Attachment 5
Summary of Grants 1, 2, & 3

The following is a brief summary of the three grant that were awarded to Carver County to conduct research at the University of Arboretum source-separated compost site. The first two grants and Phase I of the third grant were applied science research where the actual runoff from an operating composting facility was collected and tested. In addition, these research project attempted to collected subsurface samples from under the windrows and as runoff from the class V compacted gravel pad.

Phase two of the third grant departed from the applied research of the previous grants and was more oriented toward a theoretical approach.

Each of the scenario below include the actual RFP language and a very brief summary of each research project. Full details of Grants 1 and 2 can be found in the Final reports that were submitted during the 60-day comment period. The third grant is ongoing so all data is preliminary and being reviewed for QA/QC and any outlying data points that need to be evaluated for accuracy. The final report will be available in June 2014.

Grant 1

FY 2007-2008 RFP Grant language

- Grant focus: Increase organics recovery recommended in the 2005 Solid Waste Policy Report (By 1/1/07, achieve a statewide capture rate of a 27% organics and waste-to-energy rate; and by 1/1/11 achieve a statewide capture rate of 35% organics and waste-to-energy recovery rate.

- Preferred work:
  B.1) Expand existing food reuse or recycling programs, establish new organics recycling programs, or develop educational programs needed to perform continuous on-site training for food reuse or recycling program.

FY07-08 Carver/Arboretum Grant Summary

The Goal of the Carver Grant was three fold:

1. To increase the amount of SSOM being collected for composting.
2. Test finished compost resulting from the YW/SSOM mix, and
3. To collect runoff from the processing area of the compost site

The first goal was part of the RFP language given above. Through the grant, Carver County staff was able to add new haulers and bring in SSOM from 8 new municipalities. In addition they were able to add commercial accounts and one special event (the Women's US Open Golf Tournament).

The addition of the new SSOM generators resulted in the collection and processing of the materials listed in the table below.

Materials collected/processed at Arboretum Compost Site (cubic yards)

	Brush	Comm. Organics	Res. Organics	Yard waste	Total
Cu. Yd.	14,000	1,356	7,705	21,445	44,506
%	32	3	17	48	100

The project's success also contributed to changing statutory, which now allows for the co-collection of food waste and non-recyclable paper with yard waste throughout the State.

The second goal of the grant was to test the finished compost derived from SSOM/YW was tested. Results are in the table below.

MN Class I Heavy metals & PCB test requirements	MN Class I Heavy metals & PCB limits	February 2009	March 2009	June 2009
Arsenic	41	4.1	6.7	4.1
Cadmium	39	<0.77		1.4
Copper		Not tested	42	37
Lead	300	14	68	130
Mercury	5	0.040	<1.0	0.65
Molybdenum	18	<1.5	1.8	1.2
Nickel	420	11	22	29
Selenium	100	<3.1	<1.0	<0.5
Zinc	2,800	Not Tested	130	210
PCB	6	Not Tested		

The third goal was to characterize actual runoff from compost sites and to determine if rain water percolates into the surface beneath the windrows. Lysimeters were installed downstream of the SSOM/YW windrow and the YW only windrow and under the SSOM/WY windrow. Lysimeters were checked after each rain event and samples were collected if liquids were present in the lysimiters.

Grant 2

FY 2010-2012 Grant purpose – language from the MPCA RFP

A. Source-Separated Composting: focus on providing assistance to Minnesota political subdivisions to reduce the amount of organic wastes entering disposal facilities.

Project Summary

In August, 2010, Carver County Environmental Services received a $100,000 grant for their proposed project - Continuation & Expansion of the Commercial and Residential Co-Collected Organics Composting Project. The partners of the project include: Specialized Environmental Technologies Inc. (SET), the University of Minnesota Landscape Arboretum, and the Minnesota Pollution Control Agency.

Project Goals:

1) Re-establish an organics composting site on the University of Minnesota Landscape Arboretum property to allow for the continuation/expansion of established co-collected residential/commercial organics collection programs.
2) Demonstrate that with modest modifications to the operational plan such as the use of forced aerated static piles, limits on commercial organics and increased buffers, the operators can effectively avoid operational issues.
3) Supplement existing data collected by Carver County in previous demonstration projects.

The first goal was accomplished when a new compost site was established on the old Arboretum brush burning site. The site was prepared by upgrading the access off of Hwy 5 and grading and constructing a 6" gravel pad. The site began accepting materials, YW and SSOM on September 2011.

The second goal was accomplished as well, as the new facility installed a forced aeration system and there have been no odor issues reported.

The third goal of collecting additional data to evaluate whether surface water on the site was seeping into the sub soils and to evaluate the chemical make of those samples was accomplished by installing lysimeters, a common tool use to collect sub-surface water samples.

Samples were collected from November 14, 2011 through June 20, 2012. The short timeframe for collecting samples was a result of the county needing to work with MNDOT to resolve access issues from Hwy 5. The access issues delayed the project for 6 months reducing the time for collecting water samples.

In addition to the original sampling agreed to in the work plan, sheet flow sampling or collecting water that came in contact with both the windrows and the compacted gravel pad, was added at the request of the MPCA staff. Sheet flo sampling was added late in the grant and only one sample was able to b collected.

The November 27, 2012 Final Report, on file at the MPCA and submitted as part of Carver Countys comments in the 60-day comment period, contains all of the data collected in the grant period.

Grant 3
FY 2012-2013 Grant purpose – language from the MPCA RFP

Focus Area 1D. Source-Separated Compost: The evolution of compost technology and the co-composting of materials (i.e., food, yard waste, and non-recyclable paper) have resulted in currently unanswered questions such as:

- Is there a need for a pad in the curing area or will a drivable surface over certain soil types and depth to water table be enough to protect the water table below a facility?
- What is the chemical composition of the contact water from the various areas (i.e. the mixing, active (both under the windrows and in between the windrows), curing area) of the compost facility?
- Is there infiltration into the soils in the areas that have a pad vs. those that don't have a pad? Is there a difference in the infiltration rates?

To scientifically answer these questions, two research areas have been identified: 1) the chemical composition of the contact water and storm water generated at compost facilities during different composting stages (i.e. tipping/mixing, active, curing), and 2) whether there is any infiltration of contact water to the soils below the mixing, active process to further reduce pathogens (PFRP) and curing areas (post PFRP) of a compost facility. Approximately $80,000 is available for grant awards.

- Natural rain vs simulated rain-departure from grants 1 and 2.
- Phase 1 no natural mixing of contact water with stormwater
- Super concentrated contact water

Description of Grant activities
The intent of this grant was to continue the work of the two previous grants and collect subsurface samples and sheet flow samples from an actual operating compost facility. However, the grant was split into two phases, with the first phase designed to answer the questions asked in the RPF. At the direction of MPCA staff, and over the objections of the Grantee's Project Team, the research methods in second phase were modified in a manner that did not allow for the questions in the RFP to be answered. A brief description of the two phases is given below. This grant is ongoing and a full write up of the project will be included in the Final Report.

Phase I description
Phase I was designed to answer the three primary issues raised in the RFP. The intent was to again mirror the actual operations of the facility, but use a rain simulator to assure that enough samples were collected to be scientifically valid. The two previous grants experienced extended periods of drought during the prime sampling period and were not able to collect as much subsurface or sheet flow samples as was hoped.

As in Phase II, the windrows being tested were limited in height do to the requirements of the rain simulator. However, unlike Phase II a variety of compost mixes were tested, as well, as the on-site native soils and the on-site compacted, all weather, drivable gravel pad.

A Perdue Style rain simulator supplied by the MN Department of Agriculture was used to spray water over a native soil plot, the compacted class V gravel pad, a windrow with a SSOM/YW mix and a windrow of yard waste only. Due to the limitations of the rain simulator, the windrows were approximate 4.5 to 5 feet in height. In addition, a Perdue Style rain simulator is designed to be used on flat surfaces like the native soil and the on-site compacted, all-weather, drivable gravel pad. As a result, the application of the "simulated rain" on a windrow was uneven, with the crest of the windrow receiving larger amounts of water and a tapering of water toward the edges of the windrow. However, as stated above, the rain simulator was used because it would avoid

the extended periods of drought as it applied a set amount of water over a specific period of time and in a 5' x 8' area.

The windrow was placed on the existing pad over falling head suction tube soil water samplers installed three (3) feet below the surface to collect samples of water that infiltrated through the compacted gravel pad and on site Lester-Kilkenny clay loam and loam soils. These were installed for the previous two grant and data from those grants are available in the Final Reports.

Due to workloads MPCA technical staff played an advisory role and was not actively involved in this phase of the project (MPCA engineering staff were given the dates of the October project and asked repeatedly to set those dates aside so they could be on-site during the rain simulation. They decline active involvement due their work load). The project was overseen by Professor Halbach and Mark Zelwickle, the MN Department of Ag's specialist in using rain simulators. Specific parameters such as starting moisture content, pile dimensions, and the amount of water applied are not known (this statement isn't true. I believe this info was collected and is included in the report).

Phase II Description

The Goal of the Phase II departed from the stated goals in the RFP. MPCA staff designed a project to collect contact water coming off of the newly formed windrow with identical feed stock mixes through the PFRP process. Surface water and ground water collection sampling was eliminated in favor of what has been characterizes as a waste characterization of the feedstocks. The design of this phase with the three test cells having identical feed stock mixes resulted in the generation of a single data point and does not give enough information for it to be a statistically valid sample.

In June of 2013, three test pads were constructed starting with a 40-mil high-density polyethylene (HDPE) liner, a compacted sand drainage layer and a gravel mix that had very little fines and did not meet the MnDOT class V specifications. The test pads eliminated any possible contact with soils under the pad and eliminated any mixing of the contact water with storm water coming generated by the compost pad. Under normal operations, the contact water generated on the site would mix with the compost water and, via sheet flow, end up in a storm water pond for treatment.

The rain simulations were conducted July 8, 2013, on a typical mix at the Arboretum site. The dimensions of the compost piles were approximately 7' X 13' X 4' high. The average moisture content of the three mixed pile was greater than 56% at the beginning of the research. The dimension of the windrows and the moisture content were not typical of an actual operating compost facility.

MPCA staff requested that 3 rain simulations be performed on three different stages of the compost process: 1) freshly mixed SSO materials, 2) SSO materials that have reached the process to further reduce pathogens, and 3) when the SSO materials have reached the maturity needed to be moved from the processing area to the curing area.

To measure the three stages of decomposition the rain simulations were performed on July 10thon pile #3, July 11thon pile #2 and July 12th on pile #1, again on August 15th, 16th, 17th and the third on September 18th, 19th, and 20th. (was 200 gallons of water were applied to each compost pile on all three simulations?.

Following each rain simulation, the contact water collected in the subsurface sump area was measured. According to the volumes measured and recorded from the sump, approximately 50% of the water applied infiltrated through the compost pile into the subsurface. Samples of contact water were collected 24 hours after the each rain simulation. These samples were analyzed for heavy metals, PFC, pesticides, pathogens and nutrients. The results of the analysis are summarized in Appendix C.

Samples of the mixed compost solids were collected in July for analysis. In October 2013, samples of similar feed stocks were also collected and analyzed. The samples were analyzed for synthetic precipitation leaching procedure (SPLP) and the test method for the examination of composting and compost (TMECC). The results of all solids analysis can be found in Appendix D.