San Joaquin Valley Air Pollution Control District: RFP TAP11-01

SJVAPCD Technical Assistance Program Proposal

NOx, PM, GHG and Volatile Organic Compound Reductions from Composting:
Using positively aerated static piles, electric conveyance and solar powered electric air blowers to reduce compost operation air pollution

Submitted by: Association of Compost Producers, Dan Noble, Executive Director

Contents

1. Executive Summary (5.1.3) 1
Overview Statement 1
Summary of Applicant Organization and Experience 2
Project Budget 3
Project Period 3
2. Project Proposal (5.1.4) 4
Specific Tasks & Deliverables 4
Technical Approach 4
Building and Testing the Mechanical Systems 9
Roles of applicant and partners 9
3. Project Budget (5.1.5) 11
4. Project Organization (5.1.6) 12
5. Assigned Personnel (5.1.7) 12
6. Air Quality Benefit Analysis (5.1.8) 13
Focus Areas I - III, All Addressed in this Project 13
Calculated Emissions Reductions 13
Measured Emissions Reductions 14
7. Capability and References (5.1.9) 14

1. Executive Summary (5.1.3)

Overview Statement

This project will demonstrate a low-cost, practical yet highly integrated method to produce compost while reducing emissions of VOCs, NOx, PM and GHGs. 1) NOx and PM reductions will be achieved through the use of electronic *conveyor systems* to build piles instead of diesel-powered loaders, 2) the use of *solar-powered electric blowers* to replace diesel-powered windrow turners during the active phase of composting reduces GHGs from fossil fuel use, and 3) *positively aerated static piles with finished compost biofilter covers*, to greatly reduce VOC pollution, by up to 90% or more. Use of solar

power means composters can implement the system without the investment and logistical headaches of bringing clean electric power from the grid to remote locations. The blowers will inject air into the bottom of the compost pile through a series of vented pipes. Aeration will prevent anaerobic conditions and odors, despite the fact that the pile will not be turned during the 21-day active composting phase. All of the components of the system will be non-proprietary, meaning they could be re-created by any reasonably competent operator, and potentially reduce the cost of emissions reductions from composting in the San Joaquin Valley NOx, PM and GHG reductions will be calculated based on the typical amount of material handling which would occur during the active composting period using the mechanically turned open windrow composting systems which is the standard technology used in the San Joaquin Valley, and includes six turns, plus conveyance from the tipping floor and grinding stations to the actual site of composting. In addition, we have provided calculations of additional emissions reductions from the use of diesel-powered equipment to apply the pseudo-biofilter compost cap, which is required for large composting facilities as a result of the adoption of SJVUAPCD rule 4566. In addition to the calculated NOx, PM and GHG reductions from reduced off-road diesel use, the project will measure VOC reductions achieved through the use of a tall (12') compost pile topped with a pseudo-biofilter compost cap; i.e., a layer of finished, unscreened materials placed on top of the pile which acts the same as a biofilter. VOC emission measurements will be taken using SCAQMD Modified USEPA flux chamber (flux chamber) technology and analyzed in a certified laboratory following SCAQMD method 25.3 for VOCs (reported as total non-methane non-ethane organic carbon- TNMNEOC) and all other appropriate protocols..

Specific objectives of the study are as follows:

1. Renewable Energy: Prove the concept of using remote solar power to aerate large-scale compost piles such as one might find at commercial composting sites in the San Joaquin Valley.
2. Air Pollution Reduction: Measure VOC emissions from an entire active compost cycle using positive aeration and a compost cap, with concurrent measurements of VOC emissions from a baseline windrow of identical materials (control windrow)
3. Mobile Source Reduction: Calculate NOx, PM and GHG reductions for a typical system based on reduced use of diesel powered equipment at compost sites.

This project impacts all three focus area of the RFP: overcoming barriers to utilizing renewable energy, minimizing emissions from existing waste management systems, and reducing NOx and particulate emissions from heavy-duty diesel engines.

Summary of Applicant Organization and Experience

This application is the product of a partnership of entities. The lead applicant is the Association of Compost Producers (ACP; www.healthysoil.org). ACP is a 16 year old trade association representing composters statewide, and is the official California State Chapter of the U.S. Composting Council (www.compostingcouncil.org). ACP is a 501(c)3 non-profit association of public and private organizations dedicated to increasing the quality, environmental benefits, value and amount of compost being used

in California to build healthy soil, reduce waste, reduce water use, increase water purity and reduce air pollution and green house gas production. ACP Board of Directors and Professional Staff have participated in, directed and managed numerous compost operations and research projects over the past two decades. These include most recently: "*Caltrans Compost Specification and Utilization Project*"; 2005-2007 & "*Agricultural Compost Specifications"; 2008-2009*) and *Agricultural Water Quality Prop 40/50, Nutrient and Sediment Reduction BMPs; 2008-2009*). Also, Association Directors operate some of the largest compost production facilities in California, including the largest enclosed compost facility in North American and the only facility regulated under the South Coast AQMD's Rule 1133.2 for co-compost facilities, and passing all air pollution control requirements, in that extreme non-attainment airshed.

In addition, Project Partners and Work Staff have extensive experience in directing, managing, and researching compost air pollution control research projects. (See Section 5: "Assigned Personnel")

Project Budget

Project Budget Element	**Cost**
Installation and Site Preparation	$10,000
Conveyor system - leasing, transport, construction and return	$45,000
Aerated Static Pile system with solar blowers	$40,000
Flux chamber testing and laboratory analysis	$96,000
Project Management, Data Analysis & Report Write-up	$19,000
Administration and overhead (including travel & lodging)	$20,000
Total:	**$ 230,000**

This budget will be supplemented by 33% additional in-kind donations as follows:

Services	**Rendered by**	**Value**
Planning, analysis, writing	Robert Horowitz/CalRecycle	$28,500
Bio-Organic Catalyst Testing	Bio-Organic Catalyst, Inc.	$20,000
Planning, analysis, operations consultation	Kevin Barnes/City of Bakersfield	$16,000
Compost site hosting - Space & Labor	Community Recycling & Resource Recovery, Inc.	$10,500
	Total:	**$75,000**

Project Period

Task	**Completion date**
Execution of grant agreement	April 1, 2012
Installation of ASP system and conveyors	Oct. 1, 2012
VOC sampling and laboratory analysis	Dec. 1, 2012
Data analysis and draft report	May 1, 2013
Final report	Sept. 1, 2013

2. Project Proposal (5.1.4)

Specific Tasks & Deliverables

The following tasks and work products will give rise to the deliverables of this project:

Task	Work Product	Deliverable
Work with district staff to finalize detailed work plan	Detailed plan outlining testing protocols, sampling schedules and other details of the study project	Plan for review and approval by District or Project Manager
Specify mechanical system	Detailed plans for pipes, blowers, PV arrays, inverters, batteries and conveyor system	Detailed plans to build ASP and conveyor system on site
Permitting	Forms and approvals for ASP system	Research permit from LEA
Build and test mechanical systems	Construction of aerated static pile system, solar arrays, and conveyors	Operational composting system ready for materials and emissions pre-testing
Load feedstocks into system	Collection of organic materials and formation of test piles	Staggered age piles on aeration system and control windrow
Emissions testing	Collection of samples using flux chambers, chain of custody, analysis at laboratory	Valid emissions data points covering the majority of the active composting phase on aerated windows and on the control
Data analysis	Calculations	VOC emissions from piles, NOx reductions from replacing diesel.
Draft Report	Writing of results, creation of graphs and charts	Draft report
Final Report	Solicit comments from project manager and APCD, respond to comments, edit report, format report	Final report
Dissemination of results	Journal articles, newspaper and magazine articles, presentations at conferences & industry workshops	Wider knowledge of the results of the study.

Technical Approach

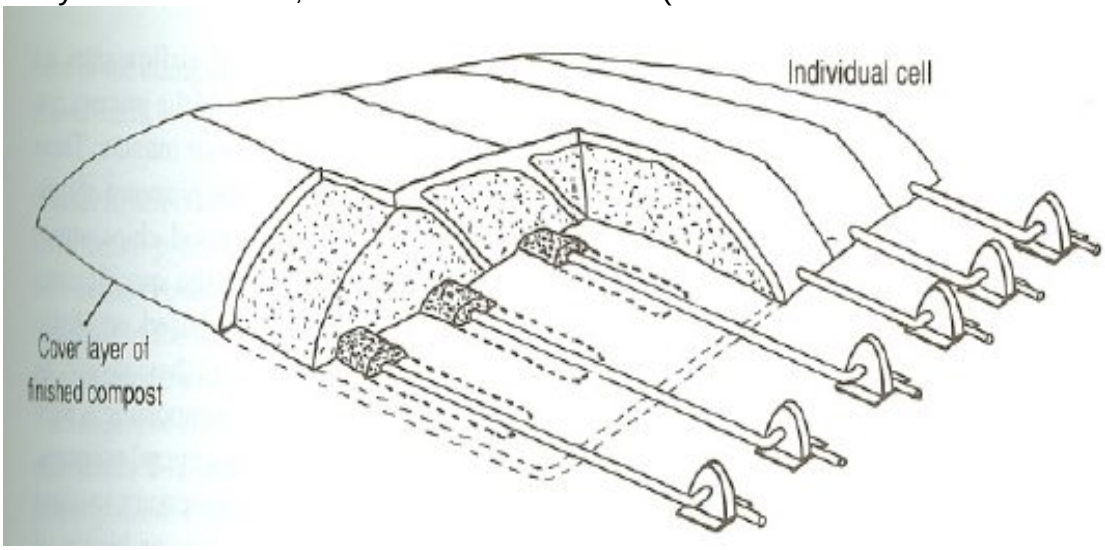
Fugitive air emissions will be assessed using the SCAQMD modified USEPA surface flux chamber technology, and hydrocarbon measurements will be performed using the SCAQMD Method 25.3 for total non-methane non-ethane organic carbon content. Both the measurement technology and the analytical method are approved and recommended by regulators in SCAQMD Rule 1133 for assessing air emissions from compost processes. In addition, air emissions speciation can be conducted supporting greenhouse gas emissions and fine particulate emissions by ammonia sources.

The proposed assessment includes one, four-day testing effort on test compost piles and baseline (windrow) compost piles constructed of the same and similar greenwaste material, and additional testing near the conclusion of the demonstration program based on the final work plan and progress during the first week of testing. A total of three

positive aeration compost piles with biofilter layer will be constructed, as well as four baseline windrow piles. The design criteria include the time or day-staggered construction of test piles and baseline piles so that adequate test data can be obtained to evaluate the emissions characteristics of the test compost process over a 22 day life-cycle, and a 60 day life-cycle for the windrow greenwaste process. The sampling will be biased toward the 'front-end' of these composting operations since the emissions are highest in the first trimester of these processes. For the solar aerated piles, testing will be conducted in both blower-on and blower-off conditions.

By conducting a side-by-side test with a baseline composting system constructed of the very same greenwaste as the various cells in the test piles, the variability related to stock material as received on a daily basis is minimized,. The baseline comparison data are important for reducing variability in the study and generating emissions data, T The emissions sampling portion of our team has collected emissions data throughout the life-cycle of typical greenwaste windrow composting operations, and those data have shaped the district's formation of a baseline emissions factor for composting in the San Joaquin Valley. The emission profile composed from other testing programs and adopted by the SJVUAPCD may be used for estimating a baseline emissions factor for this project if the District so desires. However, we recommend using this opportunity to gather more information on the compost process, to further refine both the life-cycle emissions profile and the emission factors expressed as pounds of emissions per compound of interest per ton of greenwaste.

Pile construction will approximate an Overlapping Aerated Static Pile as shown in the following diagram. Instead of one pipe per blower as shown in this image, we would likely use two or four, as shown in the first cell (however the net effect is the same).



The test 'grid' would be applied to the static pile in the matrix of overlapping static piles. And the shapes are usually rectangular as shown. We note, however, that square shapes would require substantially less pseudo-biofilter material per unit compost so we will consider other configurations as part of our planning process. Samples will be taken from each static pile from a given day in the composting life-cycle, assigning a grid

system on it consisting of grid cells of equal size, and test the scheduled number of grid cells following the test plan for that day (e.g., four randomly selected grid cells plus QC samples).

The test program will include the construction and maintenance of three test piles and four baseline test piles as described below.

Table 1: Test Plan Summary

Positive Aeration Composting with BF Layer	Test Pile #1		Test Pile #2		Test Pile #3		TOTAL
	Age	Flux Tests	Age	Flux Tests	Age	Flux Tests	
Field Test Day #1	2	4	7	4	14	4	12 + 1 QC
Field Test Day #2	3	4+4	8	NA	15	NA	8 + 1 QC
Field Test Day #3	4	4	9	4	16	4	12 + 1QC
Field Test Day #4	5	4	10	4	17	4	12 + 1QC
Subtotal							48
Return Field Day					22	4	4 + 1 QC
TOTAL							**53**

Age = age of test pile in compost life-cycle post construction

Windrow Composting with Watering/Turning	BKGD WR #1		BKGD WR #2		BKGD WR #3		BKGD WR #4		TOTAL
	Age	Flux Tests	Age	Flux Tests	Age	Flux Tests	Age	Flux Tests	
Field Test Day #1	2	4	7	NA	14	NA	60	NA	4 + 1QC
Field Test Day #2	3	NA	8	4	15	4	61	4	8 + 1QC
Field Test Day #3	4	4	9	NA	16	NA	62	NA	4 + 1QC
Field Test Day #4	5	NA	10	4	17	NA	63	NA	4 + 1QC
Subtotal									28
Return Field Day					22	4			4 + 1 QC
TOTAL									**29**

BKGD WR = background windrow

In addition to the testing described, an additional test will be conducted using a Bio-Organic Catalyst (BOC; www.bio-organic.com) additive on both the test positive aeration/biofilter layer compost system and the background windrow. The hypothesis is that a BOC additive will enhance the composting process and reduce air emissions. In order to test this hypothesis, a set of test and background compost piles will be constructed using a BOC additive. The additive will be used according to manufacture directions on a day selected to represent comparatively 'high' or highest emissions thereby providing data to compare to both the test compost systems and the background windrow. The results of the BOC additive as to how this affects the type and amount of study compound emissions will be reported along with the bulk of the test results. These tests will be paid for by the company that produces this catalyst

mixture, and is reflected in the "in-kind" contributions. These test results could prove valuable information needed in developing the most advantageous composting system for the Central Valley.

BOC Additive Testing	**BOC Test Pile (positive aeration/biofitler)**	**BKGD WR with BOC Additive**	**TOTAL**
Field Test Day #5	4 Flux Tests	4 Flux Tests	8 + 2QC
TOTAL			**10**

Note- the compost age for this test TBD after pre-test evaluation and pile temperature monitoring.

The proposed test model as shown will be fine-tuned based on the finalized work plan, crafted in consultation with the District, as well as data obtained from preliminary pile construction evaluation. Test piles will be constructed as per the work plan model using these composting systems, and temperature data will be recorded and used to provide information about the composting activity in the test pile as well as the control pile. . The proposed technical approach is conceptual, and the dates of testing and number of tests developed in the work plan after the pre-test will insure that fugitive air emissions data will be collected on the most representative days in the life-cycles of the test and baseline compost systems. Based on what is known at this time, the proposed conceptual model and technical approach for assessment will generate data representative of life-cycle emissions, emission factor acquisition per ton of greenwaste, and the technology evaluation. As such, the target data capture is given below:

Positive Aeration Composting with Biofilter Layer	**Traditional Windrow Composting with Watering and Turning**
Day 2 Compost emissions Day 3 Compost emissions plus grid spatial variability testing Day 4 Compost emissions Day 5 Compost emissions Day 7 Compost emissions Day 9 Compost emissions Day 10 Compost emissions Day 14 Compost emissions Day 16 Compost emissions Day 17 Compost emissions *Day 22 Compost emissions Daily QC consisting of media blank samples and replicate samples	Day 2 Compost emissions Day 4 Compost emissions Day 8 Compost emissions with turning emissions Day 10 Compost emissions Day 15 Compost emissions *Day 22 Compost emissions Day 61 Compost emissions Plus (with in-kind contribution): **BOC Additive Evaluation** TBD based on pre-testing

*Limited one-day return trip.

In addition to these data generated by the four-day field test, a single day, limited testing effort will be conducted five days after the testing event where data on day 22 will be

collected for both the test pile and the windrow, which closes the life-cycle emissions for the test compost process.

The total sample count for this robust technology evaluation includes 92 samples as indicated in Table 1. The assessment will include sample collection and analysis for total non methane non ethane organic (TNMNEO) hydrocarbon compounds by SCAQMD Method 25.3 (single versus duplicate samples per test location). This analysis provides information on the total hydrocarbon emissions (total non-methane non-ethane organic carbon condensable, total non-methane non-ethane volatile organic carbon, total non-methane non-ethane organic carbon by summation), methane, ethane, carbon monoxide, and carbon dioxide. QC testing will include media blank and field replicate data per batch or at a minimum 5% of total sample count.

The cost estimate for the technical services described above includes a written work plan, one four-day field test and one one-day limited field test, data evaluation, and reporting. Data will be presented in the written report as a Technical Memorandum with the measured and analyzed test results, calculated emissions factors, as well as a discussion of the effectiveness of the biofilter layer regarding odor and hydrocarbon emission control. All costs including labor, direct-billed costs, equipment rental, and travel are included; direct billed costs are not marked-up. This bid is on a time-and-materials basis and only the scope of work executed will be billed. All efforts will be made to schedule the testing during the ozone season of March to November. Weather is reliable during these times; however, the cost estimate does not include contingency for weather delay or project postponement.

Table 2. Summary of Sampling Scope of Work.

COMPONENT	TNMNEOC FLUX TESTS	COMMENT
Innovative Compost System- grid base, positive aeration, biofilter layer, no mixing.	48	Adequate life-cycle coverage, and pile spatial variability included
Windrow Baseline Compost Technology- mixing.	24	Actual baseline comparison, spatial variability included, mixing emissions included
BOC Additive Evaluation	8	Test piles with BOC additive; testing on high emissions day
Media Blank QC Samples	6	5% Minimum
Field Replicate Samples	6	5% Minimum
TOTAL:	**92**	

In addition to the assessment for hydrocarbon emissions as TNMNEOC, other compounds of interest were added for planning purposes, including additional greenhouse gas compound assessment (we already have methane and carbon dioxide included in the analysis for TNMNEOC) such as nitrous oxide (N2O), hydrocarbon speciation for comparison to UC Davis ozone reactivity model, and ammonia, which is a

compound of concern regarding nitrogen footprint and more so for fine particle formation or PM <2.5 micron assessment. Not all of these methods would need to be used for all flux measurements, however, a representative percentage can be applied to the sampling matrix, and valuable emission factors for both composting process can be obtained. By using the metrics from the study, relevant and useful information can be obtained regarding ozone precursor emissions, green house gas emissions and fine particle emission sources (e.g., ammonia reacting with nitrates and sulfates to make ammonium nitrate and ammonium sulfate in the atmosphere). These analytical costs are broken out separately for planning purposes in the cost estimate.

Building and Testing the Mechanical Systems

The heart of this project proposal is constructing, demonstrating and testing two new methods for building and aerating compost piles. These will replace diesel powered loaders, trucks and compost turners with electric powered materials and air handling equipment. The hypothesis being tested is that these methods will be proven, via the above testing regime, to significantly reduce air pollution via both the building *and* aerating the piles. This will result from:

- Substitution of fossil fuel based energy with renewable energy to power the fan and conveyor motors, and
- Elimination of diesel motors by electric powered conveyors both to power feedstock piling as well has eliminating the turning by using static pile air blowers.

These are critically important for this project since compost operations are known to take a lot of energy to both build piles, turn piles and then move the compost to cure prior to sale and shipping off site. Therefore, this project has two main proving steps to building and managing piles in this new way:

1. Purchase and construct aerated static pile system using solar powered electric blowers ($40,000 for this project, see budget detail in attachments)
2. Leasing and construction of electric power mechanical soil conveyor systems to both build piles and move finished compost piles to curing piles ($45,000, see budget detail).

These new piles will have to be proven functional to create actual composting cells, ready for materials and emissions pre-testing and then project testing. The importance of these operational changes is to demonstrate to the industry that it's both possible and produces the desired results in air emissions reductions while maintaining quality compost production.

In addition to the air testing described in the technical approach section above, the finished compost from these project piles will also be tested and compared between the piles for the basic parameters of compost testing under the "Seal of Testing Assurance" program sponsored by the US Composting Council. This will be to assure that the compost made in these unique ASP systems 1) have meet PFRP, 2) are tested for heavy metals, and 3) the finished product is tested for nutrients and compared to the control windrow; assuring that the compost is just as good, or better, and whether any nitrogen is conserved relative to the controls. This will include a Solvita maturity test at the end of active composting, which will be important to assure that any major off-gassing has been completed during the active composting phase.

Roles of applicant and partners

Dan Noble, ACP Exec. Dir.: Mr. Noble is a seasoned scientific, educational and market researcher. He has degrees and years of leadership experience in molecular

biology, science & environmental education, environmental industry economic and market research and report writing, and is in his 10th year of directing the compost association that will manage this project. He will not only administer the project but will provide technical oversight, and provide report writing and submission according to the proposed schedule and deadlines. In addition, he will create and lead workshops through is association, and in collaboration with Valley Air District staff, to broadcast the results of this study to the compost industry in California.

Chuck Schmidt and Tom Card, environmental consultants. Chuck Schmidt and Tom are the pre-eminent experts on flux chamber testing of outdoor sources in the United States. They have performed baseline testing for many compost facilities in the San Joaquin Valley, and have participated in compost emissions testing organized by the California Integrated Waste Management Board. Chuck has a Ph.D. in analytical chemistry and was a Senior staff scientist for the Radian Corporation before founding his own consultancy in 1989. Tom Card holds a masters degree in civil engineering and is an internationally recognized expert for the assessment and control of odors, air toxics, and volatile organic compounds (VOC) at industrial and municipal waste processing facilities. Mr. Card is currently the chairman of the Air Quality Technical Committee for the American Society of Civil Engineers and vice chair of the Odor/VOC Technical Sessions for the Water Environment Federation. Chuck and Tom's role in the project is to design and implement a VOC sampling plan to measure emissions from the aerated static pile

Peter Moon, O_2Compost: Peter is a licensed Professional Engineer in the State of Washington. Peter has as Bachelor's Degree in Geology and a Masters of Science in Geotechnical Engineering from U.C. Berkeley. He has 25 years of consulting (i.e. problem solving) experience, including 15 years designing and building composting systems. Peter's role in the project is to set up the aerated static pile system and the solar powered electric blowers. The project calls for a pile and blower size approximately 3x larger than previous projects, so it does represent a scaling up of previous technology.

Bob Horowitz, Senior Integrated Waste Management Specialist, CalRecycle. Bob is CalRecycle's point person for composting emissions. He has worked extensively with the San Joaquin and South Coast air districts on implementation of their composting rules, has organized two composting emissions studies, and has worked on others. Bob's role in the project is to help manage implementation, and to assist with writing and arranging the project plans, draft and final reports.

Kevin Barnes, Director of Solid Waste Operations, City of Bakersfield. Kevin Barnes is well experienced in developing and conducting facilities and operations in the waste industry, with emphasis on air emission reductions. He is the manager of one of the largest and most progressive green waste recycling facilities in California. The facility, which serves a regional population and handles 200,000 tons per year of incoming material, has received state and national industry and environmental awards for clean air projects. The facility reduced emissions, fuel, and water consumption while tripling in size to serve a growing population over the last 15 years. It has earned competitive grants and banked emission credits for its efforts. Kevin's role in the project is to design, specify and budget the conveyor systems.

David Crohn, Ph.D, UC Riverside, UC Cooperative Extension, ACP Science Advisor: Dr. Crohn is Associate Professor of Environmental Science and Extension Waste Management Specialist, Department of Environmental Sciences, University of California at Riverside. He has also been the Science Advisor to ACP since 2005. His areas of specialty are: Waste Management, Water and Natural Resources Systems Engineering, Non-Point Source Pollution, Soil and Water Engineering, Nutrient Management, Aquatic Biogeochemistry, Computer Modeling, with an emphasis on recycled organics and compost operations. Dr. Crohn will provide technical oversight throughout all project phases from design, experimental results and report write-up.
Dave Baldwin, Community Recycling & Resource Recovery, Inc.: Dave Baldwin manages the daily operations at CR&Rs Lamont compost facility in the southern San Joaquin Valley. The 190-acre facility handles more than 500,000 tons of greenwaste and food waste per year, making it one of the largest compost facilities in the world. The facility opened in 1994, and Mr. Baldwin has run the facility since 1995. CR&R and its sister company, Crown Disposal also collect municipal solid waste in the Los Angeles area, operate large transfer stations Los Angeles and San Mateo counties, and operate biomass plants in Dinuba and Madera in the San Joaquin Valley. Dave's role in the project will be to manage the construction of the composting piles as outlined in the work plan, to manage the temperature and water content of all composting piles, and to ensure that the construction of the aerated static pile systems and the emissions testing activities occur safely and efficiently within the confines of a busy commercial composting operation.

An expanded description of applicant's organization and experience can be found in the Appendix 1 to this proposal as "Appendix 1: Project Team Overview of relevant experience and Bio's of each project team member.

3. Project Budget (5.1.5)

The project budget is broken down by budget and task elements as follows:

Budget Element	Task Elements	Cost	In Kind	% In-Kind	Total	% Project
Installation and Site Preparation	Work with district staff to finalize detailed work plan, Specify mechanical system, Permitting	**$10,000**	**$20,000**	27%	**$30,000**	10%
Conveyor system & Aerated Static Pile	Build and test mechanical systems Load feedstocks into system; pre-test	**$85,000**	**$4,000**	5%	**$89,000**	29%
Flux chamber testing and laboratory analysis;	Emissions testing	**$96,000**	**$26,500**	35%	**$122,500**	40%
Project Admin, Mgmt, Data Analysis & Report Write-up	Data analysis, Draft Report, Final Report, Dissemination of results	**$39,000**	**$24,500**	33%	**$63,500**	21%
	Totals:	**$230,000**	**$75,000**	**100%**	**$305,000**	**100%**

The actual requested amount in this proposal is $230,000. The additional $75,000 of in-kind labor and cash contribution will be obtained from the contributors if this grant is awarded. If a different amount is awarded, the in-kind amounts may need to change accordingly. The budget, based on the actual awarded amount, will be further articulated and amended during the initial task element of "Work with district staff to finalize detailed work plan."

Note: If for any reason, the air district needs to modify this proposal, (the $45,000 conveyor portion in the above budget) could be removed from the proposal without affecting the other green energy and static pile and testing and VOC reduction proposal elements. *However, this would eliminate the diesel replacement with electric conveyor demonstration component (Focus Area III), thereby losing the NOx, PM and GHG demonstrated reductions for this proposed project.*

4. Project Organization (5.1.6)

This application is the result of a partnership of entities committed to finding ways to increase composting while improving air quality. The partnership is predicated upon each member performing the functions which are within their area of expertise. For example, Chuck Schmidt and Tom Card are the acknowledged experts on flux chamber testing; they will design and implement the testing program. Peter Moon is an acknowledged expert on aerated static pile systems; he will design and implement the test system. Dan Noble and ACP are a registered non-profit entity which can accept the grant monies and disburse them as needed. Dan has extensive experience managing research projects, and will provide administration, management technical oversight as well as report writing and submission on this project. Bob Horowitz has experience managing research contracts; he will assist Dan in providing administration and oversight and report writing for the project. David Baldwin, is the site manager of the Community Recycling compost facility and will be responsible for building and managing the piles according to the project profiles. Other project consulting experts, Peter Moon, of O_2Compost, Kevin Barnes, Compost Site Manager of City of Bakersfield, and David Crohn of UC Riverside and UC Cooperative Extension, and Science Advisor to ACP, will all provide appropriate project technical, operational and scientific advise on the project. The relatively simple and straightforward design of the project, and the proper use of partners in their areas of expertise, should decrease implementation issues and make oversight relatively easy and yet robust for all task elements of the project.

5. Assigned Personnel (5.1.7)

Please see the attached resumes for the applicant team that will be performing the following project functions:

- **Project Leadership, Management & Administration**
  - Dan Noble, Executive Director, Association of Compost Producers
  - Robert Horowitz, Calrecycle
- **Project Compost Operations and Site Management**

  - David Baldwin, Community Recycling
  - Peter Moon, O_2Compost
  - Kevin Barnes, City of Bakersfield
- **Flux Chamber & Laboratory Analysis**
  - Chuck Schmidt, CE Schmidt Environmental Consultants
  - Ted Card, CE Schmidt Environmental Consultants
- **Project Design, Operations and Report Technical Advising**
  - David Crohn, Ph.D, UC Riverside, UC Cooperative Extension, ACP Science Advisor

6. Air Quality Benefit Analysis (5.1.8)

Focus Areas I - III, All Addressed in this Project

This project endeavors to deliver NOx, PM, VOC and GHG reductions when compared to open windrow composting operations which are the predominant type of operation in the San Joaquin Valley. Although other types of systems exist which can reduce emissions of VOCs by up to 80 percent, the district has determined that these types of systems are not cost effective for most of the greenwaste compost operations within its boundaries. The system proposed for testing here will endeavor to demonstrate a combination of compost production methods which, until now, have not been used to operate large-scale compost operations in any sensitive airsheds. These will address the three focus areas of the request for proposal, specifically:

- Focus Area I: Renewable Energy—This demonstration project proposes to overcome the barrier to utilizing renewable energy by installing solar energy/storage systems to power air blower motors to be used to aerate static compost piles, and to maintain aeration throughout the high-emissions active composting phase.
- Focus Area II: Waste Solutions—Project will use technology which has not been operationally demonstrated on a commercial scale, to minimize VOC and GHG emissions from existing compost production systems and processes. This technology will be non-proprietary and created with components which should be available to any commercial compost operator, thereby reducing costs of emissions reductions.
- Focus Area III: Mobile Sources—Project will demonstrate the replacement of large diesel-powered compost loaders with electric powered conveyors, and demonstrate replacing diesel-powered composting windrow turners with solar power air blowers to reduce particulate matter and NO_X emissions from those existing sources on all compost operations in the San Joaquin Valley air shed.

Calculated Emissions Reductions

We have made preliminary calculations of emissions reductions based on supplanting diesel-powered equipment for the turning and capping of actively composting piles of organic wastes during the 22-day active period defined by the District. The calculations are based on multiple estimates from composting site operators as to the amount of time and fuel it takes to accomplish typical operations. In the case of turning, we

assumed 6 turns during the active composting period. The initial turn on any pile takes the most energy, and the amount of fuel and time necessary for turning steadily decreases with time. In the case of compost caps, we assumed one initial cap and three supplemental caps, per Rule 4566. For both procedures, we calculated figures for each operator supplying information, and then averaged those figures to produce District-wide estimates based on throughputs published by the District in the support documents for Rule 4566. To calculate emissions, we use USEPA figures for maximum emissions for diesel engines based on horsepower and year. In cases where composters reported using Tier 0 engines, we upgrade those to Tier 1 to obtain an emissions maximum, and because Tier 0 engines are relatively rare and becoming more so. In the case of estimating greenhouse gas emissions, we use USEPA factors for diesel fuel, combined with the hours information from operators. We have endeavored to be conservative in our accounting; for instance, we have not attempted to account for the emissions reductions associated with reduced watering, which would accrue due to larger piles and less turning. A complete accounting of the preliminary calculated emissions reductions can be found in the appendices to this application. Summary information is below.

Table 3: Emissions Reductions Summary: Potential emissions reductions from heavy duty diesel equipment use at composting sites in the San Joaquin Valley, in tons per year, due to reduced turning and reduced application of the compost cap.

SJV Rule 4566 Appendix B	Tons per year Tput	NOx & NMHC	PM	CO2E
Total Est. Throughput	1,058,183	95.5	9.65	1,086
T-put >200k/yr only	557,618	50.3	5.08	572
T-put 100-200k	103,108	9.3	0.94	106
T-put <100k	397,457	35.9	3.62	408

Measured Emissions Reductions

In addition to the calculated emissions reductions from reducing diesel use, we anticipate significant emissions reductions from the piles of composting organic wastes using the proven pseudo-biofilter compost cap concept, combined with taller piles and reduced agitation of the composting materials. Our goal will be to exceed the emissions reductions from the current mitigation measures outlined in rule 4566, roughly 19% for small facilities and 60% for larger composting facilities. However, until the results of the actual emissions sampling are done, it would be imprudent to estimate these reductions.

7. Capability and References (5.1.9)

The applicant is the Association of Compost Producers (ACP; www.healthysoil.org). ACP is a trade association representing composters statewide, and is the official California State Chapter of the U.S. Composting Council (www.compostingcouncil.org). ACP is a 501(c)3 non-profit association of public and private organizations dedicated to

increasing the quality, value and amount of compost being used in California. We do this by promoting activities and regulations that build healthy soil with compost, benefiting people and the environment. The association provides education and communication on compost benefits & proper use through support of scientific research and legislation aligned with developing and expanding organics recycling through quality compost production and utilization.

Specifically, ACP Board of Directors and Professional Staff have participated in, as well as actively direct and manage compost operations and research projects over the past two decades. These include most recently:

- Dan Noble, ACP Executive Director - Project Manager and Technical Advisor on two Calrecycle sponsored projects (*Caltrans Compost Specification and Utilization Project*"; 2005-2007 & "*Agricultural Compost Specifications"; 2008-2009*) and one Dept. of Water Resources Project (with SDSU; *"Agricultural Water Quality Prop 40/50, Grant Agreement No. 06-301-559-0, Assessment of Nutrient and Sediment Reduction BMPs, In the Santa Margarita Watershed"; 2008-2009*)
- Jeff Zeigenbein, ACP President, Deputy Director of Operations, and Supervisor of IERCA (www.ierca.org), the largest enclosed compost facility in North American and the only facility regulated under the South Coast AQMD's Rule 1133.2 for co-compost facilities, passing all air pollution control requirements.

The project lead scientist, Dr. Charles Schmidt has served as Senior Staff Scientist/Project Director, Consultant, and/or major Task Leader on a number of projects associated with the management of hazardous waste and assessment of air emissions from area sources over the past 31 years. Technical involvements have focused primarily on the assessment and evaluation of atmospheric contaminant emissions from area sources, including: the design, fabrication, and testing of direct emissions sampling devices; gaseous emission control technology design and testing; continuous real-time gas contaminant monitoring and integrated gas sampling; atmospheric emissions modeling; and data reduction, interpretation, and reporting. Responsibilities for these projects include: development of technical approach; test plan/quality assurance project plan design; project health and safety; schedule and budget management; field and laboratory supervision; and project reporting.

In addition, Project Partners and Work Staff have extensive experience in directing, managing, and researching compost research projects. Each one has been selected for their unique and deep expertise to provide oversight and input at the appropriate task element of the project (See Section 5: "Assigned Personnel").

Individual references for the key project participants are shown below. Complete resumes for each project participant are shown in the attachments to this proposal:

- Dan Noble, Executive Director, Association of Compost Producers
  - Jeff Ziegenbein, ACP President, Deputy Operations, Inland Empire Regional Composting Authority, (909) 993-1981 office, jziegenbein@ieua.org
  - Bob Engel, ACP Secretary/Treasurer, Owner/Partner, Engel & Grey, 805- 925-2771, Bob@ENGELandGRAY.com

  - Kathy Kellogg Johnson, ACP Vice President, Director of Sustainability, Kellogg Garden Products, 800-232-2322, kkjsquared@cox.net
- Robert Horowitz, Calrecycle
  - Brenda Smyth, Division Manager, Calrecycle, 916-341-6605, Brenda.smyth@calrecycle.ca.gov
- Chuck Schmidt & Ted Card, CE Schmidt Environmental Consultants
  - Greg Kelley, Managing Member, Napa Recycling & Waste Services, LLC, 820 Levitin Way, Napa, CA 94558, 707-287-1961, greg@napareccyling.com
  - J.P. Cativiela, Program Coordinator, Dairy Cares, 915 L Street C-438 Sacramento, CA 95814, Office: (916) 441-3318, Email: caresjp@aol.com
  - Nora Goldstein, Editor, Biocycle Magazine, The JG Press, Inc. Emmaus PA, 610-967-4135 ext.22, noragold@jgpress.com
  - Ms. Mary Matava, Agri Service, Inc., 389 South Melrose Drive, Suite 203 Vista, CA 92081, (760) 518.3498, MaryMatva@aol.com
  - John Cleary, P.E., Waste 2 Resources Program, Washington Department of Ecology, (509)329-3531, jcle461@ecy.wa.gov
- Peter Moon, O_2Compost
  - Ron Norton, SWRPM, Fort Lewis Public Works, Fort Lewis WA,

Signature:

Daniel W. Noble, Executive Director

ASSOCIATION OF COMPOST PRODUCERS
"We Build Healthy Soil"

Dan Noble, Executive Director
Cell: (619) 992-8389
DanWylderNoble@gmail.com
www.healthysoil.org

Attachments: Please see extensive attachments to this proposal under separate cover, which include the elements of:

- Letters of Reference and Project Support
- Research-Applicant Team Highlights
- Key Team Member Curriculum Vitae
- Individual Proposals of Major Subcontractors
- Calculations Used in the Proposal