cycle emissions of VOCs and ammonia using SC AQMD Methods 25.3 and 207.1, respectively. The VOCs and ammonia emission will be sampled using a combination of surface flux chamber sampling and ventilation duct sampling procedures are outlined in Section 8 - Sampling Procedures and Field Monitoring.

3.1.2 Odor Generation

The following parameters will be evaluated to establish which of the five (5) alternative composting technologies being assessed have the lowest potential for producing nuisance odor conditions:

- Qualitative observations
- Oxygen levels
- Odor concentration (Dilutions-to-Threshold (D/T))

Project participants involved with daily monitoring are encouraged to record any qualitative observations made on the field logbook during their visit that they deem to be noteworthy. These observations might include:

- Relative odor of both piles, especially during turning and sampling
- Presence or evidence of insects or nuisance pests
- Relative amount of un-decomposed food waste on pile exterior
- Evidence of heat or visible steam

Odor sampling and oxygen level measurement procedures are outlined in Section 8 – Sampling Procedures and Field Monitoring.

3.1.3 Compost Stability & Maturity

Compost stability refers to the biological state of compost and associated available carbon content. Highly stable material is characterized by a relatively lower and constant rate of microbial respiration than in previous stages and by a corresponding decrease in VOCs. As a result, the stabilized compost does not generate malodorous compounds.

In this project, compost stability will be determined using the following test methods:

- Carbon dioxide evolution rate (lab based method)
- Solvita test (standard industry field method)

The carbon dioxide respiration rate is a standard lab test that measures the rate of carbon dioxide released under stable moisture and temperature conditions. The Solvita test is a proprietary field test that is being used on a wide scale and is considered an industry standard field test. This test procedure also measures the carbon dioxide evolution rate, but in a qualitative manner. Compost stability sampling procedures are outlined in Section 8 – Sampling Procedures and Field Monitoring.

3.1.4 Achieving Class A Pathogen Reduction

A primary objective of the composting process is the achievement of high thermophilic (>55°C) temperatures for the destruction of disease-causing microorganisms that could potentially be present in the biosolids and manure. Exposing a material to a temperature above the normal microorganism growth range for a sufficient time is a proven method of sterilization, pasteurization and pathogen reduction. The USEPA 40 CFR 503 regulations clearly define the time and temperature relationship for controlling pathogens in organic waste materials.

Based on this relationship, time and temperature requirements were developed to significantly reduce pathogen levels in biosolids. The Class A time and temperature requirement using either the within-vessel composting method or the static aerated composting method is 55°C (131°F) or higher for 3 consecutive days. Temperature profiles will be developed for each compost pile to evaluate alternative composting technologies on achieving PFRP.

Monitoring for indicator organisms (fecal coliform and *Salmonella*) in the compost product is another critical keystone of the 40 CFR 503 regulatory approach. Indicator levels specified in 40 CFR 503 are the following:

- Fecal coliform – less than or equal to 1000 MPN per gram dry weight ***OR***
- *Salmonella* - less than or equal to 3 MPN per 4 grams dry weight.

The compost product will be analyzed for fecal coliform and *Salmonella* to demonstrate compliance with US EPA regulation 40 CFR Part 503 Class A pathogen requirements.

Temperature measurement and pathogen testing procedures are outlined in Section 8 – Sampling Procedures and Field Monitoring.

3.1.5 Economic Viability

The pilot testing will provide essential data to determine the overall cost-effectiveness of the five (5) alternative composting technologies to determine the overall cost-effectiveness of the technologies as it is applied to the various feedstocks. The following parameters will be used to identify the alternative composting technologies that will be economically implementable within the Chino Dairy Area:

- Composting Technology Purchasing;
- Equipment Purchasing; and
- Operations and Maintenance.

3.2 Secondary Objectives

3.2.1 Leachate Generation & Characteristics

The leachate quantity and quality will be measure to determine the odor producing potential from the five (5) alternative composting technologies. The quantity of leachate produced through the composting process will be measured and recorded. The leachate quality will be determined on a using the following parameters:

- Biological Oxygen Demand (BOD);
- Chemical Oxygen Demand (COD);
- Total suspended solids (TSS); and
- Total dissolved solids (TDS).

Leachate sampling procedures are outlined in Section 8 – Sampling Procedures and Field Monitoring.

3.2.2 Dust or Other Potential Nuisance Controls

The following parameters will be evaluated to establish which of the five (5) alternative composting technologies being assessed have the lowest potential for producing nuisance dust other potential nuisance conditions:

- Qualitative observations
- Pile moisture content

Project participants are encouraged to record any observations during their visit that they deem to be noteworthy. Quality observations may include visible dust and relative amount of un-decomposed organic waste on pile exterior. The pile moisture content is crucial to the achievement of optimum process conditions and should be between 55 and 60 percent. If this target is reached, the potential for dust generation is significantly reduced.

3.2.3 Final Product Quality

The quality of the compost product will be important for end-use applications and marketing. In general, a higher quality product will have a wide range of end uses, be readily marketed, and will generate more revenue on a volume basis than lower grades. The final product quality parameters listed on Table 7-1 will be used to evaluate the quality of each compost product as recommended by the United States Composting Council. These parameters will be used to determine the relative impact of the two compost processes, if any, on compost quality.

3.2.4 Processing Efficiency

The achievement of optimum degradation rates is significant as it reduces the amount of space required for composting. The following parameters will be used to compare the processing efficiency of the various process parameters:

- Heat generation
- Organic carbon reduction
- Oxygen levels

- Stability testing results

Processing efficiency parameter measurement procedures are outlined in Section 8 – Sampling Procedures and Field Monitoring.

3.2.5 Technology Scale-up & Transfer

The vendors will provide detail instructions on the technology scale-up and transfer to be included in the final design. The vendor data and pilot testing data will be used to evaluate the ability to scale-up and transfer the five (5) alternative composting technologies.

3.2.6 Technology Flexibility/Reliability

The pilot testing will provide essential data to evaluate the overall technology flexibility and reliability of the five (5) alternative composting technologies.

4.0 PROJECT ORGANIZATION & RESPONSIBILITIES

4.1 Participants & Stakeholders

The successful completion of the Pilot Demonstration Project requires clear delineation of roles and responsibilities among the different participants. Project participants and stakeholders contact information is provided in Appendix A. The responsibilities of the participating parties are as follows:

4.1.1 Inland Empire Utilities Agency (IEUA)

Inland Empire Utilities Agency (IEUA) is sponsoring the Pilot Demonstration Project and will serve as the project manager.

4.1.2 Milk Producers Council (MPC)

Milk Producers Council (MPC) will co-sponsor the Pilot Demonstration Project and will serve as the facilitators between the interests of the local diary farms and IEUA.

4.1.3 Cal Poly Pomona

Cal Poly Pomona will provide an undergraduate or graduate student to assist with the compost technologies monitoring and sampling. Responsibilities will include the following:

1. Attend training concerning techniques for monitoring and sampling;
2. Assist with monitoring and sampling;
3. Record qualitative observations; and
4. Deliver samples to designated overnight mailing service.

4.1.4 Natural Resources Conservation Service (NRCS)

We are currently awaiting a response from the US Department of Agricultural Natural Resources Conservation Service (NRCS) to a $150,000 grant request for a NRCS Conservation Innovation Grant.

4.1.5 South Coast Air Quality Management District (SC AQMD)

The South Coast Air Quality Management District (SC AQMD) will co-sponsor the Pilot Demonstration Project and lead in the collection and processing of air quality samples. SCAQMD will additionally provide regulatory oversight.

4.1.6 Stakeholders Team

The stakeholder team will provide funding and project oversight for the Pilot Demonstration Project.

4.1.7 Venders

The vendor responsibilities will be determined once the project vendors are selected and the design parameters are determined for the alternative composting technologies.

4.1.8 Tetra Tech, Inc. (Tetra Tech)

The consultant will be responsible for all planning and reporting necessary to complete the Pilot Demonstration Project as defined in the task descriptions identified in the Scope of Services. Tetra Tech will oversee and direct the operations and monitoring during the Pilot Demonstration Project.

4.2 Regulatory Oversight

SCAQMD will provide regulatory oversight on the Pilot Demonstration Project.

4.3 Vendor Team

The vendor team will be determined once the project vendors are identified and selected for the project.

4.4 Technical Team

The technical team will be determined once the design parameters are finalized for the alternative composting technologies.

5.0 COMPOSTING STUDY DESIGN & SITING

A primary project objective is to establish criteria for developing a conceptual full-scale facility design. Key design and siting criteria include feedstocks, alternative composting technologies & sizing, site requirements and availability, and regulatory approval. In this section, the approach for developing the composting study design and siting criteria information is defined.

5.1 Feedstocks

The physical and chemical characteristics of the initial mix are crucial to the achievement of optimum process conditions. In particular, readily degradable carbon substrates (energy), nitrogen content, moisture, porosity, nutrients, and pH need to be at appropriate levels. Optimum initial mix characteristics for composting biosolids and manure are summarized in Table 5-1.

Table 5-1
Optimum Initial Mix Characteristics for Composting

Initial Mix Characteristic	Optimum Level for Composting
Moisture content	55 to 60 percent
Volatile solids	60 to 90 percent
Bulk density	900 to 1,200 pounds/cubic yard
Carbon to nitrogen ratio	25 to 40
pH	6.0 to 7.5
Porosity	> 35 percent air filled pore space

Of particular significance is creating an initial mix with a moisture content between 55 and 60 percent. However, if the total solids content of the manure and bulking agents are low (high moisture content), a high bulking ratio will be required to meet the target solids content. This would result in a larger land area and operating effort.

5.2 Technologies & Sizing

Vendors will be contacted to establish the pilot scale parameters for the five (5) alternative composting technologies.

5.2.1 Ag-Bag Environmental

Design parameters will be provided in the final design.

5.2.2 Gore Laminate Membrane

Design parameters will be provided in the final design.

5.2.3 Naturtech Container

Design parameters will be provided in the final design.

5.2.4 Open Aerated Static Pile with Negative Aeration

Design parameters will be provided in the final design.

5.2.5 Passive Aerated Static Pile with Laminate Cover

Design parameters will be provided in the final design.

5.3 Implementation Plan

5.3.1 Feedstock Availability

Manure for the Pilot Demonstration Project will be provided by the Inland Empire Utilities Agency (IEUA) and the Milk Producers Council (MPC). Bulking material availability will be determined and included in the final design.

5.3.2 Technology Availability

The vendors for the five (5) alternative composting technologies have indicated their willingness to participate in the Pilot Demonstration Project.

5.3.3 Site Availability

The Pilot Demonstration Project will be sited at the IEUA Co-composting facility at 8100 Chino-Corona Road, in the southern portion of the Chino Dairy Preserve. The Co-Composting Facility is an outdoor windrow composting operation permitted to receive a maximum of 1,300 wet tons of material per day (200 wet tons per day of biosolids and 1,100 wet tons per day of manure). The facility currently implements the windrow composting method to stabilize manure and sludge and produce a "Class A" pathogen criteria product as defined in the 40 CFR 503 regulations.

The alternative composting technologies site layout will be determined and provided in the final design.

5.3.4 Regulatory Approval

South Coast Air Quality Management District (SC AQMD) will provide regulatory oversight. In addition, the project manager will coordinate with the City of Chino and the California Integrated Waste Management Board (CIWMB) for further regulatory approval. Details will be provided in the final design.

6.0 COMPOSTING STUDY OPERATIONS

6.1 Feedstock Acquisition & Delivery

The following information is provided as a general guideline. Final design will be detail depending on site conditions.

Bulking material delivered to the site by truck will be emptied onto the predetermined bulking material storage area. This will allow each material to be stored in separate piles. The delivered materials will be pushed into a main stockpile using a front end loader. A sample of each load will be analyzed for total solids to determine if the material delivered complies with the procurement specifications. The site operator will examine each load, materials that are excessively wet or are deemed to be otherwise unsuitable will be placed into a separate pile for use as pile base or pile cover. The amount of material delivered, supplier, delivery date, and any other pertinent information will be recorded. Compost overs, when they become available after the first month, will be used in pile construction and if not needed will be disposed as a mulch.

6.2 Unit Operations

6.2.1 Mixing

Material will be mixed once the feedstocks and bulking agents are available. Mixing will be done either with a FEL or mix box. Details will be provided in the final design.

6.2.2 Pile Construction

Following mixing materials will be placed in either of the vender type equipment or Aerated Static Pile (ASP) and Passive Aerated Static Pile (PASP). The vendors will provide detail instructions to be included in the final design.

6.2.3 Process Control

Process control will be achieved through temperature and oxygen monitoring. Instruction by vendors for each of the three systems will be detailed in the final design.

Monitoring of temperature and oxygen in the ASP and PASP will be done daily. If a data logger, thermocouple or thermister unit is available, continuous monitoring will be accomplished. In addition daily monitoring will be done using a hand-held unit.

6.2.4 Teardown

Following composting material will be removed for curing. The timing will depend on vendor recommendations. ASP and PASP teardown will occur after 30 days of composting.

6.2.5 Screening

The sequence of screening for the vendor systems will depend on their recommendation and be provided during the final design. In the case of the ASP and PASP some of the material will be screened before curing whereas some will be screened after curing. Ammonia and VOCs will be measured to see which operation produces the least emissions.

6.2.6 Curing

Two curing procedures are recommended. One using low air flow blowers. This could reduce the time of curing considerably and result in lower emissions. Alternatively unaerated curing will be tested. Curing will be completed when the product is both stable and mature as indicated by the final product testing results.

6.2.7 Product Management

Marketing the compost produced is crucial to the success of the program. The following five (5) broad compost markets should be considered in the IEUA region.

1. Reclamation
2. Agriculture
3. Agency use
4. Topsoil dealers
5. Landscapers

Mine reclamation and agriculture are two low end markets that will probably deliver little or no income, but would be capable of large volumes of material. In addition, these two markets should be able to use partially cured uncured compost, eliminating the curing process and materials handling step. These two end-users might be willing to transport product off-site at no expense to the Agency or perhaps pay a small amount for the product.

Use of the product by the Agency, landscapers, and topsoil dealers is a higher end use that has potential to generate revenue. However, these end-uses typically require a higher quality product than the mine reclamation and agriculture markets. In particular, the product needs to be sufficiently stable and mature. Since a relatively small amount of material would be produced, a market test to determine product value may be appropriate.

6.2.8 Health & Safety

There are some health and safety risks associated with the composting study. Adherence to the following guidelines is recommended. People entering the site need to check in with the person attending the tipping booth.

- Reflective Vests. Anybody entering the site, regardless of their task or intended purpose is required to wear an orange reflective safety vest. The vest improves visibility allowing equipment operators to more readily see people working on the ground. Vest will be available at the tipping booth.
- Heavy Equipment – Stand clear of front end loaders and other heavy equipment while they are operating. Avoid being behind such equipment and be sure you are visible to the operator.
- Pathogenic Microorganisms – The compost piles will contain some human pathogens and to minimize exposure, project staff should wash hands thoroughly and change clothing after operations. This is especially important before eating or smoking. Staff that is coming in close contact with the compost, especially during sample collection, should wear protective gloves. The use of heavy boots and work clothes is also recommended.
- Other Hazards – Depending on site activities being performed, especially at other areas of the facility (i.e. grinding), the use of safety glasses and earplugs should be considered.

7.0 FIELD MONITORING & SAMPLING PROCEDURES

This section contains a detailed description of the field monitoring and sampling procedures including compost process monitoring, VOC and ammonia emissions measurement, odor measurement, compost stability and maturity measurement, Class A pathogen reduction measurement, leachate measurement, dust measurement, final product quality measurement, process efficiency measurement, sanitation procedures, sampling equipment and supplies, sampling schedule and responsibilities. All field personnel will be familiar with the procedures outlined below.

7.1 Compost Process Monitoring

Process monitoring is a crucial component of the Pilot Demonstration Project. Tetra Tech will review the process monitoring data weekly. Process monitoring data, which includes field measurements, sampling and lab analysis, will be used to:

- Document the ability of each alternative technology to meet the Rule 1127 VOC and ammonia emissions reduction criteria;
- Determine the potential of each alternative technology to produce nuisance odor conditions;
- Determine the compost stability;
- Document the ability of each alternative technology to meet Class A pathogen reduction criteria;
- Characterize the quantity and quality of leachate generated;
- Determine the potential of each alternative technology to produce nuisance dust conditions;
- Document the final product quality; and
- Provide a quantitative means of assessing the composting conditions and how the process is progressing.

The process monitoring schedule will be provided in the final design once the design parameters are determined for the alternative composting technologies.

7.2 VOC and Ammonia Emissions Sampling

SC AQMD Method 207.1 shall be used to obtain ammonia samples and SC AQMD Method 25.3 shall be used to obtain VOC samples from each source of emissions tested. For surface types of emissions, the procedures outlined in Section 7.3.1 – Surface Flux Measurement shall be used. For a control device inlet or exhaust that is vented through a testable duct, the procedures outline in Section 7.3.2 – Duct Testing should be used. Sampling, analysis and reporting shall be conducted by a laboratory/source test firm that has been approved under the SC AQMD Laboratory Approval Program (LAP) for the cited SC AQMD reference test methods.

The VOC and Ammonia emissions sampling schedule will be provided in the final design once the design parameters are determined for the alternative composting technologies.

7.2.1 Surface Flux Measurement

Isolation emission flux chamber sampling is a direct measurement of emission rates of air contaminants. Flux chambers can be used for measuring source emissions from the following:

- Solid land surfaces
- Open ports in processes
- Cracks or vents in a process

Flux chamber measurements will be conducted as per the EPA guidance document, "Measurement of Gaseous Emission Rates from Land Surfaces Using an Emission Isolation Flux Chamber," February 1986. Testing will be conducted by placing the chamber directly on the solid surface. The method is briefly described below.

The enclosure device, referred to as the flux chamber, is used to sample gaseous emissions from a defined surface area. Clean, dry sweep air is added to the chamber at a fixed controlled rate. The chamber temperature and volumetric flow rate of air through the chamber is recorded and the concentration of the species of interest is measured at the exit of the chamber.

Dry, hydrocarbon-free sweep air (zero grade air) will be provided from compressed gas cylinders. The sweep air will pass through a calibrated rotameter with a needle-valve flow control. Inlet and outlet lines are made of Teflon® or stainless steel. The outlet line will include a sampling manifold for monitoring and/or collection of the gaseous species of interest. This manifold will consist of ports for gas sampling. A thermocouple and readout will be used (when possible) to measure the surface and air temperatures at the sample point.

The flux chamber will be wiped clean and dried before each use and then placed over the sampling area. The sweep air is added at a flow rate of 5.0 liters per minute (lpm) and the time noted when the chamber is placed on the test surface. The outlet gas concentration can be monitored using instruments until steady-state conditions are reached (typically for four to five residence times); gas concentrations are recorded every residence time. Monitoring with instruments is not required. Air temperatures inside and outside the chamber are also taken and recorded. Once steady state is reached (about 30 minutes), gas samples are collected.

The sampling sequence for the full suite will include the following:

- Placing the flux chamber
- Allowing the chamber to equilibrate
- Chamber, pile, and ambient temperatures
- SC AQMD 25.3
- SC AQMD 207.1
- OVA
- Ammonia analyzer
- ASTM D4409 NH_3, CO, CO_2
- OVA and ammonia analyzer outside of the chamber

Data will be recorded on a data form. The following data collection steps will be taken:

1. Locate equipment at the sampling location;
2. Document location of measurement, date, time, and operator;
3. Initiate sampling by starting the sweep air at 5.0 lpm, checking the flow rate and placing the chamber on the testing location;
4. Document the gas flow rate and the operating temperatures of ambient air, air inside the chamber, and bulk/solid waste material;
5. Document any other data such as surface characteristics, meteorological conditions, etc., for possible correlations with emission rate measurements;

6. Monitor the gas concentrations and record data every residence time if needed;
7. Collect gas samples (grab or steady-state) at steady state indicated by time readings. Do not exceed a sample collection rate of 2.5 lpm. This will prevent the unwanted entrainment of ambient air into the chamber;
8. Discontinue sample collection, seal sample containers/bags/sorbents, back-flush the sample collection line, and discontinue the flux test;
9. Fill out appropriate chain-of-custody forms, master sample log entries for sample collected, and store samples in appropriate fashion; and
10. Decontaminate equipment; prepare or relocate equipment and test at the next location by repeating steps 1 though 9.

7.2.2 Duct Testing

Duct testing will be done where appropriate e.g. ASP. The duct will have to be modified so that adequate velocity measurements can be made. There will need to be a straight run of duct of at least 2.5 duct diameters for EPA Method 1 compliance. If the duct is enclosed, then two (2) 20-mm holes need to be drilled at a 90º opposed angle that is normal to any upstream disturbance.

Duct velocity measurements using a pitot tube will be made prior to, and after, each sample episode. Velocity will be reported as the actual flowrate in cubic feet per minute (cfm) with a measured temperature value. This will be converted to a mass value using an ideal gas law calculation. There will be a total of sixteen (16) traverse points using EPA Method 1 locations for each velocity measurement. A differential pressure measurement will be made on the fan during each velocity measurement to provide a check on the velocity measurement.

Samples will be taken using ¼-inch Teflon® tubing placed six (6) inches into the duct using a ¼-inch drilled hole. The tubing will be replaced each sample day. The sample train will be attached to the end of the tubing. Sampling will take place in a positive pressure duct.

The following is the sample sequence for the full duct sample suite:

- Velocity measurement
- SC AQMD 25.3
- SC AQMD 207.1
- OVA
- Ammonia analyzer
- ASTM D4409 NH_3, CO, CO_2
- Velocity measurement

During off-sample days, only OVA and ammonia analyzer measurements will be made.

7.3 Odor Generation Measurement

The pile oxygen level measurement and odor sample analysis will be used to evaluate the potential for producing nuisance odor conditions.

Pile oxygen percent indicates the exchange of carbon dioxide and other gases generated through microbial metabolic activity. An adequate supply of oxygen promotes aerobic activity that minimizes odor generation associated with anaerobic conditions. Oxygen levels within each pile or windrow will be measured using an air sampling probe, air pump, and electronic oxygen meter.

All components are attached together and function as a single instrument. Pile oxygen content readings are determined according to the following procedures:

1. Insert the probe into the compost pile to the desired depth in pile;
2. Use the air pump to evacuate air until a stable oxygen level is recorded (approximately one minute);
3. Record the stable oxygen reading on the field monitoring sheet;
4. Sanitize the probe using procedures outline in Section 7.10;
5. Repeat steps 1 through 3 for remaining sample locations.

NOTE: Care should be taken to avoid placing the probe in the cavity created by the previous probe insertion point.

Odor sample collection for subsequent chemical or olfactometry analysis is used for routine monitoring or compliance with air pollution regulatory limits. The proper collection of an air sample containing odourous compounds is essential for accurate analysis of the intensity and source of the odor. For surface types of emissions, the procedures outlined in Section 7.2.1 – Surface Flux Measurement shall be used. For a control device inlet or exhaust that is vented through a testable duct, the procedures outline in Section 7.2.2 – Duct Testing should be used. Standardized testing protocols shall be used for measuring odor intensity (ASTM E544-99) and odor thresholds (ASTM E679-91).

The pile oxygen level measurement and odor sample collection sampling schedule will be provided in the final design once the design parameters are determined for the alternative composting technologies.

7.4 Compost Stability & Maturity Measurement

Compost stability will be determined using the following test methods:

- Carbon dioxide evolution rate (lab based method)
- Solvita maturity index test (standard industry field method)

7.4.1 Carbon dioxide evolution rate

Compost stability sampling shall be conducted using composite sampling procedures as defined by the United States Composting Council Test Methods for the Examination of Composting and Compost (TMECC). For a compost pile or windrow at least five (5) subsamples from three (3) depths or zones totaling fifteen (15) subsamples should be taken to accurately represent the horizontal cross-section of the windrow or pile. The three (3) depths or zones should be measured from the piles uppermost surface

The following procedures should be used when collecting the compost stability samples:

1. Collect each subsample of equal volume using a sanitized sampling tool (gloved hand, clean shovel or auger);
2. Transferred each subsample into a sanitized 5-gallon collection pail;
3. Repeat steps 1 and 2 until all subsamples are collected and transferred into the sanitized 5-gallon collection pail;
4. Mix the subsamples in the collection pail thoroughly with a santitized wooden stick or spoon;

5. Transfer the sample mix onto a mixing tarp or other appropriately sanitized surface;
6. Thoroughly blend the sample on the mixing tarp or sanitized surface and subdivide the sample into quarters;
7. Thoroughly mix and blend the quartered section and subdivide the sample into quarters again;
8. Repeat steps 6 and 7 until the sample size reaches approximately four (4) liters (1 gallon);
9. Transfer the sample into a four (4) liters (1 gallon) durable bag with seal, (e.g. Ziploc® Freezer bag)

Triplicate samples of composite stability sample each should be obtained and analyzed for the carbon dioxide evolution rate using TMECC Method 05.08-B. Appendix B list several qualified laboratories for analysis of the feedstock and compost samples.

7.4.2 *Solvita*® Maturity Index

Compost sampling for the *Solvita*® maturity index will be conducted using composite sampling procedures listed in Section 7.4.1 except the final composite sample will be placed in the *Solvita*® jar for field analysis. Large fragments such as wood chips and other bulking agents (>1/2 in.) are too large for the *Solvita*® jar and should be removed or screened from the compost sample before testing.

The stability and maturity sampling schedule will be provided in the final design once the design parameters are determined for the alternative composting technologies.

7.5 Class A Pathogen Reduction Measurement

7.5.1 Pile Temperature Measurement

The following information is provided as a general guideline. These procedures will be finalized once the design parameters are determined for the alternative composting technologies.

Temperature monitoring will be conducted daily ("routine monitoring"), with more "intensive monitoring" conducted on a weekly basis. Each compost pile will be monitored for temperature by inserting four-foot-long temperature probes into four "routine monitoring" locations in each pile. The four "routine monitoring locations are as follows:

- Five feet from end
- Middle of pile
- Five feet from opposite end of pile
- End of pile

Each of the four temperature monitoring points are at a height of three feet. The temperature monitoring locations are located one foot below that of the pile sampling locations. At each temperature monitoring point, the probe is inserted at a 45-degree angle from the horizon. The probe should remain at each depth for at least five minutes to provide uniform temperature stabilization. Temperature monitoring will be performed with dial type gages or a combination of thermocouple type temperature probes with a hand-held digital temperature meter. Temperature monitoring locations are shown in Figure 7-1.

Figure 7-1
Compost Pile Process Monitoring and Sample Collection Locations

10'				
9'	X	X	X	X
8'				
7'				
6'	X	X	X	X
5'				
4'	S	S	S	S
3'	RX	RX	RX	RX
2'				
1'	X	X	X	X
height	ß--5'-à ß---------8.5'-------à ß---------8.5'----------à ß-5' à			Pile End

NOTES:
R - Routine temperature monitoring location, 3 foot depth, daily
X - Intensive temperature monitoring location, 1, 2, 4 foot depths, weekly
S - Sample collection location, 1 foot depth
Sample depth distances begin at bottom of insulative cover

7.5.2 Pathogen Sampling

Compost product pathogen sampling will be conducted using composite sampling procedures listed in Section 7.4.1. The pathogen samples will be analyzed for fecal coliform or *Salmonella* using the USCC TMECC Method 07.01-B or 07.02, respectively.

The pile temperature measurement and pathogen sampling schedule will be provided in the final design once the design parameters are determined for the alternative composting technologies.

7.6 Leachate Measurement

7.6.1 Leachate Quantity

The quantity of leachate will be measured on a weekly basis using a pre-sanitized measuring cup. Leachate quantity and any field observations regarding the leachate will be recorded on the field monitoring form.

7.6.2 Leachate Quality

The following information is provided as a general guideline. These procedures will be finalized once the design parameters are determined for the alternative composting technologies.

Leachate samples will be collected from each pile by immersing a sanitized measuring cup into a leachate collection system. A leachate sample equal to 200 ml will be transferred into the labeled leachate sampling container. Samples should be collected such that material floating on the surface is excluded. Only pre-sanitized containers and collection equipment should be allowed to contact the liquid being sampled. The sample collection bottles will need to be labeled with the project ID, pile ID and date. Immediately after the samples are collected, they need to be placed

in a cooler with blue ice and prepared for sample shipping. Leachate samples will be analyzed for the following parameters:

- Biological Oxygen Demand (BOD);
- Chemical Oxygen Demand (COD);
- Total suspended solids (TSS); and
- Total dissolved solids (TDS).

The leachate sampling schedule will be provided in the final design once the design parameters are determined for the alternative composting technologies.

7.7 Dust Measurement

The dust generating potential will be determined by measuring the pile moisture content. It is recommended that the pile moisture content be between 55 and 60 percent for optimal composting conditions. The pile moisture content will be determined by collecting compost samples using the procedures listed in Section 7.4.1. The moisture content samples will be analyzed for total solids using TMECC Method 03.09-A. This method may be used on feedstocks, in-process composts and finished composts. The percent moisture content will be determined by the equation below.

Percent Moisture Content = 100 – Percent Total Solids

The pile moisture content measurement schedule will be provided in the final design once the design parameters are determined for the alternative composting technologies.

7.8 Final Product Quality

Final product quality samples will be collected using the composite sampling procedures outline in Section 7.4.1and analyzed for the parameters listed in Table 7-1 as recommended by the United States Composting Council.

Table 7-1
Final Quality Sampling Parameters

Parameters
METALS (Dry Weight)
Arsenic
Cadmium
Chromium
Copper
Lead
Mercury
Molybdenum
Nickel
Selenium
Zinc
PATHOGENS
Fecal Coliform
Salmonella
NUTRIENTS (Wet Weight)
Total Nitrogen (N) (%)
Nitrate N (ppm)
Ammonia – N (ppm)
Total Phosphorus (P) (%)
Total Potassium (K) (%)
pH
Soluble salts (Conductivity)
CO2 Evolution mg/gOM/day
Seedling Emergence (%)
Total solids (%)
Volatile Solids/Organic Matter (%)
C/N Ratio
NUTRIENTS (Dry Weight)
Total Nitrogen (N) (%)
Nitrate N (ppm)
Ammonia – N (ppm)
Total Phosphorus (P) (%)
Total Potassium (K) (%)
Soluble salts (Conductivity)

The final product quality sampling schedule will be provided in the final design once the design parameters are determined for the alternative composting technologies.

7.9 Process Efficiency Measurement

The following parameters will be used to compare the processing efficiency of the alternative composting technologies:

- Heat generation
- Organic carbon reduction
- Oxygen levels
- Stability testing results

7.9.1 Heat Generation

The heat generation will be determined by monitoring the pile temperature. The pile temperature is a measure of the heat generation by catabolic activity of thermophilic bacteria. A sustained pile temperature above 55 C kills pathogens and most weed seeds. Eventually, after significant degredation of the readily available organic matter, pile temperatures decrease and a curing period begin. During the curing period, mesophillic microbes (actinomycetes, bacteria, and fungi) decompose the less readily available energy sources (hemicelluose, cellulose, lignocellulose and lignin) at a slower rate of decomposition. Pile temperature monitoring procedures are outlined in Section 7.5.1.

7.9.2 Organic Carbon Reduction

The organic matter content will be measured at different stages in the composting process. This will provides a mechanism for tracking the decomposition process by measuring and documenting the organic matter content of materials at various stages of the composting process. The organic carbon reduction samples will be collected using the composite sampling procedures listed in Section 7.4.1. The samples will be analyzed for organic matter using the USCC TMECC Method 05.07-C.

The organic carbon reduction sampling schedule will be provided in the final design once the design parameters are determined for the alternative composting technologies.

7.9.3 Oxygen Levels

The Oxygen levels within each pile or windrow will be measured using the procedures outline in Section 7.3.

7.9.4 Stability Testing Results

The stability of each pile or windrow will be measured using the procedures outline in Section 7.4.

7.10 Sanitation Procedures

To prevent cross contamination between samples taken from each pile, sampling equipment will be sanitized prior to sample collection, between test piles, and after samples are collected from each of the piles. The procedure entails the following steps:

- Partially fill a five-gallon bucket with a 10 percent solution of household bleach and water. Partially fill another bucket with tap water.

- After sampling each pile, lightly scrub the Pyrex measuring cup, sampling trowel and the compositing pail with the bleach water and rinse with the tap water.
- Commence sampling the next pile and repeat the decontamination procedure after sampling has been conducted.

7.11 Sampling Equipment and Supplies

The following list of general equipment and supplies for the proposed process monitoring and sampling. The sampling equipment and supplies list will be finalized once the design parameters are determined for the alternative composting technologies.

1. US EPA flux chamber(s) as per EPA design
2. Support coolers with a mounted rotameter (0-5 liters per minute) through the cooler walls
3. Brass 2-stage regulators for bottled air (CGA 590 fitting for air and ¼-inch Swage-lock (male) adapter fitting
4. Ten-foot, ¼-inch Teflon® line with female fittings
5. Ten-foot, ¼-inch Teflon® air inlet/outlet support line
6. Large size plastic support cooler
7. Set of miscellaneous hand-tools including an adjustable cresent wrench for the CGA 580 regulator fitting, small adjustable crescent wrench for the ¼-inch swage fittings, assorted medium and small size screw drivers
8. Teflon® sheet (1/32-inch or thicker) for blank system testing
9. Type K thermocouple wires (2, 12 ft) and temperature readout
10. Rigid-wall shipping/storage crate for the flux chamber
11. Decontamination supplies including Alconox soap, paper towels, and wash water
12. Twelve (12) bottles of ultra high purity air (size 150) with 200-ppmv CO tracer additive
13. Two (2) bottle of UHP air without tracer
14. Purge pump for sample line purging
15. Air pumps with calibrators
16. Seven (7) Method 25.3 trains
17. Canisters, sample tubes, impingers, impinger reagents
18. Shipping containers
19. Hand tools
20. Additional Teflon® tubing for stack sampling
21. MiniRAE 200 Portable VOC Monitor PGM7600
22. QRAE+ Multiple Gas Detector PGM 2000
23. ASTM D 4490 NH_3, CO_2, CO Sampling Equipment
24. Hand held anemometer
25. Hot wire anemometer
26. Pitot tube with micromamometer
27. Digital or analog pressure gauge
28. Camera
29. Data forms

7.12 Sampling Schedule & Responsibilities

The sampling schedule and responsibilities will be provided in the final design once the design parameters are determined for the alternative composting technologies.

8.0 SAMPLE CUSTODY

Sample possession during all testing efforts must be traceable from the time of collection until the results are verified and reported. Sample custody procedures provide a mechanism for documentation of all information related to sample collection and handling to achieve this objective.

Chain-of-Custody forms will be used as the primary documentation mechanism to ensure that information pertaining to samples is properly recorded. Copies of the Chain-of-Custody forms and the field logs will be retained in the project file.

8.1 Documentation Procedures

8.1.1 Field Records

Field personnel will be required to keep accurate written records of their daily activities in a bound logbook. All entries will be legible, written in waterproof ink, and contain accurate and inclusive documentation of an individual's field activities, including field data and observations, any problems encountered, and actions taken to solve the problem. The type of data recorded in the field logbook includes field measurements, ambient conditions, and any other information pertinent to sample collection. Entry errors or changes will be crossed out with a single line, dated, and initialed by the person making the correction. Entries made by individuals other than the person to whom the logbook was assigned will be dated and signed by the individual making the entry. Field logbooks will be available for review by interested parties.

8.1.2 Sample Label

Each sample collected will receive a sample label that identifies the sample by a unique sample identification number. These labels are affixed to the sample container prior to sample collection.

8.1.3 Sample Master Logbook

A sample master log will be maintained for all samples collected. Each sample will be assigned a unique identification number; a full description of the sample, its origin, and disposition will be included in the log entry.

8.2 Chain-of-Custody Procedures

After the samples are collected and documented in the master logbook, a Chain-of-Custody form will be completed and will accompany the samples to the laboratory. Team members collecting the samples are responsible for the care and custody of the samples until they are transferred or dispatched to the appropriate laboratory. When transferring samples, the individuals relinquishing and receiving the samples will sign, date, and note the time on the record.

When the samples are received by the laboratory, the sample control officer will verify the Chain-of-Custody form against the samples received. If any discrepancies are observed, they will be recorded on the Chain-of-Custody form and the team members will be notified to correct the problem.

8.2.1 Shipment

All sample shipments will be accompanied by the Chain-of-Custody record, which identifies the contents of each crate. The person relinquishing the samples to the laboratory will request the signature of a laboratory representative to acknowledge receipt of the samples. Sample collection and shipment will be coordinated to ensure that the receiving laboratory has staff available to process the samples according to method specifications.

All shipping containers will be secured for safe transportation to the laboratory. The method of shipment, courier name(s), and other pertinent information is entered in the "Remarks" section when the samples are to be shipped (i.e., Federal Express, Express Mail, etc.).

8.3 Sample Handling Procedures

The objective of sample handling procedures is to ensure that samples arrive at the laboratory intact, at the proper temperature, and free of external contamination. Liquid and bag samples will be shipped via Federal Express to the appropriate laboratory by field sampling personnel.

Sample packaging requirements for hazardous materials requiring interstate transport are defined in the Code of Federal Regulations 40 (CFR) 49, Chapter 1, Part 171. These requirements outline in detail the proper classification and transportation procedures for hazardous materials that will be used in the transporting of samples.

8.4 Sample Preservation

Once the samples have been collected, the methods specify preservation, storage requirements and holding time limitations. Table 8-1 summarizes the preservation requirements for the type of samples collected during this program.

Table 8-1
Parameters for Sample Preservation

Parameter	Preservation and Storage Requirements	Maximum Holding Time (Days)
Ammonia	40 ml Vial, 4ºC	35 Days at 5ºC
VOCs	Sealed Canister	14 Days
VOCs	25 ml Vial, at 4ºC	14 Days at 4ºC
Total Solids	4 L, plastic bag	N/A
Volatile Solids	4 L, plastic bag	N/A
Bulk Density	4 L, plastic bag	N/A
C/N	4 L, plastic bag	N/A
Odor	12 L, Tedlar bag	24 hours
Carbon Dioxide Evolution	4 L, plastic bag	24 hours
Salmonella	4 L, plastic bag	
Fecal Coliform	4 L, plastic bag	
BOD	200 ml, plastic bottle	
COD	200 ml, plastic bottle	
TSS	200 ml, plastic bottle	
TDS	200 ml, plastic bottle	

This section contains brief descriptions of calibration procedures and analytical methodology for the analysis of air samples that will be collected during the testing. Each method is briefly described in the following sections.

8.5 Laboratory Standards and Reagents/Method Detection Limit Determination

Laboratory standards and reagents are obtained from the following suppliers:

- For organic analysis, analytical standards are obtained from U.S. EPA sources, SUPELCO, and MSD isotopes. Spectral grade and reagent grade solvents and reagents are obtained from chemical suppliers such as Aldrich, Sigma, Burdick and Jackson, EM Science, and Baxter.

Standards and laboratory reagents, with the exception of common laboratory solvents, are dated upon receipt. The preparation and use of standards are recorded in bound laboratory notebooks that document standard traceability to U.S. EPA or NBS standards. Additional information recorded includes date of preparation, concentration, name of the preparer, and expiration date, if applicable.

Proficiency of EPA standard methods includes a current (within one year) MDL study and a demonstration of analyst proficiency. Optionally, the MRL study may be performed every 3 years. Analyst proficiency demonstration shall be as specified in the QC portion of the applicable EPA-approved method. For methods where no analyst performance demonstration is specified, the laboratory must prepare and present a proposed analyst proficiency scenario to PMRMA for approval.

To calculate the MDL:

- Prepare a standard matrix sample at one to five times the estimated MDL (based on the Target Reporting Limit (TRL) and the instrumental detection limit).

- Process seven aliquots of the sample through the entire method.

- Calculate the standard deviation from results of the seven aliquots. The MDL should be equal to the standard deviation times the student's t-value (3.143) for that number of measurements. The MDL shall be equal to or less than the TRL. At a minimum, MDLs shall be verified annually. Frequency of this verification shall be stated in the Laboratory's Quality Control Program. If the laboratory has verified an MDL based on the appropriate matrix within these time frames, it does not have to repeat the verification process (see references A and B). All data related to determination and verification of MDLs shall be maintained at the laboratory.

All field analytical measurement data shall be reduced according to the QAPP and protocols in applicable SOPs that describe field measurements. Computer programs used for data reduction shall be validated by introducing a test set of data into the program and then comparing the end result of the test set to independently calculated results before use. This verifies the program's operations on a regular basis. Information used in the calculations shall be recorded in sufficient detail to enable reconstruction of the final result at a later date.

8.6 Methods of Whole Air Sample Analysis

8.6.1 Analysis of Canister Sample for Total Volatile Organic Compounds

Volatile organic compounds (VOCs) will be determined by using SCAQMD Method 25.3. Method 25.3 uses a sample collection train developed to capture condensable hydrocarbon compounds and volatile organic compounds. Total VOCs (condensable and volatile) are determined by combining the independent results from the analysis of a condensable trap at 4 deg C and a canister sample. The condensate trap is analyzed by liquid injection into an infra-red total organic carbon analyzer. The canisters are analyzed for total VOCs by GC after oxidation to carbon dioxide and reduction to methane. The results are determined by flame ionization detection to ppmv levels and reported as total VOCs. For this project SCAQMD staff has recommended that the 25.3 sampling time be reduced to as short as 30 minutes in order to better simulate compost conditions.

8.6.2 Analysis of Canister for Volatile Organic Compounds including Oxygenated Compounds Using EPA Method TO-15; Gas Chromatography and Mass Spectrometry/Flame Ionization Detection

The GC/MS canister methodology to be used is described in the U.S. EPA Compendium Method TO-15 and will include an extended list of compounds. EPA Method TO-14 describes techniques for the analysis of airborne VOCs collected as whole air samples in stainless steel canisters. In this procedure, up to one liter of air is withdrawn from the canister through a mass flow controller and cryofocused at -189 C in a dewar flask of liquid argon. The focused air sample is then flash heated through a hydrophobic drying system which removes water from the sample stream prior to analysis by full scan GC/MS.

The laboratory designed cryofocusing TO-15 interface is equipped with six port heated Valco valve for sampling and back-flushing contents of the cryotrap to the drier. The cryotrap consists of 1/8-inch stainless steel tubing packed with acid washed glass beads and wrapped around a cartridge heater. Canisters are connected to the cryofocusing unit through a 5 micron particulate filter. Optional syringe injection of gaseous standards is accomplished through a Swagelok T equipped with septum cap just prior to the sampling valve.

Analysis is carried out on a GC/MS system equipped with a Megabore inlet adapter, cryogenic oven controller, a J&W Scientific DB-624 30m X 0.53mm column and a Hewlett-Packard 5971 Mass Selective Detector. The detector is equipped with a jet separator. The HP 5971 MSD data system is equipped with UNIX Operating System/Thru-Put Software and the NIST/NBS54.1K Library Search Software. Quantitation is based on the internal standard technique using 50 ppbv of bromochloromethane, chlorobenzene-d5 and 1,4-difluorobenzene.

Calibration of the GC/MS is achieved via the internal standard technique. Calibration is performed by loading various amounts of standard mixes to achieve a 5 point calibration curve over a 5-100 ppbv range. Samples are diluted or concentrated for quantitation within this range. The response factor variability over the 5 point curve should be 30 percent or less or linear regression must be performed. A Continuing Calibration Check (CCC) is performed at the start of each day and every 12 hours. The CCC sample consists of the mid-level calibration standard. The relative percent difference for the check compounds must be <30 percent from the five point value for the calibration to still be valid. If any of the CCC compounds fails to meet the performance criteria then maintenance should be performed and the test repeated.

In addition to the MS detector, a flame ionization detector will be used in an attempt to quantitate oxygenated compounds, specifically higher molecular weight alcohols. The extended list includes over 60 compounds with many oxygenated compounds reported as validated by standard: methanol, ethanol, isobutyl alcohol, acetone, methyl ethyl ketone, methyl isobutyl ketone, and 2-hexanone.

The percent recovery acceptance criteria is +/-30 percent for all target species. The method spike and method spike duplicate are analyzed at a 10 percent frequency. The recovery and RPD are reported with the analytical results.

A system blank or reagent blank is run at the beginning of each day and at least once in every 12-hour shift. System blanks should be run after every high level sample to demonstrate that contamination does not exist in the chromatographic system. The acceptance criteria for reagent blanks is for contamination less than the laboratory MDL except for common lab solvents such as methylene chloride which should be less than 5X the MDL.

A daily tune check with 4-bromofluorobenzene is achieved by injecting 2 uL (50 ng) of the BFB Check Sample in accordance with CLP tuning criteria. Analysis cannot proceed unless all criteria of the tune check are met.

8.7 Methods of Impinger Analysis

The following subsections describe the analysis procedure to be used for the determination of organic acids and ammonia using liquid sorbent media.

8.7.1 SCAQMD Method 207.1 for Ammonia

Air is drawn through a midget impinger containing a solution of 0.01 N sulfuric acid that reacts with ammonia forming ammonium ion salt (ammonium sulfate) products. Sample collection rate will be 500 to 1,000 ml/min for up to 20 minutes. Maximum sample volume is 10 liters. Impinger samples are analyzed by ion chromatography per attached AAC SOP. Two (2) impingers will be used in series with the contents of each combined into one (1) 40-ml vial for analysis.

8.8 Methods of Compost Analysis

Compost analysis will be completed by SCAP using the following methods:

- Total Solids – SM2540G(3a)
- Volatile Solids – SM2540G(3b)
- Bulk Density – SM2710F (Spec. G.)
- C/N – to be determined

All from 18th ed. Standard Methods

8.9 Methods of Colorimetric Tube Analysis

Colorimetric tube analysis shall be by ASTM D4490 with the additional QA/QC procedures specified below:

- For NH_3 samples QA/QC shall be provided by having a duplicate tube measurement for every laboratory ammonia sample.

- For CO analysis the CO doped sweep gas shall be measured once per cylinder per day.
- For CO_2 analysis, an upwind ambient analysis shall be completed once per day.

In addition, tube handling and pump QA/QC shall be per attached LACSD Colorimetric Tube Protocol.

9.0 DATA REDUCTION, VALIDATION, ANALYSIS & REPORTING

The data reduction, validation, and reporting procedures described in this section will ensure that complete documentation is maintained throughout the program, that transcription and data reduction errors are minimized, that the quality of the data is reviewed and documented, and that the reported results are properly qualified and in a conventional format.

9.1 Data Reduction

The reduction of raw data generated at the laboratory bench is the responsibility of the analyst producing it. The data interpretation that is required to calculate sample concentrations follows the methodology described in the specific analytical SOP. After all analyses have been completed, a preliminary laboratory report is generated for review by the laboratory supervisors who verify that the analyses were properly performed and interpreted. After the final review by the laboratory supervisor, the raw data is transferred to sample control and presented for review by the QA coordinator. Raw data, together with all supporting documentation, are stored permanently in confidential files by sample control

The QA coordinator reviews the data for adherence to the QC method limits. In addition, the data are reviewed for the presence of outliers. An outlier is an unusually large (or small) value in a set of observations. There are many possible reasons for outliers, among which are:

- Faulty instruments or component parts
- Inaccurate reading of a record, dialing error, etc.
- Errors in transcribing data
- Calculation errors

Sometimes analysts or operators can identify outliers by noting the above type of occurrences when they record observations. In these instances, the errors are corrected, or if correction is not possible, the suspect observations may be removed from the data before calculations are performed. If no such information exists, the Dixon Criteria are used to test suspected outliers at the 5 percent significance level if there are three or more points in the data set containing the outlier. Outliers identified by this method may be removed from the data before further processing (see W.J. Dixon, Processing Data for Outliers, Biometrics, 1953, Vol. 9, No. 1, pp. 74-89).

9.2 Data Transfer and Verification

A laboratory database is used to store and transfer analytical data from the laboratory. Sample control staff are responsible for entering into the system and verifying sample and result information and generating hard copies of the analytical results.

9.3 Data Validation

All field documentation and all measurement data will be reviewed for acceptable sample collection and analysis procedures, consistency with expected results or other results, adherence to prescribed QA procedures, and agreement with the acceptance criteria described in Section 7.

Initially, the reviewer will determine whether hold times were met and that all required analytical QC checks were reported with the data. Then, all QC sample results will be reviewed to evaluate

the sampling and analytical performance. Method blank results will be evaluated to identify any systematic contamination; surrogate and duplicate results will be compared to the QA objectives presented in Section 7, and the results will be used to calculate precision and accuracy for the data set. This process will identify any analytical methods and compounds for which the QA objectives are not satisfied, and corresponding sample data will be qualified with a "flag" indicating the problem. Samples collected on the same day, analyzed in the same run or batch, or individual samples may be flagged, depending on the type of problem that has been identified.

The qualifier codes, or "flags", will be stored with the data and printed with the data when reported or transferred for any purpose. After data are received from the laboratory, entered, checked, and qualified, they are a permanent part of the data base and cannot be deleted or altered.

9.4 Data Analysis

Data will be statistically analyzed to determine the presence of valid versus outlier data. System emissions will be correlated to stack VOC and ammonia measurements. An emission factor will be developed that will establish VOC and ammonia emissions as a function of stack VOC and ammonia emissions. Total system emissions will be compost emissions plus mixing emissions plus screening emissions plus curing emissions. A system emission factor will be developed that expresses VOC emissions and ammonia emissions as a function of tons of manure processed.

9.5 Reporting

Data reporting for this project will consist of QA reporting, investigative data reporting, and QC data reporting.

General reporting practices for measurement data will include:

- Heading information identifying the sample batch and the analytical method
- Unique sample identification number or code
- Consistent units of measure
- Consistent number of significant figures
- No blank or dashed places reported; all spaces will contain a designation (i.e., not analyzed, not sampled, etc.)
- Explanation of outlier values or the cause for deviation from historical data
- Comparison with regulatory threshold values if applicable
- Quality assurance flags
- Quantification of accuracy and precision for analytical data

9.5.1 Investigative Data Reporting

Measurement data generated during the course of an investigation will be reported in tabular form from the computerized data base. The formats of the reports will vary, depending on the objectives of the investigation. In general, data will be presented according to sampling location, analytical method, parameter, and/or matrix. Data will be reported with the qualifiers discussed above, and units will be specified. Commonly used reporting formats will be catalogued and used repeatedly, while specialized formats will be developed as needed. Compound concentration will be reported in µg/m3, and ppbv.

9.5.2 General Reporting Procedures

The procedures employed to ensure report quality involve the following:

- Calculations and measurements will be verified by recalculation by the person initially providing data. The calculations and measurements are then checked by another individual who signs and dates the calculation sheets. Any calculations and measurements that differ from the initial totals are resolved by both individuals. Once the calculations and measurements are included in an internal working copy of a document, the figures are rechecked during peer review. If there are many such calculations within a report, a certain percentage (10 to 50 percent) are checked again during peer review.

- Numerical values presented in reports and comparisons of numbers appearing in text, tables, and appendixes will be addressed in a manner discussed above.

9.5.3 QC Data Reporting

Quality control results will be reported by sample matrix and method in tabular form. How these QC results influence the measurement data will be delineated. For example, matrix spike interference will influence specific samples, while laboratory blank contamination will influence all samples extracted or analyzed on a specific day or during a specific analytical run. Two levels of tables may be constructed for each type of QC check. The first level table will contain all QC data, and will present one line per parameter or analysis. First level table formats will be used in presenting duplicate samples and analyses, matrix and method spikes, and system blank results. First level QC data tables will be generated for the investigations.

Specifically developed table formats may be used occasionally as an aid to interpretation of the investigative data. The particular format will depend on how the QC results are expected to influence the investigative data. This type of table might be used to identify corresponding investigative results (samples analyzed on corresponding dates) which may be inaccurate. Specialty tables will be generated automatically or manually, depending on the volume of data to be processed and the complexity of the calculations.

10.0 QUALITY ASSURANCE OBJECTIVES

The purpose of a QA/QC program is to produce data of known quality that satisfy the project objectives set forth in this document. The QA/QC program shall:

- Provide a mechanism for ongoing control and evaluation of measurement data quality.
- Provide an estimate of data quality in terms of accuracy, precision, completeness, representativeness, and comparability for use in data interpretation.

The QA objectives for accuracy and precision are presented by sample matrix for all sampling and analytical parameters in Table 10-1 and Table 10-2. These values are estimates of the degree of uncertainty that is considered acceptable in order for the data to fulfill the needs of the program. The QA/QC program focuses on controlling and quantifying measurement error within these limits, and provides a basis for understanding the uncertainty associated with these data. In the first step of data validation, measurement data are compared to the QA objectives to determine whether gross performance problems occurred. The basis for assessing precision, accuracy, completeness, representativeness, and comparability is discussed in the following subsections.

Table 10-1
Sample Matrix and Parameters

Parameter	Method	Instrument and Laboratory	DQO Level
VOC	SCAQMD 25.3	To be determined	4
Ammonia	SCAQMD 207.1	To be determined	4
Volatile Organics/ Oxygenated	EPA TO-15	To be determined	4
NH3, CO2, CO	ASTM D-4409	Draeger/Sensidyne	3
VOC	Field Instrument	MiniRae	3
Ammonia	Field Instrument	QRAE+	3
Odor	ASTM E544-99 and ASTM E679-91	To be determined	4
Compost Parameters	Total Solids Volatile Solids Bulk Density C/N CO_2 evolution Salmonella Fecal coliform	To be determined	4

Table 10-2
Accuracy, Precision, and Sensitivity of Analysis

Parameter	Method	Accuracy	Precision	Sensitivity
VOC	SCAQMD 25.3	+/- 50%	+/-50%	
Ammonia	SCAQMD 207.1	+/- 50%	+/- 50%	0.5 µg/mL
CO2, CO	Colorimetric Tube	+/- 50%	+/- 50%	
VOC	OVA	+/- 50%	+/- 50%	1 ppmv
Volatile Organics/ Oxygenated	Canister/GC-MS/FID	+/- 50%	+/- 50%	0.3 ppbv VOCs

Data Quality Objectives (DQOs) are qualitative and quantitative statements that specify the quality of the data to satisfy the end uses of the data to be collected. As such, different data uses may require different levels of data quality. There are five analytical levels that address various data uses and the methods required to achieve the desired level of quality. These levels are:

- **Screening (DQO Level 1):** This provides the lowest data quality but the most rapid results. It is often used for health and safety monitoring at the site, preliminary comparison to local regulations or criteria, initial site characterization to locate areas for subsequent and more accurate analyses, and for engineering screening of alternatives. These types of data include those generated on-site through the use of real-time monitoring equipment at the site like the OVA.

- **Field Analyses (DQO Level 2):** This provides rapid results and better quality than in Level 1. This level may include mobile lab generated data depending on the level of quality control exercised.

- **Engineering (DQO Level 3):** This provides an intermediate level of data quality and is used for site characterization. Engineering analyses may include mobile lab generated data and some analytical lab methods (e.g., laboratory data with quick turnaround used for screening but without full quality control documentation).

- **Conformational (DQO Level 4):** This provides the highest level of data quality and is used for purposes of risk assessment, evaluation of remedial alternatives and principal responsible party (PRP) determination. These analyses require full Contract Laboratory Program (CLP) analytical and data validation procedures in accordance with EPA recognized protocol.

- **Non-Standard (DQO Level 5):** This refers to analyses by non-standard protocols, for example, when exacting detection limits or analysis of an unusual chemical compound is required. These analyses often require method development or adaptation. The level of quality control is usually similar to DQO Level 4 data.

The data collected for this testing effort include Level 5 data for the flux chamber sampling. The laboratory will perform under DQO Level 4 analysis; however, but will not be asked to prepare or submit a CLP-type data package. These back-up data will be archived and available upon request.

10.1 Precision

Precision measures the reproducibility of repetitive measurements. It is strictly defined as the degree of mutual agreement among independent measurements as the result of repeated application of the same process under similar conditions. Analytical precision is a measurement of the variability associated with duplicate (two) or replicate (more than two) analyses of the same sample in the laboratory. Total precision is a measurement of the variability associated with the entire sampling and analysis process. It is determined by analysis of duplicate or replicate field samples, and incorporates the variability caused by matrix variability, field sampling procedures, and analytical variability. The results of total and analytical precision must be interpreted by taking into consideration all possible sources of variability. Duplicate samples will be analyzed to assess field and laboratory precision, and the results will be reported as the relative percent difference (RPD) between duplicate measurements. In all cases, field precision objectives for RPD will be less than 50 percent. Analytical precision objectives are presented for each method and matrix in Table 10-2.

10.2 Accuracy

Accuracy is a statistical measurement of correctness, and includes components of random error (variability due to imprecision) and systematic error (bias). As such, it reflects the total error associated with a measurement. A measurement is accurate when the value reported does not differ from the true value, or known concentration, of the spike or standard. Analytical accuracy is typically measured by determining the percent recovery of known target analytes that are spiked at known concentrations into a field sample. The stated accuracy limits typically apply to spiking levels at five times the method detection limits or higher. The individual methods provide equations for acceptance criteria at lower spiking levels.

Surrogate compound recovery is also reported and is used to assess method performance for each sample analyzed for volatile compounds. Sampling accuracy is assessed by evaluating results for field and trip blanks.

Both accuracy and precision are calculated for specific sampling or analytical batches, and the associated sample results must be interpreted considering these specific measures. Application of calculated precision and accuracy to measurement sample results will be discussed in Section 13. An additional consideration in applying accuracy and precision is the concentration level of the samples; a procedure capable of producing the same value within 50 percent would be considered precise for low-level (near the detection limit) analyses of minor constituents, but would be unacceptable, and possibly useless, for major constituents at high concentrations.

10.3 Completeness

Completeness, also referred to as percent data capture, is defined as the percentage of valid data reported compared to the total number of samples collected for analysis. Valid data are determined during the data assessment process and satisfy the QA objectives. Completeness is determined after precision and accuracy are calculated. The objective for completeness for all measurement parameters and all sample matrices is 90 percent.

10.4 Representativeness

Objectives for representativeness will be defined for each sampling and analysis task and will be a function of the investigative objectives. Representativeness will be achieved through use of the

standard sampling and analytical procedures described in this QAPP and the frequency of testing as described in Section 5.

10.5 Comparability

Comparability is the confidence with which one data set can be compared to another. The objectives for this QA/QC program are to produce data with the greatest degree of comparability possible. The number of matrices samples and the range of field conditions encountered must be considered in ultimately determining comparability. Comparability will be achieved by using the same (standard) methods for sampling and analysis, reporting data in standard units, and using standard comprehensive reporting formats. Analysis of reference samples may also be used to provide additional information that can be used to assess comparability of analytical data produced within the program.

11.0 QUALITY CONTROL

Quality Control (QC) consists of collecting and/or analyzing a series of duplicate, replicate, blank, and matrix spike samples to ensure that the analytical results are within QC limits specified for the program. Laboratory QC samples are documented at the bench and reported with the analytical results. The QC sample results are used to quantify precision and accuracy, and identify any problems or limitations in the associated sample results. Field QC samples will be documented in field logbooks. These components of the sampling program will help produce data of known quality throughout the sampling and analysis component of the program.

11.1 Analytical Laboratory Quality Control Samples

Laboratory QC is necessary to control the analytical process, to assess the accuracy and precision of analytical results, and to identify assignable causes for atypical analytical results. The QC checks in the laboratory protocol are specific to the analytical method and generally include the use of one or more of the following QC samples.

11.1.1 Calibration Standards

Initial calibration is performed as required for each analytical method, usually using a range of calibration standards with the low standard near the detection limit for the compound. These standards are used to determine the linear dynamic range for the initial instrument calibration.

11.1.2 Quality Control Check Samples

Quality control check samples are standard samples containing the analytes of interest at a specified concentration, usually in the mid-calibration range. These samples are prepared independent of the calibration standard, and are used to demonstrate that the instrument is operating within acceptable accuracy and precision limits. Quality control check samples are required for GC/MS (off-site) analyses and their preparation and the required frequency of analysis is described in the analytical SOP. They are usually analyzed at the beginning, after every 10 samples, or at the end of an analytical run.

11.1.3 Reagent Blank

A reagent blank or method blank is a sample composed of all the reagents (in the same quantities) used in preparing a real sample for analysis. It is carried through the same sample preparation procedure as a real sample. Reagent blanks are used to ensure that interferences from the analytical system, reagents, and glassware are under control. The required frequency for analyzing reagent blanks is specified in the analytical SOP for each method, and generally consists of one per day for each method/instrument and/or one per extraction batch.

11.1.4 Method Spike/Method Spike Duplicate

A method spike is a sample of target analytes at known concentrations that is spiked into a field sample before sample preparation and analysis or into the analytical system. Two aliquots of the sample may be spiked and used for the duplicate analysis. The results of the analysis of the duplicate spiked samples are used to measure the percent recovery of each spiked compound and to compare the recovery between samples, which provides an estimate of the accuracy and precision of the method. The QA objectives for accuracy are given in Section 7. The frequency for

method spike analysis is 5 to 10 percent of samples analyzed for each method where spikes are performed. Method spikes are sometimes performed in duplicate rather than using field samples in order to obtain precision data for each target compound.

11.1.5 Laboratory Duplicates (Duplicate Analysis)

Laboratory duplicates are repeated but independent determinations of the same sample by the same analyst, at essentially the same time and under the same conditions. The sample is split in the laboratory and each fraction is carried through all stages of sample preparation and analysis. Duplicate analyses measure the precision of each analytical method. Laboratory duplicate analyses are performed for 5 percent of samples analyzed, or at least one per day, for analytical methods that do not require matrix spike-matrix spike duplicates.

Table 11-1 summarizes the specific internal QC checks performed as required for the analytical methods. This table also includes information relating to the initial calibration and ongoing calibration checks.

Table 11-1
Summary of Laboratory Quality Control

Analytical Method	Species	Procedure	QC Check Frequency	Acceptance Criteria	Corrective Action
SCAQMD 25.3	Total VOC	Ambient Blank	Prior to Sample Analysis Daily	Detect 1-to-2 ppmv	1-Repeat 2-Clean System and Leak Check
		CO2 Free N2 gas	Prior to Sample Analysis Daily	Within historical levels	Same
		Linearity Check	Monthly-3 point calibration	Cor. Cof. > 0.995	1-Repeat Calibration
		Repeat CO2 Free N2 gas	After QC calibration	Within historical levels	Same
		Single Point Response Factor Check	Daily-two standards if possible	+/-20% RPD	1-Repeat RF Check 2-Repeat Calibration
		Control Sample	Daily Prior to Analysis	Correct identification +/-30% of value	1-Repeat Control Sample 2-Repeat RF Check 3-Repeat RT Check 4-Repeat Calibration
		Method Spike	10%, Minimum 1 per Batch	+/-50% recovery	1-Repeat Matrix Sample 2-Repeat RF Check 3-Repeat RT Check 4-Flag Data
		Duplicate Analysis	10%, Minimum 1 per Batch	+/-30% RPD	1-Repeat Analysis

TO-15	VOCs and Oxygenated Organics	Method Blank	Prior to Sample Analysis Daily	<1µg/ml	1-Repeat 2-Clean System and Leak Check
		Linearity Check	Monthly	Cor. Cof.>0.995	1-Repeat Calibration 2-Repeat Linearity Check
		Single Point Response Factor Check	Daily	+/-30% RPD	1-Repeat RF Check 2-Repeat Calibration
		Retention Time Check	Monthly	Agrees with established retention times	1-Adjust instrument 2-Repeat check
		Control Sample	Daily Prior to Analysis	Correct identification +/-30% of value	1-Repeat Control Sample 2-Repeat RF Check 3-Repeat RT Check
		Method Spike	10%, Minimum per Batch	+/-50% recovery	1-Repeat Matrix Sample 2-Repeat RF Check
		Duplicate Analysis	10%, Minimum per Batch	+/-30% RPF	1-Repeat Analysis
Ammonia (SCAQMD 207.1)	NH3	Method Blank	Prior to Sample Analysis Daily	1µg	1-Repeat 2-Clean System and Leak Check
		Linearity Check	Monthly	Cor. Cof.>0.995	1-Repeat Calibration 2-Repeat Linearity Check
		Single Point Response Factor Check	Daily	+/-30% RPD	1-Repeat RF Check 2-Repeat Calibration
		Duplicate Analysis	10%, Minimum 1 per Batch	+/-30% RPD	1-Repeat Analysis

11.2 Field Quality Control Samples

Field quality control includes quality control for the field instrument(s) and replicate and blank sample collection and analysis. Field quality control is summarized in Table 11-2.

Table 11-2
Summary of Field Quality Control

Method	Species	Procedure	QC Check Frequency	Acceptance Criteria	Corrective Action
Flux Chamber	All Species	System Blank	5%	3xMDL	1-Re-Zero 2-Flag Data if Necessary

					3-Repeat Check
		Replicate	5%	+/-50% RPD	1-Flag Data if Necessary
Ammonia (ASTM D4490)	NH3	Replicate	All 207.1 samples	None	1-Fit ASTM D4490 data to 207.1 data
Carbon Monoxide (ASTM D4490)	CO	Standard	1/cyclinder sweep gas/day	+/-50% RPD	1-Record data 2-Reject tube box
Carbon Dioxide (ASTM D4490)	CO2	Standard (Atmospheric Background)	2/day	280-380 ppmv	1-Record data 2-Reject tube box
OVA	VOC	System Blank	Daily	3xMDL	1-Re-zero 2-Flag Data if Necessary 3-Repeat Check
		Replicate	100%	+/-50% RPD	1-Flag Data if Necessary
Ammonia analyzer	NH3	System Blank	Daily	3xMDL	1-Re-zero 2-Flag Data if Necessary 3-Repeat Check
		Replicate	100%	+/-50% RPD	1-Flag Data if Necessary

11.2.1 Field Duplicate Samples

A field duplicate sample is a second sample collected at the same location with the original sample. Duplicate sample results are used to assess precision, including variability associated with both the laboratory analysis and the sample collection process. Duplicate samples will be collected simultaneously or in immediate succession using identical recovery techniques, and treated in an identical manner during storage, transportation, and analysis.

Recovery and analysis of 5 percent or at least one duplicate sample per day for each method will be performed.

11.2.2 Field Blank

Field blanks are samples of purified air that are collected and processed in the field using the same sampling and handling procedures as other samples. Field blanks are used to assess the potential introduction of contaminants to the samples during sample collection in the flux chamber and analysis in the laboratory. The frequency requirements for preparing field blanks will be 5 percent of the samples collected over the course of the sampling program.

12.0 CONTINGENCIES

The Pilot Demonstration Project Implementation Plan will be finalized once the design parameters are determined for the alternative composting technologies.

13.0 HEALTH & SAFETY

13.1 Site Safety and Access

There are some health and safety risks associated with the composting study. Adherence to the following guidelines is recommended. People entering the site from the main entrance need to check in with the person attending the tipping booth.

- Reflective Vests. Anybody entering the site, regardless of their task or intended purpose is required to wear an orange reflective safety vest. The vest improves visibility allowing equipment operators to more readily see people working on the ground. Vest will be available in the blower shed.
- Heavy Equipment – Stand clear of front end loaders and other heavy equipment while they are operating. Avoid being behind such equipment and be sure you are visible to the operator.
- Pathogenic Microorganisms – The compost piles will contain some human pathogens and to minimize exposure, project staff should wash hands thoroughly and change clothing after operations. This is especially important before eating or smoking. Staff that is coming in close contact with the compost, especially during sample collection, should wear protective gloves. The use of heavy boots and work clothes is also recommended.
- Other Hazards – Depending on site activities being performed, especially at other areas of the facility (i.e. grinding), the use of safety glasses and earplugs should be considered.

APPENDIX A
PROJECT PARTICIPANTS AND STAKEHOLDERS CONTACT LIST

List of Potential Project Stakeholders

1. Bank of America- Cornelius Gallagher
2. Chino Basin Watermaster Ag Pool – Ken Manning
3. City of Chino, Department of Public Works- Pat Glover
4. City of Los Angeles Department of Public Works-
5. City of Ontario, Department of Public Works- Ken Jeske
6. P.F. Ryan & Associates - Paul Ryan
7. Dairy Producer Environmental Foundation- Nathan deBoom
8. Eastern Municipal Water District- Mike Gardner
9. Inland Empire Utilities Agency- Rich Atwater, General Manager; Tom Love
10. Los Angeles County Sanitation District- Jim Stahl, General Manager; Steve McGuin; Mike Sullivan
11. Metropolitan Water District of Southern California- Ron Gastelum
12. Milk Producers Council- Robert Feenstra, General Manager
13. Orange County Sanitation District- Blake Anderson, General Manager; Bob Ghirelli; Mike Moore, Layne Baroldi
14. USDA Natural Resources Conservation Service- Jim Earsom
15. Western Municipal Water District- John Rossi

Organizations for Project & Scientific Appraisal & Monitoring

1. Ag Bag Environmental- Debbie Linder, Operations Director
2. Association of Compost Producers- Dan Noble, Executive Director
3. California Air Resources Board, Patrick Gaffney
4. California Department of Food and Agriculture- Matthew D. Summers, P.E.
5. California Environmental Protection Agency, John Ungvarsky
6. California Institute for Women, Dawn Davison, Warden (A)
7. California Integrated Waste Management Board- Judy Friedman, Jeff Watson
8. Cal Poly Pomona College of Agriculture- Wayne R. Bidlack, Dean
9. County of San Bernardino- Jacquie Adams, Department of Health Services
10. San Joaquin Valley Air Pollution Control District- Sheraz Gill
11. Santa Ana Regional Water Quality Control Board- Mr. Gerard J. Thibeault, Executive Officer; Dixie Lass; Steve Mayville
12. South Coast Air Quality Management District- Dr. Barry Wallerstein, Executive Officer; Dr. Mary Woods
13. State Water Resources Control Board, John Menke
14. Synagro- Sam Monaco, Vice President
15. Tetra Tech, Inc.- Mike Hoover; Charles Egigian-Nichols
16. University of California Cooperative Extension- Nyles G. Peterson
17. Kellogg Garden Supply, Kathryn Kellogg Johnson
18. The Scotts Company, Roclund White