Independent School District 196

Organic Separation and Collection for Off-Site Composting Pilot Project

MINNESOTA WASTE WISE
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Sponsored by the
Solid Waste Management Coordinating Board and
Dakota County Board of Commissioners

Final Report
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Glossary of Terms

Building Chiefs – Supervisory custodians

Compostables – Organic residuals such as food waste, liquids, milk cartons, non-recycleable and soiled paper products. Excludes yard waste.

Fiber Recycling – Recycleable non-soiled paper (e.g., notebook, office, envelope, etc.) and cardboard.

Mixed Municipal Solid Waste – As defined by Minnesota Stat. §115A.03, Mixed municipal solid waste" means garbage, refuse, and other solid waste from residential, commercial, industrial, and community activities that the generator of the waste aggregates for collection. Mixed municipal solid waste does not include auto hulks, street sweepings, ash, construction debris, mining waste, sludges, tree and agricultural wastes, tires, lead acid batteries, motor and vehicle fluids and filters, and other materials collected, processed, and disposed of as separate waste streams, but does include source-separated compostable materials.

Organic – Compostable materials that readily decompose in ideal environments such as compost facilities. Compostable materials include paper, cardboard, all types of food waste and wood waste.

Recycling – As defined in Minnesota Stat. §115A.03, recycling means the process of collecting and preparing recyclable materials and reusing the materials in their original form or using them in manufacturing processes that do not cause the destruction of recyclable materials in a manner that precludes further use.

Rigid Recycling – Containers such as plastic bottles with a neck (typical PET #1 and #2 code), glass (clear and colored), aluminum and steel cans and other recycleable metals.

Source-separated compostable materials – As defined in Minnesota Stat. §115A.03, source-separated compostable materials" means mixed municipal solid waste that:

(1) is separated at the source by waste generators for the purpose of preparing it for use as compost;

(2) is collected separately from other mixed municipal solid wastes;

(3) is comprised of food wastes, fish and animal waste, plant materials, diapers, sanitary products, and paper that is not recyclable because the director has determined that no other person is willing to accept the paper for recycling; and

(4) is delivered to a facility to undergo controlled microbial degradation to yield a humus-like product meeting the agency's class I or class II, or equivalent, compost standards and where process residues do not exceed 15 percent by weight of the total material delivered to the facility.

Trash – Non compostable items such as Styrofoam and non-recycleable plastic. Excludes all recycleable materials.

Abbreviations and Acronyms

BFI- Browning Ferris Industries Waste Systems, Inc.

District or ISD 196 – Independent School District 196

MSW – Mixed municipal solid waste

MWW – Minnesota Waste Wise

NRG PS – NRG Processing Solutions, Inc.

RDF – Refuse Derived Fuel

SSOM – Source Separated Organic Material

Partner Descriptions

Browning-Ferris-Industries Waste Systems, Inc. (BFI)

The waste hauler that provided waste and recycling services, including delivering the district's waste to the compost facility. BFI provided disposal cost savings information, dumpsters and recycling bins, and assistance on waste issues as needed. For more information, visit www.alliedwaste.com.

Dakota County (County)

The County's Environmental Management Department was responsible for providing financial assistance and was the project administrator for the pilot project. The County is located in the south suburban Twin Cities of Minnesota. The County is committed to environmental sustainability by developing programs to manage solid waste, such as recycling, composting, and household hazardous waste. The Department also regulates sanitary landfills and other solid waste facilities, businesses that produce hazardous waste, well drilling, and septic system installation. For more information about the County, visit www.co.dakota.mn.us

Independent School District 196 (ISD 196 or District)

The district provided the setting for the case study. A public school district located within Dakota County that serves approximately 28,500 students in grades k-12 and is Minnesota's fourth largest school district. The 110 square mile district boundary includes all or part of seven cities – Rosemount, Apple Valley, Eagan, Burnsville, Coates, Inver Grove Heights and Lakeville - and rural Empire and Vermillion townships. The District has 18 elementary schools (grades k-5), six middle schools (grades 6-8), four high schools (grades 9-12), the School of Environmental Studies optional high school (grades 11-12), the Area Learning Center alternative high school (grades 9-12) and Dakota Ridge special education school (grades k-12). The district has a total population of 135,535 people. For more information, visit district196.org

Minnesota Waste Wise (MWW)

The contractor for the pilot project. MWW is a non-profit organization that was started in 1994 to work with businesses located throughout the state on solid waste issues by providing technical assistance. MWW provided the bulk of the technical assistance to ISD 196 for the entirety of this pilot project through waste audits, presentations, acting liaison between all partners, and provided technical assistance to individual schools. For additional information visit www.mnwastewise.org

NRG Processing Solutions (NRG PS)

The owners of the MSW compost facility that processed about seven tons of the ISD 196's waste per day. The facility is located in the rural area of Dakota County, approximately 5 miles from the outer radius of the district's boundaries, and is operated by Specialized Environmental Technologies, Inc. NRG PS is one of the largest composting companies in the Midwest and owns and/or operates eleven yard-waste compost facilities, a construction and demolition debris transfer station, a MSW transfer station and one MSW Processing and Compost facility.

Solid Waste Management Coordinating Board (SWMCB)

SWMCB provided a $27,000 grant to implement the pilot project, to study the success and challenges of implementing a large-scale project in an institutional setting. Formed in 1990, SWMCB is a joint powers board comprised of two county commissioners from the metropolitan counties of Anoka, Carver, Dakota, Hennepin, Ramsey and Washington. To enhance intergovernmental coordination, the Board also includes the Director of the Minnesota Office of Environmental Assistance (OEA) and the Minnesota Pollution Control Agency (MPCA) as ex-officio members. The mission of the SWMCB is to increase the efficiency and environmental effectiveness of the region's solid waste management system. For additional information about SWMCB, visit www.swmcb.org

District 196 Organic Separation for Off-Site Composting Pilot Project

Executive Summary

Independent School District 196 (ISD 196), the fourth largest district in Minnesota, implemented a district-wide organic collection pilot during the 2002-2003 school year. This was the largest known project of its kind in the state. The intent of the pilot project was to compost the non-recyclable, organic portion of the mixed municipal solid waste (MSW) stream. The project was designed to determine the amount of organic waste generated and the ability to capture it, to identify resources and requirements needed to implement an organic collection program, and to provide information on the potential expenses and cost savings with the expectation that the project could be replicated in similar settings.

The overall goals of this project were to evaluate and measure opportunities, challenges and barriers in organic processing as a means to manage solid waste in an institutional setting in Dakota County. Core project partners included BFI, Inc. (hauler), Dakota County, ISD 196, Minnesota Waste Wise (contractor), NRG Processing Solutions (compost facility). Funding was provided by the Solid Waste Management Coordinating Board and Dakota County.

The district initially volunteered an elementary, middle and high school (one of each) for the pilot, but later decided to expand the project to all 30 schools and two administrative buildings which offered greater transportation efficiencies.

Steps for Organic Separation for Off-Site Composting:

1. Identify existing waste management infrastructure and opportunities for change
2. Identify compost facility
3. Determine feasibility of organics collection
4. Develop core teams
5. Develop new waste management infrastructure that includes organics collection
6. Educate
7. Implement
8. Evaluate and monitor for success
9. Modify

The district's waste management contract with the hauler required the MSW be delivered to a processing facility and the fiber and rigid recyclables be collected and delivered to a local recycling facility. Knowing this, the district needed to determine if the existing waste management infrastructure would allow for necessary changes prior to implementation of the organics project. The contract between ISD 196 and the hauler did allow for variations that included changing the MSW processing facility type and location without requiring an amendment. A known benefit of waste diversion from the previous waste disposal location at the refuse derived fuel (RDF) facility to the compost facility was the closer proximity of NRG PS than the RDF facility to the district's boundaries, offering a potential reduction in transportation costs, which is typically a major limiting factor in implementing organics

collection project. Additionally, NRG PS provided a lower per ton tip fee than the RDF facility, providing another potential cost savings for the district.

ISD 196 disposed of approximately 8-10 tons of waste per day generated by 28,500 students and 4,000 faculty at 30 school buildings and two administration buildings. An initial waste sort conducted in May 2002, prior to project commencement, found that 77%, by weight (and 54%, by volume), of the waste stream was organic. The largest volume of observed contaminants consisted of styrofoam trays, single serve plastic containers and recyclable rigids such as plastic bottles. Waste sorts done in similar school settings in the region found that approximately 80% of the total solid waste is generated in the cafeteria area, and the majority of wastes generated in other areas of the school, such as classrooms, were typically recyclable.[1] It was apparent that separation in the cafeteria area should be the focal point of the organic collection pilot to minimize non-organic contamination at the compost facility.

Over the summer break, ISD 196 worked closely with project participants to develop the new waste management infrastructure that included organics collection. Modifications were necessary to deliver the organic fraction of the waste stream to the compost facility and deliver the non-compostable fraction to the RDF facility. The new system also included an increased focus on recycling, with the intent that recyclable fibers (e.g. paper, cardboard, etc.) should be recycled and not placed in the organic stream for composting.

The district had less than six months from the time the County proposed the project to the time of implementation. Subsequently, ISD 196 was faced with significant and immediate challenges that included the short timeframe to identify implementation strategies, completing the internal organic separation infrastructure for 32 buildings, and effectively communicating the change to all affected individuals. To assist with this process, the district developed an internal core team that consisted of the district's Coordinator of Buildings and the Elementary and Secondary Education Curriculum Coordinators. The district's internal team met with project partners and other key internal groups such as Building Chiefs, Food Nutrition Services Managers and Principals to identify opportunities for changes within the existing waste system in the cafeteria areas and throughout the school. The groups also identified and developed educational opportunities for faculty and students.

To separate the organics, each school was required to set up at least two waste station(s) in the lunchroom. Students were required to place their cafeteria waste into the appropriate container as they exited the lunchroom. Bins in the waste station included a "COMPOSTABLES" bin, a "TRASH ONLY" bin and a "BEVERAGE CONTAINERS" recycling bin for co-mingled rigids. Items that went into the bin labeled "COMPOSTABLES" included organic waste such as: food waste, milk cartons, paper napkins, paper bowls, paper wrappers, paper plates, wax paper bags, paper bags and any other type of paper or food waste. Examples of wastes that went into the bin labeled "TRASH ONLY" included: plastic eating utensils, plastic and Styrofoam bowls, Styrofoam trays, plastic juice containers or juice boxes, plastic baggies, and plastic cups. All empty plastic pop bottles were to be deposited into the bin labeled "BEVERAGE CONTAINERS ONLY" or for simplification purposes just labeled "POP BOTTLES" for recycling.

[1] Minnesota Waste Wise ERASE Project (2001)

The more controlled atmosphere of elementary schools enabled these schools to complete necessary source separation training within the first weeks following project implementation. Students were then fully capable to conduct the source separation on their own, without adult supervision at the waste stations. However, middle and high schools were faced with more significant training challenges due to varied education methods. The more involved schools used their own administration, student councils or student groups to assist in the education process by providing project education in the regular science classrooms. ISD 196 utilized additional educational opportunities such as using the district's web site to promote and explain the project in more detail, production of the "Compost and You" educational and training video, and student tours to the compost facility.

NRG PS tracked the volume of waste delivered from mid-September through December 2002 and found that in 67 days of deliveries, nearly 400 tons of waste was delivered with an average of nearly 18% composted. However, a representative waste sort performed at the end of the pilot phase indicated that 75%, by weight, of the separated organic waste tipped at the compost facility was organic, suggesting that more of the organic fraction of waste could have been composted. The post pilot waste sort found that schools were doing a good job of separating the Styfroam trays as only a minimal amount of trays were noted in the post-sort compostable stream compared to the pre-project waste sort conducted a year earlier.

Additional results of the post-pilot waste sort noted that recycling of containers (mostly plastic beverage containers) significantly improved at secondary schools as a result of increased education efforts and additional recycling bins that were readily accessible and visible. Year-end evaluations indicated that 72% of schools reported an increase container recycling, with some schools experiencing a plastic bottle recycling rate increase of more than 400%. Results of the sort indicated an overall decrease in the weight of plastic bottles in the waste stream from 6% to 2%, a significant decrease given the almost negligible weight of empty plastic bottles.

Results of the project indicate both environmental and economic benefits for the district. In addition to increased recycling, survey results show that environmental education has been enhanced at all levels within the district's infrastructure, and has assisted some schools in identifying areas for additional source reduction opportunities. The district closed the loop on organic recycling by using the finished product from NRG PS as a soil amendment on athletic fields at the secondary schools. The district also realized a 10% cost savings in waste disposal costs.

Through commendable leadership, ISD 196 has led the way for an alternative waste management option of their nearly 10 tons-per-day generated waste. The project has demonstrated that MSW is not simply garbage needing disposal, but is a renewable resource.

Goals of District 196 Project

The goal of this case study was to design and implement an ongoing source separated organics program for ISD 196 by addressing potential barriers, such as: capital costs, supply costs, staff time required to separate organics from the MSW stream, economic

viability of organics collection from the hauler's perspective, and the effectiveness of educational programs.

Specific goals include:

1. Achieving outcomes established in the Regional/Dakota County Solid Waste Master Plan.
2. Reducing the amount of waste going to landfills.
3. Increasing the amount of source separated organic material that is recovered, composted and marketed from the institutional sector.
4. Educating youth, families, District staff and officials on the benefits of organics recovery including the study's process and outcomes.
5. Determining the effect of source separation on the average amount of materials collected.
6. Reducing MSW management costs for ISD 196.
7. Instituting a permanent system for effective separation, collection and composting of source separated organic material at schools and other district buildings.
8. Identifying further opportunities, barriers, and challenges to instituting permanent organics separation, collection and composting for schools and other district buildings and the potential to expand or duplicate the pilot project in other school districts.

STEP 1: Identify Waste Management Infrastructure Prior to Project Implementation

ISD 196 disposed of approximately 8-10 tons of waste per day generated by 28,500 students and 4,000 faculty at thirty (30) school buildings and two administration buildings and one of the first steps in identifying opportunities to implement a large-scale, organics separation project was to first understand the existing waste management infrastructure. This is necessary for a multitude of reasons, including identifying areas that can manipulated and identifying areas of possible cost savings and cost increases, to see if the project could even be initiated.

Hauling System: The District participates in an open hauling system, and offers rubbish removal and recycling contracts every two years with an option to renew for an additional two years, per Minn. Stat. §123B.52. Furthermore, school districts in Dakota County are required that the non-recycleable fraction of the waste stream be processed, in accordance with the Regional/Dakota County Waste Master Plan and Minn. Stat. §115A46 and §115A.471. The district was spending approximately $180,000 on disposal and recycling services annually.

Although the district was in the middle of the contract for the pilot, the contract language was written in a way that the hauler must abide with all applicable federal, state and local laws, and ISD direction, which allowed for variation in final disposal location without a contract amendment.

MSW: According to Dakota County Ordinance 110, a hauler that collects or transports MSW for disposal must obtain and maintain an Operating License. A Hauler shall obtain

and maintain a Base License from the county in which it is located in order to be eligible for an Operating License. All vehicles used in collection or transportation of MSW shall be included in the License and have a Regional MSW Hauler decal affixed to the vehicle.

Prior to project commencement, the district's MSW was delivered to a processing facility called NRG Energy, Inc in Newport, located approximately 22 miles from the district's boundaries. ISD 196 was sending the MSW to NRG Newport in a front-loading, compacter truck. The number of pickups by the hauler varied by the school, based on the volume of waste generated and the amount of space available in the loading dock area. Those schools that generated a large volume of waste, such as some of the secondary school, but had limited space available for a second MSW dumpster, required twice a day pickups by the hauler.

# of Schools	MSW pick up/day
22	1
8	2

MSW sent to NRG-Newport is processed into refuse derived fuel (RDF) that is later burned in place of coal at power plants for energy purposes. Environmentally, it is better to send high-fraction organic waste (e.g., food waste) to a compost facility rather than to a processing facility like Newport because organic waste has a low BTU (burn) value and is considered a "negative fuel." It complicates the process of turning waste into high-grade RDF. Because of this, high content organics are often extracted as residuals during the processing of the waste and are sent to a landfill. As these organics decompose in the landfill, they become significant generators of methane, a greenhouse gas. Alternatively, organic residuals not sent to a landfill can be delivered to a close proximity compost facility for composting. Since the district generates a large volume of heavy-fraction organic waste, it makes environmental and economic sense to send the organic waste directly to a compost facility. This serves the purpose of sending the waste to the best-suited processing facility while also eliminating excess transportation.

Recycling: According to Minn. Stat. 115A.151 public entities are required to implement recycling programs. The district had recycling programs for both fibers and rigids. The fiber recycling consisted of collection for cardboard, paper (office, construction, colored, envelopes, etc.), newspaper and magazines, and the rigid recycling consisted of plastic containers with necks (typically PET code #1 and #2), glass and aluminum and steel cans.

The district was on the following recycling schedule:

School Type	Fibers	Rigids
Elementary School	1/week	1/week
Middle School	2/week	1/week
High School	2/week	1/week

Recycling of both fibers and rigids was collected in 90 gallon carts or dumpsters located on or around loading docks or behind schools in areas not readily accessible to the public. Most elementary schools had one fiber and rigid cart for recycling collection while most secondary schools had one to four carts for rigids and a dumpster for fibers that was picked up by the hauler on a predetermined schedule, independent of the actual volume collected.

Visual inspections yielded that recycling programs, especially for rigids, were very limited. Fiber recycling consisted mainly of cardboard and some paper from classrooms. Most schools were not recycling plastic pop bottles and pop bottle recycling bins were virtually non-existent, and at those schools that did have bins, they were inappropriately located. These observations appear consistent with other school districts in the region.

It was estimated by the hauler that approximately 6-7 tons of fiber and less than a ton of rigids was collected and recycled weekly from the district prior to implementation of the project.

Food Rescue Program: Since 1998, ISD 196 has donated cafeteria food that has not been served to students and staff to the Twelve Baskets Program. Twelve Baskets is Second Harvest St. Paul Food Bank's prepared and perishable food rescue program. It is based on the simple concept that excess food, which is not placed on the serving counter, should be used rather than throwing it away.

ISD 196 schools store excess food, which has not been put on the counter for student to take, in freezers or refrigerators until it is collected by Twelve Baskets in refrigerated trucks. The food is then taken to charitable organizations and is served to their clients.

Currently there are two organizations that serve the state of Minnesota; All Seasons Food Rescue and Twelve Baskets. They will accept food from any source that has the ability to store the un-served food properly. Examples of un-served food that they accept, include:

Prepared foods
Meats
Deli
Produce
Dairy
Canned/Dry goods
Limited bakery goods

Examples of food sources, include:
Restaurants
Grocery stores
Delicatessens
Nursing homes
Hospitals
Companies with cafeterias
Schools

STEP 2: Identify Compost Facility

Given that transportation related issues are typically the limiting factor in implementing organics collection projects, the district was fortunate that a commercial compost facility was located in close proximity at only 4 miles from the district's boundaries. In fall 2002, NRG PS's permit was expanded to include processing of not only source-separated organic materials but MSW as well. This permit expansion was important because although the goal was to have no more than 15% contamination (i.e., non-compostable waste) tipped at the compost facility, it allowed for variability in the contamination limits.

Front loader loading processed compostable waste into in-vessel bags at NRG PS.

STEP 3: Determine Feasibility of Organics Collection

In March 2002, Dakota County contacted ISD 196 to gauge interest and access the feasibility of implementing an organic collection pilot project. The County worked with the district in the past on successful implementation of environmental projects, and ISD 196 has a reputation for being progressive through enhancement of awareness and implementation of environmentally friendly programs. County staff spoke directly with Facilities Management staff, which led to the initial proposed scope of the project to include three of the district's schools; an elementary, middle, and high school.

Possible Cost Savings: Although possible barriers of the project were not fully understood, ISD 196 realized that there were some benefits. First of all, the tip fee at the compost facility was lower than the per ton fee at the waste-to-energy facility in Newport, offering an opportunity for possible savings in disposal costs. For purposes of the pilot, the compost facility secured a per ton tip fee of $45.00 as compared to $66.79 at the Newport facility. Furthermore, the compost facility was 4 miles from the district's boundaries as compared to 22 miles to Newport, again offering a potential savings in hauler costs.

Another potential cost savings is exemptions from solid waste taxes. Minn. Stat. §297H offers a 17% tax exemption on waste services to generators on all source-separated waste that is intended for recycling or composting. With an increased rate of recycling expected and implementation of an organics separation project, the district had the potential for significant savings in their disposal costs.

Leadership Benefits: Other benefits included the district's observation that Minnesota needs alternative waste disposal options and locations, especially for organics which are better suited for composting than at a waste-to-energy (e.g., RDF facility in Newport). Also, the district wanted to be a model and leader in the concept that waste should be treated as a resource. And finally, the pilot offered a great educational opportunity to enhance environmental awareness of students, teachers, administrators, parents and the community.

Determine Focus: The proposed objective was to commence with the start of the new school year in fall of 2002. Involved district staff enthusiastically embraced the initial proposal, with the expectation that a successful program would be phased-in district wide, and permanently. ISD 196 Facilities Management was interested in implementing the pilot with minimal change required and disruption in daily operational activities.

Initial discussions included a focus on the food prep area waste, which offered a collection of a heavy fraction and high content non-recycleable organics from the remaining waste stream within the schools.

Subsequent discussions by project participants resulted in the recommendation by the district to minimize transportation costs by changing the scope to include all buildings within the district.

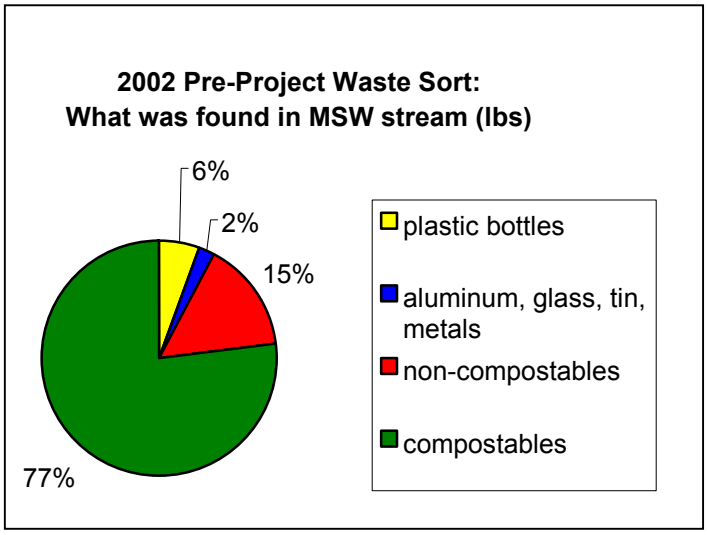
Without hesitation the district openly volunteered to commence with efforts to see if the pilot was even feasible, knowing that they would still be abiding with applicable waste management regulations (e.g. public entities law). The participants decided to find out if this was even possible. A waste sort was needed to make a final determination that if the project included all the schools instead of the initial three, would there be a high enough concentration of compostable materials to make it even feasible.

Pre-Project Waste Sort: In May 2002, prior to commencement of the organics pilot, a waste sort of the district's MSW was preformed to determine the percent of overall organics in the waste stream and evaluate the options and feasibility for an organics collection program. Because the district recommend using all schools in the pilot, the sort was performed on one day's generation of MSW which equated to approximately 9 tons of waste. The project partners arranged the waste sort without the knowledge of the district, to ensure that schools would not alter daily waste management habits (e.g., increase recycling efforts) that may have skewed results.

MSW was collected from all school buildings and the two administrative buildings, and delivered to NRG PS. A front loader was used to place the waste on a conveyer belt and to an elevated platform where volunteer sorters performed a negative sort on the waste. Operationally, 30 cubic yard roll-off would work better under the picking platform than the 3 cubic yard bins. Longer chutes from the picking stations to direct the flow into the bins should be constructed. That is, sorters only pulled the non-organic waste and threw in chutes into 3 cubic yard bins further separating recyclables, non-compostables (rejects) and compostable organics. The organic or compostable waste stayed on the belt, where it eventually ended up in a pile on the facility's floor. Recyclables were sorted into plastic bottles, aluminum and steel cans and other metals. Reject waste included all non-compostable material that consisted mostly of Styrofoam trays and single serve containers from the cafeteria. Compostable organics included items such as food waste, paper and cardboard, etc.

Quantitative Results: Results of the waste sort indicated that 77%, by weight, of the 9 tons of waste was organic and could be recovered for composting. However, this percentage is artificially inflated to due a multitude of factors, including:

1. NRG PS was not able to fully control the speed of belt on the sort line. Therefore, a fair portion of the non-organic waste was not able to be fully pulled from the line and placed in the correct bin. Although sorters were diligent in their sorting efforts, they were not always fully able to pull off non-organic material before the material mixed with the pile of organics.
2. Because it was the end of the school year, there appeared to be fair amount of year-end purging of materials (i.e., encyclopedias, books, papers, etc.) which also carried significant weight.
3. Did not pull out recycleable paper and cardboard, as it was cross contaminated with food waste, etc.



The results also showed that six percent (6%) of the waste stream, by weight, consisted of recycleable PET bottles that should have been in the recycling stream, not the MSW stream. Another two percent (2%) of the MSW stream consisted of glass, tin, aluminum, steel and other recycleable metals. Therefore, overall eight percent (8%) of the stream should have been recycled.

BY WEIGHT fifteen percent (15%) of the waste stream was non-compostable, consisting mainly of materials such as styrofoam trays and containers, plastic single serve containers, plastic utensils, etc. However, BY VOLUME, these materials comprised over fifty percent (50%) of the stream. If these items could not be source separated by the district, it would not be feasible to implement the project as it would have been too resource intensive for the compost facility to pull out non-compostable contaminants on a routine basis. These materials needed to be eliminated out of the waste stream both economically and effectively by the district somehow.

Qualitative Results: A significant amount of the results could not be quantified, but qualitative results included:

1. The majority of rejected materials, or non-compostable materials included: PET and LDPE plastic, styrofoam trays (a major contaminant), air duct filters, a table, at least 4 car windshields, door hinges, staples, some metal, non-toxic paint, and a bus bumper.

2. The waste comprised of very limited amounts of industrial or hazardous waste, as schools are doing a good job of keeping these wastes out of MSW stream.

3. Yard waste was found in the load – several plastic bags of grass and some shrub prunings. According to Minnesota regulations, it is illegal to mix yard waste with MSW.

4. It was relatively easy to determine what kind of school/building the materials crossing the picking line derived from – elementary, high school, automotive shop, administrative, etc.

5. Operationally, 30-cubic yard roll-off would work better under the picking platform than the 3-cubic yard bins. Longer chutes from the picking stations to direct the flow into the bins should be constructed.

6. There were very few plastic garbage bags in the loads, contrary to what was expected. The schools previously stated that plastic bags were rarely used to save on purchasing costs.

Identify Focus of Project: The conclusion was to increase recycling efforts and focus on the cafeteria areas because this appeared to be the where the largest amount of organics was generated, as well as the largest volume of non-organic waste was coming from, not the bathrooms or classrooms.

After reviewing the results of the waste sort, it was clear that the major contaminants of the waste stream were styrofoam trays and PET bottles. If these two types of waste materials were eliminated from the waste stream, then it was believed that the non-compostable portion of the compostable waste stream would be below the target fifteen percent (15%) contamination limit at NRG PS.

It became the priority for the project to separate non-organic from organic wastes in the cafeteria areas, where the majority of waste is generated. To do this, a minimum of two waste collection containers, one for compostables and one for trash, would be needed. The focus was to source separate styrofoam trays.

STEP 4: Develop Core Team

In order to implement an organics collection project on this scale and to change the behavior of 28,500 students and 4,000 staff, the district realized that two core teams needed to be developed. One of the teams would consist of the core project partners (BFI, County, District, MWW and NRG PS) that would meet often and routinely to discuss the logistics of project implementation and provide continuous feedback for necessary adjustments.

Due to the enormity of the project and the short timeframe established for implementation, another core team was established that consisted of Senior Administration (e.g., Elementary and Secondary Education Directors), Coordinator of Facilities, and the Food and Nutritional Services Coordinator. The role of this team was to work with school staff to identify opportunities, challenges, and barriers within schools in implementing the organics collection project.

The technical assistance contractor worked closely with both core teams to ensure all questions were answered resulting in a successful project.

STEP 5: Develop New Waste Management Plan

Factors That Affected New Infrastructure:

The first task for the project was to establish a new infrastructure to begin separating the district's waste from one main waste stream into three: compostable, recyclable and non-

compostables. The clock was ticking and the project partners only had a couple weeks to have the new infrastructure set up in time to begin the first day of school.

Identifying Opportunities, Challenges and Barriers:

MWW and County staff conducted audits and held countless meetings with the district's core team and other district staff (custodial, food service, principals, teachers and students) to implement the new infrastructure to collect compostable materials. Several surveys were given as well to help determine the best procedure for collection of compostables. After many hours of research were conducted, a new waste management plan was developed accordingly.

Opportunities

1. **Plastic Bags:** Results of surveys and meeting discussions with Building Chiefs and custodial staff yielded the response that the majority of secondary schools and some elementary schools were not using plastic bags. The reasoning for the limited usage of plastic bags was because of budgetary issues at schools and because the lunchroom waste collection bins (i.e., Gondolas) in most schools are too large for bags to be used as liners. Because most schools were not using plastic bags to bag waste and instead left most waste unbagged, it provided an opportunity to implement the project without biodegradable bags to bag the compostable stream.

2. **Waste and Recycling Containers:** Because all schools had two or more barrels or gondolas for waste collection, no additional bins needed to be purchased for the source-separated project. At a minimum for the project, each school needed one bin for compostable waste and another for trash (non-compostable waste). Recycling containers were needed at all secondary schools, especially for rigids. Using MWW contacts, Pepsi and Coca Cola donated large recycling containers at middle and high school to aid in increasing recycling rates.

3. **Food for People Program.** It is economically and socially preferred to continue to send unserved, perishable food to Food for People programs rather to put this food in the waste stream.

4. **Hauler Support.** The contract with the hauler allowed for flexibility in the disposal location, as long as the waste was processed. Additionally, the hauler was very supportive of a organic separation program and willing to find options and solutions to barriers in implementing such a program.

Challenges

1. **Getting the Word Out About Project:** The district had major concerns not only about educating all 28,500 students and 4,000 staff, but getting both groups to buy into the message to result in successful separation of the waste in the cafeteria area. Core project partners and the internal district team met during the summer months preceding the 2002-2003 school year, but there was little time to educate the necessary people necessary to do the actual separation. The district decided early in the planning process to implement the project at the start of the new school year, and therefore educating students and staff over the summer months was not possible given that the project partners were not able to determine the feasibility of the project in the institutional

setting until the end of the 2001-2002 school year. Therefore, the district relied on its internal organizational infrastructure to ensure affected students and staff received the necessary information about the project. Therefore, the following information command system was established for communication, education, expectations, and feedback purposes:

Coordinator of Buildings -> Building Chiefs - > Custodians (day and evening)

Directors of Education -> Principals - > Faculty and Other staff -> Students

Food and Nutritional Services Coordinator -> Food Service Supervisors

After School Program Director -> Program Coordinators -> Students and other Participants

Even with the educational infrastructure in place, the district decided to delay the start date of the project for all schools to allow for more time to educate the students on the importance of proper separation of the waste materials in the lunchroom. The new kick-off dates at the secondary schools were two weeks into the school year and at the elementary schools the proceeding week.

2. **Daily Activity Changes:** Other than the student and faculty doing the actual waste separation, the other major players were the custodial staff. Custodians are the backbone of the project, ensuring that the appropriate waste collection bins are in place and cleaned on a regular basis. Initially some custodians indicated resistance to changing their behaviors to include recycling and compostable containers in their current waste management system. They felt their jobs offered little extra time during the lunch period to add collection of other compost bins. However, it was explained that the volume of waste generated would not be increasing as a result of the project, so the impact to specific lunchroom job duties should be minimal.

3. **Special Education School:** Dakota Ridge, an alternative K-12 school serving approximately 120 students part and full time, did not have a lunchroom prep or cafeteria area. Instead, meals were brought in from another school and often times students ate in the classrooms. Because of this set up, containers to collect the compostables would need to be added to the classrooms.

4. **Focus on Cafeteria:** Minnesota Waste Wise used their previous experience with schools to know that approximately 80% of a school's waste is created in the lunchroom. If we concentrate on this area alone, we could eliminate a majority of the contaminants.

5. **Classroom waste:** Classroom waste was mainly compostable waste (paper). It was noted that most schools did not have a program for paper recycling. Most schools did not allow students to drink soda in class, so pop bottles were not a big concern. Most of these bottles would be captured in the halls for recycling. Remember, schools did not use any trash bags, so classroom waste was thrown in free flowing into dumpsters already.

6. **Capture all food waste:** Schools often practiced using garbage disposals for ridding of food waste. The project coordinators educated cafeteria staff and encouraged them to utilize compost collection bins instead.

Barriers:

1. **Reusable Serving Containers:** At the 30 schools, all but 3 of the school have dishwashers because new school lunchroom prep areas were designed without a dishwasher or the space in the case the school wanted to install one in the future. Even though 30 schools have dishwashers, mainly only the elementary schools use the dishwashers. Even at those schools that use dishwashers, breakfast is always served on Styrofoam trays and lunch is served on both reusable and Styrofoam trays depending on the number of food service staff available and time related issues. The new school food systems are designed to be quick and efficient. The use of small plastic containers to hold individual serving sizes is to avoid waiting lines and to be able to feed all the students using the most minimal food staff and time as possible. The option of converting the schools to reusable trays was not a viable one for this project.

   It was estimated that it would cost $7,500 per school to start reusing dishwashers (or replace altogether with large enough ones to handle the loads) at those schools that retired their dishwashers several years ago. This cost includes the purchase of additional trays, needed upgrades, retrofitting of hardware, staff salary and benefits, and excludes hidden costs such as water usage, electricity and ongoing maintenance costs for dishwasher operation.

2. **Conversion to Biodegradable Serving Items**: The May 2002 waste sort found that the styrofoam tray comprises the largest volume of non-compostable waste for the district pushing the district and core project partners to research options for conversion from styrofoam trays to biodegradable trays. Findings of the research resulted that the conversion was cost prohibitive due to the large volume of disposable trays the district goes through in a given school year. In the 2001-2002 school year, the district went through a total of nearly 1.8 million trays. This is in addition to those schools that were also using washable trays. Research showed that the most economical biodegradable tray of a comparable size to the utility and compartmentalized styrofoam trays, even with a discount for the large volume order, would increase costs per tray by 2.5 to 4 cents. The expense of compostable trays alone would cost the district $100,000 annually, making this option cost prohibitive.

3. **Biodegradable Bags.** Purchasing compostable bags for this project was just too cost prohibitive. The schools were not able to afford even the luxury of regular trash bags, so the idea of purchasing compostable trash bags at a cost of three times the cost of plastic bags was economically prohibitive.

   Remember, the goal of this project was to make a project that was self-sustainable and would exist after the grant was over. We didn't want to provide a waste management plan that was too cost prohibitive for the district to continue the following year. As more programs come on line, prices will reduce, but for now the compostable items are just too expensive.

   It was decided since there were more compostables than trash in the waste stream at elementary schools, and costs were such an issue for the schools, that we would contain the trash in trash bags for NRG PS staff to remove at their facility. This would ensure less bag purchasing costs (since volumes were less for trash, less bags would be used). Compostables would remain free-flowing in the elementary schools' dumpsters. Trash bags were expensive for the district. As you will recall earlier in this report, trash bags

were not purchased at all for containing trash. Trash was free flowing in most dumpsters. Most schools used gondolas, large roll-off type trash containers, in the lunchroom. These gondolas were too large; liners did not fit. Styrofoam trays could be stacked by students to further reduce the volume of trash or non-compostable waste. Fewer bags would need to be used as a result.

Another thing to note, compostable waste is very heavy and wet. Bagging this type of waste successfully is very difficult, liners break. The best possible option available, knowing all these circumstances, was to bag the non-compostables with a regular trash bag, and free-flow the compostables in the trash at elementary schools only. Middle and high schools would have the benefit of separate dumpsters for source separation. Bags full of non-compostables (or also known as trash) would then be removed by staff at the NRG facility. Since most schools did not use trash liners to begin with, custodial staff were already used to the fact that gondolas (or other trash containers) needed frequent washing to minimize odor and sanitary issues.

Why not just add another dumpster at each school instead of dealing with bags at all? Separate dumpsters would have helped source separate compostable from non-compostable waste. But for this project, it was not feasible to add more dumpsters onsite at each school. Those reasons will be discussed in barrier #4 below.

4. **Limited External Space.** Discussions with Building Chiefs and the hauler indicated limited space at almost all elementary school loading dock areas for an extra dumpster for source separated organic waste. Many of the middle and high schools have two dumpsters, so we were able to utilize dumpsters with one devoted to source separated organics, and another for trash. It was decided that there was no other option for the 22 elementary schools than to deliver all the waste to NRG PS for processing, but keeping it as clean as possible using trash containment bags to separate the trash from the compostables. Compostables comprised of 77% of the waste by weight, and most of the non-compostables were created in the lunchroom. These non-compostables had to be source separated from the rest of the waste. Essentially because of cost and space constraints with adding extra dumpsters at all 22 elementary schools, it was decided that extra dumpsters could not be used for this project to aid in source separation. We had to go with what we had, one dumpster at all elementary schools. This left us with one major problem. How will the trash and compostables remain separated for NRG PS? There was clearly only one reasonable answer. We had to use trash bags to contain either the trash or the compostables.

Other factors that solidified this decision:

- Compostables are typically wet and very heavy. Bagging this waste would be difficult and likely to tear the bags as a result of dumping into dumpsters by custodial staff. Compostable bags were out of the question for cost and durability reasons. Even if the District was given free compostable bags, eventually the District would find themselves needing to purchase expensive, compostable bags. We needed to set up a viable infrastructure that was sustainable.
- Bathroom waste would continue to be placed in plastic bags. It was decided that due to hygienic and safety issues the bathroom waste would not be sorted by students, although the majority of it is organic.
- Several elementary schools also included a “liquids” bin for leftover milk, water and soda drinks. Although this material could have been jointly collected as a compostable

material, some schools separated this from the compostables stream in order to minimize "messy" transportation and tipping of bins for school janitors and to minimize weight in the compostables bin.

All factors listed above revealed that the decision to free-flow the compostables was the best answer, even though this was a new concept to the compost facility and to the environmental community.

Dumpsters for New Infrastructure:

22 Schools (elementary schools) with once a day pick up: only one dumpster for both trash and compostables. Because of space and cost constraints (see explanation in "Barriers that Shaped New Infrastructure" section for more details) all elementary schools were unable to receive a dumpster for trash and compostables. Thus, they had to commingle their compostable free flowing waste with their bagged trash.

Eight schools (mostly middle and high schools) would have twice a day pick up and have separate dumpsters for source separating trash from compostables.

Apple Valley High, Eagan High, Dakota Hills, Eastview, Deerwood, Black Hawk Middle, Rosemount High, Falcon Ridge, Rosemount Middle, Scott Highlands, Valley middle, Southview Elementary received extra dumpsters from BFI for source separation.

Goal: Reduce non-compostable waste from regular waste stream to 15% or less by volume.

Current composition of compostable waste was 54% by volume. This rate needed to increase to a rate of 75% by removal of contaminants either through source separation or by using trash bags to contain the trash from the free-flowing compostables at the elementary schools.

Minn. Stat. §297H.06 – Allows for source separated materials to be tax exempt if they are processed for composting. Since we had to combine our trash bags in with the free-flowing materials, this did not allow for the district to receive the tax exemption.

5. **Limited Internal Space.** It was readily apparent that to make this project as efficient as possible, the less waste containers needed, the better it would be for everyone involved due to financial and staff resource issues, as well as concerns over limited space in the cafeteria areas. Although it was initially difficult to grasp for some building chiefs, the project did not involve additional generation of waste, just a different management method which may result in overall workload change, but the space needed for waste stations in the cafeterias remained consistent with previous years. The only change was the need to move containers around in the cafeteria to different areas, which may affect staff proficiency.

6. **Limited Time for Education.** With a program of this scale, it was clear that one of the major barriers would be to educate the affected staff and students in a timely manner. The program was to be implemented in all schools within the first weeks of school, barely enough time to educate students on the program enough that they would be able to source separate effectively. The remedy was to set up an education plan, using the existing District 196 infrastructure to educate affected students and staff.

Result: The New Infrastructure

To separate the organics, each school was required to set up at least two waste stations in the lunchroom. Students were required to place their cafeteria waste into the appropriate container as they exited the lunchroom. Bins in the waste station included a "COMPOSTABLES" bin, a "TRASH ONLY" bin and a "BEVERAGE CONTAINERS" recycling bin for co-mingled rigids. Items that went into the bin labeled "COMPOSTABLES" included organic waste such as: food waste, milk cartons, paper napkins, paper bowls, paper wrappers, paper plates, wax paper bags, paper bags and any other type of paper or food waste. Examples of wastes that went into the bin labeled "TRASH ONLY" included: plastic eating utensils, plastic and Styrofoam bowls, Styrofoam trays, plastic juice containers or juice boxes, plastic baggies, and plastic cups. All empty plastic pop bottles were to be deposited into the bin labeled "BEVERAGE CONTAINERS ONLY" or for simplification purposes just labeled “POP BOTTLES” for recycling.

The more controlled atmosphere of elementary schools would enable these schools to complete necessary source separation training within the first weeks following project implementation. Students would then be capable to conduct the source separation on their own, without adult supervision at the waste stations. However, middle and high schools were faced with more significant training challenges due to varied education methods. Education was crucial for success of the new infrastructure.

STEP 6: Educate

Signs, labels and bins

A design contractor was sought and hired to develop the educational signs for the new waste collection infrastructure. Labels that read “compostables” in green lettering and “trash” in red lettering were printed by a professional sticker printing shop and paid for by Dakota County. Corresponding duct tape in red and green was purchased to help distinguish the trash and compostable collection bins. The tape was to be used by the custodial staff to place around the top rim of actual collection containers accordingly.

Signs, duct tape and label were distributed to all schools. It was the responsibility of building chiefs at each school to make certain the bins were appropriately labeled, adorned with the color-coded duct tape and signs hung before the project began.

District 196 purchased containers for the collection of "Trash Only" materials for those schools that needed them. Dakota County worked with District 196 to purchase plastic bags needed to contain the trash material at the elementary schools. Grant money was used to purchase bags and the costs were minimal.

The district created additional copies of the trash and compostable posters for the elementary schools to be used as training tools within classrooms prior to kick off. Having the posters hung in classrooms was an easy way to get the students familiar with the signs and educate them on the difference between plastics and paper wastes. Surprisingly, young students could not decipher the difference between the two materials prior to the program. This made the volunteer monitors that much more invaluable for the project kick off and training.

Monitors

Elementary schools and middle schools were to have volunteer monitors at the schools to help them distinguish what was trash and what was compostable for the new cafeteria bins. High schools decided to opt-out for the use of volunteer monitors during the first week of the new process, instead they turned to their own students, for instance utilizing the student council or 'green teams' for assistance. Some high schools used their televised morning announcements to encourage students to source separate. Some high schools also included teacher monitors to help encourage students to separate properly.

Volunteer monitors were issued for the first week of the project at each elementary and middle school accordingly. After their week of monitoring, the monitors were asked to fill out a survey to describe their experiences and critique how their school and students faired at separating their cafeteria waste. Results of the surveys revealed that most students showed improvement in their speed and ability to separate their wastes as the week progressed. Monitors offered valuable feedback to help improve the separation process and is listed below:

Suggestions made by monitors:

- To help students with separation, monitors will be needed for more than one week, recommend two weeks at least
- Have the student line up and have the bins in a linear order: trash bin, milk dumping bin, compostables bin, and tray stacking station
- Have students separate their wastes on their trays prior to arriving at the collection bins to increase speed of "going through the waste separation line"

Rewards for students

Dakota County purchased pencils to help encourage and reward students that properly separated their wastes in the lunchroom. The pencils were made from recycled blue jeans and stated "Compost, can you dig it?" and "Please source separate your waste in the lunchrooms." Each of the 28,500 students received a pencil. There were complaints soon after from students and staff, that the pencils were very difficult to sharpen. Some schools did not want to pass out the pencils as a result, most however did.

Other educational activities done throughout school year at various schools:
- One high school created a short TV show that was aired at the school to all students in the kick off week. The short 2-minute video described the project and how students were to source separate.
- A video was created at the district level by a small group of students. This short movie is nearly 13 minutes at length and depicts a young boy learning why composting is a good thing to do. This video was humorous enough for high school entertainment, yet easy enough to follow by very young elementary students. Copies of this film were issued to all schools to be shown at the beginning of the next school year to help kick off the project yet again for an even better year of composting.
- Posters were created for the football fields at three schools. These three schools used the finished compost for the football fields to help close the loop. The 3' by 3' signs are made from durable recycled plastic and depicts the layout of the project and what happens to the food waste as it is converted to compost.

STEP 7: Implement

During Implementation

Bags were used to keep non-compostable waste separated from compostable waste in elementary schools, which can only have one dumpster. The other four high schools and four middle schools were able to keep their waste source separated by using extra dumpsters delivered from BFI.

Once BFI delivered loads to NRG PS, NRG PS facility employees were to remove the trash bags filled with trash from the free-flowing compostables during the sorting process.

1. Recycling

It was noted during initial waste audits and evident in the initial waste sort results that the district needed to enhance or in most middle and high schools, begin a pop bottle-recycling program.

Results from the waste sort indicated that pop bottles alone comprised of about 8% by volume of the total waste from the district. If you included aluminum cans, that

number increased to 9%. It was clear that the district needed to revamp their recycling programs throughout the district, especially at the high schools and middle schools, where vending machines were used. None of the elementary schools had vending machines available to students, although some teachers and students brought bottles or cans from home for lunch.

Minnesota Waste Wise sought commitments from the Minnesota Soft Drink Association, The Coca-Cola Company and Pepsi Company. These organizations donated pop bottle recycling bins, valued at about $500 per school, for the high schools and middle schools totaling a $4000 donation.

The vending companies delivered the recycling bins at the high schools and middle schools within weeks of commitment and the bins were set up throughout those schools by janitorial staff.

The high visibility of these recycling bins increased the recycling of bottles within these schools dramatically. Some schools experienced a 500% or more increase in recycling for bottles.

The project team created a recycling program for rigids (glass, tin, aluminum and plastic pop bottles) by:

- Making the recycling bins more readily available in hallways, lunchroom, lunchroom prep area, and/or classrooms
- Labeled the recycling bins so they were more visible. Some of the donated recycling bins (see photo below) looked like a "pop bottle" so they were pretty obvious.
- Making the recycling bins standard throughout the school to avoid confusion.
- Placed recycling bins next to trash bins for easy access. The Pepsi and Coke recycling bins used the "hole" system so that the bins were used just for recycling purposes and discouraged a "catch all".

Dakota County and MWW staff presented to district's Nutritional Service/Food Service Managers. This provided a good opportunity to discuss the project, the food service staff's role, and respond to concerns and questions. It was evident that food service staff had real opposition to the project. Efforts made by MWW and Dakota County to convince food service to convert plastic, disposable single-serve containers to paper (or eliminate them all together) was met with strong opposition. Dishwashers were out of order or were not in place at most schools. Reusables could not be used. (See barriers section of this report for more details.)

The food service staff at all schools were asked to perform recycling and source separation of trash and compostables in their area. This request, however, was not followed by all the school's food service areas.

2. On-Going Education and Awareness

All schools were visited on several occasions by MWW and Dakota County staff to collect data prior, during and after, throughout the implementation of the composting program. This allowed for photos and notes taken for the final report. Visiting the

schools prior to the kick off, allowed for janitorial staff to address remaining concerns or have questions answered about the project.

- **After School Activity Staff**
  MWW staff held a meeting with the YMCA after school program coordinator. The meeting was set to discuss the compost program, so the after school programs could participate and separate their snack-time waste properly in the lunchrooms.
- **Principals**
  Staff from MWW and Dakota County conducted three informational meetings with all the school principals to review the project prior to implementation and to answer questions and address concerns.
- **Administration Staff**
  The administration staff was instrumental in making the project a success. They helped administer information to all principals and delegated tasks, as needed to schools, staff, students and project partners. This group was the command center for the district and without their commitment; the project would not have been a success.

3. Lunchroom set up

80% or more of the schools' waste is directly from the lunchroom. The District concentrated on collecting non-compostables successfully in this area alone, with a goal to reduce the non-compostables in the total trash collected to an acceptable percentage for NRG.

All bins from the The District, with much guidance from MWW and Dakota County, created a working system to collect, separate compostables, the Styrofoam trays, plastic wrap, plastic utensils, plastic cups and other non-compostables. Some schools were willing to train students to stack their trays to help conserve space in the trash collection bins so they did not fill up so quickly. This was a decision made by janitorial staff. By stacking the trays, the janitors did not have to make as many trips to the dumpsters, thus conserving more of their time, space in the dumpsters and would also reduce the amount of trash bags used. Stacking the trays was already a common practice at some of the schools to help conserve space in the trash bins, so the schools knew that training students to do this was feasible.

Each school set up source separating bins in the lunchroom. Each school set up at least two collection stations in the lunchroom. Each new station included a separate bin for trash only materials, recycling bins for rigids (mostly plastic pop bottles) and a bin for compostables. (See "Step 6" for more details.)

4. Collection of Dumpters

Apple Valley High, Eagan High, Dakota Hills, Eastview, Deerwood, Black Hawk Middle, Rosemount High, Falcon Ridge, Rosemount Middle, Scott Highlands, Valley middle, Southview Elementary received extra dumpsters from BFI for source separation. BFI set up extra dumpsters for compostables at those schools (8) that had twice a day pick up (and had high amounts of non-compostable waste). This way, the trash could remain source separated, as opposed to commingled waste (like the elementary schools). The trash receptacles at these eight schools would be routed with other area business waste and delivered to the incinerator for processing.

elementary schools and the source separated compost bins at the eight middle and high schools, would be delivered to NRG PS for processing. What was not composted, was to be delivered to NRG Newport for waste to energy processing.

STEP 8: Compost

Process at NRG PS Empire Township (step by step process)

1. BFI tips loads on the tipping floor.

2. NRG PS staff visually evaluated loads.

3. Non-compostables and rejects were removed by hand and using the skid steer.

4. Non-compostables were loaded into a roll off and weighed before being shipped to Newport for RDF.

6. Organics were ground and weighed, then mixed with bulking agent (yard waste or wood chips) and loaded into the compost system. NRG tries for a carbon to nitrogen ratio of around 20-25, amount of bulking agent added is based on the compost operator's experience with the feedstock and their assessment of what is being bagged that day.

6. Once the compost is ground, it is placed in in-vessel bags called CTI System bags. The CTI System bags hold 180-200 tons of material; they are 10 feet wide by 200 feet long, 8 mil thick. NRG uses aeration to control microbe activity. Aeration is necessary because the microbes need oxygen to function. Changing the fan cycle can be used to regulate temperature as well.

   MPCA requires that materials in vessel be held at a temperature above 131 degrees F for 3 consecutive days. Science has shown that this amount of time and this temperature kills all pathogens harmful to humans (it also kills most weed seeds). This is a standard in the composting industry and is known as PFRP - Process to Further Reduce Pathogens.

7. Once the compost process is completed, the compost will be screened, analyzed and marketed. Active phase composting takes place in the CTI System. Curing takes place in the static piles. The time in each phase varies on the original feedstock mix, how pressed NRG is for space on site, what the end use will be will effect how long it is processed. The time frame can be from 12 weeks to 2 years. ISD 196 material will probably be finished composting within 12 months.

   NRG markets the cleanest SSOM compost into the same markets as the yard waste - retail, commercial landscapers, soil blenders, baggers of soil products. The SSOM compost with a higher percentage of contaminants is sold for land reclamation and as a soil amendment for agricultural use

STEP 9: Evaluate and Modify

Discoveries made during project

1. **"Our students are not separating fast enough."**
   Some schools had issues resulting from the new separation process in the lunchrooms. Volunteer monitors were placed at all the elementary and middle schools to assist those students to source separate their compostables from non-compostables (trash).

   Most young students did not understand the difference between what was paper and what was plastic, so simply instructing them verbally "plastic in this trash bin, paper and food in this compost bin" would necessarily work for these students. Volunteer monitors found that much of the work was "hands on" in the truest sense of the word. Volunteers had to instruct each student as they went through the disposal bins, what was compostable and what was considered trash. It was a very slow process the first couple of days during lunch.

   One middle school tried to get their students to cooperate and source separate all their waste, but they said that the waiting line to the trash bins was out of the lunchroom, down the hall. This particular school decided not to place more bin collection stations. Not because they lacked bins, but because they feared they couldn't manage all the stations, resulting in poor participation by students. Students need constant guidance in the beginning, to ensure a successful collection program. Knowing this, the school decided to instead, to collect the recyclables (aluminum cans and pop bottles) and have students stack their Styrofoam trays for the trash bins and everything else would go into compostable bins.

   This school used volunteer students to help manage and instruct their peers on keeping the trays out of the compost bins and stacking them properly. When asked why the students volunteered, they replied that they thought the job was fun and important to make sure the project was successful at their school. Peer volunteers seem to work well in high school or middle school situations for a project like this.

   MWW and Dakota County staff visited this school often and noted that even though this school was only source separating trays and recyclables, their compostable waste was respectable in comparison to other high schools and middle schools.

2. **"I didn't know that facility was not part of this compost route"**
   After a couple weeks into the project, NRG reported to MWW and Dakota County that there were bus bumpers and auto parts found repeatedly in the waste stream. Other reports from school janitors that the BFI hauler picked up both the trash and compostable dumpsters together were also made. It was also discovered that on occasion, BFI encountered problems on occasion with a broken down truck, so they were unable to do a separate pick up for compost.

   Remedy: MWW and Dakota County staff noted, after seeing the hauling first hand, that the hauler was picking up one of the maintenance facilities waste on the compost route that should not have been included.

   MWW and Dakota County held discussions with BFI regarding this issue and the hauler discontinued picking up that facilities waste on the compost route. On the issue

of the commingling of the trash with compost dumpsters, the situation was cleared with the understanding that during times of truck scarcity, the waste would not be hauled to the compost facility, but rather brought directly to the incinerator instead.

3. **"No, that doesn't go in there."**
   High schools opted not to have monitors their first week of school, which resulted in poor participation from students. Even with the signs, labels and colored duct tape, the participation was meek.

   Remedy: High schools decided to continue education in the classrooms. One high school's students created a short video program that was viewed in the beginning of school to help educate students. Signs were also created that were simplified version of the Dakota County signs. These signs merely read "Plastic/Styrofoam" for trash bins and "Paper/Food" for compostable bins. High school students seemed to know the difference between paper and plastic.

   The janitor at this school took special interest in the compost program and made a grand effort to help make the project succeed at his school. He continuously trained his team of custodians and made sure that all the bins were properly labeled not only inside the lunchroom, but also the dumpsters outside for the janitors to know which dumpster was designated for trash and which was designated for compost.

   Because of this Custodial Chief, this school managed to increase their recycling rates by nearly 500%. They started with only 3 90-gallon carts for plastic bottles, but during the compost project, they increased their recycling needs to 15 90-gallon carts that were "always filled to the rims".

One of the "gondolas" used at the schools for compost collection.

One high school allowed students to visit the compost facility on a tour to help educate and improve the compost separation at their school. The students that attended were going to provide further education at the school, but this never came to fruition and the school continued to do poor separation.

Education is ongoing at the high schools. A group of students created a compost video that will be showed during the first of the school year for next year to help jump-start it again. The thought is, as students from the elementary schools grown into the high schools, the programs will greatly improve.

4. **"Our compost bins are overflowing"**
   Custodial staff complained regularly that the bins for compostable material were not picked up in time for the lunch rush. The compost bins would still be full from the day before, so no room was for the new compostable material from the day's lunch waste.

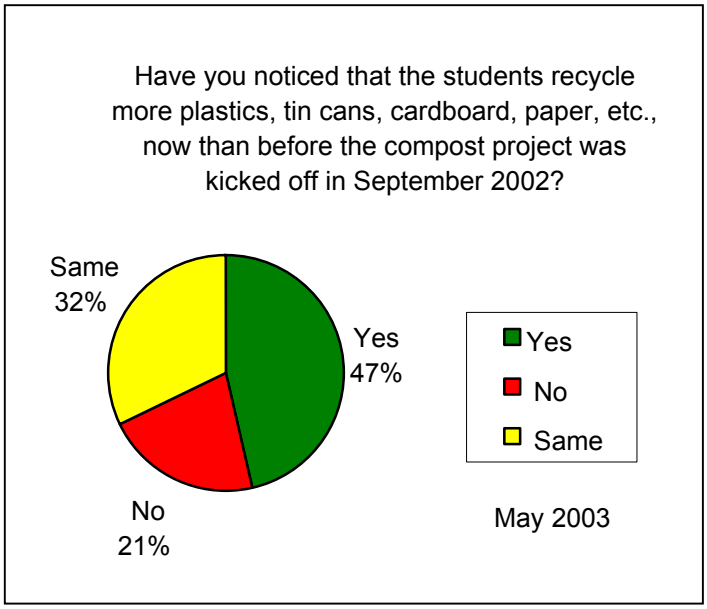
   Remedy: Coordinated with BFI to try to arrive on a regular schedule and in the morning to ensure the bins would be empty for the lunch rush.

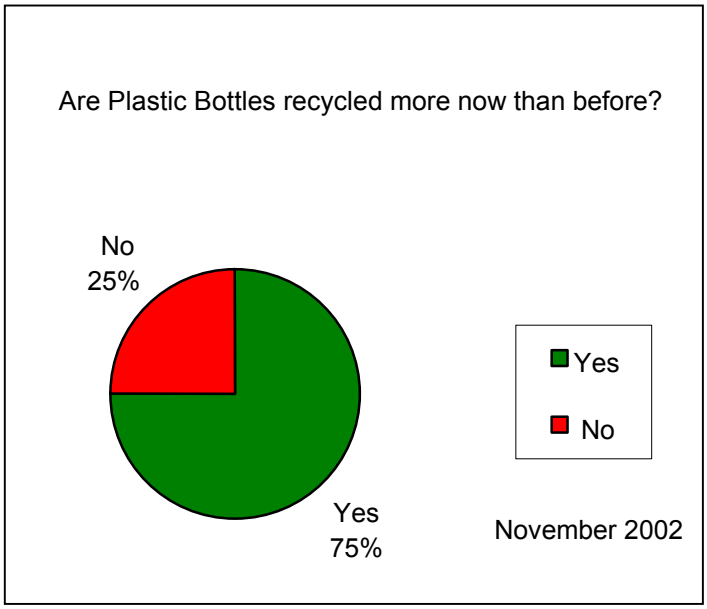
Final Waste Sort

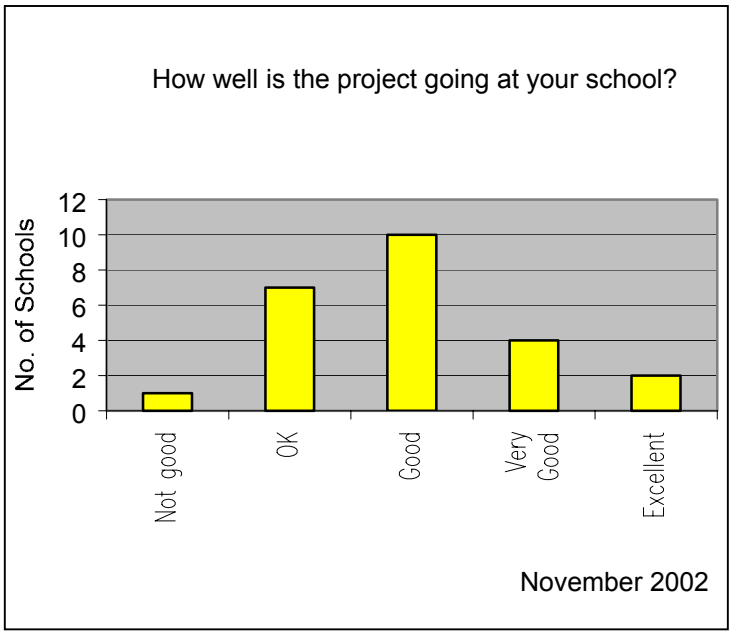
A final waste sort was conducted to provide the necessary data to determine if the district was successfully source separating. It would also determine what materials still remained in the compostable waste stream and improvements that need to be made.

Although technically 77% of the total waste stream is considered compostable, it is very difficult to capture this entire amount. The district was able to implement this project and capture up to 57% in less than a year and with continued education this percentage can be expected to increase. This is a major accomplishment in light of the time constraints and the sheer volume of people that needed education to achieve this compost amount. Of the approximately 1,400 tons of waste generated in the school year by the district, approximately 800 tons (57%) of the waste was source separated by the students and faculty at each school and diverted for composting. The remainder of the waste (43%), or the non-organic stream with a high BTU value, was sent to Newport for processing into RDF.

Janitor surveys showed some interesting points shared below:







Costs for the District's Composting Project

It is important to consider all the costs involved for a composting project before you begin. Inevitably, there will be some hidden or unanticipated costs associated with a composting project. For our project, we discovered many costs we didn't foresee, but were fortunate enough to have grant money and support from other organizations that wanted to see our project succeed. Every compost project will be different, but essentially there are the following composting costs involved which we have described in this section.

- Costs associated with permits and operating costs for the compost facility
- Costs associated with the infrastructure within the schools (new bins, bags, etc.)
- Costs to make the signs for the new infrastructure
- Staff time to implement the project for training or otherwise (school staff, compost project staff)
- Hauling costs to the compost facility
- Costs for separation training (videos, signs, etc.)

Composting Facility Operating Costs:

There are currently no contracts that provide for the funding to build or operate an organic composting facility. The NRG PS Empire Facility is privately funded and was developed to specifically address the need to pull organics from the MSW stream. By removing the organic fraction, NRG PS is able to improve the yield from the resulting RDF (refused derived fuel) and lessen dependence on landfills. Empire is a "merchant facility" and accepts materials from all haulers.

The cost of permitting a facility such as Empire is difficult to determine. Engineering costs related to the permit itself (not construction) exceeded $100,000. The original permit

application was filed in 1995, the permit was actually granted in September 2002. During that time the facility changed hands.

Factors such as engineering, testing and legal fees are wholly dependent on the requirements included in the permitting process. The Empire Facility was required to undergo an Environmental Assessment Worksheet (EAW) process before receiving regulatory approvals. This process took 18 months. Such a process can also include a full scale Environmental Impact Statement (EIS) resulting in thousands of dollars in additional testing and engineering expenses.

The permitting process for the Empire Facility was unusually long. This was due to several factors. The process was complicated by the fact that Dakota County is both the landowner and one of the regulators for the site. The inclusion of the County on the MPCA permit required numerous County Board approvals. Other contributing factors included slow response time, public notice period, EAW, and complications due to change of ownership.

NRG PS Tip fees and Operating Costs:

The tip fee set for the ISD 196 project was $45 per ton. This tip fee was set artificially low to assist the participating collection company (BFI) in keeping the additional operating costs from being prohibitive to the Project.

The facility operating costs for the ISD 196 project was calculated to be in excess of $55 per ton tipped, so NRG had a loss of revenue of about $10 per ton. This per ton cost includes permitting costs ($2.75 per ton @ 10,000 tons tipped per year), overhead, labor, depreciation, insurance and extra costs due to data collection and special handling of the ISD 196 materials.

The total tonnage processed from the school district during the course of the pilot project was 1063.69. The standard tip fee for co-mingled loads is $55 per ton. The school district tip fee was $45/ton or $47,866.05. At $55/ton, tip fees would have been $58,502.95. Therefore, NRG PS/SET's contribution in reduced tip fees was $10,636.90.

The cost of data collection/tracking/reporting, tours, the waste sorts, and attendance at meetings, project management during the nine-month project is estimated to be $7,616.

The actual tip fee required for the operation of the facility for 2003 is projected to be in the range of $50-55 per ton. When combined with the existing Dakota County hauler incentive fee for materials that are processed, this tip fee results in a "disposal cost" of $35-40 per ton. This is well within the current landfill market rates and provides no additional cost to participating generators.

District's Infrastructure costs:

The district incurred some costs to place the new infrastructure in each school. Some schools needed extra collection bins so that they had enough separation bins in the lunchroom. The district also needed to purchase trash bags for the collection and separation of the trash from the compost material in the dumpster (elementary schools only). Each school handled their trash slightly different from the next. Most schools traditionally didn't spend their funds on trash bags and simply had the custodial staff wash the collection bins after they were tipped into the dumpster. Costs are watched very closely at the school district because funding is very tight.

For this reason, we felt it was important to not cause the schools extra-incurred costs because of this pilot. The goal was to create a project that would continue forth after the grant money was dissipated. To successfully create a compost project as such, the project needed to be cost sensitive so that the schools would continue because it was cost beneficial, not burdensome. Schools are watchful of their funds, so it was especially important to not have this new waste management processing cost more than incineration for the district.

Composting Infrastructure Costs:

During the project, there were some hidden costs associated with staff time with all custodians, principals, teachers, MWW, Dakota County, NRG, BFI and lunchroom staff. These costs could not be calculated.

The district received a $27,000 grant from the Solid Waste Management Coordinating Board, which is tasked with the planning and implementation of solid waste policies and strategies in the metropolitan area. The grant was issued to determine the feasibility of implementing an organics collection project in a school setting. The majority of the grant funds were spent on acquiring a contractor for technical assistance to help the district implement the project in a sustainable, yet expedient manner. In addition, Dakota County provided funds for education that included sets of cafeteria signs for each school. Both of

these services can eventually be performed by the district, given the commitment of additional resources such as time and staff, which will reduce these costs.

The chart below shows the costs incurred using the grant money issued by SWMCB and Dakota County.

ISD 196 Grant from SWMCB ($27,000 received)

Description of Product/Service	Payment Amount
Minnesota Waste Wise (Contractor)	15,000.00
Red/Green Duck Tape for Containers	251.98
Plastic Bags (for Trash)	3,266.07
Copies of Posters by District - Education	280.00
196 Web Production	499.90
196 Video Production	1,185.50
Graphic Design for Athletic Field Signs	389.47
Athletic Field Signs - Graphics and Production (5)	6,063.18
Compost for Athletic Fields	63.90
TOTAL	**27,000.00**

Dakota County Contribution

Desription of Product/Service	Payment Amount
Blue Jean Recycling Pens	5,664.50
Labels (Compostables, Trash)	921.42
Posters for Cafeteria (Compostables, Trash)	15,135.35
Athletic Field Signs - Production (5)	109.85
TOTAL	**21,721.27**

Hauler Costs:

BFI experienced a cost increase of 6% as a result of this project. Rerouting the waste material to the compost facility resulted in an additional three hours per day (Monday through Friday) in transportation costs. This is because BFI had to add an additional truck to the ISD 196 route. BFI managed to fill up the waste truck headed for NRG Newport with 72 additional accounts, 32 of which were added accounts after project implementation to make up for the lost volume from source separating compostables.

BFI used two front loading, compactor trucks for the project, one truck delivered the compostable waste to NRG PS and another delivered waste to the RDF facility in Newport. BFI had the additional front end, compactor truck in stock, and therefore did not have to

incur additional capital costs to purchase a new truck or modify an existing truck for the implement the project.

The compost truck however, was not completely full. This caused some lost revenue for BFI. If the schools were to source separate completely, the loads going to NRG PS should be full loads.

Breakdown of costs incurred by hauler:

6% cost increase caused by (most costs passed on to District):

- Additional compost route (additional driver, fuel, truck)
- The compost truck delivering to NRG PS only half-full
- Additional three hours per day in transpiration costs
- Capital tied up with two additional compactors and several dumpsters
- Other costs include: extra signage on dumpsters to prevent illegal dumping by area residents, staff time in project meetings (roughly 30 hours), three hours worth of training of employees and opportunity costs
- The cost to BFI to deliver the final waste sort to the Waste Management facility was around $700.00. BFI needed to add a driver to pick up the trash and compostables. Only the District's material was on the truck. The truck was not full for either the trash or compostable material thus BFI incurred some opportunity costs associated with the sort in addition to the $700.00.

Compost Results

Data Summary: Tons of material processed over time

TIMEFRAME	# OF DAYS	TONS TIPPED	TONS RDF	TONS COMPOSTED	PERCENT COMPOSTED	AVG TONS/DAY TIPPED	AVG TONS/DAY COMPOSTED
9/23 - 10/17	19	118.64	105.32	13.32	11.23%	6.24	0.70
10/21 - 10/30	8	41.71	27.58	14.13	33.88%	5.21	1.77
10/31 - 11/13	10	63.77	60.84	2.93	4.59%	6.38	0.29
11/14 - 11/29	12	73.80	59.82	13.98	18.94%	6.15	1.17
12/2 - 12/13	10	52.46	43.71	8.75	16.68%	5.25	0.88
12/16 - 12/26	8	42.39	33.56	8.83	20.83%	5.30	1.10
TOTALS	**67**	**392.77**	**330.83**	**61.94**	**15.77%**	**5.75**	**0.98**

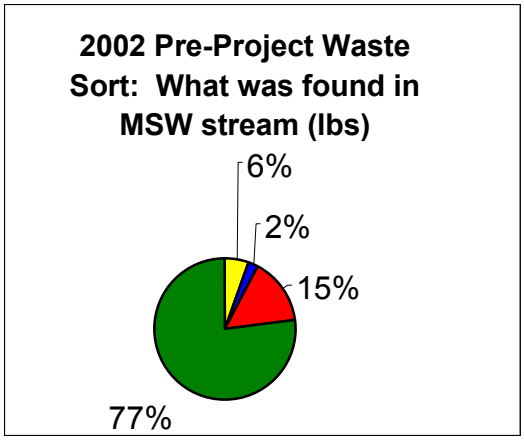
The chart shows the District's waste material processed at the NRG PS facility. Note that the percentage of material that was composted was only16%, even though roughly 54% by weight was compostable as discovered in the first waste sort. This could be explained by several variables.

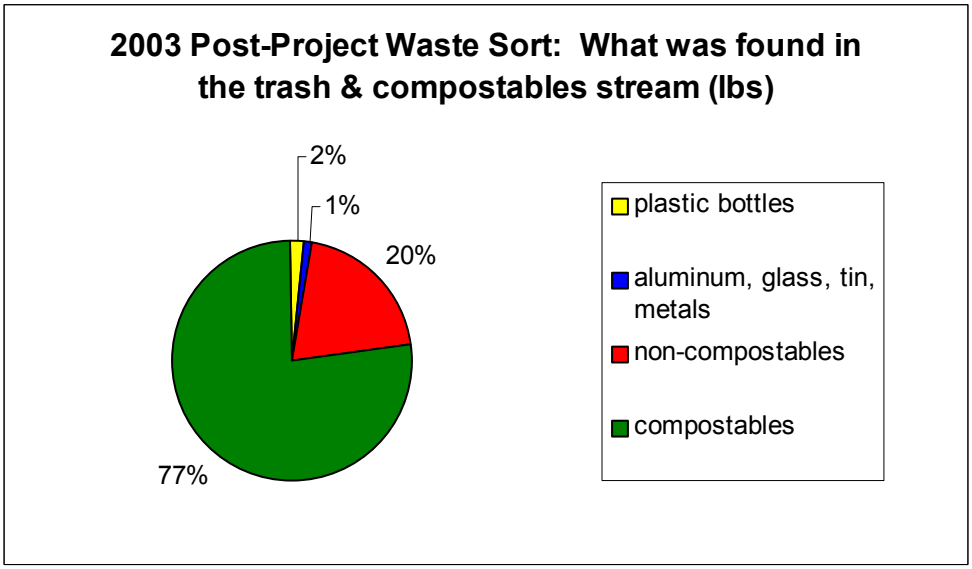
Only tracked tonnages at NRG PS through December 2002, as that was the initial pilot phase of the project before it was extended through the school year. Also, it became increasingly difficult for the compost facility to track the data as more waste from other sources were tipped at facility.

Possible operational explanations for data variability include:

- Variability in evaluation of what should be pulled from the material.
- Operational experimentation with more or less intensive separation, evaluation of what the material looked like ground, etc.
- Difficulty in keeping ISD 196 material separated from other incoming feedstocks.
- Difficulty in distinguishing which bags to pull and which to reject. Both organics (mostly from the restrooms) and rejects were bagged.
- Co-collection of clean source separated materials with poorly separated materials resulted in the whole load being contaminated.
- Delivery of loose materials versus the use of biodegradable bags as originally proposed.
- Floor sort versus a line sort of material coming into the NRG PS facility. The tip floor at the facility is small. This did not affect processing of District material until March when the total tonnages at Empire increased dramatically.

NRG operators removed rejects/non-compostables from District loads by floor sort. The picking line was not operational through the duration of this project; upgrades to the processing facility did not begin until January. Floor sorting is not as efficient as sorting from a picking line. The picking line is now operational. We anticipate that more organics will be recoverable using the picking line and as the generator improves separation methods. We know the organics are there (waste sort data shows this) and we are confident that the trend towards higher percentages of organics recovered will mirror that of the recycling industry.





Conclusions and Results

1. Use of a reusable resource. Closing the loop by using compost on district athletic field, reducing the amount of fertilizer and irrigation needed for turf maintenance.

The district is purchasing back the finished compost from the compost facility, closing the loop in the program. Students are reinforced to continue to separate the waste by the knowledge that this preferable "fertilizer" was created by their own diligence. Currently the district has purchased compost for three schools' athletic fields for test purposes. Plans are also being made to purchase more compost for landscaping and erosion control projects. Compost is a mixture of degraded organic waste which makes it nutrient rich and a beneficial soil amendment. The compost is not only enhancing the soil conditions at the three football fields that are sited on poor, sandy soils, but it will also reduce the amount of fertilizer and irrigation needed to maintain the turf on the athletic fields. This constitutes an important cost savings, as well as a water quality improvement and water conservation measure.

ISD 196 used some of the final compost on their fields for fertilizer. Signs were created to further educate students and staff about the significance of the project and composting.

2. Video: created for use for all schools and any other schools that would like to participate in a compost project to aid in education.

3. Site visits to NRG PS: students were able to take field trips out the facility for further education.

4. Cost savings incurred by the district totaled or about 10% of total waste disposal costs.

5. The project was successful at source separation and delivery of compostable material to NRG PS for processing. As the processing procedure and education of students progresses throughout the years, so will the percentage of material composted.

6. Interpretation of waste sort results from sorts #1 and #2 indicated that there were less recyclables in the compostable stream. The compost stream was cleaner because there were much fewer trays as well, caused by the use of trash bags to capture source separated waste.

7. Even though transportation to NRG PS is closer than Newport facility, savings in transportation costs not realized because additional routing was needed for project.

8. Although there was some internal skepticism throughout the district at times, the project was well received by the public. The district received more positive feedback about this project than any other program ever. Individual schools, teachers and the superintendent's office have communicated to parents and the community about the compost project. The superintendent's office reported that they have never received such positive comments about a project. Many parents have praised the district's efforts to enhance environmental awareness and treat trash as a treasure.

9. Patience is a virtue – do not expect perfection from onset. Expect growing pains.

10. Some schools were better than others for participation. Not every school had the same results.

11. Media coverage continues for this project, both newspaper and TV media coverage.

12. MEI finalist (even as a first year project)

13. Received the Governor's Award for Pollution Prevention and Excellence 2003

14. Some schools are looking at alternatives for bathroom waste and classroom waste collection.

15. Some schools informally worked to minimize amount of non-compostables generated in cafeteria area in order to minimize need for source separation.

16. Even though district observed cost savings on trash disposal costs, it would have been significantly more if district could have received a Solid Waste Management Tax exemption.

17. Hand sorting at NRG PS was not effective. NRG PS did not have their sorting lines operational either, which would have helped further eliminate contaminants.

18. Data tracking is essential for project evaluation and feedback to project participants to determine effectiveness of educational message, and where educational efforts need to be focused in the future.

19. Surveys given to a sample of principals, teachers, students and parents at the end of the year were not successful. Many were not turned in for evaluation.

20. During the 2002-2003 school year approximately 800 tons of waste was diverted for composting, an environmentally preferable waste management method.

21. Independent School District 196 (ISD 196) disposed of approximately 8 tons of waste per day generated by 28,500 students and 4,000 faculty at thirty (30) school buildings and two administration buildings. An initial waste sort conducted in May 2002, of one day's generation of waste, indicated that 77% of the waste by weight was organic and compostable. Prior to the compost project implementation in the fall of 2002, the district sent all of its Municipal Solid Waste (MSW) to NRG Energy, Inc., a resource recovery facility in Newport. MSW sent to the resource recovery facility is processed into fuel called refuse derived fuel (RDF) that is later burned in place of coal at power plants for energy purposes. Environmentally, it is better to send high-fraction organic waste (e.g., food waste) to a compost facility rather than to a processing facility like Newport because organic waste has a low BTU (burn) value and is considered a

"negative fuel." It complicates the process of turning waste into high-grade RDF. Because of this, high content organics are often extracted as residuals during the processing of the waste and are sent to a landfill. As these organics decompose in the landfill, they become significant generators of methane, a greenhouse gas. Alternatively, organic residuals not sent to a landfill can be delivered to a close proximity compost facility for composting. Since the district generates a large volume of heavy-fraction organic waste, it makes environmental and economic sense to send the organic waste directly to a compost facility. This serves the purpose of sending the waste to the best suited processing facility while also eliminating excess transportation.

22. Of the approximately 1,400 tons of waste generated in the school year by the district, approximately 800 tons (57%) of the waste was source separated by the students and faculty at each school and diverted for composting. The remainder of the waste (43%), or the non-organic stream with a high BTU value, was sent to Newport for processing into RDF. Although technically 77% of the total waste stream is considered compostable, it is very difficult to capture this entire amount. The district was able to implement this project and capture up to 57% in less than a year and with continued education this percentage can be expected to increase. This is a major accomplishment in light of the time constraints and the sheer volume of people that needed education to achieve this compost amount.

23. Benefits of environmental education, changing behavior today and for future generations. All 28,500 students, 4,000 school staff and parents of students were educated about composting as a viable option for waste management on some level.

24. Although relatively difficult to quantify, the educational benefits of the project have been substantial to others as well. The district has a total population of 135,532 people and 32,329 households and is comprised of a 110 square mile area, including all or part of seven cities – Rosemount, Apple Valley, Eagan, Burnsville, Coates, Inver Grove Heights and Lakeville, and rural Empire and Vermillion townships. A significant number of these people have been exposed to the project in one fashion or another through district communication.

25. At the onset of the compost project, most students and some faculty did not know the meaning of the word compostable, let alone the difference between compostable versus non-compostable materials for separation purposes. With the launch of the project, all 28,500 students and 4,000 faculty in the district have been exposed to this concept in the cafeteria and in the classroom,

26. Responses to a recent survey conducted in the district documented that the majority of students and staff had increased awareness of environmental issues overall as a result of the compost project. This was especially true for concerns about waste generation, and resulted in significant increases in recycling rates, and diligent separation at the schools of compostable and non-compostable wastes. Results also showed that students have learned how they can make a change to the environment by their direct actions.

27. As part of the education for the compost project, the teachers and students worked together to develop and produce an eleven minute video that describes the purpose of the compost project. This includes a description of how the organic waste gets from

the compost bin in the cafeteria and is processed into compost and finally concludes with the environmental benefits of such a program. The video has been shown at schools as an educational tool to assist in the project, with a plan to initiate regular scheduling on the local public access channel. The project has also been highlighted on the local televised program, the *Environmental Journal*. Teachers and students have also worked together in the development of a district-wide website, and students at an elementary school have developed their own school website devoted to the compost project. Ongoing education of students remained integral to the success of the project. Student participation in waste sorts and tours of the compost facility assisted in expanding knowledge not only about the project, but about overall waste generation and opportunities for waste minimization. Student councils and other student groups have become involved in making new signs for cafeterias to continue assisting students to separate their waste into the appropriate bin. Parents of elementary school age children have noted that some of the children have reported behavior changes by the entire family, by separating compostable and non-compostable items at home. As a result of students' expanded learning, the students have given presentations to state and local policymakers on the importance and benefits of the compost program in their school.

28. Substantial increase in recycling rate; PET bottles recycling increases by as much as 500%.

In an effort to create a cleaner compost material for the compost facility, the district needed to reduce the amount of recyclables in the waste stream. A significant key to the success of the organic collection project was assisting the district in getting the right waste to the right place, and that included increasing recycling rates for paper and rigid containers. Prior to the implementation of the compost project in the school district recycling was limited in scope and it was soon realized that efforts were needed to enhance the recycling rates. MWW worked with vendors Pepsi and Coca-Cola to donate large recycling bins for polyethylene terephthalate (PET) plastic bottles at each middle and high school, a total value of $5,000. As a result, up to twelve additional recycling containers were placed inside each school in an effort to improve student awareness and to capture more recyclables by creating a convenient way to recycle these materials.

The project increased environmental awareness in all schools, and with the new bins placed strategically in the cafeterias and school hallways, recycling rates increased by as much as 500% for plastic bottles and paper in some schools. By increasing recycling, less virgin product is needed to make new products, reducing the emissions from energy consumption.

The initial waste sort indicated that nearly 6% of the total waste stream was PET bottles, totaling 1,000 pounds or 6 cubic yards. After implementation of the compost project and increasing the recycling rate district wide, results of a recent waste sort indicated that increased recycling eliminated 632 pounds of PET bottles from the waste stream daily, increasing overall recycling of PET bottles by 63%. BFI verified this saying there was an increase of rigid recycling of 100% from one ton to about two tons weekly from all schools. At of the end of the school year, less than 2% by volume of the total waste stream was comprised of PET bottles as opposed to nearly 6% prior to project implementation.

Economic results

1. Purchasing savings on styrofoam trays

During the project, the district noted a reduced use of trays in the cafeteria which resulted in some purchase cost savings. The reasons for the reduced use of trays could be a direct result of some of the schools going to reusable trays for the compost project. As you will see with the data below, the district's growth created an increase in the use of trays from 2001 to 2002. Once the project began in 2003, you will see a decrease in the use of trays, where it should have another increase from a result of growth.

Utility Trays
2001: 994,500 trays or a total of $36,758
2002: 1,214,500 trays or a total of $48,340
2003: 1,196,500 trays for a total of $46,855

This is a reduction of $1,485 year to date and a reduction of 18,000 trays from 2002-2003.

Compartment styrofoam trays
The Styrofoam 5 compartment tray normally used for elementary schools has also seen a drop.
2001: 632,000 trays for a total of $16,378
2002: 642,500 trays for a total of $17,913
2003: 505,000 trays for a total of $13,797

This is a reduction of 642,500 to 505,000 there is a reduction of 140,000 total trays. Also a reduction of purchasing costs totaling $4,116 for 2003.

2. Disposal savings to District

Even with some additional costs such as routing another truck and renting more dumpsters, the district observed immediate savings. The district saved 10% in the 2002-2003 school year on their waste disposal fees as compared to the previous year. For all costs associated with the project, it is estimated that the total payback period could be realized in two years for a program of this scale and design. Also, if the Minnesota Department of Revenue determines that this project qualifies for the solid waste management tax exemption, it would significantly increase the cost savings.

A Note About Commitment and Leadership

ISD 196 has always been known as an environmentally progressive school district and with the implementation of the compost project continues to be a model for other schools, districts, public and private sectors, and the overall community. Initial discussions with the district were to implement a pilot project in three schools, to determine the feasibility of implementing a compost project in an elementary, middle and high school setting. However, the district was committed to implementing a permanent and sustainable project, and part of this included implementing the project in all thirty schools, not just a subset of them.

Because the grant was not received from the Solid Waste Management Coordinating Board until May 2002, and the plan was to commence the project in all schools at the start of the 2002-2003 school year, planning efforts needed to be concise, efficient and productive. The district realized early on that a strong leadership role was needed to make such a large-scale project work in such a short timeframe especially given that the summer months did not allow for education of students and most faculty. Intensive cooperation and collaboration effort was needed amongst all the project participants. It also required the need for all school principals, building chiefs (head custodians) and cafeteria food staff supervisors to provide feedback on methods for effective implementation in each school. It also meant that each of them would play a role in implementation of the project when the teachers and students returned in the fall of 2002, to teach them about composting and separating their waste so the project could be launched in September. Without the strong leadership early on from the district, a project like this could not have been implemented in all 30 schools in a matter of months. And when the occasional barrier surfaced, district and school administration met with affected school individuals to find innovative methods to continue the program, not allowing any school to cease participation in the program.

ISD 196 has also shown a strong leadership role by meeting with other government entities and school districts in the metropolitan area to assist them in commencing with similar projects with their schools. Principals, assistant principals, and building chiefs have met with other districts eagerly sharing both stories of success and areas for additional improvements and opportunities. The ISD 196 interim superintendent has also presented at a local organic workshop, discussing not only the obvious successes of the project, but also the lessons that were learned by the district that included areas for improvement in upcoming years.

And finally, the district continues to show its commitment to the program and leadership in the community by continuing the pilot on a permanent basis. In addition, the district is purchasing back finished compost from NRG PS. The district is ensuring those athletic fields that have used compost will have educational signage that explains how organic waste from the schools cafeterias is used as soil amendment on the turf.

The ISD 196 project has demonstrated that the recovery of organics from the commercial waste stream is not only viable, but also desired by the generator. The desire or demand for this additional processing opportunity is clearly demonstrated in the efforts of ISD 196 personnel to educate its employees and modify their in-house practices to allow for the separation and recovery of organics. This program also enhances current processing efforts by reducing landfilled volumes and increasing RDF yields. NRG PS views the Empire Facility as a valuable addition to the existing NRG/public/private processing partnership with the Metro Counties. (NRG PS conclusion)

A model for others

Policymakers and staff from local, state and federal levels of government, the private and public sectors and non-profit organizations are eagerly anticipating all results of the ISD 196 organic collection project, in hopes of initiating similar projects. By design, the district implemented the project in a fashion that readily worked within the existing infrastructure, with on minimal changes to workloads and minimal impact for those managing solid waste. This allows for comparable projects to be replicated by other districts or individual schools, and many aspects can be easily incorporated into any business that generates organic waste, both at large and small scales. As earlier stated, the district has already met with other levels of government and school districts to assist them in implementing similar projects.

The project also exemplifies how public and private sectors, in addition to non-profit organizations are able to amicably and effectively work together to solve problems in a short timeframe to better the environment. In fact, an environmental educator at the U.S. Environmental Protection Agency - Region 5, contacted project partners to highlight the district and partners for their ability to work together, implementing such a large-scale sustainable project that promotes environmental education and conservation today and for many years to come.

Of the approximately 1,400 tons of waste generated in the school year by the district, approximately 800 tons (57%) of the waste was source separated by the students and faculty at each school and diverted for composting. The remainder of the waste (43%), or the non-organic stream with a high BTU value, was sent to Newport for processing into RDF. Although technically 77% of the total waste stream is considered compostable, it is very difficult to capture this entire amount. The district was able to implement this project and capture up to 57% in less than a year and with continued education this percentage can be expected to increase. This is a major accomplishment in light of the time constraints and the sheer volume of people that needed education to achieve this compost amount.

The compost project not only allows for a cost savings to the district, but also an opportunity for marketing that extends to all project participants. This is the largest district-wide composting project of its kind in the nation, and for that reason alone, it is a great project to promote. Other school districts, and individuals from local, state and federal governments have been contacting the district to learn more about the project.

This project has allowed the composting facility to use this project as a study sample to promote their composting services to other districts. In addition, other partners on this project, such as MWW and BFI, are now able to promote composting to other school districts and other sectors that produce high-content organic waste. In fact, several BFI customers and MWW members have expressed interest in starting a composting project of their own as a result of the district's successful efforts.

Recommendations

1. The State of Minnesota needs to redefine organics in Minnesota Statutes. This will allow for some variability in the way that organics can be source separated and handled. If the state was to allow for materials brought into a compost facility and that facility can reach a certain percentage of composting, then that material should be allowed for the tax exemption by the state. This would open more doors to other districts that do not have the space for extra dumpsters for source-separated organics collection.

2. Use the compost facility's picking line. Hand sorting at the compost facility was not effective enough to eliminate most of the contaminants. Improve the sorting line at the NRG PS facility to aid in the source separation of materials delivered.

3. Develop project team devoted to the compost project in the district.

4. Develop teams for ongoing education. Focus on middle and high schools, students are more difficult to train.

5. Continue to look into using biodegradable bags and cafeteria items to minimize need for source-separation as costs may decrease for these materials in the future. Try to

eliminate the use of Styrofoam or plastic containers in the lunchroom when paper alternatives are available. Use bulk catsup instead of single-serve for example, to reduce plastic wastes.

6. Convert dumpsters to compactors at schools where appropriate, to collect and contain compostables. By doing this conversion from regular dumpsters to compactors, it would allow for the materials to remain source separated at the schools and it would eliminate the Solid Waste Management Tax, as it is currently written in Statute. The initial cost in purchasing or renting compactors can be redeemed given the appropriate timeframe.

7. Monitors are a must to train students in the cafeterias for source separation in the beginning of each school year. Students may need the occasional re-training.

8. Continue to promote recycling of PET containers to reduce the existing amount of bottles in the compost stream.

9. Use more durable plastic trash bags and ensure the bags are tied securely to reduce the amount of bag breakage/failure in the BFI truck during delivery to NRG PS. NRG PS would like the district to use compostable bags for containment of bathroom waste or have this waste free flowing to avoid confusion between trash bags and bathroom waste bags. Most of the bathroom waste is compostable and ideal for NRG to compost.

Resources

1. School Composting: A Manual for Connecticut Schools
2. A Guide To Commercial Food Composting, Composting Council Research and Education Foundation, Maryland (1997)
3. Methodology for Conducting Composition Study for Discarded Solid Waste (1996), Reinhart and McCauley-Bell
4. Minnesota Waste Wise ERASE Project (2001)

Appendix A
Monitor List for Trash and Compostables

List of "Compostable" Materials:

1. ALL food waste (fruits, vegetables, dairy products, meats, bones, liquids etc.)
2. Milk cartons
3. Cotton products
4. Coffee grounds/filters
5. Paper products
    a. Plates, bowls, boats, cups
    b. Napkins and towels
    c. Paper trays and liners

d. Lunch bags (white, brown, etc.)
e. Facial Tissue
f. Wax Paper Containers, Bags and Cardboard (including waxed corrugate)
g. Cardboard (e.g. Pizza boxes)
h. Wrappers
i. Any other type of paper
j. Cafeteria foil on sandwiches

List of "Trash Only" Materials:

1. Styrofoam
   a. Plates and Trays
   b. Cups
   c. Bowls
   d. "To Go" Containers
2. Plastics
   a. Bottles
   b. Cups and Lids
   c. Containers
   d. Plates
   e. Bowls
   f. Silverware/Utensils (e.g. sporks, etc.)
   g. Stir sticks, straws, lids
   h. Plastic juice containers (these are not recyclable either)
   i. Juice boxes
   j. Plastic baggies
3. Single Serve Containers
   a. Lunchables, plastic frozen entrée containers)
   b. Chip Bags
4. Aluminum
   a. Foil
   b. Wrappers
5. Condiment packets (ketchup, mustard, jam, jelly, butter, mayonnaise, taco sauce, salad dressing, cream, etc.)
6. Non-recyclable plastics (only plastic bottles with 'necks' are recyclable, such as water and soda bottles)

List of "Recycling" Materials:

1. Plastics Bottles (MUST have a 'neck' such as soda and water bottles)
2. Aluminum Cans

Appendix B
School District 196 Survey of Nutritional Services Staff

School Name Contact Name Phone Number	Plastic Trays used daily?	Styrofoam trays used?	How often is Styrofoam used?	Is a dish washer used?	Are Styrofoam trays stacked?	How many break fasts are served?	How many lunches are served?

Rosemount High School Nancy Anderson 651-423-7538	Yes	Yes	Everyday	No	Yes	60	580-600
Apple Valley High School Terri Murphy 952-431-8237	Yes	Yes	Everyday	Yes	Yes	150	500-600
Eagan High School Marilyn Eykyn 651-683-8560	Yes	Yes	Everyday	Yes	Yes	15– Just started serving 2000	1500
School of Environmental Studies Lisa Germond 952-431-8754	Yes	No	N/A	Yes	N/A	Breakfast is not served	200
Eastview High School Jean Martin 952-431-8944	No	Yes	All the time	Don't have one No	N/A	200	Over 700
Rosemount Middle School Betty Snippes 651-423-7647	No	Yes	Everyday	No	No	80	650
Valley Middle/ Southview Elementary Patti Barahona 952-431-8311	No	Yes	Everyday	Yes	Yes	Elementary - 30 Middle- 200	Elem. - 300-350 Middle- 900 -950
Scott highlands mid/ Highland Elementary Karen Bauer 651-423-7650	No	Yes	Everyday	Yes	Yes	Elementary -16 Middle-50	900 total
Blackhawk Middle/ Deerwood Elementary Cookie Calhoun 651-423-7650	Yes	Yes – Elem. Regularly, Middle - never	Everyday	Yes	Yes	70	900

Falcon Ridge Middle School Micki Dahl 952-431-8774	No	Yes	Everyday	Yes	No	50	450-500
Rosemount Elementary Shannon Morrison 651-423-7679	Yes	Yes	Rarely, except for breakfast	Yes	No	80	400
Northview Elementary Gail Offerman 651-683-6833	Yes	Yes – when short staffed	Have only used them for 8 days	Yes	N/a	30, on styro, they are short-staffed in the morning	420-425
Westview Elementary Ericka Davis 952-431-8347	Yes	Yes	4 times a week	Yes – 40 years old, limited with what they can do	No	50	400
Parkview Elementary Mary Overgaard 952-431-8345	Yes	Yes	Just for breakfast	Yes	Yes	80	420
Diamond Path Elementary Greta Fliegel 651-423-7669	Yes	Yes	Once/ twice a month and breakfast	Yes	Yes	35-40	380-400
Greenleaf Elementary Ilene Benesh 952-431-8276	Yes	Yes	Only if dishwasher is down	Yes	Yes	30	550-600
Cedar Park Elementary Marjorie Mills 952-431-8367	Yes	Yes – If short staffed	Sometimes	Yes	No	100	400
Thomas Lake Elementary Karen Kidwell 651-683-6887	Yes	Yes	If short staffed and for breakfast	Yes	Yes	30	350

Echo Park Elementary Sandy Kretlow 952-431-8366	Yes	Yes	On a normal year, 1 a week, but this year short staffed 2 times a week	Yes	Yes	70 – Styrofoam every day	450
Woodland Elementary Bonnie Rowland 651-683-6886	Yes	Yes	2-3 times a year, only if short staffed	Yes	Yes	30-50	375-450
Pinewood Elementary Juanita Kulhanek 651-683-6986	Yes	Yes	Breakfast everyday	Yes	Yes – stack and then tossed	50	505

Appendix C
2002 Waste Sort Description, Data, and Conclusions

Date Conducted: Thursday, May 16, 2002
Location of sort: Empire Compost Facility

Description of Waste Sort

On Wednesday, May 15, 2002, BFI delivered two truckloads of waste collected from the 33 buildings of ISD 196 to the Empire Compost Facility. Wednesday's weather was clear, no rain, with temperatures in the mid to upper 60's.

Waste was sorted on Thursday, May 16th. Large reject items were removed by hand. A front-end loader fed the waste into a trommel equipped with bag breaking knives and a 5-inch screen. A skid steer loaded overs onto the conveyor belt feeding the picking line. Overs were mainly paper with very little food waste. The first 4 picking stations removed reject items including plastic film, Styrofoam, etc. The last 2 picking stations removed PET bottles. Cans and glass were removed at all stations and collected in 55-gallon drums on the picking platform.

The minus 5 inch material from the trommel was virtually all of the food waste and PET bottles. After approximately 45 minutes of processing, NRG PS staff decided to forego the use of the trommel because its use prevented the sorting of PET bottles and because there were so few plastic bags in the waste stream that its use as a bag breaker was not necessary. Material was then loaded onto the picking line conveyor directly.

Waste Sort Data

	POUNDS	TONS	CUBIC YARDS
TOTAL WASTE DELIVERED			
Load #1	15,060	7.53	
Load #2	3,280	1.64	
Total	**18,340**	**9.17**	
WASTE COMPONENTS AFTER SORTING			
Plastic PET bottles	1000	0.5	6
Aluminum cans	100	0.05	1
Misc. metal	260	0.13	2
Rejects	2720	1.36	25
Compostable Organics	13620	6.81	40
Total	**17,700.00**	**8.85**	**74**

LABOR HOURS	
Total hours sorted on May 16	3.75
Number of people sorting	19
LABOR HOURS	**71.25**

Total hours sorted on May 17	6
Number of people sorting	3
LABOR HOURS	**18**

TOTAL LABOR HOURS	89.25

Qualitative Observations

1. Rejected materials included PET and LDPE plastic, Styrofoam trays (a major contaminant), air duct filters, a table, at least 4 car windshields, door hinges, staples, some metal, non-toxic paint.

2. Industrial/special wastes included 1 fluorescent bulb, 1 car battery, several cell batteries, 4 aerosol cans.

3. Yard waste was found in the load – several plastic bags of grass and some shrub prunings.

4. It was easy tell what kind of school/building the material crossing the picking line was from – elementary, high school, automotive shop, administrative, etc.

5. Operationally, 30 cubic yard roll-off would work better under the picking platform than the 3 cubic yard bins. Longer chutes from the picking stations to direct the flow into the bins should be constructed.

6. There were very few plastic garbage bags in the loads, contrary to what was expected. The schools rarely use plastic garbage bags because of budget constraints and because of the size of lunchroom waste collection bins (AKA Gondolas) in most schools are too large for bags to be used as liners.

Waste Sort #1 Conclusions

1. It may not be necessary to use degradable bags if the education program includes more information on the benefits of not using any bags and source separation can occur to remove contaminants.

2. Styrofoam trays were a major contaminant. If these were collected and bagged in an identifiable bag for easy removal at the compost site, they would not need to be replaced with paper trays.

3. PET bottles were a major contaminant. A recycling program was needed to help remove these non-compostable items.

Appendix D
2003 Waste Sort Methodology for ISD 196 MSW

May 15th, 2003 9:00 a.m.
20 Volunteers

Goal

To determine the following:

a. The amount of compostable material in the compostable, bagged and RDF waste streams.
b. The amount and types of recyclables in the compostable, bagged and RDF waste streams.
c. The amount of contamination in the compostable waste stream.

Representative Sampling

1. Representative sort was conducted on three waste streams:
   a. COMPOSTABLE STREAM: free flowing compostable stream normally delivered to NRG PS
   b. BAGGED WASTE STREAM: non-compostable waste in plastic bags (mainly from elementary schools) delivered to NRG PS (co-mingled with the compostable waste)
   c. RDF STREAM: non-compostable waste delivered to NRG Newport (from the middle and high schools).
2. The sample consisted of 10% (by weight) of each stream.
3. Sorting categories
   a. Recyclables:
      i. Plastic PET bottles
      ii. Aluminum and tin cans
      iii. other metals (such as pipe, misc. metals).
   b. Non-compostables: rejects such as Styrofoam, non-recyclable plastics (all other non-compostables).
   c. Compostables: organics (paper, cloth, cardboard, food waste).
   d. HHW

Methodology

1. All three waste streams delivered to the St. Paul, Waste Management Facility.
2. The RDF waste stream remained separated from co-mingled NRG PS waste.
3. Front loader thoroughly mixed and took a vertical sample (10%) of co-mingled waste and weighed it. Separated out contents of each waste stream into their appropriate containers for different materials at each table station. Sorters sorted waste into following categories:
   a. bagged waste
   b. Plastic PET bottles

c. Aluminum and tin cans
d. Other metals (such as pipe, misc. metals)Non-compostables: rejects such as Styrofoam, non-recyclable plastics (all other non-compostables).
e. Compostables: organics (paper, cloth, cardboard, food waste).
f. HHW

4. Documented final results. Weighed each container as it became full (note weight of containers empty) and recorded (needed one-two people to man the weigh scale and recorded (to keep the numbers consistent). Two individuals brought up full containers from table stations for weighing and replaced them to the original table for refill. Once a container is weighed, its contents were deposited in a location set for RDF or recycling away from sample piles to avoid accidental resorting and re-weighing.
5. Following RDF sort and documentation:
   a. Recyclables were collected for recycling and
   b. All other waste was discarded, except bagged plastic waste.
6. Already separated plastic bagged waste was weighed, then opened and sorted into the following categories:
   a. Plastic PET bottles
   b. Aluminum and tin cans
   c. Other metals (such as pipe, misc. metals) Non-compostables: rejects such as Styrofoam, non-recyclable plastics (all other non-compostables).
   d. Compostables: organics (paper, cloth, cardboard, food waste).
   e. HHW
7. Each container was weighed as it became full (note weight of containers empty) and recorded (needed one-two people to man the weigh scale and record, to keep the numbers consistent). Two individuals brought up full containers from table stations for weighing and replaced them to the original table for refill. Once a container was weighed, it contents were deposited in a location set for RDF or recycling, away from un-sampled piles to avoid accidental resorting and re-weighing.
8. Front loader mixed RDF waste. It took a vertical section from center of waste pile equating to 10% of waste by volume and was weighed. The sample was sorted into categories using buckets and sorters. RDF stream was sorted into following categories:
   a. Plastic PET bottles
   b. Aluminum and tin cans
   c. other metals (such as pipe, misc. metals)Non-compostables: rejects such as Styrofoam, non-recyclable plastics (all other non-compostables).
   d. Compostables: organics (paper, cloth, cardboard, food waste).
   e. HHW
9. Each container was weighed as it became full (note weight of containers empty) and recorded (Two people were needed to man the weigh scale and record to keep the numbers consistent). Two individuals brought up full containers from table stations for weighing and replaced them to the original table for refill. Once a container is weighed, it contents were deposited in a location set for RDF or recycling, away from sample piles to avoid accidental resorting and re-weighing.
10. After recycling materials were weighed, they were placed those materials in bags for recycling.

Protective clothing that was needed:

- Safety Glasses
- Tyvek Suits and jeans and long-sleeved shirts
- Hard soled/sturdy shoes (no holes). Boots preferred.

- Gloves

Other things needed:

- Separation table for sorting.
- Containers to hold separated items with labels/tags. Minimum 20 containers (18-gallon recycling containers).
- Scale for weighing waste materials
- Clip boards and forms for data
- Container or bags to place recyclables into once finished with sort (recyclables must be recycled).
- Tools for sorting by hand (garden rakes)
- Volunteers. Dakota County to coordinate.
- Front end loader and operator (NRG)

References: Methodology for Conducting Composition Study for Discarded Solid Waste (1996), Reinhart and McCauley-Bell.

Appendix E
Waste Sort Release Agreement

This document Affects Your Legal Rights, Read It Carefully

I, _____, wish to participate in the Waste Sort (hereafter "Waste Sort") that will take place at the NRG Processing Solutions' (NRG PS) Empire Compost Facility, 16454 Blaine Avenue, Empire Township, on the 16th day of May, 2002. I received a copy of a description of the Waste Sort and understand what the Waste Sort involves.

I understand that I will be appropriately outfitted and instructed by NRG PS staff to participate in the Waste Sort. I also recognize that there is an element of risk in any activity associated with a Waste Sort. Knowing of the risks involved, I certify that I am fully capable of participating in the Waste sort and am in good health and have no physical limitations that would preclude participating in the Waste sort. In consideration for being allowed to participate in the Waste Sort, I further understand and agree to the following:

(1) For the purpose of this Agreement, all references to "NRG PS" includes its employees, agents, paid or unpaid volunteers and contractors, and any other sponsors/providers and their employees, agents, paid or unpaid volunteers and contractors.

(2) I agree to participate in the Waste sort according to the rules and instructions of NRG PS, including wearing any appropriate protective equipment.

(3) WAIVER OF LIABILITY. I agree that participation in the Waste Sort is voluntary and I personally assume all risks in connection with the Waste Sort and I hereby expressly forever release NRG PS from any claims, demands, injuries, damages, actions or causes of action whatsoever for any acts of active or passive negligence on the part of NRG PS or the site where the Waste Sort is occurring. I understand this is a binding contract that supersedes any other agreements or representations, and is intended to provide a comprehensive waiver and release of liability. If any part of this Agreement is deemed unenforceable, all other parts shall be given full force and effect.

(4) The terms of this Agreement shall serve as a release and assumption of risk binding on me and any other person, including my estate, heirs, assigns, legal guardians and all members of my family.

(5) I further give my permission to NRG PS to use photographs taken of me during the Waste Sort for their promotional purposes.

I HEREBY CERTIFY THAT I AM LEGALLY COMPETENT TO SIGN THIS AGREEMENT AND/OR MY PARENT OR LEGAL GUARDIAN HAS CAREFULLY READ THIS AGREEMENT AND FULLY UNDERSTAND ITS CONTENTS. I AM FULLY AWARE THAT BY SIGNING THIS AGREEMENT I

AM WAIVING CERTAIN LEGAL RIGHTS, INCLUDING THE RIGHT TO SUE. I UNDERSTAND THIS AGREEMENT IS A BINDING CONTRACT AND SIGN IT OF MY OWN FREE WILL.

_____ _____

Date (Print your name)

_____

(Signature of Participant)

(Must also be signed by parent or guardian if participant is a minor)

ADDITIONAL PARENT/GUARDIAN WAIVER FOR MINORS

I, the under-signed parent or legal guardian, do hereby represent that I am, in fact, acting in such capacity and agree to allow the minor named herein to participate in the Waste Sort. In addition to the above, I further agree, on behalf of said minor to RELEASE, HOLD HARMLESS and INDEMNIFY NRG PS from and against any and all claims/liability for any injury which may be suffered by said minor rising out of, or in any way connected with his/her participation in the Waste Sort. I agree to be responsible for any medical expenses incurred by the minor.

_____ _____

Date (Print your name)

_____

(Signature of Parent or Legal Guardian)

Appendix F
Educational Material