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SOLID WASTE MANAGEMENT
FAYETTEVILLE REGIONAL OFFICE

OPERATIONS PLAN

CITY OF DURHAM, NORTH CAROLINA

SOLID WASTE TRANSFER STATION

Prepared by:

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Charlotte, North Carolina

Carmen J.

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Transmittal

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HDR

Attention Mr. James Coffey Date 9/19/94 Job No 7592-01-18

To NC-DEHNR - Division of Solid Waste Management
401 Oberlin Road
Raleigh, NC 27605

Regarding Durham Solid Waste Transfer Facility

We are sending you:

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Signed Johanna Quinn

If enclosures are not as noted please notify us at once

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SECTION 1.0
INTRODUCTION

1.1 GENERAL

This Plan describes the proposed operation of the City of Durham Transfer Station to be located at the East Geer Street site. This station will be one of several integral components of the City's Solid Waste Management Program and will be capable of transferring an average of 600-700 tons per day (TPD) of municipal and commercial solid waste daily.

The City provides for the disposal of municipal, commercial, and certain special non-hazardous solid waste generated within the City and Durham County. The City does not accept any waste generated from other out-of-County communities. The service area is comprised of over 200,000 people, generating over 240,000 tons of waste annually.

1.2 PURPOSE

This Operations Plan has been prepared in accordance with the North Carolina Department of Environment, Health, and Natural Resources (DEHNR) Solid Waste Management Regulations for Transfer Stations, and is intended to be utilized as a reference document for employees on-site for operation of the proposed transfer station.

1.3 BACKGROUND

Currently, the majority of the waste generated in the City of Durham as well as Durham County is disposed of in the City's landfill, located on East Club Boulevard in the City of Durham. The Landfill is permitted to receive waste until May 1995, after which time there will be no municipal solid waste landfill options within Durham County or the City.

In anticipation of the current Landfill's permit expiration date, efforts were made by the City to site a new sanitary landfill in Durham County. However, difficulties encountered in siting a new landfill resulted in the City's decision to transfer Durham's waste by rail to a permitted regional landfill facility in Montgomery County, N.C.

The decision to build a solid waste management facility to rail haul Durham's waste to

the sanitary landfill facility in Montgomery County, N.C., has been incorporated into the City of Durham's Solid Waste Management Plan which was issued in 1993. The Solid Waste Transfer Station project, however, comprises just one element of the City's overall plan for dealing with waste. The proposed plan is an integrated approach which includes source reduction efforts, recycling, composting, new collection and financing strategies, and public education programs to encourage involvement in all aspects of waste management, from generation through disposal. Refer to Appendix C, Solid Waste Management Plan, for additional details.

1.4 PROJECT DESCRIPTION

In consideration of the limited disposal capacity remaining in the existing landfill, the City Council has authorized the design and construction of a 600 - 700 ton per day (TPD) solid waste transfer station. The City has selected an abandoned rail yard owned by the Norfolk-Southern Corporation, with a total of approximately 53.2 acres, for the location of the facility (see Appendix E, Site Inventory and Selection). The site is located off of East Geer Street in the City of Durham, near the intersection of East Geer and Miami Boulevard (see Sheet G.02), and is adjacent to the Norfolk Southern rail line.

The transfer station will consist of an enclosed building in which trucks, after being weighed on a scale system, enter, unload their wastes on a tipping floor inside the building, and exit. The building will be enclosed to minimize odor and control dust and litter. The waste will then be pushed into enclosed and watertight rail containers, located below the tipping floor on rail cars. At design capacity, approximately 30 - 35 rail containers will be loaded daily. At the end of each day, a train will pull the rail cars to Addington Environmental, Inc.'s Montgomery County landfill, where the waste will be unloaded and disposed. The general site plan layout for this site is presented on Sheet C.01 of the Construction Drawings.

The transfer station will only accept solid waste which is generated by households, institutions, commercial, and some industrial establishments. Explosives, pathological and biological wastes, and other hazardous waste are not acceptable wastes for processing at the facility. The primary function of this facility will be the transfer of solid waste from collection trucks to water tight rail containers.

1.5 EXISTING CONDITIONS AND ENVIRONMENTAL IMPACTS

1.5.1 Land Use

In accordance with the North Carolina State Environmental Policy Act (SEPA) which states that activities related to projects on the "Major Actions" List, which includes new construction in excess of $150,000 in cost, more than 5,000 square feet, and more than one (1) acre of previously undisturbed ground, are subject to an environmental assessment process.

An Environmental Assessment (EA) was conducted for the project to review the environmental impacts of the construction and operation of the solid waste transfer station. The Environmental Assessment contains a project description, review of the existing environment, the need for alternatives to the project, environmental impacts associated with the project, and mitigation measures for those impacts. The Environmental Assessment is included as Appendix D and is summarized in the following paragraphs.

1.5.1.1 Existing Conditions

The site is an abandoned rail yard which consists of a 14.8-acre parcel of property owned by the Norfolk Southern Corporation. Additional property from the American Legion Fair Association (18.0 acres), the Durham Herald Company, Inc. (18.0 acres), and the estate of Mr. Fred E. Hamlin, Jr. (2.4 acres) will be required for the facility layout and to provide access to Miami Boulevard, bringing the total site area requirement to 53.2 acres. There is no major structural development located within the site boundaries.

The site is located to the north of East Geer Street near the intersection of East Geer and Miami Boulevard, and parallel to a main line of the Norfolk Southern railway system. The project vicinity is composed primarily of residential, open space, transportation corridors, and business and institutional land uses. The site and immediate surrounding area is zoned I-2 for light industrial development and use, and C-1, C-2, and C-4 for commercial development and use. This zoning classification therefore allows a solid waste transfer station as a permitted use. Other zoning classifications within half a mile radius of the site in addition to the previously mentioned

classifications include I-3 for heavy industrial use, and R-2, R-6, R-G, and RA 20-30 for general, single, duplex, and apartment residential districts. There are no prime or unique agricultural lands, public lands such as parks, or areas classified as scenic or recreational at the site or in the immediate surrounding area of the site.

1.5.1.2 Impacts

Project development of this site does not conflict with zoning or planned land use for the area. Certain provisions of the zoning code regarding industrial development such as the solid waste tansfer station facility discuss, in general terms, the requirements of compatible structural design and visual screening and buffers with which the facility will comply. The site is already well-buffered from surrounding property(ies) by the natural terrain, i.e., a wooded area and an embankment. The closest residential area is located along Fay Street, which is approximately 520 feet east of the site. Primary access to the site would be from the intersection of East Geer Street and Miami Boulevard. The construction of the transfer station will not impact any prime or unique agricultural lands, public lands such as parks, or areas classified as scenic or recreational, as these are not characteristics of the existing uses of land at the site or the immediate surrounding area of the site.

1.5.2 Water Quality and Geological Resources

1.5.2.1 Existing Conditions

There are no serious conflicts between the proposed site plan and existing surface water features or wetlands. The nearest surface water bodies are limited to a number of small draws which cross the site and flow to Goose Creek (which is located approximately 300 feet at the nearest point east of the site). Site development will not result in any significant (i.e. > 0.33 acres) wetland impacts.

The site topography consists of flat to gently sloping terrain along the rail lines that rises sharply from west to east. An elevation difference of approximately 40 feet exists across the site from west to east; with the terrain from north to south being fairly level. Earthwork will be necessary to overcome sharp grades and provide a more level and usable area for facility operations and erosion control.

According to the U.S. Department of Agriculture "Soil Survey of Durham County, North Carolina" and geotechnical investigations, the site area on which the transfer station facility will be constructed is overlain by mayodan sandy loam soils. The depth to the seasonal high water table for these soils is more than six feet.

1.5.2.2 Impacts

City of Durham utility services are available within the immediate vicinity of the site.

Wastewater will originate during normal facility operations primarily from equipment and tipping floor cleaning, and sanitary wastes. Wastewater will be discharged into the City sanitary sewer system and will meet the standards established by the City of Durham utility department. Water and sanitary sewer line designs will be based on a maximum flow of 1000 gpm (fire flow) and 250 gpm, respectively.

The wastewater associated with the project will have no adverse effect on surface or groundwater at the site as the facility will be designed so the tipping floor area will be totally enclosed, wastewater will be collected, pre-treated (grit and grease removal) and discharged directly into the City's sanitary sewer system, and long-term outdoor storage of waste or other materials will not be allowed. To control stormwater runoff and erosion, the site will be graded to include a drainage system constructed along the perimeter of the facility layout and will include a water quality control retention basin. These same design features will also serve to protect surface and groundwater at the site from being polluted with toxic substances and from suffering the effects of eutrophication.

1.5.3 Air Quality

1.5.3.1 Existing Conditions

Air quality at the site is considered to be good, as there are no industrial or commercial facilities immediately adjacent to the site which emit air pollutants.

1.5.3.2 Impacts

The facility will have little impact on ambient air quality. The facility, shall be fully enclosed, and air exhaust from the transfer building will be filtered and scrubbed if required, thereby making the emission of any air toxics highly unlikely. Proven odor scrubbing technologies and other odor prevention measures will be incorporated to control emissions and maintain air quality.

1.5.4 Archaeological

1.5.4.1 Existing Conditions

No known historical or archaeological resources exist on the site; however, an older structure (Fairgrounds Clubhouse) is located to the east of the site on property owned by the American Legion Fair Association.

1.5.4.2 Impacts

The North Carolina Department of Cultural Resources, Division of Archives and History, was consulted as to the presence of any potentially significant archaeological or historical resources within the project area. An informational search done by the Department indicates that there are no known structures of historical importance or archaeological resources located within the site area. The Department of Cultural Resources also stated that, based on their present knowledge of the area, it is unlikely that any archaeological resources which may be eligible for inclusion in the National Register of Historic Places will be affected by the project construction, and that no archaeological investigation is recommended in connection with this project (letter, N.C. Department of Cultural Resources; July 15, 1993).

Therefore, no significant impacts of historical or archaeological resources are expected as a result of project development.

1.5.5 Wildlife and Unique Habitats

1.5.5.1 Existing Conditions

The site area is wooded with urban types of development and land uses existing in the immediate vicinity. No known fish or wildlife habitat areas or endangered or protected species exist in the project area; however a rare plant species, *Silphium terebinthinaceum* (a Candidate for state listing) has been recorded within two miles of the site.

1.5.5.2 Impacts

The North Carolina Department of Environment, Health and Natural Resources, Division of Parks and Recreation, was consulted as to the presence of any significant ecological resources or rare and endangered species within the project area. A field survey was conducted to evaluate the possibility of the Candidate species occurring at the site, and the findings (which were reported to the State) showed that the risk of the plant occurring at the site was negligible. The N.C. Department of Environment, Health and Natural Resources concurred with this finding, and in their letter dated August 9, 1993 stated that there are no listings of rare, threatened, or endangered species at the site, nor are there any known special natural resources at or near the site. Therefore, no significant impact of the natural area is expected as a result of project development.

1.5.6 Aesthetics and Facility Operations

1.5.6.1 Existing Conditions

The project site is a vacant parcel of generally wooded land that slopes westward towards the rail line. The nearest structures are the American Legion Fair Association buildings located approximately 180 feet east of the facility. The closest residential area is located along Fay Street, which is approximately 520 feet east of the site.

1.5.6.2 Impacts

The external and internal design of the facility will be developed to provide for overall facility aesthetics and protection from the weather. All components of the facility including the tipping area, hopper and transfer vehicle load out area will be enclosed. The visibility of the facility is minimized by the existing natural vegetation and topography. A landscaping plan is included as a part of the design to enhance the local aesthetics. Existing vegetation adjacent to the perimeter of the site will be maintained where possible. Ditches and berm slopes will be seeded for erosion control, and appropriate areas will receive trees and shrubs for screening of the facility and truck traffic. Noise and odor from facility operation will be minimal because of enclosed systems.

- Noise

  The transfer building will be totally enclosed and constructed with an acoustic building shell (interior insulation and liner panel system) to contain noise within the building.

  On-site traffic and motor noise levels will be controlled by maintaining the natural wooded buffers around the site and through the addition of berming and noise barriers that attenuate and redirect the noise path away from the nearest residences.

- Odor

  All waste will be removed from the facility at the end of each day's operation, i.e., no waste will be stored (on-site) overnight on the tipping floor.

  The waste will be transferred from the collection vehicles to the rail containers in a manner that minimizes storage time on the tipping floor. Based on an 8-hour loading operation, the maximum length of time that the waste would be retained in the building is approximately 3 hours.

As part of routine operating procedures, the tipping floor and loadout areas will be cleaned and thoroughly swept or washed down on a daily basis.

Tipping floor spotters will identify loads and material sources of particular high odors for immediate treatment with deodorizers and transfer materials to a rail container.

The air exhaust from the tipping area will be filtered and scrubbed if required. Proven odor scrubbing technologies and other prevention measures will be used to prevent the escape of odors.

The transfer building will be totally enclosed to prevent the escape of odor. Transfer trailers/containers will be equipped with rigid covers to prevent odor emissions once containers are moved from the transfer building.

- Vector Control

The transfer station will be cleaned of all waste at the end of each day. In addition, the tipping floor and loadout areas will also be washed down to prevent the infestation of rodents and insects. No waste will be stored overnight.

All building material selections and architectural closure designs will be done in such a manner as to reduce the potential for rodent nesting and/or insect infestation.

Interior curbing and trench gratings at major egress points from the building will be provided to control the incidence of any rodent from escaping the tipping floor or loadout areas.

As part of the operating plan for the transfer station, a professional extermination company will also be employed to develop a vector prevention and control program which will include regular monitoring of the operation of the facility and handle specific problem areas should they occur.

1.5.7 Traffic

1.5.7.1 Existing Conditions

There is immediate access to the site via Avondale Drive, Geer Street, East Geer Street, and Miami Boulevard. Primary access to the site will be from the intersection of East Geer Street and Miami Boulevard. Major feeder routes into the area include Highway 15-501 from the north and south; Interstate 85 from the west; and Highway 70/I-85 from the east. Avondale Drive's current daily traffic volume within the site vicinity is approximately 8,700 vehicles, Geer Street's current daily traffic volume within the site vicinity is approximately 15,400 vehicles, East Geer Street's current daily traffic volume within the site vicinity is approximately 7,700 vehicles, and Miami Boulevard's within the site vicinity is approximately 10,700 vehicles.

1.5.7.2 Impacts

All project-related traffic will ingress and egress by East Geer Street or Miami Boulevard, and a dedicated access road of approximately 800 feet will serve the facility. Anticipated truck traffic to the site would generate an average of 240 waste delivery trips per day, plus an additional 5 - 10 employee vehicles per day, for a total of approximately 245 - 250 vehicle trips per day. Therefore, assuming the total traffic impact of 250 vehicles making daily round trips to the site, the total traffic impact on Avondale Drive would be 5.7%, if all trips were made via Avondale Drive; if all trips were made via Geer Street, the total traffic increase would be 3.2%; if all trips were made via East Geer Street, the total traffic increase would be 6.5%, and if all trips were made via Miami Boulevard, traffic impacts would increase a maximum of 4.7%. Existing traffic data from the Durham Department of Transportation was reviewed to determine the impacts to roads and streets in the vicinity of the proposed sites. Traffic volumes on Geer Street at the site entrance are approximately 77% of design capacity. Any truck queuing would take place on the project site itself and would be accommodated by the 800 foot dedicated access road to the facility. Based on the facility's minimal increase to the existing traffic volumes of the adjacent roadways and facility assess designs, the project should have no significant adverse effect on traffic conditions in the area.

SECTION 2.0
OPERATIONS

2.1 PERSONNEL REQUIREMENTS

Personnel required to operate the Durham Transfer Station are exhibited below. The number of positions was based on solid waste projections and estimated facility throughput.

Table 2-1
Personnel Requirements

Position	
Supervisor	1
Shift Foreman	1
Scale Attendant	2
Equipment Operators	4
Laborer	3
TOTAL	11

It is imperative that all transfer station personnel be versatile in their work activities, i.e., the Supervisor or Shift Foreman may be required to operate the scale, compactor, or the front-end loader if the designated personnel are on break, vacation, or ill.

2.2 DAILY OPERATIONS

2.2.1 Operating Hours

Hours of operations will be as follows:

Monday - Friday	7:00 a.m. - 3:00 p.m.
Saturday	7:00 a.m. - 12:00 noon

The facility will be closed Sundays and on the following holidays:

New Year's Dave
Thanksgiving Day
Christmas Day

The station will operate on 7:00 a.m. - 12:00 noon schedule on:

Martin Luther King, Jr.'s Birthday
George Washington's Birthday
Independence Day
Labor Day
Veteran's Day
Christmas Eve

In addition, operating hours may be evaluated from time to time by the City to accommodate special circumstances. Special circumstances may also include temporary closure for repairs or other reasons. Notices will be posted at the main entrance of the facility advising users of any special operating hours. Notices of holiday closings or special hours will be posted at least one week in advance.

2.2.2 Access Control

The entire facility will be fenced with chain-link fencing material for access control during non-operating hours. Vehicular gates will be installed at the two access points. During operating hours, access to the tipping floor area will be controlled by the scale attendant at the scale house. The location of the scale house was chosen to promote improved control of users entering and exiting the facility.

2.2.3 Traffic Routing and Parking

All vehicles will enter from the intersection of East Geer Street and Miami Boulevard. An alternate road will be used for construction vehicle access.

Access roads on the site will be hard-surfaced, all weather roads with adequate signing and lighting. A counter-clockwise traffic pattern will be established which will provide for maximum use of the site without interference to traffic.

Permanent parking for visitors and operations personnel is provided at the transfer building as shown on the Construction Drawings. Refer to Sheets C.01 through C.25 of the Construction Drawings for site plan details.

2.2.4 Entrance Procedures

All trucks, trailers, and other commercial vehicles will stop at the scale house located at the entrance to the transfer building. Users will be charged a price per ton of refuse or a flat fee for various vehicle types. Upon arrival at the scale house, the scale attendant will determine the load characteristics and its acceptability to enter the transfer system. If the load is determined to be unacceptable, it will be rejected and directed to an alternate disposal point or notification will be given to the proper authorities for handling of illegal or hazardous loads. If deemed necessary, one of the City's solid waste inspectors will be called upon to inspect the load and recommend proper action. After the weighing process, incoming vehicles will be directed to the transfer building for unloading. Vehicles will enter the building, maneuver to an area designated by transfer station personnel, and deposit their load. After unloading, the vehicle will be directed to exit the station. Vehicles not previously weighed empty will be directed across the out-bound scale to determine the vehicle weight. Private automobiles and low-sided pick-up trucks will not be charged for the disposal of household solid waste. Appropriate signage will direct such vehicles to the citizens load-out area where an attendant will direct the unloading process.

2.2.5 Load Inspections

In order to ensure the prohibition of unacceptable wastes from this facility, the City will employ personnel trained to recognize unauthorized and hazardous wastes. Additionally, training will be required of facility personnel

to recognize hazardous wastes and to know the proper procedure in the event that such material is received.

2.2.6 Equipment Requirements

Various types of mobile equipment will be required to operate the transfer station. The equipment required is presented as follows:

Table 2-2
Station Equipment

Equipment	Quantity
Wheel Compactor	1
Power Sweeper	1
Front-end Loader	2
Mobile Leveling Crane	2
Rail Yard Tractor	1
Fork Lift	1

This transfer facility is designed with two (2) load-out hoppers and a compaction area. Operation will require the use of two (2) heavy-duty, wheel-type front-end loaders. The loaders will push refuse placed on the tipping floor into the compaction area and to the load-out hoppers after compaction with a wheel-type compactor. The loaders will be equipped with a 5 cubic yard bucket with a steel bolt-on cutting edge.

Waste compaction will be accomplished by using a three-wheel landfill compactor equipped with chevron type wheels. The waste will be pushed from the tipping floor area to the compaction zone where the wheeled compactor will consolidate the refuse on the floor by traversing the waste piles. After compaction, the waste will be pushed to the load-out hoppers and loaded into an open-top rail container.

In addition to the front-end loaders and three-wheel compactor, two (2) self-propelled mobile leveling cranes will be required to level and compact the

waste as it is loaded into the rail containers. These mobile cranes will be custom modified with refuse handling grapples in order to facilitate the required operations.

Back-up equipment for the front-end loaders, compactor, and leveling cranes can be made available from standby equipment located at the landfill or through short-term rental agreements. In all cases, the recommended equipment mix is such that breakdowns of any one item will not prevent the proper functioning of the station.

2.2.7 Inclement Weather Operations

Inclement weather will not significantly affect the operation of the transfer station. All waste will be processed within an enclosed building. All-weather roads and drainage systems will be properly maintained and functional at all times.

2.2.8 Salvaging

Salvaging/scavenging of any type will not be permitted at this facility.

2.2.9 Special Wastes

In general, anything considered hazardous or any waste having a solids content of less than 25%, by weight, will not be acceptable. Other wastes deemed not acceptable at this facility are:

Animal carcasses
Dust
Petroleum products
Industrial process waste
Land clearing debris
Heavy construction rubble
Commercial loads of vehicle tires
Earthmover and agricultural equipment tires
Loads of paint cans (six or more)
Loads of drums (six or more)

Asbestos
Liquids
Closed drums
Slaughterhouse waste

White goods will be accepted at a designated location on-site. Depending upon the quantities received, certain white goods may be stockpiled for recycling purposes in a designated area, but not for more than a period of 30 days.

2.2.10 Daily Cleanup

Daily cleanup of this facility will involve removal of all solid waste from the transfer building and subsequent sweeping or washdown of the tipping floor, compaction zone, loading/hopper area, and drive-thru load-out area.

2.2.11 Records

Below is a list of records that will be maintained regularly for this facility:

Table 2-3
Record Keeping

Record	Frequency of Completion
General Site Inspection	Monthly
Accident Reports	Monthly
Waste Quantities Received	Daily
Construction Drawings	(copy on site)

2.2.12 Vector Control

A professional extermination company will also be employed to develop a vector prevention and control program which will include regular monitoring of the operation of the facility and handle specific problem areas should they occur.

2.3 ENVIRONMENTAL CONTROLS

2.3.1 Erosion and Sediment Control

During construction, the contractor shall comply with all applicable provisions of the approved Erosion and Sedimentation Control Program. Refer to Sheet C.12 of the Construction Drawings for details. Measures to be taken shall include but not be limited to:

(1) Installation of temporary erosion control devices and silt fences as indicated on the Construction Drawings. All storm water management facilities and erosion controls shall be installed and made operational by the completion of required drainage grading.

(2) Periodic inspection and required maintenance of erosion control measures shall occur weekly or after each rainfall event, whichever is most frequent.

(3) Any eroded material shall be promptly removed from streets, drives, walks, ditches, water courses, drainage pipes, and/or structures.

(4) Silt fences and other erosion control measures shall be checked periodically for deterioration.

(5) Contractor shall grade all ditches as required to maintain positive site drainage.

(6) Additional erosion control measures may be required to suit field conditions as directed by the site Supervisor or engineer.

Permanent erosion and sediment control measures have been designed in accordance with the City's Critical Watershed Protection Ordinance and Storm Drainage Design Manual of Practice. Refer to Sheets C.07, C.08, C.09, C.12, C.13, and C.24 of the Construction Drawings, and Section 02272, Soil Erosion and Sediment Control, for details.

****

Five Conditions for Recycling There are five key conditions for successful recycling of any particular material:

1) market creation;
2) awareness;
3) convenience (ease of separation, space needs, etc.);
4) a collection system; and
5) incentives to participate.

Each of these conditions must be met to establish a recycling program. For example, it is difficult to establish a market by making arrangements with an end user or processor unless a collection system is in place that guarantees a steady supply of recyclable material. On the other hand, without a ready market for materials, there are no revenues to offset the costs of collection and materials would have to be stored and unfortunately, possibly landfilled.

Clearly, all five of these conditions must be pursued in an integrated manner. For any potentially recyclable material one could assess the degree to which each of these conditions is present. For example, old newsprint might rate high in convenience, and in the collection system (at least for city residents). In terms of awareness and market creation, old news print recycling may have room for growth. Currently, the incentive to participate in old newsprint recycling is primarily concern for the environment. Economic or other non-economic incentives (ranging from variable rates for garbage collection to "mock bills" to reminders about the costs of landfilling) might increase the rate of participation.

Among the five conditions, the two that appear to need the most attention in general are market creation/development and (for businesses) improvements in convenience. The most obvious example of an area where market development is needed is the mixed paper market. An example of an area where convenience is needed is the collection of cardboard from businesses. There is a ready market for cardboard; however, smaller businesses in the city report difficulty in finding space to store cardboard.

If a market exists for a material and it is convenient for the generator to separate that material from the solid waste stream, there is still a need for awareness -- the generator must know that the material is recyclable -- as well as needs for a collection system and some kind of incentive to participate. A well-designed educational campaign can create non-financial incentives to participate. Civic pride, persuasion from peers or neighbors, or concern for the environment could bring about participation without the need for direct economic incentives. (The threat of higher taxes, of course, is always an indirect economic incentive for adults.)

****

(2) search for a new landfill site immediately;

(3) further investigate a resource recovery option;

(4) expand recycling programs to full scale; and,

(5) implement pilot mulch and composting systems for yard waste and sludge.

The City has followed these recommendations with results that will be explained in the following sections. An inventory and assessment of current management was done in May, 1992 in " The Status of Solid Waste Management in Durham" (See Appendix A). This document is intended to help the City Council and the community make informed decisions regarding future solid waste management directions.

The Solid Waste Subcommittee of the Environmental Affairs Board (EAB) met with staff and representatives from local businesses, industries and institutions to discuss and share viewpoints on the solid waste issues discussed in this plan. This input along with a series of meetings with the Sanitation Staff and discussions with our solid waste contractors contributed to the development of the plan. It is important to note that many citizen groups have played a role in the recent history of solid waste management in this community. There have been several solid waste citizens's committees, including a solid waste task force, a waste-based economic development committee, a citizen's advisory committee on locating a new landfill, a regional solid waste management committee with local representatives and other means of involving the public in solid waste management decisions. The EAB's Solid Waste Subcommittee has assisted the City Council in other issues such as a technical evaluation of the pyrolysis method of solid waste disposal, a comparative environmental analysis of solid waste management technologies, and an assessment of the landfill contractor's environmental records. Durham is fortunate to have talented, dedicated citizens willing to do their part in caring for the community.

How the Report is Organized

Solid waste management is a far more complex venture than it was a century ago. To help break a complex discussion into manageable components we have divided this report into six major sections. The first four -- Source Reduction, Recycling/Composting, Collection, and Disposal -- focus directly on the waste stream and on Durham's efforts to reduce waste, divert waste, or dispose of waste safely and cost-effectively. The latter two sections -- Education and Financing -- discuss those solid waste management issues that impact upon all aspects of the waste cycle from generation through disposal.

Each section of the report is different and reflects the unique characteristics of its topic. In designing each section we have tried to get at the pertinent issues as succinctly as possible rather than following a set framework for the discussion. Where necessary we have also included sidebars that open up more specific issues for discussion.

Solid Waste Management Plan

INTRODUCTION

This report is a presentation to the Durham City Council and the greater Durham community. It describes the current challenges we face in our management of solid waste -- most notably, the requirements that we reduce the amount of solid waste we dispose by approximately one-third between now and 2001 and that we plan an integrated solid waste management strategy to collect and dispose of the remaining waste. Our community has a sanitary landfill that has a limited useful life and increasing solid waste management costs resulting from state and federal mandates. This report suggests some of the principles that can guide us toward solutions. And it makes some suggestions about what those solutions might be.

We cannot address our needs until we understand them and are able to discuss them coherently as a community. Therefore, one of the goals of this document is to educate members of the community about the choices they face. Arriving at optimal decisions about solid waste will be made easier if the problem itself is well defined and well understood.

This report is founded upon six basic assumptions:

- ◊ Progress in solid waste management is but one of many goals of the Durham community. The solid waste management plan should complement other goals of the community whenever possible.

- ◊ Solid waste goals must be set and achieved by every sector of the community working together. Government can lead the effort in significant ways but is not necessarily the best or most desirable locus for many activities.

- ◊ There is no panacea in the field of solid waste. Any means chosen has both benefits and costs. Furthermore, the future is unknown because technology, consumer and business behavior, and the law can be expected to change significantly over the next ten years. A mix of solutions increases a strategy's flexibility and fairness.

- ◊ Solid waste policies and programs should be based upon the best information available. We are just beginning to understand our community's behavior in regard to solid waste. It is important to proceed cautiously and to make informed decisions that reflect the unique characteristics of our community.

- ◊ Solid waste strategies should be integrated with each other and should build upon existing customs, institutions and systems wherever possible.

- ◊ Although all components of this plan involve the City of Durham, some will affect Durham County residents and businesses. The City will make every effort to coordinate this plan with the County of Durham on issues that affect both governments and with the County's Solid Waste Management Plan.

"Taking out the Trash"

Solid waste management is one of the few activities that every member of the community participates in on a daily basis. All of us are involved in waste generation. All of us are part of a collection system -- whether we roll a cart out to the curb, walk to a container, drive to a drop-off site, or haul to the landfill. All of us help to pay the growing costs of solid waste management through taxes and fees. Many of us, too, have begun to recycle materials or reduce the amount of waste that we generate.

Yet "garbage," the natural output of any society -- and the unnaturally large output of a "disposable" society -- is a common area of concern that most of us prefer not to think about. "Taking out the trash" traditionally does not hold the place of honor among the chores of the household or of the community. This situation is not new. In her acclaimed history of Durham County, Jean Bradley Anderson recounts the solid waste crisis of a century ago:

> The too-rapid growth of the city, the large influx of strangers in the factories and mills, and unhygienic living and working conditions created problems that the simple municipal government set up in Reconstruction times could no longer handle. Though the town had a water supply and one main sewer, it made no provision for the collection of garbage or for cleaning the mud- and manure-mired streets. Most people thought the role of government should be limited, and they actually resisted government interference, as they called it, in their lives.
>
> (p. 207)

We are in another time of challenge today, as this report will show. "Taking out the trash" is taking on a new meaning, as we strive for ways to divert materials from our collective waste stream. With its legacy of civic responsibility and concern for the environment, Durham can find answers. The role of government will be limited, as it was a century ago -- in this case, because effective solid waste management calls for each individual and business to re-examine their daily decisions and habits and to reconfigure the way they choose, use, and use up valuable materials.

Background

The State of North Carolina legislature has recognized the discrepancy between current means of handling solid waste and future possibilities. Local governments have been advised to generate solid waste management plans that set goals and objectives; provide an inventory and assessment of current systems; identify local needs to meet these objectives; evaluate the options and recommend actions. The City of Durham had a solid waste management study completed in 1987 that included recommendations to:

(1) continue to rely on landfilling as the primary means of disposal for the next five years;

Throughout the report we refer to the "community." By this term we mean the children and adult citizens, the businesses and industries, the institutions, and the governments of the City of Durham and Durham County.

A general premise that is assumed in this report but not always specifically mentioned is the need to consider the regional possibilities for coordination and cooperation in establishing and implementing many of the solid waste management ideas presented. Our Triangle J Council of Government region contains some of the most qualified professionals in the state who are dealing with the same state and federal mandates that we are here in Durham. Opportunities for joint training, site visits, presentations, etc. should continue as we all work to assure excellence in solid waste management for our respective communities. In addition, staff participation in professional organizations such as the North Carolina Recycling Association and the N.C. Chapter of Solid Waste Management Association of North America results in training, resources and peer contact that keep us from "reinventing the wheel".

Change will continue to be a fact of life in solid waste management for the foreseeable future. Durham has made, and will continue to make, difficult decisions in response to changing conditions. Having an overall sense of direction which the community is willing to support will make decisions easier and more effective. We hope that this report is a starting point with which Durham can take a careful look at its solid waste management and come to consensus about goals and objectives for solid waste management over the next ten years.

SOURCE REDUCTION

Source reduction is one aspect of waste reduction. Before discussing source reduction it is important to highlight some of the key terms and issues associated with waste reduction in general.

Waste Reduction

The North Carolina General Assembly has established waste reduction goals of 25% by June 30, 1993 and 40% by June 30, 2001. The State law specified that waste reduction includes source reduction, reuse, recycling and composting.

Source reduction is a term applied to strategies that "avoid the creation of waste by reducing the total amount and/or toxicity of waste at the source" (NC-SWM Waste Reduction Alternatives, p. 4). Source reduction is unique from all other waste management strategies in that it focuses on prevention of waste generation rather than on treatment of waste. Examples of source reduction activities include:

- ◊ Purchasing in bulk
- ◊ Buying only what is needed, and using up what is bought
- ◊ Making phone calls instead of using memos
- ◊ Using products with non-toxic ingredients
- ◊ Renting rather than purchasing items
- ◊ Copying on both sides of the page
- ◊ Purchasing products with less packaging
- ◊ Purchasing more durable products
- ◊ Maintaining and repairing equipment and other items
- ◊ Using telephones and electronic mail instead of paper communication
- ◊ Redesigning production processes to reduce errors and waste

As an effort to change collective behavior patterns, source reduction has much in common with approaches to energy and water conservation.

Reuse is "the use of goods of production more than once in their current form and for their original or similar purpose" (NC-SMW Waste Reduction Alternatives, p. 4).

- ◊ Selling or donating goods no longer wanted
- ◊ Using scraps of paper for notes
- ◊ Using the same envelope several times
- ◊ Shipping products in reusable containers (such as milk crates)
- ◊ Redirecting scraps from the production process into the originating point of the process
- ◊ Using scrap materials as art materials, i.e. the local Scrap Exchange Program

Source reduction and reuse are closely related. For example, storing leftovers in a peanut butter jar involves reuse of the jar and source reduction of whatever disposable item would have been used to store the food. Both source reduction and reuse require the individual to adopt a different attitude toward physical items. The individual asks, "What is the minimum that I need to accomplish the task?" and "How can I best use the items already at hand?"

At the same time, reuse and recycling are closely related in many instances. When an industry takes leftover raw materials and returns them to the manufacturing process, this activity could be considered either reuse or recycling. For purposes of simplicity, however, this report will consider reuse primarily in conjunction with source reduction.

Recycling refers to the series of activities by which materials, that would otherwise become waste, are collected, separated, or processed and used as a raw material (NC-SMW Waste Reduction Alternatives, p. 5). Recycling can be as complex as taking an old appliance, separating the useful scrap metal, selling the metal, reprocessing the metal, and incorporating it into a new manufactured product. Recycling is essentially a more basic form of reuse, in which the components of used items are processed and directed into new functions or components in new items.

This report separates recycling from source reduction/reuse, primarily because most recycling activities require different kinds of government and community activity. For residential recycling to occur, governments (at least at this point in time) often become involved in setting up, or fostering the creation of, infrastructure for collection, processing, and marketing of materials.

Education is the area in which recycling and source reduction/reuse overlap. Because education also plays into issues of disposal, collection, and financing, this report includes a special section that describes educational needs and recommendations in an integrated manner.

Taken together, source reduction, reuse, and recycling constitute the spectrum of waste reduction activities. We can use (need) less to begin with (source reduction), use what we have more than once (reuse), or take the components of used items and turn them into new useful items (recycling). All three kinds of activities reduce the amount of the waste stream that is destined for disposal, thereby reducing disposal costs and potentially reducing the impact of landfills (or incinerators) on the environment.

The simple reason that waste reduction has become such a concern now is that the cost of landfills and other waste disposal methods have gone up rapidly in recent years. Out of concern for human health, the EPA has set stricter standards on landfill design to reduce the environmental threat to groundwater supplies. Likewise, stricter air pollution control laws make it much more expensive to incinerate solid waste today than it was twenty or thirty years ago. In addition, greater public concern for the environment, new requirements for public participation and the decreasing supply of suitable land near urban areas have made it much more difficult for many communities to site a landfill or an incinerator. As a result, the community will want to minimize the amount of waste that has to be handled in costly disposal methods.

Other reasons for waste reduction are somewhat less emphasized but may be equally important. Waste reduction can conserve virgin resources (such as trees and petroleum) and reduce the environmental impacts associated with resource extraction activities (such as mining). It can improve efficiency in manufacturing, retailing, and other human organizations (particularly in the case of source reduction). Sometimes waste reduction leads to other benefits such as job creation or community empowerment.

Not all waste reduction is necessarily desirable or even beneficial from the standpoint of the "total environment." Collecting recyclable materials, processing them, and transporting them to end users may result in a negative net impact on the environment as a whole due to the quantity of fuel used in the recycling process. For instance, glass milk bottles are easier to recycle than plastic but much heavier to transport to markets and return for reuse. Eliminating certain food packaging may create more of a health risk (through food poisoning) than would be created through the manufacture and disposal of the packaging. The net costs of any waste reduction activity change through time as markets, public opinion, technology, and the environment change. The national push to reduce waste may be founded less upon rational measurement than upon a moral position based upon our culture's "love of the land." At any rate, a community developing a plan for waste reduction should know whether it is doing so simply to meet legal mandates, or whether it has other rational or moral reasons for reducing its waste.

How Much Waste Reduction Is Possible?

Intensive efforts to promote and create an infrastructure for waste reduction can lead to surprisingly large diversions of waste from disposal. As of spring 1992, New Jersey had achieved a statewide reduction of more than 25% (the goal it targeted in 1987) and had revised its waste reduction goal to 60% (placing more emphasis upon source reduction and reuse). This accomplishment was achieved by creating a landfill tax of $.12 per cubic yard to fund grants, loans, public education, and essential administrative costs; by involving all sectors of government, industry, media, schools and community organizations; and by making the minimum 25% recycling rate mandatory.[1] In some areas, such as the town of Belmar, citizens' garbage is not collected if it contains recyclables and they can be issued a summons for failing to recycle.[2]

To be sure, New Jersey's situation is different from Durham's. The state is in closer proximity to recycling markets; and municipalities have been given strong backing from the state to develop recycling programs. Still, the fact that the New Jersey governor's task force on recycling sees 60% reduction by the year 2000 as an achievable goal shows that source reduction, reuse, and recycling may have more potential than most in North Carolina have imagined. Durham's maximum potential for waste reduction cannot be determined accurately because it depends upon

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1 Regina Desvernine, "What Motivates People to Recycle?" Proceedings of Second U.S. Conference on Municipal Solid Waste Management, p. 517-520.

2 Aletha Spang, "Recycling Never Takes a Vacation" Proceedings of Second U.S. Conference on Municipal Solid Waste Management, p. 373.

several factors which are still unclear. Levels of waste flow control, environmental regulations, financial capabilities, markets for materials, and public and political acceptance are still developing. To cite a few examples, it is still unclear whether the state will decide that cardboard is eligible for composting; what refinements in mixed-waste composting with sludge are possible to create a better product; what the penalties will be for failure to achieve mandated reduction goals; or whether processors of paper feedstock will locate closer to the Triangle area.

Despite the uncertainty of the future, an examination of the most recent waste stream composition analysis in Durham suggests that a great deal more than is currently recycled could be diverted from the waste stream. The most recent waste stream analysis for the Durham Sanitary Landfill examined the commercial and residential waste streams for the county over a one-year period (1990).[3] (The composition of the waste stream that is landfilled is likely to have changed since 1990 because of increases in recycling rates and institution of the earth products collection program and earth products ban.)

The 1990 study showed that some fractions of the waste stream are ripe for immediate recycling and others could conceivably become feasible for recycling in the near future, as markets develop. For example, corrugated cardboard/kraft constituted 18.8% of the commercial waste stream, 23.4% of the industrial and 9.5% of the residential. Adjusting for the relative proportions of commercial, industrial and residential waste, corrugated cardboard/kraft accounted for approximately 17% of Durham's total waste stream in 1990. Ensuring that cardboard collection was available to all residents and businesses, with a 67% rate of participation, would create a waste reduction of approximately 10% -- 1/4 of Durham's overall reduction goal, achieved in "one fell swoop."

Other segments of the waste stream might be removed through source reduction and reuse. Office and computer paper make up 5.4% of the commercial waste stream; an aggressive campaign to promote the use of two-sided copies and to minimize unnecessary printouts might conceivable produce a 1.5% or greater reduction in this segment (even without recycling). Lumber and wood constituted 2.9% of residential and 3.4% of commercial waste. Promotion of lumber and wood exchange-and-reuse activities conceivably could generate a 1% or greater reduction in wood and lumber disposal rates.

The present-day waste stream is only a starting point for estimating waste reduction potential. With large markets such as California, New Jersey, and New York City aggressively pushing for changes in production and packaging to encourage recycling and source reduction, it can be expected that the kinds of materials coming into Durham in ten years will have less packaging, and be more conducive to recycling. Likewise, given the statewide push for waste reduction, it can be hoped that more end users for recycled materials will locate in closer proximity to the Triangle.

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[3] SCS Engineers, Final Report, Waste Composition Analysis for Orange and Durham Counties, North Carolina, March 1991.

It seems unlikely that the full 40% reduction will be achieved solely through recycling. Market development in North Carolina will lag significantly behind that in areas with greater urban concentrations. Additionally, some researchers have suggested that -- based upon the experiences of states further along in recycling efforts -- exclusive reliance upon source separation programs (in which the resident or business separates materials for recycling) usually has difficulty moving beyond a 30% reduction level.[4] Other recycling technologies, such as mixed-waste recovery facilities, are more expensive to operate and produce a less marketable material.

Based upon these observations, this report sets a starting goal of 25% reduction through recycling/composting and 15% reduction through source reduction. While the Department sees these goals as achievable, we emphasize that they are only a preliminary estimate, and that a new and more thorough study of Durham waste composition must be conducted.

Source Reduction (and Reuse)

Source reduction, once regarded as merely a "good idea," must become a key component of any solid waste management plan. Unfortunately, few communities have progressed far enough with source reduction to serve as models in this area. When the state office of Waste Reduction surveyed local governments several reported source reduction activities; but all of these activities turned out to be recycling programs.

The newness of source reduction as an organized governmental pursuit means that Durham, with few precedents from which to draw, has the freedom to choose the philosophy and the core initiatives for its program. These choices should reflect the unique characteristics of the community and take into account the city's overall mission, its economic health, and its responsibilities for meeting state and federal mandates.

A child's riddle illustrates the unusual nature of source reduction as an area of governmental pursuit:

Q. What gets bigger the more you take away from it?
A. A hole.

Source reduction, unlike most activities, does not produce any measurable products -- in fact, it results in the elimination of products. Therefore, source reduction is an elusive thing, hard to teach and even more difficult to measure.

On the other hand, source reduction is a traditional human way of maximizing the benefits of materials found in the environment. For example, Plains Indians were widely noted for their ability to put all parts of a buffalo to use, thus conserving resources and increasing the benefits of a successful hunt. Similarly, farmers in the piedmont have traditionally used "everything from

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[4] John F. Williams and Jeremy K. O'Brien, "Calculating a Community's Maximum Recycling Potential." Proceedings, Second U.S. Conference on Municipal Solid Waste Management, p. 43.

a hog but the squeal." For a materialistic society, source reduction appears at first glance to be a hardship, a process of subtraction -- making copies on both sides, buying in bulk, avoiding the use of paper and plastic food utensils, etc. But source reduction can be viewed positively instead if consumers begin to think in terms of "maximum efficient use of resources." Companies that have begun to pursue source reduction with vigor recognize that source reduction -- elimination of waste -- is not a hardship but rather a way of enhancing productivity and profitability. Source reduction is more profitable than recycling for the individual since it eliminates the need for purchasing a material in the first place rather than merely eliminating disposal costs for a material.

Locally, corporations such as IBM have demonstrated leadership in source reduction activities. IBM's corporate definition for packaging source reduction is as follows: "Maximum source reduction occurs when the least amount of resources are consumed for the life of the product or program." IBM has generated cost savings of up to $1,000,000 on individual projects to design reusable containers for shipment of components and products.[5] Likewise, IBM's push to use electronic inter-office communication has created major reductions in the paper waste output of its facilities in Research Triangle Park.

Large-scale progress in source reduction by a community could have two major impacts: on the one hand, consumers, businesses, and institutions would achieve greater productivity and efficiency; on the other hand, some members of the labor force might be displaced due to reductions in demand for packaging, disposable products, and even garbage collection!

Effective source reduction is a process requiring ongoing exchange of information and ideas among businesses, consumers, and government. Over time Durham can develop an approach to source reduction tailored to its own needs and reflecting an ongoing dialogue among government, citizens, businesses, and institutions. Meetings held in January and February, summarized below, represent an early phase of that dialogue.

Identifying Needs

Community Advisory Group The input of the Community Advisory Group is a useful starting point for gauging the community's desires and interests in regard to source reduction. In a meeting held in January, the group -- including small business owners, larger industry representatives, private residence citizens, and environmental advocates -- generated a variety of specific proposals for source reduction. (Appendix B contains a summary of this and other advisory group meetings.)

The advisory group emphasized the importance of pursuing source reduction on two distinct levels: (1) the individual consumer/citizen/taxpayer; and (2) the manager or corporate decision maker who has the power to change an organization's policies. (Smaller businesses tend to fall

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[5] Allen Perry, "Source Reduction." Proceedings, Second U.S. Conference on Municipal Solid Waste Management, p. 419.

somewhere in between these two levels.)

The general themes expressed by the group included:

> Education can have a strong impact and has not been effectively pursued. Many people still do not take source reduction seriously and consider it a hobby or game that they can choose to play or not. One-to-one contact is the best way to encourage the behavior changes necessary for source reduction. Schools should be a primary target for coordinated educational efforts and should be audited in the same way as businesses.
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> Consumers will begin to change behavior when information and encouragement reach them through a wider variety of media and on a non-stop, frequent basis. Community-wide tracking of source reduction performance, tied to gentle "threats" of billing, bans, or mandatory recycling, can increase source reduction and recycling through a "carrot-and-stick' approach. Positive incentives such as deposits on containers also can change consumer behavior.
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> One large company with a strong source reduction program can have as great an effect as many individual consumers. Businesses are interested in source reduction because it can improve efficiency and generate a more positive corporate image. They would be willing to invest in solid waste audits if they could be reasonably assured of achieving cost savings or greater market share. The greatest barrier to current industry involvement in source reduction is lack of technical expertise.
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> Standards for source reduction policies in the private sector should be set by a non-governmental organization. This group should also choose award-winners and grant "seals of approval" to businesses, schools, and institutions that meet standards.

SunShares SunShares currently is contracted by the city to provide source reduction education. The Sanitation Department asked SunShares to provide ideas for the city's source reduction policy (see Appendix B). SunShares staff emphasized the following general principles:

> Reach children. Education of children is a way to influence the business and residential sectors simultaneously, since children will grow up to function in both households and businesses.
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> Make source reduction easy and convenient whenever possible. Ease and convenience are the most important factors influencing the extent of participation.
>
> One-on-one education is the best way to create voluntary changes in behavior.
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> The quality of leadership on source reduction issues will influence how quickly the community moves forward.

Source reduction efforts should be designed, wherever possible, to be of economic benefit for the local community.

Flexibility is essential in planning a solid waste management system. The transfer station fits in with this principle by giving the city flexibility to redirect wastes away from disposal as new alternatives arise.

Sanitation department employees particularly stress the need for more efforts to reduce waste generation in the commercial sector. Overall, they favor an expansion of education and technical assistance, with the possible addition in time of regulatory measures such as bans on the introduction of specific materials into the landfill. In addition, employees stress that the city should advocate changes at the regional, state, and national level that will complement and strengthen its own initiatives.

Specific ideas include:

Increased efforts to educate the public through television and demonstrations at shopping malls

Use of waste audits to assist businesses with source reduction

Requirements that businesses generate periodic reports on waste production and waste reduction

Coordination of local initiatives with regional efforts to prevent negative economic impacts on the community

Lobbying of state and federal government for legislation supporting source reduction, such as packaging requirements or requirements that businesses accept used packaging of their products

Projected Trends

The degree of source reduction in Durham over the next ten years will be affected greatly by changes in the national economy, technology, federal regulations, and consumer spending patterns. Nevertheless the Department believes it is important that the city move forward and aggressively promote source reduction, particularly in the business sector.

The city's plan should be realistic about the "unknowns" affecting source reduction and should be flexible enough to adapt to changing circumstances. At the same time, city policy and leadership is capable of influencing national conditions in small but significant ways (through purchasing policies, for example, or through policies that enable consumers to send messages about source reduction back to manufacturers).

Goals

1. **To make source reduction the preferred form of solid waste management in the Durham community.** The state's hierarchy of solid waste management activities places priority upon source reduction, primarily because source reduction eliminates all costs of collection and processing or disposal. This plan proposes that source reduction be given a prominent and integrated role in Durham's solid waste management for the first time. Source reduction will reduce the community's public and private disposal costs, thereby allowing more dollars to be reinvested in the community.

2. **To achieve a 15% per capita reduction of waste through source reduction by 2001.** The goal of 15% is based upon the best available data for Durham's commercial and residential solid waste stream, and should be revised upward if possible as better data is collected. In the commercial sector, we estimate reductions in office/computer paper (1.5%), corrugated cardboard (4.5%), lumber/wood (1%), food waste (4%), and other paper (4.5%), along with a 1% reduction due to improvements in product and equipment durability, a 1% reduction from other sources combined, and a 0.5% reduction resulting from the use of approximately 12% less plastic garbage bags. This 17.5% reduction in the commercial sector, combined with residential source reductions of 10%, would lead to an overall reduction at the source of approximately 15%.

3. **To maximize the use of source reduction strategies that create economic benefits within the Durham community.** Source reduction can and should be integrated with the community's economic development goals and aggressively promoted as a way to make Durham businesses more competitive. The results of past and present source reduction programs should be assessed to determine the cost savings generated by the source reduction. This data can be used to "sell" source reduction to Durham businesses.

Objectives

1. To establish, by July 1, 1994, a comprehensive waste reduction education program that places priority upon source reduction before recycling and uses targeted information to reach all sectors of the community, including children.

2. To set goals for the 125 largest waste generators to reduce waste through source reduction (see recycling objectives) and maintain contact until 90% of generators achieve those goals.

3. To measure the impacts and costs of source-reduction programs.

4. To provide recognition to outstanding source-reducing individuals, agencies, businesses, schools, and other institutions; and to foster the exchange of ideas for source reduction.

5. To integrate source reduction into the city's internal waste reduction policy (see recycling

objectives).

Management Options

The World Wildlife Fund[6] has suggested that source reduction strategies fall into three general categories:

1) education/ voluntary/recognition programs
2) economic incentives and disincentives
3) administrative/regulatory actions.

We found this distinction to be a useful starting point for discussions of potential strategies.

Following are brief descriptions of the options suggested by our study. These options were those most often favored by the groups consulted. Evaluation is particularly difficult in the case of source reduction because few local governments have established large-scale programs or demonstrated measurable results.

The Financing section of this report recommends that a pilot project with careful evaluation of cost and impact be used before full-scale implementation of any program. Source reduction programs are an area in which the pilot-project approach will be particularly valuable.

Education/Voluntary/Recognition Programs These kinds of programs are designed to "address gaps in knowledge or awareness that could otherwise encourage source reduction behavior by individuals or manufacturers."[7] Educational programs require the lowest degree of intervention but also may tend to have the lowest impact upon behavior. They include:

- ◊ School curricula
- ◊ Information outreach through the media, seminars, other instruction and training opportunities, shopper awareness campaigns, or data dissemination
- ◊ Voluntary goals and standards for source reduction
- ◊ Awards programs
- ◊ Waste audits
- ◊ Services that promote waste reduction

Source reduction/reuse education is most cost-effective when combined with recycling/composting education in an integrated program. The Education section of this report discusses the need for an integrated solid waste education strategy, describes options in more detail, and recommends a tentative plan for solid waste education.

Economic Incentives or Disincentives In addition to education programs, economic incentives and/or disincentives are often considered as strong motivators in changing behavior and

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[6] World Wildlife Fund, Getting at the Source, p. 56.

[7] World Wildlife Fund, Getting at the Source, p. 59.

encouraging source reduction. Taxes, fees and credits along with direct subsidies are the primary means of providing economic incentives to change waste generation, disposal and purchasing habits.

Taxes, fees and credits can be applied to three different areas which include activities, products and materials. Examples of activities that can have an economic impact include unit pricing for household waste disposal, full cost landfill fees, surcharges on easily recyclable materials, and tax credits for businesses that have measurable source reduction programs. There has been a strong emphasis in the input from local interested groups that the current City policy of providing two free pickups for businesses and no special business recycling programs does not give a consistent message to these businesses.

Measures such as a waste tax to cover disposal, special waste taxes (such as the state imposed 1% tire disposal tax) on products that are difficult to dispose of, deposits on returnable items, and tax rebates to makers of returnable and reusable products are options that can be considered on market products.

Taxes or fees on virgin materials or all raw materials may promote source reduction. Special taxes on toxic materials call attention to the benefits of low toxicity manufacturing processes.

The other side of the coin involves providing subsidies to businesses and individuals in their efforts to promote, initiate and maintain source reduction practices. These subsidies could range from research grants, pilot projects, individual rebates for bringing own bags, low-interest loans and business and manufacturing financial assistance.

Many of these economic incentives are not practical or possible for local governments to establish. The most common of these that are used by municipal governments include unit based disposal fees for residential solid waste, no free disposal for businesses, full cost accounting in landfill tipping fees, landfill surcharges, subsidies, and providing source reduction materials such as compost bins, coffee mugs and shopping bags. Other creative incentives and motivational tools could be encouraged from the public.

Administrative/Regulatory Actions Aside from the first two listed below, these programs require a high degree of government intervention but tend to have the largest guarantee of generating reductions in waste stream tonnage or toxicity. In general, the ease of implementation of these programs is increased when they have been preceded by effective educational programs and economic incentives.

The city could work with other localities to push for legislation (e.g. to change packaging requirements or require manufacturers to take back packaging).

The city could (and should) change its own policies in purchasing, communication, and other areas to promote source reduction as a prerequisite for mandating actions on the part of residents or businesses. A city policy can have an educational impact.

One regulatory change would be to require businesses to describe their source reduction/recycling program at the time of application for a new or renewed business license. Such a regulation would have to be designed so that it did not infringe upon the constitutional rights of the business. The impact of this program would be primarily educational, since it would be difficult to "enforce" a business's compliance with its source reduction program.

Another option is to make solid waste audits mandatory for selected businesses or for all businesses. The audits could be repeated on a periodic basis. Businesses would be assured of confidentiality in regard to their production processes. Their inputs, processes, and outputs would be assessed to determine opportunities for source reduction, and they would be informed of potential buyers of recyclables or reusables. The business would prepare a comprehensive source and waste reduction program to be placed on file with the city.

Finally, the city could ban additional materials from disposal in the sanitary landfill. Primarily such an action would promote additional recycling, but it might promote source reduction as well. Banned materials could include, but not be limited to, newspaper, aluminum cans, steel cans, HDPE and PET plastic, selected glass containers, cardboard tubes, corrugated cardboard, and metal coat hangers (all currently banned from the Alamance County landfill effective July 1992).

Tentative Plan for Source Reduction

Rationale Durham's source reduction policies should agree with the city's mission of providing cost-effective service with integrity and friendliness, should take economic impacts into consideration, and should be comprehensive enough to achieve their intended goal. We believe that a carefully designed source reduction program can be of environmental and economic benefit for the community.

We emphasize here, as in the Financing section, that a more detailed understanding of Durham's waste stream is needed in order to design an optimal source reduction strategy. Our goal of targeting the largest waste generators for solid waste audits not only serves as an educational tool but also provides an excellent source of data about the Durham waste stream.

In the short term we recommend pilot projects in education, recognition, and voluntary programs (including waste audits) as a starting point for source reduction. Our recommended educational strategy is discussed in more detail in the Education section of this report. The only full-scale program we recommend at this point is an effort to target school-age children for intensive source reduction and recycling education. (Such an effort may be partially or completely funded by the state.) Other pilot projects should be evaluated and either scuttled, maintained, or broadened based upon their impact. Programs that can be accomplished by private for-profit or non-profit enterprises, including waste audits, should be favored wherever possible.

Timetable

Year 1	Development of city policy on source reduction
	Creation and dissemination of community-wide source reduction philosophy
	Fostering private sponsorship of awards program for businesses
	Advice to consumers for reducing unwanted promotional mail
	Contact with state board of education and with school system to develop source reduction education for all students in a targeted age group
	Pilot testing of various educational programs
	Pilot testing of voluntary solid waste audit program, tied to resource exchange database and business license process.
	25 largest waste generators receive free waste audit from city
	Exploration of low-cost media outreach opportunities, in cooperation with other jurisdictions
Year 2	Data collection on solid waste stream by sector (see Finance section)
	Next 100 largest waste generators receive free waste audit from city
	Comprehensive school outreach begins
	Continuing pilot testing and evaluation of educational and voluntary programs
Year 3	Study of equitable alternatives for charges on waste
	Comprehensive media campaign begins (coordinated with other jurisdictions)
	Effective pilot projects expanded in scope if necessary
Year 4	(Depending upon progress toward waste reduction goals)
	Establishment of equitable, volume or weight-based charges for solid waste generation/collection (nominal charges)

Training of city collectors to assist residents with source reduction

Solid waste audits made mandatory for businesses

Year 5 — Lobbying efforts at state or national level

Continuing evaluation of progress toward mandated goals

Years 5-10 (depending upon progress toward goals)

Increases in solid waste charges

Bans on landfilling of selected materials

Privatization of profitable activities such as solid waste audits, reuse information exchange, etc.

Reduction in media outreach efforts, if necessary

Year 10 and beyond — Setting of new goals

Phase-out of media outreach

Maintenance of school outreach program for an additional ten years

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Household Hazardous Wastes

According to the 1990 waste composition analysis, household hazardous waste constitutes approximately 0.5% of the Durham County waste stream. From an environmental standpoint, household hazardous wastes have not been given the attention that they deserve. Tonnage costs more than toxicity in the short run and therefore gets more attention, but toxicity is of more concern in the long run. The city needs to look closely at its current household hazardous waste program and determine what kinds of changes would be needed to make it effective in keeping more household hazardous materials out of the landfill.

In the absence of a more careful look at the household hazardous waste program, two general observations can be made (based upon input from the community advisory group): 1) the collection program should be made more frequent and convenient for residents; and 2) more education is needed about the types of hazardous materials, their long-term impact on the environment, and ways of limiting their use. One approach favored by the advisory group is "point-of-purchase" education, in which retailers and vendors of hazardous materials assist in the dissemination of information.

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RECYCLING AND COMPOSTING

This section of the plan addresses recycling and composting. Combined with source reduction and reuse, these complete the community's waste reduction activities.

Collection of recyclables is not addressed in detail in this section. Collection programs should be integrated with goals for waste reduction, solid waste disposal, financing, and even education. We examine collection issues in a separate section in order to emphasize how collection arrangements can be integrated with other elements of solid waste management.

RECYCLING

Recycling is the most emphasized and, arguably, the most popular form of waste reduction currently in the U.S. Popularity, of course, does not necessarily make for success in recycling programs. In fact, the opposite can sometimes be the case: the dramatic increase in the number of recycling programs around the country in the past three years has led to an oversupply of some recyclables in some areas. High participation rates are to be encouraged, but without end users to take recyclables and turn them into new products, the recycling process is not complete.

Despite short-term setbacks in recycling, most policy makers remain confident that recycling can divert a significant quantity of solid waste from landfill disposal. The first hurdles have been crossed, as the public has become prepared to embrace recycling, and as governments and private handlers have become familiar with the behavior of markets, the needs of end-users, and the means of collecting and processing recyclables. Some areas of the country where there is a scarcity of landfill space are moving into a second and more intense phase of recycling (see the discussion on New Jersey in the beginning of the Source Reduction section).

As North Carolina cities go, Durham is one of the most advanced in its development of a recycling infrastructure. Besides the city and its contracted recycling handlers (SunShares, and BFI for some commercial cardboard), there are several private businesses in the city and county involved in picking up, processing, or purchasing selected recyclable materials ranging from office paper to scrap metal. Handling, processing, storage, purchase, and markets for recyclables in Durham were described in detail in the 1992 report, "The Status of Solid Waste Management in Durham." Appendix A contains the report.

Whether Durham will be able to intensify its recycling infrastructure significantly remains to be seen. There is room for improvement in awareness and participation rates, and there is at least one material -- corrugated cardboard -- that is ripe for more comprehensive collection arrangements. Certainly several more percentage points of waste reduction can be gained through recycling. But the key to establishing an intensive recycling community -- in Durham as anywhere -- will be the creation of stable markets, preferably through the attraction of processors and end-users to Durham or the surrounding area.

A recent report by the North Carolina Department of Economic and Community Development

concluded that the outlook is not so rosy for the development of new end-uses for recyclables within North Carolina.[8] For the most part, market growth for recyclables in the near future will be a result of improved processing rather than development of new capacity. Aluminum is the most successful market and may soon reach its maximum recycling potential. Improved processing can reduce the contamination of post-consumer glass and plastics and make these more marketable; however the costs of collection and transportation of these materials will remain high. Demand for the largest segment of the paper stream, mixed paper, is extremely low and is not likely to improve in the near future. The market for steel cans could improve if enough municipalities begin collecting steel cans to convince a processor to locate in the state.

It appears, then, that the greatest room for recycling growth in Durham lies primarily in increasing participation rates for recyclables that currently have strong markets. The input of community advisory group members suggests that awareness, convenience, and establishment of collection systems are the best ways to increase recycling participation. Accordingly, the city's recycling strategy should focus on education and on improvement of recycling convenience, with provision of collection where necessary.

At the same time, the city should continue efforts to foster the creation of new markets, particularly those that would generate jobs and/or economic benefits within Durham.

Durham has been and should continue to be a North Carolina leader in recycling. As the city continues to expand recycling in all sectors, it should be realistic about the costs and benefits of recycling programs. The goals and objectives outlined here are designed to maximize the benefits of recycling and minimize the negative impacts.

Goals

1. To focus on recycling those materials that cannot be removed from the waste stream through reduction at the source.

2. To develop recycling programs and policies that involve all waste generators in the community according to their waste generation patterns.

3. To create, wherever possible and desirable, five conditions for recycling: markets, awareness, convenience, collection systems, and incentives.

4. To achieve a 25% diversion of waste per capita through recycling by July 1, 2001.

5. To maximize the use of recycling strategies that create economic benefits within the community.

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[8] North Carolina Recycling and Solid Waste Management Plan, Volume 1, p. 3-17.

Objectives

1. To establish a comprehensive source reduction and waste reduction policy for city departments, employees, and contractors.

2. To develop an accurate system for measuring waste generation, waste reduction, and recycling rates among all relevant sectors of the community:

    1) county and city retailers;
    2) county and city food service providers;
    3) county and city office-related businesses;
    4) county and city light industry, maintenance, and landscaping businesses;
    5) local governments, schools, and universities;
    6) health care facilities;
    7) county and city manufacturers;
    8) city residents;
    9) county residents;
    10) any other meaningful groupings or subgroupings.

3. To set achievable recycling goals for each of these groups, to be revised if necessary on an annual basis (see objective #10 below).

4. To establish and maintain a list of known recyclable materials currently in the community and the generators' perceived barriers to participation.

5. To foster the interchange and dissemination of information and awareness about recycling options among all members of the community, such that by January 1, 1997, 90% report some personal recycling activity either on the job or at home and show a basic awareness of the recycling opportunities available to them.

6. To participate in regional efforts to spur market creation.

7. To identify and aggressively target the twenty-five largest waste generators to encourage establishment of comprehensive waste reduction programs (emphasizing source reduction and reuse before recycling).

8. To update and/or revisit these waste generators on an annual basis in order to encourage maintenance of waste reduction systems; to evaluate and expand programs if effective; and to publicize and award highly successful programs.

9. To expand, consolidate, reorganize, or privatize collection arrangements whenever such changes in collection can achieve greater efficiencies without decreasing the stability of the market for the affected materials.

10. To measure annual local waste generation, reduction and recycling activity.

11. To complete a study of the potential costs and benefits of additional economic incentives or disposal bans that would encourage recycling or other waste reduction.

12. To approve, if necessary, economic incentives or disposal bans in order to meet goals for recycling.

Identifying Needs

Waste Reduction The over-riding need of the community is increased waste reduction. As of January 1993, the greater Durham community (city and county) had achieved a 13% reduction in waste from base year levels. A 25% reduction is mandated by July 1, 1993 and a 40% reduction by 2001.

Little has been documented about the proportion of waste reduction that reasonably can be achieved through a source reduction strategy.

How much waste reduction should be taken care of by recycling? A reasonable starting point for goal-setting in source reduction/reuse has been established as 15%. Thus a goal of 25% reduction by 2001 should be set for recycling and composting. With recycling and composting now accounting for 7% of the current waste reduction total, a gain of an additional 18 percentage points is needed over the next eight years.

Data Collection A second need (emphasized by community advisory group members) is the collection of more accurate and detailed data on recycling. Such information is a prerequisite to the design of recycling strategies with strong returns on investment. "Detailed data" means data grouped according to types of businesses, institutions, and residences that share similar waste generation patterns. The current and potential levels of recycling activity from each generating group can thus be estimated. This information will be useful for fostering market creation as well for allocating costs (if economic incentives are used to spur recycling).

Expansion in Recycling Rates for Specific Materials A list of the major materials that are being recycled in Durham today includes:

Glass
Aluminum
Steel/Bimetal
Newspaper
White paper/Office paper
Mixed paper (magazines)
Cardboard
Mixed plastics (Nos. 1-6)

Observation by solid waste collectors and by the commercial waste reduction officer indicates that there is room for expansion in the volume collected of many of these materials. For example, within the commercial sector, a great deal of cardboard gets thrown away that could be recycled right now. Additionally, businesses throw away large quantities of mixed paper and white paper.

Among residences, there are possibilities for expansion in curbside recyclables to include all mixed plastics, mixed paper, white paper, and cardboard.

Expansion in the Range of Recyclable Materials The city should remain open to the possibility of recycling additional materials as markets, packaging, and technology evolve. Not to be forgotten are construction and demolition recyclables such as wooden pallets and lumber. There is a need for ongoing research and development in this area.

Evaluating Options

Recycling has great popular appeal as a solid waste management technique. It has been said that in past few years recycling has become "as American as apple pie." From the standpoint of the local government, however, recycling needs to be pursued enthusiastically yet wisely. Because the field is so new and because operational costs can be so high, the mix of recycling programs must be chosen carefully and adjusted to fit the community's needs.

Management Options

Recycling markets fluctuate almost on a daily basis. It is difficult to make long-term plans for recycling, because the current level of knowledge about waste generation in the Durham community is not sufficient to make an adequate assessment of the future benefits of various materials and recovery programs.

In the short term the city can choose from two broad options in regard to its recycling programs: (1) it can seek to expand recycling through whatever means necessary as quickly as possible; or 2) it can seek to limit recycling expansion to those materials/programs that generate a relatively high return (in terms of waste reduction) on the city's investment. Philosophically, these two options differ on the question of whether cost considerations or waste reduction should take primacy in the city design of recycling programs.

In addition, the city can continue to expand its educational activities for residents, carried out through the SunShares contract and in public information from the Sanitation Department, and can pursue other activities designed to improve recycling participation under the current recycling system.

The state solid waste management plan recognizes the challenge of designing recycling programs: "Developing and implementing recycling programs is always a time-consuming and sometimes

costly endeavor".[9] Based upon suggestions in the state plan, this report recommends that the city use the following seven criteria to establish priorities for recycling options:

1) Tonnage diversion potential. Those materials most prevalent in the waste stream and with the highest likely recovery percentages can make the greatest impact on the waste stream.

2) Environmental/health risk reduction. Some recycling programs have exceptionally high value in reducing the toxicity of the waste stream destined for disposal and the hazards associated with its management.

3) Ease of implementation. Programs requiring less lead time, effort, and degree of unique or specialized skills (or programs that complement existing programs well) can achieve their intended impact sooner and with less cost.

4) Technology performance track record. New approaches, such as the composting of mixed solid wastes, do not have the same guarantee of success as programs that have been tried and tested in other localities.

5) Public demand. The recovery rate is likely to be greater if the public already has expressed a strong interest in a specific program prior to its implementation.

6) Resource requirements. It is important to consider the cost of a potential program (additional staffing, equipment, operational costs, educational activities, and/or facilities) in relation to its waste reduction benefits.

7) Availability of markets. Some recycling programs may not be feasible because there are no end users for the material within marketing distance.

8) Presence of end users for new programming. New programming needs end users for the services it provides in order to be successful.

Potential Programs

Given these criteria, it seems that it would be unwise for the city to expand recycling infrastructure rapidly without the ability to make informed decisions. We recommend that the city choose to expand the recycling program incrementally, while enhancing general levels of awareness about waste reduction. The former activity will bring some movement toward state-mandated goals; the latter will lay the groundwork for the introduction of an integrated waste reduction strategy.

Department staff have estimated that a significant proportion of commercial cardboard could be

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[9] North Carolina Recycling and Solid Waste Management Plan, Volume III, p. 4-21.

recovered by subsidizing the cost of cardboard container rental for businesses in the city and by using existing departmental trailers and equipment to collect cardboard from businesses that do not have space for a cardboard container.

Residential cardboard could also be recovered with minimal cost to the city by arranging cardboard collection days during off-peak times for earth products collection and utilizing earth products crews to carry out the service.

One barrier, besides contamination, to curbside collection of mixed plastics #3-6 is location of stable markets for the materials. Existing equipment, with modification, could handle the collection of these materials. However, a stable long term market must be available before collection is financially reasonable to provide.

Incremental changes to the recycling system can also include scaling back or eliminating some functions. The chapter on collection includes a recommendation that earth products vehicles and crews be used half-time for other collection and education activities during non-peak collection periods.

Priority ancillary programs to be pursued in the short term include education, waste audits with volunteer staff, business and commercial site plan process changes, and data collection.

It is believed that the state will be designing a curriculum for solid waste education. Educational coordinators, whether city employees or otherwise, should be charged with achieving measurable gains in awareness and knowledge among the targeted population. Community advisory group opinion favors placing strong emphasis on education of children.

Waste audits of businesses would fulfill the objective of reaching the largest waste generators and would assist in waste stream data collection and in establishment of a recyclables database.

Site plan process changes would add the stipulation that sites be designed to allow room for on-site recycling -- a routine check for recycling capability would be added to the building permit review process.

Data collection and analysis would fulfill several of the objectives related to study of the waste stream.

Tentative Schedule for Recycling Strategy

Year 1	Enhancement of commercial cardboard collection program
	Institution of new site plan process
	Identification of major sectors of waste generators and setting of waste reduction goals for each group (to be revised annually)

	Waste audits of 25 largest waste generators
Year 2	Enhancement of residential cardboard and mixed plastic programs
	Year of initial detailed measurement of waste generation/reduction activity in community
	Establishment of inventory of recyclable materials
Year 3	Design and approval of integrated, equitable recycling program
	Additional enhancements to recycling programs as desirable
Year 4	Phase-in of integrated recycling program begins, with possibility of economic incentives through a financing mechanism
	Attainment of 90% awareness goal
Year 5	Revision of community recycling goal if necessary
	Changes in recycling program linked to changes in community recycling goal

COMPOSTING

Composting involves the degradation of organic materials into an important soil amendment that assists in the natural balance of the plant cycle. Technically, composting can be considered a form of recycling, since the components of materials (primarily nitrogen and carbon) are processed and provided to "end users" (growing plants). However, composting is very different from most other recycling, which involves manufacturing processes. In essence, composting is a technique of accelerating the natural process of decay.

Current state regulations ban yard trash (locally referred to as Earth Products) from disposal in a sanitary landfill so that the composting of this material is a reasonable alternative for disposal. To a lesser but increasing extent Durham residents and businesses are engaging in "backyard composting" -- a more efficient system since it eliminates the need for collection and mechanized composting processes.

North Carolina's ban on yard trash in sanitary landfills has resulted in increased responsibility on the local government level for addressing issues such as separate collection, special drop-off facilities, and public education. Haulers share their concern for being placed in the "enforcement" role for a rule and situation over which they have no control. The Department still has some concern about the proper disposal location of earth products that are very contaminated with regular garbage and garbage that contains a great deal of earth products.

Over the next ten years it may be possible to expand the scope of composting activities to include other organic materials such as paper and food waste. This section of the report briefly describes the status of the current composting programs and discusses possible future developments in composting.

(As with the recycling section, this section does not discuss collection issues in detail. See the Collection section for discussion of earth products collection.)

Current Composting Programs

Earth Products (Yard Waste) Composting

The City of Durham obtained a permit from the state for earth products composting in December 1991. The Sanitation Department began a separate collection for earth products in February 1992. The change in collection accomplished two objectives; to prepare the citizens for the January 1993 ban of yard waste from the landfill, and to reduce our waste stream going to the landfill. The City has used low level technology to begin transforming the earth products collected from the curb to a compost product ready to return to the earth. During 1992, the collected earth products were formed into windrows, shredded by a contractor and turned periodically to accelerate the natural decomposition process. The resulting product is a quality material that would be much more marketable if it were screened. Efforts to interest local landscapers in buying the product in bulk have had only limited results. There is a lot of interest from the public in the compost but they want it delivered. Recent budget concerns have resulted in the general concern that in order to justify the purchase of a screen there must be an increased demand for the product. Without the assurance of a market ahead of time, further capital investment is considered risky.

The City Parks and Recreation Department has used the compost in the landscaping projects done for the City. The landfill can use some of the compost in the final seeding of the landfill and borrow area. Because of this, there is no immediate concern that a compost market is critical. This is a material that may have a revenue potential if equipment and marketing was provided. Whether the cost of preparation and marketing would be less than the revenue is questionable at this time. There seems to be a lot of interest in the use of compost by citizens, but if and how much people are willing to pay for compost is not certain.

Backyard Composting

The City has promoted backyard composting by including it in the contract with Sun Shares. The previous year included the following backyard composting educational activities:

- ◊ Establishment of three demonstration sites: West Point on the Eno Park, N C Museum of Life and Science and Sun Shares

- ◊ Classes on composting provided for NC Cooperative Extension Service Master Gardeners, who conduct free public workshops twice each month
- ◊ Backyard composting training given to City Earth Products Crews
- ◊ Composting and Vermicomposting flyers distributed broadly throughout the community
- ◊ Manual written for use at Composting Workshops
- ◊ Compost database established via public and block leader survey, with special mail notifications addressed to this group
- ◊ Slide show on backyard composting obtained from Cornell University
- ◊ Participation in regional compost fair in RTP
- ◊ Compost units provided to City for four Clean-Up Days
- ◊ Traveling Wormbox to schools, agencies, fairs, festivals and events
- ◊ Feature article, *Adventures*, the NC Museum of Life and Science Newsletter
- ◊ Articles (2) in Herald Sun Newspaper by Cooperative Extension agent Carl Matyac

There are many benefits from home composting for both the homeowner and the City. The homeowner can not only compost yard waste but in addition add vegetable matter from food preparation and leftovers to reduce the demand on the sewer and garbage collection systems. The homeowner has control over the quality of the product, and has it conveniently available when needed. No transportation costs are involved in collection or delivery.

It is felt that many more residents will participate as more knowledge of the process and product is made available. It is obvious that many residents in high density housing areas may have limited need, use and space for home composting.Some neighborhoods could develop a community compost project but they would need careful supervision. If there was a change in the present collection system in ease or cost, it would not be unreasonable to expect more interest in this process.

There are some communities who have encouraged backyard composting by providing free or low cost compost bins to residents. The local Youth Service Corps recently had a project of making compost bins from pallets and making them available to the public for purchase. It is recommended that exploration of further coordination of governmental services and local volunteers could result in an excellent backyard compost program that is responsive to the community.

Future Developments

Municipal Solid Waste Composting

Municipal solid waste composting is one of the volume reduction technology alternatives that was included in the Solid Waste Management Feasibility Study - Orange and Durham Counties in 1988. In the past few years, this environmentally appealing technology for volume reduction has been tried in several communities. Many of these projects are not currently in operation due to odor control problems. The question of a market for the final product has also been a concern for local governments who are considering this option. At the present, the Department does not feel that mixed waste composting will be beneficial for this community.

Mixed Paper/Sludge Composting

There is a feeling that using a source separated organic waste material in a composting process has real promise. Sun Shares, the Sanitation Department and the Department of Water Resources have been cooperating on a pilot program of composting mixed paper and sludge. This research activity won the EPA's Region IV "Beneficial Use of Sludge" Award in 1992. Continued research is now taking place with a lot of interest in the possibility for a use for "hard-to-market" mixed paper and an alternative means of sludge disposal. The EPA has funded a marketing study of the mixed paper waste/sludge compost. The results of the study may provide information on the potential of this special compost to assist in the solution of two environmental problems: market for mixed paper and disposal of wastewater sludge.

Biowaste Composting with Wastepaper Some innovations in recycling and composting are refinements of existing processes, or additions of specific recyclables (such as mixed plastics) that divert a small fraction from the waste stream. Other innovations amount to revolutions in terms of the effect they can have on citizen behavior, collection and processing operations, and waste diversion. One such innovation that may lie in the not-too-distant future is biowaste collection and composting, originally developed in Europe as a way to circumvent contamination problems associated with mechanical separation and composting of mixed solid waste.[10]

In Europe composting has received greater emphasis as a recycling technique. The European Economic Cooperative and many member countries have set a goal of 50% waste reduction by the year 2000, of which half is targeted to come from composting of "biowaste" -- which currently includes food waste and yard waste. In Germany and the Netherlands municipalities have tested collection of biowaste to evaluate the feasibility of source separation of biowaste. Biowaste collection programs have demonstrated high levels of public acceptance and participation (85-90% except in areas with apartments where storage is a problem). The quality

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[10] Discussion on biowaste taken from Luc De Baere, Richard Tillinger, Willy Verstraete, "A European Evaluation of Biowaste Collection and Composting: The Positive Impact of the Wastepaper Fraction." Proceedings, Second U.S. Conference on Municipal Solid Waste Management, pp. 13-23.

of the compost derived from source-separated biowaste is much higher than that derived from mixed waste composting plants, because the degree of contamination is much less. Most of the 5% or less of impurities found in the biowaste are plastics. The quantity of waste diverted from landfills through biowaste collection averages approximately 20% in areas without yard waste and higher in areas with yard waste.

Current biowaste composting programs have problems preventing their introduction on a larger scale. High moisture content causes leakage from collection trucks and creates odor problems. Seasonal variations in biowaste volume and content occurs because of variations in the proportion of yard waste present in the biowaste. Provision of separate containers for biowaste collection encourages some people to dispose of more yard waste than they had previously.

SunShares' research and development program has investigated the possibility of composting mixed paper waste and food waste. The study determined that mixed paper and other organics can be composted together to produce a toxic-free soil-like compost. The study, concluded that further exploration of these kinds of composting is warranted and might eventually lead to large scale composting operations incorporating significant percentages of collectable, source separated organic wastes currently being disposed in the sanitary landfill.

In a few years improved biowaste composting and collection technology, increased manufacturing of non-metal-based inks/dyes and biodegradable paper products and packaging could make biowaste composting a feasible municipal activity in the U.S. The key to development of biowaste technology will be regulatory changes to allow the inclusion of disposable paper products and wastepaper into the biowaste fraction (along with yard waste and food waste). Such changes could more than double the amount of the compostable fraction of the waste stream and enable an estimated 25 to 35% of the typical U.S. municipal waste stream to be handled through biowaste collection and composting. Biowaste collection that included non-recyclable paper would encourage industries to develop products that can be disposed through composting.

As of 1990 the waste stream composition study indicated that approximately 8% of Durham's waste stream was composed of food waste. An additional 21% (approximately) is made up of office paper and mixed uncoated paper. Clearly it is desirable for Durham to remain open to the possibilities of biowaste composting with mixed paper. The City should monitor developments in biowaste collection and composting carefully.

Composting Goals

1. To encourage backyard composting wherever possible as the preferable alternative to collection of organic solid waste.

2. To find end-users for compost products.

3. To continue to investigate other possibilities for composting of solid waste and implement those that are publicly acceptable and cost-effective.

3. Collect more detailed data about the Durham waste stream and the community's progress toward waste reduction goals.

4. Evaluate the cost-effectiveness of pilot waste-reduction programs, as well as collection and education programs.

5. Ensure that any changes in the financing system distribute costs equitably.

6. Employ a comprehensive public process in developing the final version of the solid waste management plan.

Tentative Schedule for Financing Plans

Year 1 — Conducting of individualized studies of the Durham waste stream.

Determination and publication of full costs of solid waste management in Durham, based upon state guidelines.

Pilot-testing of new waste reduction and financing programs; evaluation of cost-effectiveness of existing programs (to be repeated annually as needed).

Year 2 — First year of data collection on waste stream and waste reduction.

Year 3 — Integrated financing approach for solid waste proposed, presented to public, revised, and approved.

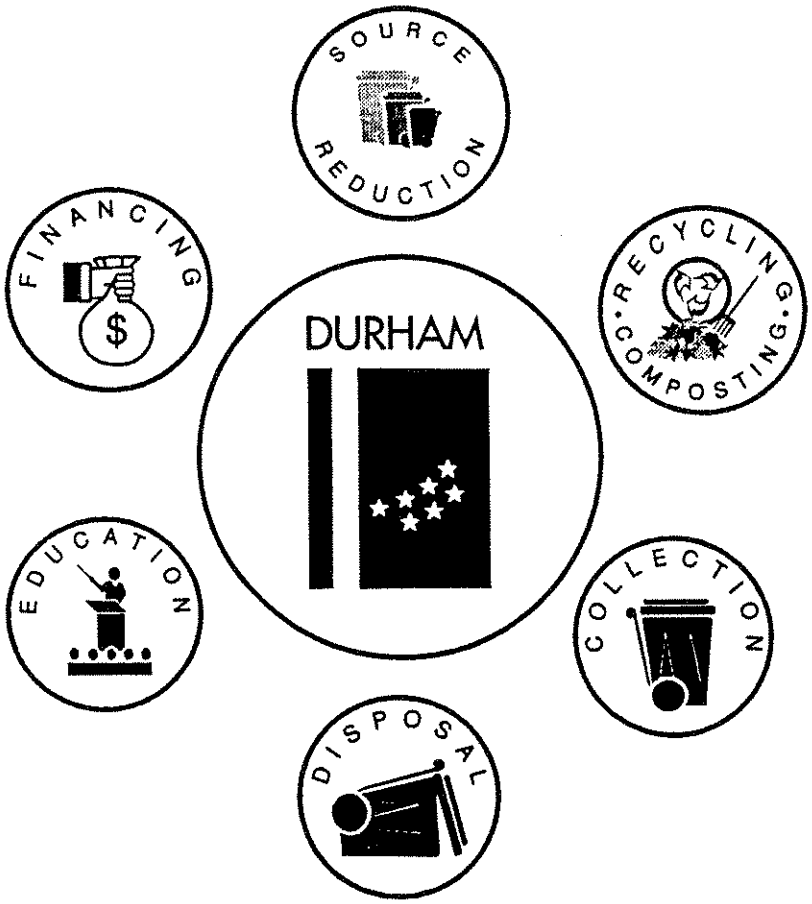
Second year of data collection on waste stream and waste reduction (to be continued each subsequent year).

Year 4 — Integrated financing approach phased in, using "mock billing" for six months to enable customers to make adjustments in behavior ahead of time.

Long term: Reduction or phase-out of fees if waste reduction programs become less expensive because of less need for education or improvements in markets.

CITY OF DURHAM

Solid Waste Management Plan



PRELIMINARY

MARCH 1993

Developed by

Durham Sanitation Department

Guidance from

Solid Waste Subcommittee of the
Durham City/County Environmental Affairs Board

FOREWORD

The Sanitation Department is pleased to present this preliminary draft solid waste management plan to the City Council. We hope that this draft serves as a first step in the development of a comprehensive, integrated, and flexible solid waste management strategy for the next ten years.

The development of this plan was a collaborative effort, involving Department staff and employees, the Solid Waste Subcommittee of the Environmental Affairs Board, SunShares staff, BFI and a community advisory group which met on six different occasions.

The Department is particularly indebted to the members of the community advisory group for their patience and insight. Their willingness to discuss the often-difficult issues involved in solid waste management helped make this a stronger report that recognizes the diversity of interests in the community.

We emphasize that this is only a preliminary plan. Where there are clear recommendations to be made, the Department makes them. In other areas where a higher degree of consensus is needed, we strive to present a balanced description of issues and options. The Department looks forward to assisting in a public involvement process that will strengthen understanding of solid waste issues and generate a plan and a direction that the community can support wholeheartedly.

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Solid Waste Management Plan
EXECUTIVE SUMMARY

Solid Waste Challenges

The Durham community faces several challenges in its management of solid waste:

How can the community meet the state-mandated waste reduction goal of 40% by 2001?

How can collection and disposal be carried out most efficiently and effectively?

How can members of all sectors of the community -- businesses, industries, institutions, governments, and residents -- be encouraged to work together in their roles as waste generators and waste diverters?

How can the costs of solid waste management be distributed equitably?

How can the community's solid waste management approach remain flexible enough to respond to ongoing legal, technological, economic, and behavioral changes which will affect solid waste management over the next decade?

How can solid waste management activities be integrated with each other and with other community goals?

This report suggests some of the principles that can guide us toward answers to these questions. Ultimately, a strategy for solid waste management should be the product of an ongoing discussion between the various sectors of the community.

Basic Assumptions of the Plan

The City has followed the recommendations of a 1987 solid waste management study to conclusion. Now the City is readying itself for a new phase of solid waste management in which waste reduction -- including source reduction, reuse, recycling, and composting -- receives increased emphasis. This plan has six basic assumptions:

◊ Plans for solid waste management should complement other goals of the community whenever possible.

◊ Solid waste goals must be set and achieved by every sector of the community working together.

◊ Each waste management alternative has both benefits and costs.

◊ Solid waste policies and programs should be based upon the best information available

about our community.

◊ To be effective solid waste strategies must be integrated with each other and with existing customs, institutions and systems.

◊ Although all components of this plan involve the City of Durham, some will affect Durham County residents and businesses. The City will coordinate this plan with the County of Durham on issues that affect both governments and with the County's Solid Waste Management Plan.

WASTE REDUCTION

An examination of the most recent waste stream composition analysis in Durham suggests that a great deal more than is currently recycled could be diverted from the waste stream. However, it seems unlikely that the full 40% reduction will be achieved solely through recycling because of poor prospects for market development and the prohibitive expense of more complex recycling technologies. This report sets a preliminary goal of 25% reduction through recycling/composting and 15% reduction through source reduction and reuse.

SOURCE REDUCTION AND REUSE

Source reduction is a term applied to strategies that avoid the creation of waste by reducing the total amount and/or toxicity of waste at the source. Reuse is the use of goods of production more than once in their current form and for their original or similar purpose.

Community advisory group members considers source reduction and reuse the optimal form of waste reduction, since it requires minimal infrastructure and often generates cost savings for participants. The Department recommends that the City aggressively promote source reduction, particularly in the business sector.

Goals

1. To make source reduction the preferred form of solid waste management in the Durham community.

2. To achieve a 15% per capita reduction of waste through source reduction by 2001.

3. To maximize the use of source reduction strategies that create economic benefits within the Durham community.

Tentative Plan for Source Reduction

Year 1 Development of city policy on source reduction
Creation of community-wide source reduction philosophy

Sponsorship of awards program for businesses
Advice to consumers for stopping unwanted mail
Development (with state) of school education curriculum
Pilot testing of various educational programs
Pilot testing of waste audit with 25 largest waste generators
Exploration of media outreach cooperation with other jurisdictions

Year 2
Data collection on solid waste stream by sector (see Finance section)
Comprehensive school outreach begins
Continuing pilot testing and evaluation of programs

Year 3
Study of equitable alternatives for charges on waste
Comprehensive media campaign begins
Effective pilot projects expanded in scope if necessary

Year 4 (depending upon progress toward waste reduction goals)
Establishment of equitable, volume or weight-based charges for solid waste generation/collection
Training of City collectors to assist residents with source reduction
Solid waste audits made mandatory for businesses

Year 5
Lobbying efforts at state or national level
Continuing evaluation of progress toward mandated goals

Years 5-10 (depending upon progress toward goals)
Increases in solid waste charges
Bans on landfilling of selected materials
Privatization of profitable activities such as solid waste audits, reuse information exchange
Reduction in media outreach efforts, if necessary

RECYCLING and COMPOSTING

Recycling

Recycling refers to the series of activities by which materials that would otherwise become waste, are collected, separated, or processed and used as a raw material for a new item.

The City's recycling strategy should focus on increasing participation through education and improvement of recycling convenience, with provision of collection where necessary. At the

same time, the City should foster the creation of new markets. The City should be realistic about the costs and benefits of recycling programs.

Recycling Goals

1. To focus on recycling those materials that cannot be removed from the waste stream through reduction at the source.

2. To develop recycling programs and policies that involve all waste generators in the community according to their waste generation patterns.

3. To create, wherever possible and desirable, five conditions for recycling: markets, awareness, convenience, collection systems, and incentives.

4. To achieve a 25% diversion of waste per capita through recycling by July 1, 2001.

5. To maximize the use of recycling strategies that create economic benefits within the community.

6. To reduce the cost of curbside recycling.

Tentative Schedule for Recycling Strategy

Year 1	Enhancement of commercial cardboard collection program Revising site plans to allow recycling locations at major complexes Identification of major sectors of waste generators and setting of waste reduction goals for each group Waste audits of 25 largest waste generators Expansion of backyard composting program
Year 2	Enhancement of residential cardboard, mixed plastic programs Detailed measurement of waste generation/reduction activity in community Establishment of inventory of recyclable materials
Year 3	Design and approval of integrated, equitable recycling program Additional enhancements to recycling programs as desirable
Year 4	Phase-in of integrated recycling program, possibly supported by economic incentives for recycling Attainment of 90% awareness goal
Year 5	Revision of community recycling goal if necessary Changes in programs to meet revised recycling goal

Composting

Composting involves the degradation of organic materials into an important soil amendment that assists in the natural balance of the plant cycle. In essence, composting refers to techniques of accelerating the natural process of decay. The educational, marketing, and research activities associated with composting should be pursued on an ongoing basis.

Composting Goals

1. To encourage backyard composting wherever possible as the preferable alternative to collection of organic solid waste.

2. To find end-users for compost products.

3. To continue to investigate other possibilities for composting of solid waste and implement those that are publicly acceptable and cost-effective.

COLLECTION

The most labor and equipment intensive sector of solid waste management is collection. This important link between the waste generator and the market or disposal method is the service most visible and familiar to the public. Because of differences in materials and destinations, many operational options are available for providing these services. In general, a collection system includes: personnel, equipment, operational procedures, customer responsibilities and information for personnel and customers. A collection system should be designed for efficiency but has to be compatible with other solid waste management goals.

Goals for Collection

Beyond collection needs that are apparent at present, the solid waste management plan cannot foresee what developments in collection will be necessary over the next ten years. City services should be flexible enough to accommodate and react to changes in the general collection needs of the community. The Department recommends that future options for collection systems be evaluated using the following criteria:

Compliance with state and federal mandates
Efficiency
Safety of employees and citizens
Flexibility
Convenience and simplicity for operators and users

Tentative Schedule for Collection Plans

Year 1 — Co-collection study - same truck collection of solid waste and recyclables and/or same truck collection of solid waste and yard waste

Earth products container change - eliminating the use of plastic bags for yard waste which would reduce labor and improve compost quality

Increased cardboard collection from businesses and free container rental for cardboard

More media advertising

Continuation of customer service program and the implementation of information systems that support good customer relations.

Year 2 — Earth products frequency change

A special downtown co-collection route to encourage recycling - especially cardboard

Review of the exempt list policy - determine if other criteria or limitations could be used.

Long term: — Automation (one man crew) study for certain service areas

Continuous monitoring and evaluation of the system, to generate new options as circumstances and technology change.

DISPOSAL

Most of the waste generated in the City and County is disposed at the Durham City Landfill, which has been in operation since 1974. The City of Durham made efforts to site a new sanitary landfill in Durham County. Response to neighborhood concerns, watershed protection and a lack of industrial areas of sufficient size, resulted in a decision to transfer Durham's waste by rail to a permitted regional landfill. A decision has been made to contract with Addington Environmental, Inc., Norfolk and Southern Railroad and Montgomery County, N.C. to handle the transport and disposal of Durham's waste. This contract is a twenty-year solution for the disposal of Durham's waste.

Goals

1. To pursue through legislation establishment of flow control in an effort to enhance long

term planning, increase possible recyclable markets, improve financing options and stabilize tipping fees.

2. To build a solid waste management facility that not only provides for the basic transfer function but includes programming approved by the City Council.

3. To operate the existing landfill in accordance with federal standards until closure; and then to ensure its safe closure.

4. To remain receptive to new solid waste disposal alternatives.

5. To maintain and improve provisions for handling of special wastes: construction and demolition debris, scrap tires, used oil, white goods, lead-acid batteries, yard trash, and household hazardous waste.

6. To establish an effective illegal disposal prevention system.

Tentative Schedule for Disposal Plans

1993 Siting and design of solid waste transfer station.

1994 Construction of solid waste transfer station.

1995 Closure of existing landfill begins.
Establishment of permanent household hazardous waste facility.
Opening of transfer station.
Enhancement of illegal disposal prevention system if needed to prepare for variable-fee structure.

Long term: Continuing evaluation of disposal alternatives.

EDUCATION

Education is a key component of an integrated solid waste management plan. A well-planned, well-executed education strategy generates efficiencies by showing community members the relationships among purchasing patterns, operational designs, patterns of consumption, recycling, composting, safe disposal of special wastes, the designs of collection programs, disposal and financing issues, and environmental concerns. In addition, an educated public is better prepared to participate constructively in future decisions about waste reduction, collection, disposal, and financing, and is better equipped to advocate changes in legislation or in corporate behavior that will advance Durham's solid waste agenda.

The Plan recommends that proposed educational activities be pilot-tested and evaluated to estimate the impact of the activity upon reductions in either tonnage or toxicity of the waste stream. Like any solid waste management activity, education should be viewed as an investment that assures a significant return. At the same time, it should be recognized that the benefits of some of the most effective educational activities may not be visible or measurable immediately.

Goal

To develop and maintain an integrated educational strategy that helps Durham residents, businesses, and institutions to make their behavior supportive of the community's solid waste reduction and management goals.

Tentative Objectives

Community-wide philosophy for source reduction
Integrated media campaign
Coordination of reuse opportunities
Expansion of commercial recycling conference
Voluntary solid waste audit program
Promotion of information exchange
Publicity for effective source reduction programs
Coordinated school outreach
Training for collection crews
Awards to effective schools

FINANCING

Financing underlies all other decisions about solid waste management. Some financing activities are required by the state, others involve policy makers, and still others are primarily the responsibility of management.

Goals

1. Determine and publicize the full costs of solid waste management.

2. In the short term, provide funding for those aspects of solid waste management that accomplish the following:

   Maintain existing levels of service with increases in efficiency wherever possible;

   Accomplish a smooth transition from a landfill to a transfer station with flexibility as a solid waste management facility;

   Enable more detailed tracking of progress toward waste reduction goals;

2.4 STORMWATER AND WASTEWATER CONTROL

2.4.1 Stormwater/Drainage Control

Stormwater runoff from the facility and access roadways will be managed per local code requirements. This includes a storm drainage system utilizing an on-site detention pond and direct discharge into Goose Creek. Drainage ditches and inlets will be inspected on a regular basis and after each storm event. If necessary, ditches and structures will be cleared of clogged debris as soon as possible. The storm drainage plan has been prepared in accordance with the City's Critical Watershed Protection Ordinance and North Carolina Sedimentation Pollution Control Act. Refer to Sheets C.07, C.08, and C.09 of the Construction Drawings for details.

2.4.2 Wastewater

The majority of wastewater generated by the transfer station will come from washdown of the tipping floor, compaction and loading areas, with peak flows occurring in the late afternoon in conjunction with station cleanup. Washdown will demand approximately 3,000 gallons of water at the rate of 100 gallons per minute (gpm). The washdown water will be collected from the tipping, compacting, and loading floor areas and routed through a grit and grease trap and into a 10,000 gallon holding tank prior to being discharged to the City's wastewater collection system. The resident time afforded by the holding tank will serve to buffer the City system from significant fluctuations in flow or biological loading. The tank is designed with provisions for a pump and haul operation, should contaminant levels in the washdown water exceed the maximum allowed for direct discharge to the sanitary sewer. The wastewater control system is also equipped with two (2) 2,000-gallon grease and grit traps in order to settle out solids and separate any oil-based waste flowing into the system from the tipping floor (upper level) and load-out (lower level). Sanitary waste will not flow through the grease and grit traps. Refer to Sheets C.15, C.16, and C.22 of the Construction Drawings for additional details.

SECTION 3.0
EMERGENCY (CONTINGENCY) PLAN

3.1 PURPOSE

This section of the Operations Plan is intended to serve as an outline for action in case of an emergency situation at the transfer facility.

The provisions of this emergency plan will be carried out immediately in the event there is an occurrence of fire, explosion, or release of any toxic or hazardous material(s) which could present a hazard to human health, property, or the environment. This plan would be followed by all personnel and contractors.

3.2 FIRE CONTROL PLAN

Whenever there is a fire alarm, visible detection of fire, an explosion, or other similar emergency situation, the facility emergency coordinator (station Supervisor or designated personnel) should immediately:

(1) Determine location of the emergency situation.

(2) Determine if there is fire or explosion, then immediately organize the designated emergency response team to identify the source and the extent of the hazard and implement applicable fire control procedures.

(3) Concurrently, the Emergency Coordinator should assess possible hazards to employees' health and property and determine whether or not he and his Response Team can control the fire. Where conditions warrant, in the opinion of supervision, the area should be evacuated to a designated assembly area.

(4) Rescue of injured personnel is of prime importance and should receive first priority.

(5) Control of the fire should be maintained when possible.

(6) The local fire department, hospital, and personnel on the call list should be notified immediately and informed of site location, location of emergency, extent and type of fire or explosion, and any injuries incurred.

3.2.1 Emergency Response Team

The Response Team would act under the direction of the Emergency Coordinator or Station Supervisor and is responsible for the following:

(1) Must know physical building layout, all exits, points of assembly, and evacuation procedures.

(2) Must be capable of responding to alarms and emergencies at the direction of the Emergency Coordinator.

(3) Must be capable of extinguishing and/or containing fires until the local fire department arrives (therefore knowledgeable in the use of portable fire Extinguishers, handling of fire hoses, and first aid equipment).

3.2.2 Fire Control Provisions

Fire Extinguishers will be maintained in all working areas where fire potential exists. Fire protection will also include fire hoses at installed hydrant locations inside the tipping floor area and in the lower level load-out area. In addition, the tipping floor and compaction areas are protected by an automatic sprinkler and alarm system.

Trucks delivering solid waste to the site will be screened for obvious fires prior to off-loading. Part of the standard training program for operating personnel will include instruction on fire prevention and emergency response. Emergency response telephone numbers will be posted near all telephones located at the transfer station.

3.3 ACCIDENT/INJURY RESPONSE

3.3.1 Injury

In the event of an injury or illness, the following procedures will be followed:

(1) Report injury or illness immediately to station Supervisor, even it if appears minor.

(2) Take the necessary action to secure the scene to prevent further damage to property or personal injuries (i.e., shut down all equipment).

(3) Determine location and severity of injury.

(4) If it is determined that the injury is serious, phone the Rescue Squad (911). Describe the site location, location of injury, and specific injuries incurred. If the victim requires medical attention, but ambulance services is not deemed necessary, transport victim to nearby approved medical facility.

(5) Do not attempt to move the victim unless the victim is in danger or if the injury appears minor and the victim can move himself without a great deal of pain.

(6) Notify Emergency Coordinator.

(7) Notify police if necessary.

(8) Investigate circumstances and possible causes of the accident and complete necessary forms.

3.3.2 Accident Investigation

Each accident will be investigated by the Supervisor of the employee immediately following an accident. An Accident/Incident Investigation Report should be completed as part of the investigation. The following procedures will be used as a guideline:

- Animal carcasses
- Dust
- Petroleum products
- Industrial process waste
- Land clearing debris
- Heavy construction rubble
- Commercial loads of vehicle tires
- Earthmover and agricultural equipment tires
- Loads of paint cans (six or more)
- Loads of drums (six or more)
- Asbestos
- Liquids (<25% solids content)
- Closed drums
- Slaughterhouse waste

3.4.2 Hazardous Waste Exclusion

The City's primary concerns regarding the involuntary receipt of hazardous or unacceptable waste include the protection of City employees, facilities, and the environment. A broad spectrum of training may be required depending on the employee's position and designated responsibilities as described below:

(1) Supervisors and Designated Waste Screening Responders

This Hazardous Waste Training Program element is designed to help Supervisors and designated screening responders identify and address potential waste hazards in the workplace. It is not designed to train personnel as hazardous waste handlers, but to familiarize them with the basic types of hazardous waste, with how they (hazardous waste) can be identified, and the safe working practices and procedures to be followed should a potential hazardous waste be identified.

Supervisors and designated responders will be trained to identify potential hazardous waste, assess the situation to determine what is involved, and know the proper procedures to be followed in addressing the situation. The goals of this program are to help personnel:

a. recognize hazardous waste;
b. understand potential hazards; and
c. respond safely.

Supervisors and designated personnel will be required to receive this training upon commencement of employment and annually thereafter.

(2) Solid Waste Inspectors

Solid waste inspectors will be required to initially complete 40 hours of training in compliance with OSHA requirements. This training covers the following areas:

a. safe work practices;
b. environmental and chemical hazard recognition;
c. hazardous waste characteristics;
d. hazard communication;
e. materials handling;
f. toxicology;
g. basic emergency response and preparedness; and
h. site control and decontamination.

In addition to this training, solid waste inspectors will be updated annually or more frequently as needed on issues related to hazardous materials.

(3) Other Employees

As stated previously, the City's primary concern and objective is to protect employees, property, and the environment. In order to help assure this, all station employees must be prepared to safely respond if a potential hazardous waste is recognized. At a minimum, all employees will be trained to:

a. keep alert for the content of all incoming loads;
b. be alert to any smoke, unusual odors, or vapors emitting from a load of solid waste;

c. look for materials labeled with hazard warnings, such as a picture, symbol, or warning words; and

d. contact the facility Supervisor and/or designated responder if a hazardous waste is recognized. Do not attempt to handle the suspected material.

3.4.3 Suspicious Loads

If a suspicious or questionable material is spotted, employees are to clear the area of all non-employees and notify the Supervisor or designated responder immediately. Employees are not to attempt moving or handling waste suspected to be hazardous without the instruction of the Supervisor. The Supervisor will assess the situation and call for help as needed. Emergency information and phone numbers will be posted at the facility. If the situation is a non-emergency and it can be determined where the material originated, the generator will be contacted to remove the waste.

SECTION 4.0
SAFETY GUIDELINES

4.1 PURPOSE

The following safety guidelines have been developed to facilitate the development of a safe working environment for employees of the facility.

4.2 GENERAL SAFETY PROCEDURES AND GUIDELINES

(1) Employees will be properly trained and informed of all safety procedures prior to assignment of job responsibilities.

(2) The Station Supervisor will periodically review the operation of machinery and equipment to assure that safety rules and guidelines are being adhered to.

(3) The Station Supervisor will be responsible for prestart checks by the operators and must assure that the equipment is always safe and in proper operating condition.

(4) All mobile equipment and vehicles operated on the premises must be driven under the maximum safe speed. Speed limits will be posted where applicable.

(5) All hopper areas must be properly barricaded when not in use.

(6) Site user rules will be posted at the entrance to the site.

(7) Transfer station employees must be constantly alert for potential hazards.

(8) Transfer station employees must be constantly alert for the possibility of fire or explosion. Mobile equipment must be equipped with fire extinguishers.

4.3 PROCESS FLOOR HAZARD CONTROL

(1) Traffic spotters will control, limit, and direct vehicle unloading, keeping mechanically unloading vehicles separated from manual unloading vehicles in

order to avoid interference and facilitate smooth traffic flow and minimize delay.

(2) Spotters must remain out of the path of any moving vehicle and be constantly aware of all vehicles maneuvering on the tipping floor.

(3) All employees will be required to wear safety shoes, hard hats, goggles, and reflective vests, and will not be allowed to work should they fail to do so.

(4) Smoking is strictly prohibited on the tipping floor.

(5) Dust levels on the tipping floor will be monitored by the transfer station Supervisor. If dust levels begin to become a health hazard, the Supervisor will instruct employees to wear the appropriate breathing apparatus. Should the breathing apparatus not prove effective because of high dust levels, employees will be evacuated from the building until the dust has settled and the area is determined safe.

4.4 RAIL CONTAINER LOADING

(1) Loading operations will not begin until the Station Supervisor or his designated representative has ascertained that a container is in position and is ready to load.

(2) After is has been determined that the container is ready to load, the Station Supervisor or his designee will signal the front-end loader operator to begin. Extreme care must be exercised to ensure that the container is in place with tops open.

(3) Front-end loaders will be signaled when containers are fully loaded and the rail car is ready to exit the loading area. Precautions must be taken to assure that materials are not dropped into the hopper which could injure personnel or damage transfer vehicles below.

(4) No person will move or load waste without a spotter or Supervisor's assistance.

4.5 SAFETY TRAINING

4.5.1 General

Personnel training in job responsibilities, job operations, accepted safety methods, and potential hazards associated with the facility are important elements in achieving a safe workplace. Supervisors will be responsible for assuring that all new employees receive adequate training to prepare them for performing their assigned responsibilities in a safe and productive manner, and in accordance with approved City policies.

4.5.2 On-the-Job Training

On-the-job training will be performed by supervisors and foremen responsible for the employee. This training includes but is not limited to:

(1) City's safety program familiarization;
(2) prescribed safety clothing and equipment for the job and how to use it;
(3) emergency treatment of injuries;
(4) proper procedures for reporting a fire, serious injury, or accident;
(5) potential hazards associated with the job;
(6) safety policies; and
(7) disciplinary procedures.

4.5.3 Supplemental Safety Activities

Supplemental safety training and reinforcement of safety activities including safety film and/or slide presentations, promotional literature such as safety posters, bulletins, pamphlets, and other related media, will be provided.

SECTION 5.0
INSPECTION PLAN

5.1 SAFETY

Safety inspections of the transfer station's operations will be conducted periodically with written reports of deficiencies submitted to the Director of Sanitation. Monthly inspections will also be performed to assure that hazards are kept to a minimum and safe work practices are enforced. A written report of these monthly inspections will also be submitted to the Director of Sanitation. Unannounced formal inspections may also be made by various agencies of the State of North Carolina.

During inspections, emphasis will be placed upon the condition of the facility and equipment, and shall review the status of the following:

(1) general housekeeping;
(2) use of prescribed protective equipment by employees;
(3) compliance with published safety regulations;
(4) proper maintenance of buildings, equipment, and vehicles, including:
    a. perimeter fencing,
    b. access gates,
    c. on-site roads,
    d. wastewater collection system,
    e. stormwater collection system,
    f. transfer station building integrity, and
    g. mobile equipment; and
(5) proper cleanup procedures (daily).

SECTION 6.0
PERSONNEL TRAINING AND JOB DESCRIPTION OUTLINE

6.1 TRAINING

Employees assigned to the transfer station will be required to attend formal classroom as well as on-the-job training as appropriate for their position. Listed below are specific training examples for each operations position. Job descriptions and accoutabilities are also outlined.

6.2 GENERAL TRAINING

All new employees will undergo the following training:

(1) employee orientation; and
(2) new employee indoctrination;

in accordance with established City policies and procedures.

6.2.1 Scale Attendants

Scale attendants will be specifically trained by their Supervisor on the responsibilities of their job and additional policies regarding billing procedures and monitoring of the incoming waste stream for unacceptable waste. Scale attendants will also receive hands-on training on the use of the computer system, where they will be taught the proper techniques for weighing and identifying vehicles. The training will incorporate the accounting principles necessary for managing various transactions.

6.2.2 Heavy Equipment Operators

Heavy Equipment Operators (HEO) will be taught the correct preventive maintenance and safety check-off procedures for the equipment they will be operating. HEOs will be taught proper operating techniques for all equipment and will be tested to ensure safe and correct operation.

6.2.3 Laborers

Laborers at the transfer station will be trained as traffic spotters and will be instructed on the correct procedures for controlling and limiting the number of vehicles allowed in the tipping area. They will be taught hand traffic signals and proper vehicle positioning. Laborers will also be advised on the proper procedures for removal of potential dangerous materials from the maneuvering area. Their training will focus heavily on safety policies and procedures.

6.3 JOB DESCRIPTIONS

The following job descriptions are provided for transfer station personnel.

JOB DESCRIPTION
TRANSFER STATION SUPERVISOR

NATURE OF WORK

Supervises all activities at the transfer station and:

- Ensures timely traffic control with the unloading and reloading of solid waste in a safe and productive manner;
- Ensures timely and accurate weighing and collections through effective supervision of scalehouse operations;
- Ensures proper, safe, and efficient operation of all transfer station equipment, buildings, and grounds, including daily maintenance checks;
- Ensures human resource productivity and safety through supervision training, development, motiviation, appraising accomplishments, and recommending personnel actions; and
- Provides timely and accurate verbal and written communications with management, employees, and the public.

Supervision is exercised over personnel assigned to the transfer facility.

ILLUSTRATIVE EXAMPLES OF WORK

- Plans for schedules and supervises employees and on-site equipment;
- Inspects for and prohibits unacceptable and/or hazardous waste disposal at the transfer station;
- Provides or arranges for maintenance and appearance of building and grounds;
- Directs location of solid waste disposal;
- Directs loading of transfer vehicles;
- Enforces user and employee safety regulations;
- Keeps necessary records and provides for computer data input;
- Reviews and evaluates work performance of station employees;
- Answers user questions and resolves user problems;

- Arranges for labor assistance when necessary;
- Arranges for additional transfer vehicles when necessary;
- Assists with flow of work and clean-up of area.
- Operates equipment when necessary; and
- Performs related work as required.

JOB DESCRIPTION
TRANSFER STATION FOREMAN

NATURE OF WORK

Supervision of all activities at a transfer station:

- Ensures traffic control and directs loading of solid waste in an accurate, timely, efficient, and economic manner. Ensures proper screening of waste.
- Acts as Station Supervisor in his/her absence. Assists in supervision of scalehouse operations and workforce scheduling, as directed.
- Ensures proper, safe, and efficient operation of transfer station equipment, including daily maintenance checks and reports deficiency reports. Operates all equipment as needed.
- Coordinates transportation needs to ensure efficiency.
- Ensures proper screening of wastes.
- Maintains clear and timely communication with supervisor, subordinates, and public.

ILLUSTRATIVE EXAMPLES OF WORK

- Directs location of solid waste disposal, loading of transfer vehicles.
- Keeps traffic control moving safely and efficiently.
- Enforces user and employee safety regulations.
- Assists in supervising the receipt and recording of cash.
- Keeps necessary records and reports as assigned.
- Assists in reviewing and evaluating work performance of assigned employees.
- Answers user questions and resolves user problems.
- Arranges for labor pool assistance when necessary and additional transfer vehicles when necessary.

- Assists with flow of work in transfer and cleanup activities.
- Operates equipment when necessary.
- Performs related work as required.

JOB DESCRIPTION
HEAVY EQUIPMENT OPERATOR

NATURE OF WORK

- Operates assigned equipment and performs assigned duties in a safe and productive manner.
- Performs daily preventive maintenance and safety checks in a timely and effective manner. Monitors performance of assigned equipment and provides accurate and timely reports of deficiencies or other needs to supervisor.
- Effectively monitors waste stream for hazardous and dangerous materials.
- Follows City policies, procedures, and standards of conduct.
- Communicates with public, peers, and supervisors in an effective and professional manner.

ILLUSTRATIVE EXAMPLES OF WORK

- Operates heavy and complex equipment, such as crane, yard tractor, bulldozer, compactor/excavator or wheel loader in a safe and effective manner.
- Work is performed under supervision and is carried out in accordance with standardized equipment operation practice and general work instruction, or shift supervisor.
- Operates assigned equipment in spreading, compacting, and loading solid waste safely and efficiently.
- Operates assigned equipment in loading waste into designated rail containers.
- Inspects equipment for proper operating condition and loose or worn parts, as assigned.
- Reports defects or damage to equipment to the appropriate authority.
- Observes instruments while vehicle is in operation.
- Participates in special projects as directed.
- Participates in cleanup activities as directed.
- Performs related work as required.

JOB DESCRIPTION
LABORER

NATURE OF WORK

Routine manual work, usually of a repetitive nature; and

- Ensures safe and proper operation of all tools and equipment required for job assignments. Performs preventative maintenance, as assigned.
- Ensures safe and effective movement of traffic when assigned as a tipping floor spotter. Monitors waste for hazardous and dangerous materials.
- Performs all work assignments in a timely and efficient manner.
- Performs all City policies, procedures, and standards of conduct.
- Maintains clear and timely communication with supervisors and public (customers).

May work in adverse climatic conditions.

Work is performed under an assigned Supervisor who may not be physically present at all times.

ILLUSTRATIVE EXAMPLES OF WORK

- Performs tipping floor traffic spotter functions in a safe and efficient manner.
- Performs routine heavy or light manual labor, primarily requiring physical exertion and operation of manual and powered tolls and equipment as assigned.
- Performs non-routine manual labor assignments, such as: removing snow from roads and spreading sand and cinders on icy surfaces; cleaning gutters, culverts, catch basins, and other drainage structures; digging and backfilling ditches; working on grounds maintenance.
- May drive a light truck on a relief or trainee basis.
- Initiates and participates in cleanup activity.
- May work as a trainee equipment operator.
- Performs related work as required.

JOB DESCRIPTION
SCALE ATTENDANT

NATURE OF WORK

- Ensures accurate, timely, and appropriate vehicle weighing; accurately records and reports truck load data not automated.
- Ensures that scale and recording devices are operating properly. Immediately reports any equipment malfunction.
- Ensures accurate and proper administering of cash receipts; accurately prepares daily bank deposits in a timely manner.
- Treats customers in a pleasant, considerate, and efficient manner. Provides correct information and directions to customers. Maintains clear and timely communications with peers and supervisors.
- Screens loads for hazardous/dangerous materials and promptly notifies Supervisor when unsure about the acceptability of material to be unloaded.
- Follows City policies, procedures, and standards of conduct.

ILLUSTRATIVE EXAMPLES OF WORK

- Accurately weighs and records data, utilizing proper data codes.
- Enters truck load data not automatically recorded.
- Records City vehicle information, as assigned.
- Assures scales and recording devices are operating properly.
- Screens truck loads for hazardous or unauthorized waste.
- Participates in cleanup activity, as assigned.
- Ensures proper acceptance and recording of cash for non-credit customers.
- Provides directions and information to user clientele, in a professional and friendly manner.
- Reroutes trucks for examination of load.
- Prepares daily bank deposit.

- Receives and handles phone calls, in an efficient, professional, and friendly manner.
- Performs related work as required.

Appendix C

City of Durham
Preliminary
Solid Waste Management Plan

COLLECTION

The most labor and equipment intensive sector of solid waste management is collection. This important link between the waste generator and the market or disposal method is the service most visible and familiar to the public. Because of differences in materials and destinations, many operational options are available for providing these services. In general, a collection system includes: personnel, equipment, operational procedures, customer responsibilities and information for personnel and customers.

A collection system should be designed for efficiency but has to be compatible with other solid waste management goals.

Collection Avoidance

The number one collection policy should be collection avoidance. Practices such as backyard composting result in little if any need for earth products collection. Waste reduction would affect collection needs as well in all three major areas: residential, commercial and industrial. Increased informational opportunities are recommended to keep the public informed on waste reduction options, collection schedules, policies and practices. More specific recommendations on education are included in the Education section.

Encouraging the use of a delivery/backhaul system for items such as recyclable printer cartridges, cardboard boxes, and telephone books would improve overall energy and waste efficiencies. This approach involves using the same system that delivers these items to pick up and take to a central collection point the used or outdated items. Incentives for this type of creative waste handling could be established in Durham. The incentives could include award programs, special recognition, a tax reduction, a reduced tipping fee, or others.

As things change and develop, the frequency, type and continuation of traditional services may be worth reconsideration. If yard waste were not collected by the City, there might be more opportunities for small collection businesses to develop and more interest in the convenience of home composting. Another decrease in collection activities could take place from a reduction in frequency of service and from collection of more than one material in the same truck.

Residential Collection

The residential solid waste and recycling collection system has undergone a great deal of change in the last few years. The Department has handled the transition from twice weekly back yard collection of garbage to weekly curbside collection from roll-out carts. Curbside recycling collection, in response to the 1987 Solid Waste Management Study, now is provided citywide by the City and Sun Shares. This service has recently changed from biweekly to weekly and added additional materials; steel/tin food cans and HDPE and PET plastic bottles and jugs. Drop-off recycling is also provided for the community. Four of the fifteen sites provided by contract with Sun Shares have additional containers for cardboard and mixed paper. A detailed

description of other local drop-off facilities are included in Appendix A. Some of these are provided by businesses and an additional facility is provided by the City at the Sanitary Landfill.

The Department also instituted other special collections. Earth products collection was initiated to prepare residents for the landfill ban on yard waste which went into effect on January 1, 1993. This service provides the resident with an option for disposal of lawn trimmings and other yard waste in order to keep this type of material from being mixed in with the waste that must go to the sanitary landfill.

In response to a City Council direction, large furniture and appliance collection is now provided for curbside pickup from city residents when scheduled ahead of time. This special collection service prevents much of the illegal dumping of household large items along creek beds and less traveled streets and alleys.

These changes have resulted in increased efficiency and a level of service that promotes waste reduction and recycling. It is generally accepted that the increased convenience of collection of both recyclables and garbage on the same day resulted in a substantial increase in the tonnage of recyclables put out at the curb.

The Department recognizes the need to continue to improve efficiency and to be flexible in collection method approaches. It may prove to be more cost effective to have different types of equipment and methods to handle collection in different areas of the City. There is a lot of difference in the density and travel distance between collection in the downtown district and in Treyburn.

Public/private partnership opportunities may become more cost effective. The City currently works with Sun Shares in such a partnership to provide curbside recycling to all City single family residents. This type of partnership encourages competition and results in a more cost and efficiency conscious climate.

Commercial Collection

Commercial collection service is provided for all locations which need a stationary container (dumpster) for their solid waste storage. This service is used primarily for businesses but also includes apartment complexes. This service has remained the same in recent years but is now provided for the City by a private contractor. Commercial customers, who must provide their own or rented containers, receive free collection of solid waste twice weekly. There is no limit on the number of containers that may be serviced. The limitation is generally waste generation and space requirements.

The City provides cardboard container collection once a week. In its contract with SunShares, the City provides for glass collection from restaurants and bars. Other private firms in the area provide recycling services for businesses for a fee. A list of these firms are included in the Triangle Recycling Resource Guide.

There is some general concern that current commercial service does not promote or encourage waste reduction and recycling. One approach that deserves study includes offering one recycling pickup and one solid waste pickup per week. Another involves covering the rental of the cardboard container but reducing solid waste collection to once a week. A series of meetings with local business representatives could result in other suggestions that would optimally reduce solid waste, encourage waste reduction and recycling and not create an undue financial burden.

Industrial Collection

Currently the City of Durham does not provide any collection service for industry. This service is provided entirely by the industry itself or by private waste contractors. The City does however provide a disposal facility for the waste.

Goals for Collection

The City and the Sanitation Department want to continue to provide responsive collection services. It should be noted however, that the commercial private sector may be needing and providing different services, such a more frequent collection or collection of specific recyclable items, that could impact the City's plan. It is intended that City services will be flexible enough to accommodate and react to changes in the general collection needs of the community.

Evaluation

The Sanitation Department feels that evaluation of current collection systems will be vital in the planning and design of new collection systems. The use of computer programs that assist in the calculation of data to compare collection alternatives is worth exploration. The GIS (Geographic Information System) has been used in other cities to simplify routing and route balancing in a manner that reduces trips to the landfill or transfer station and keeps fuel consumption minimal.

Criteria that are recommended for evaluation of collection systems include the following:

1. Compliance with state and federal mandates

2. Efficiency - This includes consideration of who and how to provide this service; frequency needed; the possibility of co-collection; and what type of container or set-out needed.

3. Safety consideration of the employees and citizens - It is felt that any equipment must maximize the safety for the employee working on and around the equipment and for the citizens that have the equipment in front of their homes and on the streets that they travel.

4. Flexibility - The ability to have a system that is not rigid in demands for specific equipment, a fixed number of employees or limited to a certain waste is desired.

5. Convenience and simplicity - The most successful collection programs are traditionally convenient and simple both for the collectors and for the residents and businesses.

Design Considerations

System design considerations should involve the following:

- ◊ The use of pilot programs in order to evaluate the system and to make fair and objective decisions
- ◊ Options that are based on needs and that are demand-responsive
- ◊ Dependable equipment and methods
- ◊ Reliable equipment
- ◊ A phase-in approach that allows for public education, information dissemination, and employee assistance with training and career development.

Tentative Schedule for Collection Plans

Year 1 Co-collection study - same truck collection of solid waste and recyclables and/or same truck collection of solid waste and yard waste

Earth products container change - eliminating the use of plastic bags for yard waste which would reduce labor and improve compost quality

Cardboard collection from businesses or free container rental for cardboard

Study of the possibility of more media advertising

Continuation of customer service program and the implementation of information systems that support good customer relations.

Year 2 Earth products frequency change - Earth products are not generated in great amounts during "off-peak" seasons, such as between the first of January and the beginning of April. During "off-peak" times collection could shift to a bi-weekly schedule, and earth products collection personnel could shift to collecting other

materials such as cardboard or mixed paper or to conducting demonstrations of composting options.

A special downtown co-collection route to encourage recycling - especially cardboard

Review of the exempt list policy - determine if other criteria or limitations could be used.

Long term: Automation (one man crew) study for certain service areas

Continuous monitoring and evaluation of the system, to generate new options as circumstances and technology change.

Summary

Other than the specific plans listed above, this section contains the following recommendations:

Collection Avoidance

- ◊ Increased informational opportunities
- ◊ Incentives for creative waste handling
- ◊ Evaluation of need for traditional services in traditional manner

Residential Collection

- ◊ Flexibility in collection method approaches
- ◊ Exploration of public/private partnerships benefits

Commercial Collection

- ◊ Commercial/Business input into methods for encouraging waste reduction and recycling in commercial container service

DISPOSAL

The first vision that comes to mind when the phrase "solid waste disposal" is mentioned is the picture of a sanitary landfill. Most of the waste generated in the City and County is disposed at the Durham City Landfill, which has been in operation since 1974. This facility has served both the City of Durham and Durham County well. It has been expanded both horizontally and vertically during the past twenty years and has a permit to continue to receive waste until March 1995. Although this facility is well operated, even if there were room for further expansion, it could not continue to be used because of new federal and state regulations regarding landfill design and construction. From October, 1993 until closure the landfill will have to follow federal guidelines for operation. When this landfill closes in 1995, there will be no sanitary landfill disposal option in Durham County and local waste will have a longer journey to a final resting place.

Landfill

In following the recommendation included in the Solid Waste Management Study done in 1987, the City of Durham made efforts to site a new sanitary landfill in Durham County. Response to neighborhood concerns, watershed protection and a lack of industrial areas of sufficient size, resulted in a decision to transfer Durham's waste by rail to a permitted regional landfill facility that will be sited in Montgomery County, North Carolina. A decision has been made to contract with Addington Environmental, Inc., Norfolk and Southern Railroad and Montgomery County, N.C. to handle the transport and disposal of Durham's waste.

This transportation and disposal contract is expected to include a requirement that the City disposes a minimum of 150 tons per day. At the current waste disposal rate of 650 tons per day, the City can meet the minimum tonnage, increase recycling and waste reduction and feel comfortable that the contract minimum is reasonable. Rail hauling of waste to the sanitary landfill in Montgomery County is expected to be an efficient, environmentally friendly and cost effective transportation option now and for the long term. This contract would be a twenty year solution for disposal of Durham's waste.

Flow Control

In preparing a solid waste management plan, it is necessary to consider both the current and potential waste streams. The waste stream is ordinarily assumed to be the waste generated within a specific geographic area, usually either a municipality or a county. Many of Durham's neighboring county and municipal landfills have an ordinance that prohibits out-of-area wastes. However, most do not have ordinances that direct where the waste must be disposed. The City of Durham does have control over the disposal location of the waste collected from city residences and businesses by the City or its contractor because the City hauls it or legally binds haulers to dispose at designated locations. There is no legal control on disposal of waste generated and collected by others. Generally, it is not cost effective for other haulers to take their waste out of county for disposal because of the haul distance. There is some concern

however, that if the tipping fees in Durham continue to increase at a rate higher than neighboring areas, there may be an increase in the amount of waste that is taken out of county. Any private sanitary landfills that may be built in the nearby vicinity (at least two have been proposed in the last two years) could have tipping fees lower than Durham's or be owned and used by one of the major haulers in Durham County. Mecklenburg County has recently had its flow control ordinance legally challenged. The general feeling in the business at the present is that flow control is legally questionable until this issue has been clarified by the courts.

It is recommended that the City pursue through legislation establishment of flow control in an effort to enhance long term planning, increase possible recyclable markets, improve financing options and stabilize tipping fees.

Transfer Station

When the final disposal location is not nearby, a transfer station is needed as the place where local collection trucks can empty their waste loads. At the transfer station, all waste is weighed, inspected and recontainerized for shipment to the receiving landfill. Durham's new transfer station will be a solid waste management facility that not only provides for the basic transfer function but includes programming approved by the City Council. This program includes the following:

1. An area for centralizing recyclable materials market preparation that simplifies the current collection pattern of City vehicles and that provides for flexibility in the future. This will make it attractive to send recyclable materials to market both by truck and by rail. It may be possible that the rail option opens new markets for materials that are or could be collected here in Durham.

2. A permanent household hazardous waste (HHW) collection site that will provide improved service to the local citizens and reduce the City's liability.

3. Storage for collection trucks that belong to the City will be provided on site. Mileage the trucks travel can be reduced by being able to remain at the site where they are unloaded.

4. Control of rodents, pests, and other vectors should be an integral part of the facility and its operation.

5. A facility for educational and community meetings will be useful in implementing the many programs in solid waste management that involve training and instruction.

6. Staff offices will be provided thus keeping solid waste management administration available at the site.

7. An area for special waste handling for items such as used oil, tires, lead-acid batteries and white goods will be provided. There will also be a citizen's loadout area that will include recycling drop-off bins for the current materials collected and can include more in the future.

8. The transfer station will be part of a master design plan that includes expansion room for a commercial or residential material recovery facility.

An engineering firm has been selected to assist in transfer station site evaluation and selection, to design the transfer station and administer the construction contract, and to assist in the public participation process of siting and operations. The transfer station is scheduled to be in operation by the first of 1995. This facility should consolidate many of the City's solid waste management functions for many years to come.

Closure of Existing Landfill

Once the transfer station begins to receive all of the local solid waste, the current landfill will be closed. Closure will require a special engineering plan and the installation of a methane gas recovery system. A preliminary pilot program for using the landfill gas to supplement gas from the Northside Wastewater Treatment Plant's anaerobic digesters to operate the engine driven blowers is being considered. The landfill will be capped with a material (natural or synthetic) approved by the state and prepared for a natural grass cover. It will be necessary to monitor the integrity of the cover, to maintain stormwater management measures, and to monitor landfill gas emissions and groundwater wells. This monitoring may need to continue for as long as thirty years. It may be reasonable to expect that the cost for this closure and monitoring will be included in the tipping fee that will be charged for waste that is brought to the transfer station. In effect, it will be necessary for the community to bear the cost of the closure of our existing landfill and our proportional share of the cost of closure of the landfill in Montgomery County at the same time.

Landfill Alternatives

The City of Durham has been a major player in exploring landfill alternatives both locally and on a regional basis. In 1988, HDR Engineering, Inc. of North Carolina prepared a report for the Regional Solid Waste Task Force entitled "Solid Waste Management Feasibility Study - Orange and Durham Counties". This report stated that waste-to-energy incineration and municipal solid waste composting were the major technologies that could effectively achieve a volume reduction of more than 50 per cent. The report stated that mass-burn could result in a 80% volume reduction, refuse derived fuel (RDF) in a 60-70% reduction and RDF with a source separation recycling program in a 70-80% reduction. The Regional Solid Waste Task Force (RSWTF) took steps to cooperate in an additional study of the incineration and composting alternatives when differences in the goals of the two communities resulted in the dissolution of the RSWTF.

The state disposal hierarchy includes incineration with energy recovery and for waste reduction.

The Department is sensitive to the local community's concern regarding the cost and environmental threat of a mass burn incineration process. The Solid Waste Subcommittee of the Durham City/County Environmental Affairs Board prepared a report entitled "A Comparative Environmental Analysis of Solid Waste Management Technologies" in which they stated an interest in a refused derived fuel (RDF) that could be derived from a major portion of the waste stream, mixed paper (See Appendix C). Mixed paper is hard to market for recycling purposes and has the potential of being an excellent RDF material that could be used to co-fire local coal boilers. A study to analyze the environmental and economic consequences of a mixed paper RDF may be recommended once the impact of this issue has been considered on local collection and disposal practices.

There is a proposed plan being discussed in the region that involves the incineration of solid waste to produce steam for the operation of an electric utility turbine. This facility is located in a nearby county and may develop into another alternative for disposal. The cost of this disposal method is uncertain at this time, but the City will endeavor to stay informed of the development of this project.

Emerging technologies have been considered in the past and will be considered in the future. Pyrolysis was investigated as an alternative disposal method in 1991. The Environmental Affairs Board Solid Waste Subcommittee responded to a City Council request to evaluate this thermal conversion technology. A copy of their report is included in Appendix D. The Department feels that the City should remain receptive to new ideas, but be cautious in investment in experimental, unproven disposal methods.

Mixed Waste Processing

Because the responsibility for separation is removed from the resident, a centralized system of recovering recyclable materials by hand from mixed waste is not considered by this community as the best way to involve and educate citizens. Active participation in waste reduction and recycling is thought to be a way to change behavior and affect long term patterns for the creation of a more waste conscious population. In addition, keeping materials clean from the beginning assures a more dependable market. Because of this, a mixed waste processing system is not recommended.

Special Waste Management

The state legislature imposed bans on the following special wastes from sanitary landfill disposal:

- ◊ Construction and demolition debris
- ◊ Scrap Tires (whole)
- ◊ Used Oil
- ◊ White goods
- ◊ Lead-acid batteries
- ◊ Yard trash

All of these bans are in effect now and the City has provisions for handling these wastes.

Construction and demolition debris - The City operates a rubble landfill for land clearing material which includes leaves, stone, cinder block, masonry, rock, stumps, clean soil and untreated wood. There are several private landfills that take this type of waste here in Durham County. The City's tipping fee is higher than most of the private C & D landfills, thus the amount of waste brought to the City facility has declined dramatically in the past few years. At the present, the tipping fee operation at the Sanitary Landfill on Club Boulevard handles both the sanitary and the rubble landfill weighing and accounting operations. Once the tipping operations are relocated at the new transfer station, the proximity of the station to the rubble landfill may influence the practicality of continuing to provide this service for the community. A survey to determine present local disposal capacity for this type of waste and the amount of City waste that currently goes to the City's facility is recommended.

Scrap Tires - The City has provided a special collection facility for the entire county for several years. Initially the tires were collected and sent to a tire monofill in Cabarrus County, North Carolina. There the tires were shredded and buried in a landfill permitted for tires only. The current contractor, Tires Into Recycled Energy and Supplies, Inc., has sold 29% of the tires for tire derived fuel, 48% as civil engineering chips, and 16% as crumb rubber. Of the remaining, 2% is in inventory and only 5% is sent to a landfill. It is recommended that the City continue to contract for this disposal and include in the bid specifications a requirement for high recycling and reuse.

Used Oil - The City has a program for the collection of used oil that is generated by residents that change their vehicles' oil at home. A tank for this oil has been located at the Sanitary Landfill and is planned to be moved to the new transfer station. This collection system worked satisfactorily and gives the City a way to screen the oil and reject any that appears to be contaminated. There is a concern that providing used oil collection at the curb may result in oil being spilled in and along the city streets. The present drop-off tank system keeps the oil confined to an area that is prepared to handle any oil spills that may result from leaky containers or accidents. If it is determined that this program and those provided by private companies and garages are not adequate for the community, additional tanks may be located at other city facilities that have personnel and security available for monitoring this type of collection.

White Goods - Old appliances have been separated from the rest of the waste stream and recycled for several years. Motors and capacitors are removed from all appliances and CFC gases are recaptured from refrigerators and air conditioners. This program will continue at the new transfer station. There is draft legislation that provides for collection of a fee added to the appliance purchase price to help defer these costs. It is recommended that the City continue the present program and stay current with any legislation that may provide funding for this special waste handling procedure.

Batteries - The Sanitary Landfill has accepted lead-acid batteries from the public and sells them for battery reclamation. Many local retail outlets for batteries will give a credit for old batteries when a new one is purchased. Because of this very few are brought to the landfill for recycling. The City will continue providing for lead-acid battery recycling. It will still be our responsibility to assure that waste that is banned from sanitary landfill is not sent to the contractor's landfill.

Household batteries have very limited markets and have not been recycled locally. If a reasonable disposal method or local market becomes available, the City would add household batteries to the list of items that are handled separately at the landfill or transfer station. It is important to point out that recent developments in battery manufacturing have resulted in a large decrease in the quantity of cadmium and mercury used in these batteries and thus the long term concern is reduced.

Yard trash - The City began collecting earth products (yard trash) separately ten months ahead of the January 1, 1993 landfill ban. This service change helped educate the community and made the ban easier to implement. An earth products composting facility has been permitted and compost is now available for the public. (See Composting Section and Collection Section)

Household Hazardous Waste - The City Water Resources and Sanitation Departments have jointly coordinated three special household hazardous waste collection days. These collections have been paid for with funds that were budgeted in the Water and Sewer Fund. The City plans to continue providing this service but is interested in finding a more cost effective method. City personnel have been involved in a proposal for a TJCOG regional agreement to contract with one hazardous waste contractor for disposal of the region's HHW. It is hoped that this agreement (See Appendix E) will provide for a lower cost option of handling local HHW. The one-day collection program has been successful but has inherent limits on the number of residents who can participate and the amount of waste that can be safely disposed. Currently there is draft legislation for a $.10 per item tax on all hazardous household items that will be distributed to the counties on a per capita basis. This tax may help educate the public on what is hazardous and will help defray the costs of providing responsive and effective HHW management.

Illegal Disposal

Illegal disposal and dumping are a concern to the community. As the cost of proper disposal continues to increase, the financial benefit of illegal disposal increases. A staff Solid Waste Compliance Officer makes regular rounds to and through areas that have in the past been plagued by illegal dumping. Citizens have worked with the officer to identify the culprits. Several dumpers have been caught and have been made to clean up the waste. Just the presence of the officer has resulted in less dumping in the City limits. Efforts to increase the effectiveness of this position will continue.

The following management options are recommended to improve the illegal disposal problem within the City of Durham:

- ◊ Create a public hotline to call in the vehicle license plate numbers of observed violators. Violators would receive written warning of the legal penalties of littering and illegal dumping.

- ◊ Create an informational plan for residents that explains the ordinances that require contractors to handle the waste generated in home improvement, landscaping, etc.

- ◊ Studying the effectiveness of creating a system that requires contractors to account for proper disposal of waste materials generated in their work.

- ◊ Create a training program similar to a "crime watch" for all city workers out on the streets to use in reporting disposal violations.

Goals

1. To pursue through legislation establishment of flow control in an effort to enhance long term planning, increase possible recyclable markets, improve financing options and stabilize tipping fees.

2. To build a solid waste management facility that not only provides for the basic transfer function but includes programming approved by the City Council.

3. To operate the existing landfill in accordance with federal standards until closure; and then to ensure its safe closure.

4. To remain receptive to new solid waste disposal alternatives.

5. To maintain and improve provisions for handling of special wastes: construction and demolition debris, scrap tires, used oil, white goods, lead-acid batteries, yard trash, and household hazardous waste.

6. To establish an effective illegal disposal prevention system.

Tentative Schedule for Disposal Plans

1993	Siting and design of solid waste transfer station.
1994	Construction of solid waste transfer station.
1995	Closure of existing landfill begins. Establishment of permanent household hazardous waste facility.

Opening of transfer station.
Enhancement of illegal disposal prevention system if needed to prepare for variable-fee structure.

Long term: Continuing evaluation of disposal alternatives.

EDUCATION

Education is a key component of an integrated solid waste management plan. This section of the report presents options for educational programs and suggests an approach that will ensure education is an integral part of efforts in source reduction, recycling, collection, composting, disposal, and financing.

Goal

> To develop and maintain an integrated educational strategy that helps Durham residents, businesses, and institutions to make their behavior supportive of the community's solid waste reduction and management goals.

It is easy to forget, in the excitement over new technologies and processes for waste reduction, collection, and disposal, that the revolution in solid waste management hinges upon changes in the way that individuals relate to their physical environment -- the way that they treat the materials that they purchase (or grow), use, and discard. More than most municipal activities, solid waste management has become a cooperative venture requiring knowledge and commitment on the part of every citizen for its success. Solid waste management is a community activity involving the Department, a non-profit agency (SunShares), private businesses, and -- most importantly -- individual citizens. Source reduction, source separation, and multimodal separation, processing, and disposal of discarded materials requires a major evolution in citizens' understanding of their own responsibilities.

Gail Anderson, public information coordinator for the Des Moines Metropolitan Area Solid Waste Agency, describes how Des Moines came to see public education as important:

> The Agency was at a crossroads....[A]fter careful study a Comprehensive Plan was developed which called for the implementation of new solid waste management programs including both residential and commercial recycling, yard waste processing, household hazardous waste programs, and special waste programs. However, there was one element critical to each new program -- public education. After all, with other program components intact, these new programs meant a relentless change in people's attitudes and habits. Each new program would require the public's cooperation and participation. While most people want to do the right thing, change can often be difficult. Ultimately, the Agency viewed public education as the key to successful solid waste management.[11]

A well-planned, well-executed education strategy generates efficiencies by showing community members the relationships among purchasing patterns, operational designs, patterns of

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[11] Gail L.C. Anderson, "Public Education -- the Key to Successful Solid Waste Management." Proceedings, Second U.S. Conference on Municipal Solid Waste Management, p. 351.

consumption, recycling, composting, safe disposal of special wastes, the designs of collection programs, disposal and financing issues, and environmental concerns. Achieving the goal of 40% reduction in the waste stream requires a collective behavior change on the part of the Durham community. Education has been, and will continue to be, a key contributor to that behavior change. In addition, an educated public is better prepared to participate constructively in future decisions about waste reduction, collection, disposal, and financing, and is better equipped to advocate changes in legislation or in corporate behavior that will advance Durham's solid waste agenda.

Current Educational Activities

A variety of educational activities are underway at present in Durham. The most notable and significant are those provided by SunShares, under contract to the City. SunShares targets a variety of audiences including house and apartment dwellers, block leaders, businesses, school children, civic groups, churches, festivals, and radio, television, and newspaper audiences. The means of communication used by SunShares range from newsletters to demonstration sites.

The Department also incorporates education into its activities wherever possible. Holiday schedule change notices have incorporated information on the earth products ban, reminders about the 7 a.m. time for rolling carts out to the curb, and "thank-you's" from collection teams for customer cooperation. The Department's recycling crews also use fliers to educate customers about proper recycling methods. In order to provide residents with a more integrated understanding of solid waste management, the Department published and distributed to all residents a customer calendar and guide with information on garbage, recycling and earth products collection and tips on recycling, composting, and source reduction.

Other agencies, businesses, and institutions in the area also have made a strong commitment to education, particularly in the area of waste reduction. The City's Public Information Office has provided solid waste information in utility bills. Local news media have covered a variety of solid waste issues through news and feature stories. The Cooperative Extension Service has sponsored training in home solid waste management and backyard composting. The Environmental Awareness Advisory Committee of the National Institute of Environmental Health Sciences in Research Triangle Park publishes a "Recycling Resource Guide" annually which lists public, private, and non-profit contacts for the recycling of various materials. Duke University's "Duke Recycles" program has had great success in educating faculty, staff, and students about waste reduction. The Washington Duke Inn and other private businesses also have noteworthy internal education programs.

Current and Future Needs

Community advisory group members, SunShares staff, Department customers, and Department staff and employees were asked to highlight the areas in which the current educational approach is deficient. From these discussions, the following educational goals emerged.

1. Use more person-to-person educational approaches, such as presentations and demonstrations.

2. Ensure that all school children are exposed to a solid waste and waste reduction education curriculum during at least one of their years in school.

3. Increase the use of electronic media for public information and education.

4. Help the community adopt a more proactive stance toward change by keeping it well-informed about new developments in solid waste management.

5. Provide businesses, industries, and citizens with more assistance in finding ways to exchange or recycle valuable materials.

6. Provide businesses and industries with solid waste audits to help them voluntarily reduce their waste generation and increase their waste diversion.

7. Maximize the coordination and accuracy of information being generated at diverse points in the community.

Tentative Objectives

Based upon the needs identified above, the following objectives are suggested by the Department for consideration. These objectives are organized according to their primary target audience.

Community as a Whole

Coordinating Committee for Solid Waste Education The city should help to establish and maintain a group with representatives from the media, business, trade, and civic groups, schools, non-profits, neighborhood organizations, and government to plan and coordinate the wide array of public informational activities related to source reduction, reuse, recycling, composting and solid waste collection and disposal. The coordinating committee can work to ensure that the public is not receiving "mixed messages;" the committee also can plan strategies to make maximum use of its collective resources.

Community-Wide Philosophy on Source Reduction The city can adopt an official statement of support for source reduction and distribute this to all businesses, institutions, and residents.

Integrated Media Campaign A variety of media efforts can be used to develop awareness and knowledge among Durham residents and businesses about the methods and the importance of source reduction. These efforts might include:

◊ regular features in newspapers or on television news;

- ◊ public service announcements or paid advertising showing "how to's" of source reduction and community goals;
- ◊ organizing media events to create "hard news" stories on source reduction;
- ◊ sponsorship of television documentaries;
- ◊ targeting of neighborhood and community newsletters;
- ◊ coordination with other local governments in the region/viewing area.

Coordination of Reuse Opportunities Expanding upon SunShares' "Beyond Trash" information sheet, a guide can be published listing businesses/individuals/nonprofits that can reuse materials normally thrown away by residents. The city can sponsor small-appliance repair classes, neighborhood yard sale days, and other events to encourage reuse.

Businesses

Expansion of Commercial Recycling Conference The annual commercial waste reduction conference can be given greater prominence as a city event and can place greater emphasis on source reduction.

Voluntary Solid Waste Audit Program One way to encourage business recycling and source reduction would be for the city to coordinate a group of trained volunteers (with experience in various types of businesses/industries) to visit businesses, and, when there is not a concern regarding confidentiality, examine inputs, processes, products, and waste, and recommend a program for waste reduction. Information gained from the audits could be used to develop a database of usable materials (see item 5 above) and to gain a better picture of the commercial waste stream.

The potential impact of solid waste audits and other direct interaction with businesses to encourage recycling should not be underestimated. To cite one example, a pilot recycling project involving six hotels/motels in Central Florida generated diversion rates averaging 13% after just five months.[12]

Promotion of Information Exchange This program builds upon the principle, "One person's trash is another person's treasure." It establishes a central database listing potentially usable waste materials and where they are being generated. Businesses, etc. could use the database service to locate materials.

Publicity for Effective Source Reduction Programs Standards for meaningful source reduction programs can be set by an independent group such as the Chamber of Commerce. Awards or "seals of approval" can be presented to businesses and institutions

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[12] Jonathan Earle, Jo Townsend, and Marie Hammer, "Economic Aspects of Florida's Pilot Hotel/Motel Recycling Program." Proceedings, Second U.S. Conference on Municipal Solid Waste Management, pp. 159-167.

that have strong programs in place. "Tours" of award-winning businesses can be organized.

Residents

Encourage Reductions of Direct-Mail Marketing The city can provide consumers with pre-addressed postcards to make it easier to request that they stop receiving promotional mail.

Schools

Coordinated School Outreach The city can work with the school system and the state to develop a targeted solid waste education program with a major source reduction component. This program would be designed to reach all school children in the county at an appropriate age to encourage responsible purchasing and waste reduction habits. The educational program could be linked to waste audits of schools, development of composting/recycling programs at schools, and "waste-reduction patrols" at schools.

Students of different ages might be targeted with different kinds of education. Young children may be most open to education about concern for the environment in general and may influence behavior of their parents, while secondary level students are at a prime age for examining their own emerging habits as consumers.

Educating Collection Crews as Ambassadors Collection crews can be trained and given responsibility and incentives for educational outreach in the community.

Awards to Schools for Effective Source Reduction This program can be combined with other school outreach efforts.

An Integrated Educational Approach

The most central point to be made in this section of the plan is that, in order to be efficient and effective, solid waste educational activities ought to be designed and executed in a coordinated and integrated manner. The integration of the solid waste management infrastructure ought to be reflected in the information that users and potential users receive. This will not be an easy task, since a variety of public and private agencies are involved in solid waste management, and since change is occurring so rapidly in the field of solid waste management.

As stated in the Finance section, the Department favors a cautious approach to the development of new programs. A recent study in Florida concluded that "local governments are not collecting enough data to evaluate the effectiveness of ... the public education/information components of

[waste reduction] programs."[13] Proposed educational activities should be pilot-tested and evaluated to estimate the impact of the activity upon reductions in either tonnage or toxicity of the waste stream. Like any solid waste management activity, education should be viewed as an investment that requires a significant return. At the same time, it should be recognized that the benefits of some of the most effective educational activities (such as those involving young children) may not be visible or measurable immediately (despite the very persuasive impact that some young children can have on their parents!).

The key to any effective educational program will be the degree of coordination among all the generators and sharers of information. It may not be necessary or desirable to have a "Solid Waste Education Czar" who would be able to control the quality and content of all information related to solid waste in Durham. The creativity and diversity evident among private citizens, businesses, non-profits and government agencies in promoting responsible solid waste management should be encouraged through the development of an educational "coordinating committee" as described above. For example, composting is an area of interest shared by private landscapers, the Cooperative Extension Service, SunShares, the Museum of Life and Science, garden clubs, the Sanitation Department, and the Parks and Recreation Department. Increased interaction among these groups in regard to composting education would help to accelerate community involvement in composting.

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[13] Raymond A Shapek, "Measuring the Effect of Media Use in Recycling Education/Information Programs." Proceedings, Second U.S. Conference on Municipal Solid Waste Management, p. 318.

FINANCING

Financing underlies all other decisions about solid waste management. This report has chosen to treat financing separately only for simplicity's sake. When the community advisory group discussed alternatives for source reduction, recycling, collection, disposal, and education, the issue of financing was always present.

Some financing activities are required by the state. Other activities are policy-related: the community, through its elected policy makers, determines how important the priorities for solid waste management are (relative to other community needs) and who should pay for accomplishing those priorities. Management-centered financing activities include tracking the performance of various programs and finding creative ways to stretch out the value of the community's dollars.

State-Required Activities Related to Financing

The state requires communities to carry out two specific activities that affect financing: 1) use a public process to establish solid waste management goals and objectives; and 2) notify all users of the solid waste management system of the full costs of solid waste management. These requirements are discussed below.

Public Process The state solid waste plan emphasizes that communities must employ a comprehensive public process in developing the final version of their solid waste management plan. The public process should include all sectors of the community and should provide citizens with the best information available about Durham's solid waste management costs, state mandates, and management options available. Interested citizens should be able to comment upon the community's proposed goals for solid waste management and upon the relative importance of solid waste goals relative to other community priorities. At the same time, participants in the process should come away with a better understanding of the concerns of other sectors and the trade-offs inherent in any specific solid waste solution.

Without a strong public process that achieves some agreement about Durham's solid waste management goals and objectives, the community is likely to be stalemated and sidetracked by debate over specific financing or management proposals. Debate over specific programs will find community members "arguing past" each other since they have never achieved agreement on more basic issues or come to understandings of each other's needs.

Determination of Full Costs The most basic information needed for financing decisions is a determination of the full costs of solid waste management. The state's guidance document for waste reduction emphasizes this point:

> The first step is to determine your cost of waste reduction and recycling programs, and of all other solid waste management programs. The Act states that "each county and each municipality shall determine the full costs for solid waste management within the service

area of the county or municipality for a one-year period ... and shall update the full cost determination every year thereafter." Each local government must also inform the users of solid waste management services of these costs.[14]

The Department received in September 1992 a preliminary full-cost determination guidance document from the state, which provides technical assistance for identifying components of services and establishing systems for accounts. However, at this point the state has not yet developed the rules which will require reporting of that data. Department staff will be using the full-cost determination approach to estimate costs of services.

The requirement that all users of solid waste management services be informed of the costs of solid waste management can be met, at the outset, through notices in utility bills, media events, contact with individual commercial customers, and efforts to provide information to private haulers and their customers as well as other landfill users. Any user-fees that are developed should be designed such that in the course of paying for services, customers becomes familiar with the full costs of solid waste management and begin to understand their role in reducing costs.

Policy-Related Activities Related to Financing

Balancing Solid Waste Management with Other Community Priorities The time is long gone when community priorities could be considered in isolation from each other. Decisions about how to pay for solid waste management have a direct or indirect impact on the funding of other priorities. While the 40% reduction goal is a firm mandate driving long-range decisions about solid waste management, annual decisions about revenue and spending will have to consider Durham's needs in general. For example, it may be that at present, an issue such as safety commands more attention, while waste reduction may become more of a concern as the 2001 deadline becomes closer.

In the short term, it may be best to finance those aspects of solid waste management that accomplish the following:

1) Maintain existing levels of service with increases in efficiency wherever possible;

2) Accomplish a smooth transition from a landfill to a transfer station with flexibility as a solid waste management facility;

3) Enable more detailed tracking of progress toward waste reduction goals;

4) Educate the community about the importance of waste reduction; and,

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[14] **A Source Reduction and Recycling Guidance Document for North Carolina Communities** NC Department of Environment, Health, and Natural Resources, Division of Solid Waste Management, Office of Waste Reduction. March 1992 (p. 39)

5) Experiment with waste-reduction approaches on a small scale to determine the relative effectiveness of different programs.

Goal (1) should make available some additional funds for waste reduction. Goal (2) should ensure that Durham is not constrained in its waste-reduction efforts by its investment in the transfer station. Goals (3), (4), and (5) should lay the groundwork for an informed waste-reduction strategy that has broad-based community support and maximizes the return on each dollar invested.

Durham's leadership should also be aware of opportunities to serve other priorities in the process of pursuing solid waste management. Funding decisions can be "win-win" rather than "zero-sum." For example, education, collection and even financing arrangements can be designed to encourage cooperation and communication among neighborhood members. Increased community solidarity and pride --a potential byproduct of such arrangements -- could help to improve public safety.

Goals

1. Employ a comprehensive public process in developing the final version of the solid waste management plan.

2. Determine and publicize the full costs of solid waste management.

3. In the short term, provide funding for those aspects of solid waste management that accomplish the following:

   Maintain existing levels of service with increases in efficiency wherever possible;

   Accomplish a smooth transition from a landfill to a transfer station with flexibility as a solid waste management facility;

   Enable more detailed tracking of progress toward waste reduction goals;

   Educate the community about the importance of waste reduction; and,

   Experiment with waste-reduction approaches on a small scale to determine the relative effectiveness of different programs.

4. Collect more detailed data about the Durham waste stream and the community's progress toward waste reduction goals.

5. Evaluate the cost-effectiveness of pilot waste-reduction programs, as well as collection and education programs.

6. Ensure that any changes in the financing system distribute costs equitably.

Deciding Who Should Pay Allocation of the costs of solid waste management is perhaps the biggest "sticking point" in devising a solid waste management strategy. Few citizens disagree, for example, with the importance of source reduction. However, many citizens may have concerns about paying for source reduction education -- particularly if they feel that they have done as much source reduction as they can.

The simplest way to allocate costs would be to continue using the current combination of revenue sources: using tipping fees to pay disposal and recycling costs and using property taxes to pay for collection and education.

There are two potential problems with such an approach. In the first place, the current financing system is not well-integrated with the goal of waste reduction. Individual users of the landfill feel the impact of increasing tipping fees and do change their behavior accordingly (witness the sharp decline in the number of tandem trucks at the landfill after a flat fee was established for pickup truck loads). Industries and institutions (such as Liggett and Duke University) who haul their own solid waste also are spurred to develop comprehensive waste reduction programs. Beyond these sectors, however, the current financing system provides little incentive for waste reduction. Larger haulers simply pass along tipping costs to their customers; city commercial and residential customers have no direct cost for solid waste management services (the cost is buried in their property taxes) and thus little incentive to reduce; county residents, who use container sites, pay a flat annual fee and others pay private collectors a service fee that likewise is not tied to waste generation behavior.

Secondly, the current financing system might not be in a position to handle increased costs in solid waste management, particularly those created by the goal of waste reduction. The state's guidance document puts the question simply:

> Attaining the waste reduction goal will require a significant increase in the resources dedicated to reduction and recycling programs. Additional staff; an aggressive public education and technical assistance program; collection, processing, and marketing programs will be needed. In this time of fiscal constraints, which are impacting local governments especially hard, where is this funding to come from?[15]

The implication is that it will be difficult for policy makers to use the property tax as a source of additional revenue for waste reduction programs:

> Historically, waste reduction and recycling programs are paid for through the general fund. However, because there is competition among programs for this source, local governments are encouraged to move from tax-based support for solid waste management financing to a system supported by fees obtained from users of solid waste management

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[15] **A Source Reduction and Recycling Guidance Document for North Carolina Communities** NC Department of Environment, Health, and Natural Resources, Division of Solid Waste Management, Office of Waste Reduction. March 1992 (p. 39)

services.

> Total solid waste management costs include source reduction and recycling programs. User fees collected from residences and commercial businesses for trash collection are used by waste haulers to pay for salaries, fuel costs, supplies, utilities, contracts, capital expenditures, and landfill tipping fees. Local governments are increasingly using tipping fees not only to pay for landfill costs, but also to fund source reduction and recycling programs within their communities.[16]

Thus tipping fees and/or user fees are a possible source of revenue to pay for waste reduction programs. For the short run tipping fees are easier to administer but they may allocate costs unfairly in that users of city-provided collection services do not feel the full impact of tipping fees.

A flat user fee (such as that paid by county container user residents) is another way to fund waste reduction programs. In smaller communities with high levels of cohesion, a flat fee, combined with a strong public education program, might be sufficient to bring about waste reduction, provided that collection systems for recycling were in place. In Durham, however, it seems that a flat user fee would be perceived primarily as an additional tax rather than as a charge for specific services rendered. Residents and businesses charged the fee would have little or no control over the amount of the fee, since it would not respond to their individual changes in waste generation and reduction behavior. A flat fee could be made somewhat equitable, however, by tying it to water usage rate, size of household, or some other measure loosely reflecting the variations in solid waste generation among individual households and businesses. This still would not encourage waste reduction unless there were adequate controls or reduction potential over all aspects of the fee.

A variable-rate user fee would provide the strongest incentive for individuals to reduce their waste. For residences, such a fee might be imposed through a bag, tag, variable volume container, or weight-based charging system.

In response to a Council request, during FY 90-91 a committee composed of staff from several departments began a study of alternatives for charging user fees. This committee agreed that a weight-based system had the potential to act as a system that educated and motivated citizens to the values of waste reduction and recycling. The Council approved funds for a trial test of the weight-based system and the staff continued to make implementation plans.

The system was designed to involve an onboard scale, fitted on the lift and dump mechanism of the semi-automatic refuse truck; a scanner to read bar code information that identified the cart owner; and a computerized system for recording weights and cart numbers. The weight data was

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[16] **A Source Reduction and Recycling Guidance Document for North Carolina Communities** NC Department of Environment, Health, and Natural Resources, Division of Solid Waste Management, Office of Waste Reduction. March 1992 (p. 41)

to be downloaded into a billing system so that the fee could be included on local water bills.

The first scale was placed on a City refuse truck in April, 1991. Initial trials had problems due to recurrent corrosion of electrical parts. The corrosion problem was solved, however the State of North Carolina Agriculture Department was not satisfied with the accuracy performance of the scale in the preliminary tests performed in July 1991. The manufacturer of the scale has worked diligently to improve the scale. They replaced the load cell and have assisted in an additional tests. In February, 1993, the scale passed all tests performed in the lab at Weights and Measures in Columbus, Ohio where the scale is manufactured. At this time, the State of North Carolina has not changed its determination that the scale must perform as accurately as a grocery butcher scale. It would be unlawful for the City to use the scale until it received N.C. approval. The Sanitation Department has continued the process of placing bar codes on all roll-out carts. This will allow for other collection route data to be available. (Department staff point out if the weight based system cannot be used, that the existing investment in roll-out carts would make implementation of a tag system easiest, followed by a variable-cart-size system). For commercial users, a charge per pickup and based on container-size would be a way to charge based upon waste generation. Appendix F contains cost and revenue estimates for several residential variable-fee arrangements.

Variable fees are more expensive to implement and more difficult to structure fairly. If the variable fee system encourages residents or businesses to reduce the frequency of pickup, there may be a threat to public health or odor problems. If the variable fee covers a significant percentage of total operating costs, it may be difficult to project revenues because of the difficulty of predicting the impact of economic incentives upon the waste generator's behavior.

The menu system is a kind of variable fee system that overcomes the problem of revenue instability by having customers "subscribe" to a set array of collection services for a year's time. The customer makes large-scale waste reduction decisions once a year and may be more open to education at that time. The disadvantages of a menu system are that it may be operationally difficult to manage and that it may not allow much of a "choice" for lower-income residents.

Department staff favor further exploration of menu systems as a possible means of creating incentives for waste reduction. Under a menu system the Department would begin to look more like a traditional utility in its provision of diversified levels of service to its customers.

Department staff and community group members also favor a phase-in period for any fee system that is established, so that customers can become accustomed to the new system and have time to adjust their behavior and thereby generate cost savings.

Another consideration in regard to variable-rate fees is whether they should be structured to cover all costs of solid waste management or whether they should be structured only to provide additional revenue in order to support waste reduction programs. Many of the costs of solid waste management are fixed in the short term. For example, collection trucks and crews will

continue to serve the same route weekly, regardless of the quantity of waste generated along that route. A residential user fee that honestly reflected solid waste management costs would have a flat-fee component to cover fixed costs (collection and staffing) and a variable-fee component to cover costs of disposal (and perhaps education).

The biggest question in regard to user fees for solid waste management is the problem of making fee structures equitable for both residents and businesses. Neither sector wants to be charged out of proportion for its "contribution" to the waste stream. For example, residential users, who generate roughly 1/3 of the waste stream, do not want to pay more than 1/3 of the costs of solid waste management. (It should be pointed out, however, that under the current property-tax funded system, the industrial and commercial sectors, for which collection either costs the city nothing or is far more efficient than residential collection, subsidize the cost of collection from residences. On the other hand, the industrial and commercial sector generate two-thirds of the waste and thus create the need to have greater disposal capacity).

Community advisory group members disagree about how a user-fee system for financing solid waste management ought to be structured. They agree, however, that before embarking on any significant changes in its financing approach, the city needs to obtain more detailed information about waste generators throughout the city/county. Waste generators should be categorized according to the type of wastes they generate (to the extent such categorization is feasible) and waste reduction should be tracked over time within each of these categories.

In addition, community advisory group members agree that the city needs better information with which to project the impact of various financing arrangements upon waste reduction behavior. For example, it is not clear at present how much a variable rate for residential solid waste collection would affect residents' disposal/diversion behavior.

Management-Centered Activities Related to Financing

The dilemmas associated with establishing financing arrangements at the policy level (as well as the state mandate for full-cost accounting) suggest two areas of activity for management: collection of more detailed data about the Durham waste stream and evaluation of the cost-effectiveness of pilot waste reduction programs.

Data Collection Currently there is limited detailed information about the city and county waste streams. A 1990 study showed the composition of the residential and commercial waste streams; it did not show variations in solid waste generation or composition among individual businesses, types of businesses, or size or socio-economic level of households. Ongoing monitoring of waste generation and reduction habits in Durham is limited to calculation of the total tons disposed in the sanitary and rubble landfills, tons taken to the earth products compost site and calculation of the total tonnage of recycled material handled by SunShares.

Community advisory group members emphasized that decisions about waste reduction policies must be based upon more detailed data about the waste stream. Group members recommended

that the city collect the following kinds of data:

- ◊ Determinations of the full costs of waste disposal and diversion programs;
- ◊ Measurements of how close the community is to meeting its goals and sub-goals for waste reduction;
- ◊ Measurements of levels of awareness in the community about the costs of solid waste management and the opportunities for waste reduction; and,
- ◊ Measurements of current waste-generating/reducing behavior, specifically as it varies between different categories of community members. (The Recycling section proposes sub-categories of businesses and institutions that might be measured separately because of similar waste-generating behaviors.)

An additional element of data collection that might become necessary would be the number and size of illegal disposal sites.

The kind of data desired often dictates the means or the feasibility of collection. Some data simply cannot be obtained because of legal restrictions. For example, haulers cannot be required to provide the names of the companies they service, and haulers cannot separate their loads to show which portions were generated by which businesses. Other data, such as measurements of variations in waste generation among various socio-economic groups) can be obtained periodically through detailed studies, but would be prohibitively expensive to maintain on a constant basis. Finally, some information is best obtained through estimation and extrapolation rather than through measurement of the whole. For example, the waste stream of restaurants in general can be estimated by waste-auditing a representative sample of restaurants and correlating variations among restaurants to variations in size and volume of business.

Data collection activities also should be structured to fit the primary uses of the data. Some data are useful primarily in the design phase of a new system or program. Data on variations in waste generation due to socio-economic group might be useful in designing a fee structure for residential collection but need not be collected on a continuous basis. Other data might need to be collected periodically to provide feedback to individual users making decisions about waste reduction, or to assess the impact of a given waste reduction program (see below). For example, businesses might choose to make a change in their number of containers or their frequency of pickup based upon data provided through a solid waste audit. Finally, some data would best be collected and monitored on a continuous basis, so that the community as a whole can see its waste reduction progress and adjust its efforts accordingly.

The Department has several tools and personnel available currently that could be used for data collection on the waste stream. Hand-held polycorders can be used to measure the frequency of set-out rates among residential users. Potentially, collection crews could be trained to do periodic visual assessments of the residential waste stream. On the commercial side, the Department has one waste reduction officer who could carry out visual inspections of the waste stream generated by specific businesses. At the landfill, the tipping fee division is installing a new computer accounting system that will be able to show changes through time in tonnages disposed by

various haulers (including city collection vehicles) and that will enable scale house operators to record visual assessments of the contents of vehicles entering the landfill.

Improvements could be made that would enable very detailed measurement and tracking of residential waste generation patterns. Equipping one or two collection trucks with scales can enable comparisons of solid waste tonnage among different neighborhoods or at different times of the year. The GIS database, once all cart numbers have been added and tied to addresses, can be expanded to include data on tonnage generated per route per week, weight generated in individual carts, average household generation within the area served by one block leader, set-out rates, recycling participation rates, and earth products participation rates.

The commercial and industrial waste streams (and county residential waste streams) generate more than 2/3 of the Durham waste stream but current arrangements make data collection difficult for these generators. Private hauling arrangements limit the kind of information that the city can obtain, and limit the city's control over data validity. Five approaches could be used to improve data collection in these sectors:

1) Voluntary surveys mailed to businesses and industries could ask them to assess the composition of their waste streams. This data might help in designing recycling programs and source reduction education but would not improve the equitability of any fee-structure design.

2) Solid waste audits of representative businesses and industries, besides helping the audited business to pursue waste reduction, might provide a basis for extrapolating about the waste-generation behavior of a sub-sector in general (say, movie theaters or department stores).

3) Changes in contracts with city-contracted haulers (BFI and SunShares) could include payment to the haulers to dedicate trucks to survey activities, such as keeping the output from a specific business separate so it could be weighed at the landfill. Another alternative includes the requirement of on-board scales that could determine the net weight difference of the waste loads before and after emptying the containers.Such contract changes would have to be carefully designed to ensure the validity of data.

4) City (and/or county) assumption of collection for commercial and residential users would give the city (or county) the ability to design data collection systems that measure or track individual user behavior. This approach would require a major investment in capital and personnel. The measurement itself would be at considerable expense as well.

5) Studies by outside contractors can provide specific data to support policy decision making. Outside firms can bring the benefits of experience in data collection, can generate results more quickly, and require no investment in capital and training. The disadvantages of using outside firms for data collection are that city staff do not become as familiar with the data and that long-term monitoring and revision of information can

be prohibitively expensive.

Choosing Data Collection Activities The Department is moving ahead with data collection by upgrading its computer accounting system to provide more information on the waste stream based on the tipping records of private and city haulers. The Department also is pursuing the installation of a GIS-linked data management system. Finally, the Department's waste reduction representative, who monitors the commercial waste stream, will begin to record visual inspection data on the composition of commercial waste streams.

One objective of the public process as this plan develops further is to determine how much data collection is necessary. The Department is prepared to move forward with any feasible data collection activities, including those carried out in conjunction with contractors.

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Is Measurement the Best Waste Reduction Mechanism?

The assumption of this plan (shared by the community advisory group) is that civic pride and awareness alone cannot bring the Durham community into compliance with state mandates for waste reduction. According to this assumption, imposing costs upon each waste generator in proportion to waste generated and reduction achieved, sooner or later, will be necessary to create incentives for waste reduction. The prerequisite to such cost imposition, as recommended by this plan, is a careful, detailed measurement of waste generation and diversion patterns in all sectors of the community.

It is worth stepping back and examining this assumption briefly. The rationale for an elaborate measurement and tracking system is that such a system is necessary to ensure that costs are allocated fairly. Measurement systems have costs of their own, however. Not only do they require staff to collect and analyze data, but they also potentially require enforcement mechanisms, appeal mechanisms, and cooperation of private entities. Furthermore, measurements of waste generation taken today might fail to give credit for waste reduction efforts already taken. (The individualized approach of solid waste audits would help to offset this problem.)

Another way entirely to approach the waste reduction challenge is to emphasize education and civic pride, then to continue to raise tipping fees to meet disposal and recycling costs. If the public is willing to pay higher tipping fees (either directly or indirectly), then waste reduction is not needed. When tipping fees become high enough, the public will find ways to self-impose waste reduction practices.

Sticking to the basic mechanism of tipping fees to influence the behavior of waste generators might be a much slower route toward waste reduction (and costlier for the average citizen), but it would be vastly simpler to implement.

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Evaluation of Programs' Cost-Effectiveness Waste reduction programs must be assessed in terms of their impact in diverting (or removing at the source) tonnage and toxicity from the waste stream. The city may not have the resources to continue a program that has only a marginal impact on the waste stream -- unless the program is expected to have "ripple effects" that lead to more significant waste reduction in the long term. For each program, a formula should be designed for answering the question "How much diversion, in the short term and the long term, does the taxpayer's dollar purchase through this program?" In other words, policy makers need to know the return on their investment in any waste reduction program.

It is worthwhile to pilot-test a variety of waste reduction programs -- or, where useful, to study other jurisdictions' experiences -- before making a major investment in a program. One of the priorities for management is to conduct such pilot tests for a length of time and with enough rigor to enable reasonable estimates of the program's total cost and total impact on waste reduction goals. The economic impact upon the community as a whole (as well as upon individual sub-sectors of the community) must also be evaluated as part of any pilot-test of a program. If possible, variable-rate user-fees (a kind of waste-reduction program) should be pilot-tested through mock-billing exercises with limited populations.

The decision whether or not to privatize a new or existing service is another area in which the return on investment should be assessed prior to making a decision. The state recommends that local governments consider the following issues in defining the role of the private sector in a government program:

1. Consider privatization when public service delivery is particularly problematic.
2 Privatization works best with services which are similar to business operations, equipment intensive, and require low public contact.
3. Initiating privatization with new services or the expansion of old ones minimizes employee displacement.
4. Privatize if cost savings are significant. Don't privatize if performance measures cannot be quantified and verified.
5. Ask yourself if a formal inspection system can be designed.
6. Decide if the private sector has more stable or better market access and agreements.
7. Determine if the public is supportive of this effort. Seek public input on proposed changes in service provision.
8. Consider what provisions are needed to continue services if the contractor reneges.[17]

One of the best ways that the city can meet the goal of cost-effectiveness is by maintaining a willingness to be creative in its use of public funds. Loans, grants, partnerships, and joint ventures are all ways that the city can use taxpayer dollars to leverage solid waste management outcomes in the community. For example, city funding of a half-time executive director for

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[17] **A Source Reduction and Recycling Guidance Document for North Carolina Communities** NC Department of Environment, Health, and Natural Resources, Division of Solid Waste Management, Office of Waste Reduction. March 1992 (pp. 37- 39)

Keep America Beautiful of Durham City-County (and operating overhead) could make it possible for that organization to raise private funds to support activities in litter control that might reduce the incidence of illegal dumping, improve the monitoring of illegal dump sites, and reduce the costs of street cleaning in the long term. Other leveraging possibilities include the use of revolving loan funds to help small recycling ventures to expand, or the establishment of a community waste reduction "challenge fund" that would be directed toward the purchase of community amenities if the community met waste reduction targets.

A Tentative Plan for Financing Solid Waste Management

Proposed Criteria As stated at the outset of this section, financing decisions ought to be made with as much public participation and input as possible. At the same time the schedule for meeting waste reduction mandates is short. This proposal outlines a timetable for the community to develop a financing system for solid waste management, and it suggests a way to cover costs in the short term without resorting to a property tax increase.

The Department recommends that any financing plan chosen by the community meet the following criteria (other criteria may be established by the community):

1) The financing arrangement should provide enough funds to maintain existing levels of service in collection and to cover the costs of disposal;

2) The financing arrangement should provide enough funds to cover recycling, source reduction, and educational activities, to be designed and refined as necessary to reach the 40% reduction goal;

3) The financing arrangement should communicate to each business, institution, and adult citizen the full costs of solid waste management in Durham;

4) If substantial progress toward the waste reduction goal has not been made by the end of Year 3 of this plan, a financing arrangement with built-in incentives for waste reduction should be instituted;

5) Any variable-rate financing system should be structured as equitably as possible using a careful collection of data on the waste generation behavior of Durham businesses, industries, institutions, and residents.

Tentative Plan This proposed timetable for development of financing arrangements assumes that economic incentives will be needed for the community to reach the 40% waste reduction goal by 2001. Reflecting the interests of community advisory group members, this timetable recommends a three-year period of study and consideration before institution of a fee for collection.

Year 1	Conducting of individualized studies of the Durham waste stream.
	Set up of data collection system for waste reduction monitoring (based upon level of community interest in data collection).
	Determination and publication of full costs of solid waste management in Durham, based upon state guidelines.
	Pilot-testing of new waste reduction and financing programs; evaluation of cost-effectiveness of existing programs (to be repeated annually as needed).
Year 2	First year of data collection on waste stream and waste reduction.
	Increase if necessary in flat rate fee for waste reduction programs.
Year 3	Integrated financing approach for solid waste proposed, presented to public, revised, and approved.
	Second year of data collection on waste stream and waste reduction (to be continued each subsequent year).
Year 4	Integrated financing approach phased in, using "mock billing" for six months to enable customers to make adjustments in behavior ahead of time.
Long term:	Reduction or phase-out of fees if waste reduction programs become less expensive because of less need for education or improvements in markets.

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