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ENVIRONMENTAL STEWARDSHIP AGENDA
WAKE COUNTY, NORTH CAROLINA

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2.0 Waste Management

The U.S. Environmental Protection Agency (USEPA) has been collecting and reporting data on waste generation for over 30 years. During calendar year 2009, the USEPA reported that residents, businesses, industries, and public institutions in the U.S. generated approximately 243 million tons of municipal solid waste (MSW), which equates to 4.34 pounds per person per day. For the purposes of the USEPA report, MSW includes such items as packaging, food scraps, yard waste, furniture, electronics (i.e., *televisions, computers, cell phones*), tires, and white goods (i.e., *appliances*), but does not include hazardous, industrial, or construction and demolition debris.

The USEPA reports that as of 2009, there were 1,900 MSW landfills and 87 waste-to-energy facilities permitted to operate in the U.S. Of the 243 million tons of MSW generated during calendar year 2009, 29 million tons (~12 percent) of MSW were combusted to generate energy (*waste-to-energy*), 82 million tons (~34 percent) were recycled or composted (*waste diversion*), and the balance of 132 million tons (~54 percent) were disposed of in landfills.

Based on best available information from the State of North Carolina, Wake County's waste generation rate for 2010 was estimated to be approximately 4.42 pounds per person per day.

2.1 Waste Material Generation

The primary waste materials generated in Wake County are municipal solid waste, yard waste, construction and demolition debris, white goods (appliances), scrap tires, electronics, and household hazardous waste. The State of North Carolina requires that these materials be disposed of at permitted facilities. Each facility is required to report to the State annually on the quantity and source of waste materials received. The reported quantities of waste materials generated in Wake County for fiscal year 2005 to fiscal year 2010 are presented in **Table 2-1**.

Table 2-1
Waste Material Generation Wake County (tons)
2005 to 2010

Waste Material Type	2005	2006	2007	2008	2009	2010
Municipal Solid Waste	609,100	633,003	648,170	636,250	634,116	596,565
Construction and Demolition Debris	426,859	462,405	491,563	502,624	332,586	265,625
Yard Waste	60,063	63,328	65,739	61,054	73,760	76,805
Household Hazardous Waste	475	407	422	472	585	639
White Goods (Appliances)	1,748	1,459	1,421	1,068	1,005	847
Electronics	473	475	744	603	906	986
Scrap Tires	9,825	11,177	13,117	13,180	11,781	12,046
Total	1,110,548	1,174,260	1,223,183	1,217,259	1,056,748	955,523

Data Source: Solid Waste Management Annual Reports, Household Hazardous Waste Facility Annual Report, Scrap Tire Management Annual Report, County Waste Disposal Reports

2.2 Waste Material Recycling

Material recycling is provided in Wake County for both traditional and non-traditional materials. Traditional recyclable materials in the community consists primarily of mixed paper, corrugated cardboard, plastic food/beverage containers, glass food/beverage containers, and metallic food/beverage containers. Non-traditional materials include such items as yard waste, electronics, scrap tires, and white goods.

2.2.1 Traditional Material Recycling

The majority of traditional recyclable materials are processed at two facilities in Wake County: Recycle America and Sonoco Recycling. Each of Wake County's 12 municipalities collects recyclable materials from residents through curb-side collection programs and county-run convenience centers. Unlike waste material disposal, the State of North Carolina does not have strict requirements for processors to report the quantity and source of recycled materials received. However, the county and municipalities maintain records of these materials before delivering them to local recyclable material processors. **Table 2-2** presents the quantity of recycled materials collected annually by local governments in Wake County.

Table 2-2
Local Government Traditional Material Recycling (tons)
2005 to 2010

Local Government Agency	2005	2006	2007	2008	2009	2010
Apex	2,230	2,395	2,656	2,093	2,650	2,926
Cary	7,603	7,488	8,586	8,969	9,322	11,136
Fuquay-Varina	600	600	727	852	801	897
Garner	838	745	880	908	822	1,445
Holly Springs	1,050	868	1,243	1,115	1,978	1,706
Knightdale	364	329	380	434	487	506
Morrisville	310	564	612	695	778	720
Raleigh	16,185	17,598	19,243	20,915	21,634	22,630
Rolesville	0	97	149	173	151	267
Wake Forest	1,418	1,823	1,993	2,767	2,635	2,689
Wendell	130	144	129	262	236	278
Zebulon	125	130	140	153	259	192
Wake County (convenience centers)	7,190	7,311	7,676	8,262	7,615	8,290
Wake County (government buildings)	295	342	356	396	298	259
Wake County Public Schools (mixed paper)	1,932	884	724	807	780	653
Total	40,269	41,318	45,494	48,799	50,446	54,592

Data Source: Solid Waste Management Annual Reports

2.2.2 Non-Traditional Material Recycling (Landfill Disposal Bans)

In an effort to increase the quantity of materials diverted from municipal solid waste landfills, the North Carolina General Assembly has enacted legislation over the years that bans certain materials from being disposed in a landfill.

Before October 2009: materials such as yard waste; whole scrap tires; aluminum cans; white goods (appliances); and lead-acid batteries (car batteries) were banned from landfills.

Since October 1, 2009: the following additional materials have been banned from landfills: rigid-plastic containers; used motor vehicle oil filters; oysters shells, and wooden pallets.

After July 1, 2011: discarded computer equipment and televisions will be banned from landfills.

The historic trend has been that as materials have become banned from landfill disposal, recycling markets have emerged to accommodate the diversion of materials. In some instances, the legislative bans include surcharges at the point of sale of the item (tires and appliances). The revenue from the surcharges are then used to subsidize recycling program costs around the State.

2.3 Waste Material Disposal

It is understood that some quantity of materials can not be recycled or reused and can not be designed out of the system. Once waste reduction, reuse and recycling have been achieved to the greatest extent practicable, a waste material will remain that requires disposal. Consistent with national trends, landfill disposal is currently the primary waste disposal method for local governments in North Carolina because it serves as a low-cost, efficient, and environmentally responsible method for waste disposal.

There is currently one MSW landfill in Wake County and four construction and demolition debris landfills in Wake County.

2.3.1 Regulatory Requirements for Landfill Disposal

In 1989, the North Carolina General Assembly passed the Solid Waste Management Act, which required all 100 counties to provide for the safe disposal of solid wastes produced in each county and to reduce the amount of waste disposed of in landfills by 25 percent. The result of this legislation was that counties were mandated to begin managing and planning for solid waste collection and disposal. The General Statutes were also amended to require that each county implement a recycling program for solid waste materials that can be economically recycled.

Current-day municipal solid waste landfills are planned, permitted, designed, constructed, operated, and monitored to ensure compliance with environmental protection requirements for air resources, land resources, surface water resources, and groundwater resources. During the planning and permitting phases of landfill development, regulatory agencies require landfill owners to conduct environmental studies to ensure that landfills are located in a manner that avoids or minimizes impacts to streams, wetlands, groundwater, and other environmental

resources. Prior to issuance of final permits for construction and operation, regulatory agencies solicit public input on proposed landfill projects through public hearing sessions and public comment periods.

The time required to develop the South Wake Landfill was approximately 20 years, at a cost of approximately \$5 million. Current regulatory requirements for landfill development have become more stringent, and so it should be expected that developing a new landfill in Wake County will require at least the same time duration and financial cost as the South Wake Landfill.

2.3.2 Landfill Disposal of MSW

During 2010, 99-percent of the municipal solid waste generated in Wake County that required disposal was disposed of in three landfills:

1. South Wake Landfill owned by Wake County Government (74 percent);
2. Sampson County Landfill owned by Waste Industries (20 percent); and
3. Upper Piedmont Landfill owned by Republic Services (5 percent).

Other landfills that received municipal solid waste generated in Wake County included the Lee County Landfill in Bishopville, SC, and the Charlotte Motor Speedway Landfill (Cabarrus County, NC) owned by Republic Services.

No waste from Wake County was combusted in a waste-to-energy facility in 2010. Over the past decade, only 228 tons of (0.004 percent) of municipal solid waste generated in Wake County has been combusted in a waste-to-energy facility.

2.4 Financial Considerations for Solid Waste Management

Local governments in Wake County have been involved in solid waste management services since the 1970's. Solid waste management in Wake County, just as in most other regions of the nation, consists of a system of public and private programs and facilities that provide for waste collection, transportation, and disposal, as well as recyclable material collection, transportation, and processing.

2.4.1 Cost of Service Factors

In general, the cost-of-service for solid waste management is comprised of the following factors:

1. The type of material (waste material or recyclable material)
2. The size and type of disposal container (roll-cart, dumpster, compactor, open-top);
3. Type of collection vehicle (manual versus automated)
4. The frequency of waste collection (daily, weekly, bi-weekly, other)

5. The proximity of the final destination for the material (waste or recyclable) relative to the source of the material; and
6. The type of disposal and recycling facility.

It is generally acknowledged that the cost factors related to the type of material, the size and type of disposal container, and the frequency of waste collection are relatively fixed for a given residence, business, industry, or public institution. For example, a residence, business, industry or public institution can define its level of service requirements, and then solicit bids from any number of private waste management companies to provide the service. Competitive market forces for these cost factors aid in holding costs relatively low.

With regards to the type of disposal, nationally and locally, landfill disposal remains the low-cost waste disposal method, as waste-to-energy facilities continue to remain more expensive than landfills due to the higher capital cost and operating cost requirements. So, in Wake County private waste management companies contracted for service will haul waste to a landfill for disposal.

Within Wake County, the cost factor that has the most variability – and, therefore, the most impact on cost of service – is the proximity of the final destination of the material relative to the source of the material. The proximity cost factor is the cost of transportation, which is a direct function of diesel fuel costs and equipment operations and maintenance costs. A benefit of the South Wake Landfill to the residences, businesses, industries, and public institutions in Wake County is that it is located closer to the source of the wastes generated than any other landfill. This proximity advantage results in a reduced cost of service versus for solid waste management due to lower costs for transporting waste. The blended “cost-of-service” for the South Wake Landfill system is approximately \$31 per ton, and the blended “market-rate” price for the South Wake Landfill system is approximately \$36 per ton. Market forces for landfill disposal service offers Wake County the opportunity to charge a “market-rate” price versus “cost-of-service” price because of the value offered by proximity. The financial performance of the South Wake Landfill system is presented in **Table 2-3**.

Table 2-3
South Wake Landfill Disposal System
Financial Performance Summary

Reported Financial Metric	2009 Actual	2010 Actual	2011 Estimate
Waste Received at South Wake Landfill, tons	463,126	439,069	425,000
South Wake Landfill System Revenues, \$	\$16,479,023	\$15,709,399	\$15,082,279
South Wake Landfill System Expenditures, \$	\$14,162,864	\$13,488,077	\$12,897,159
Net Revenues, \$	\$2,316,159	\$2,221,322	\$2,185,120

Notes:

(1) Revenues reported are from "tipping fee" charges at the South Wake Landfill (\$30/ton) and East Wake Transfer Station (\$36/ton)

(2) Expenditures reported include all labor, materials, supplies, and equipment required for South Wake Landfill and the East Wake Transfer Station operations, including reserve funds for soil purchases, landfill closure, and landfill post-closure care and maintenance.

(3) Net Revenues reported are funds that are rebated back to local government partners to fund solid waste programs and services in their respective jurisdictions. Funds are distributed on a pro-rata basis.

2.4.2 Public/Private Partnerships for Solid Waste Management

Since the 1970's, Wake County has been developing solid waste disposal facilities in the county using a public-private partnership model. Under this model, Wake County assumes responsibility for land acquisition and environmental permitting, and then solicits proposals from the private sector to design, build, and operate the landfill facilities in accordance with the environmental permits. Wake County pays the private-sector partner using revenue generated from the tipping fees charged for waste disposal.

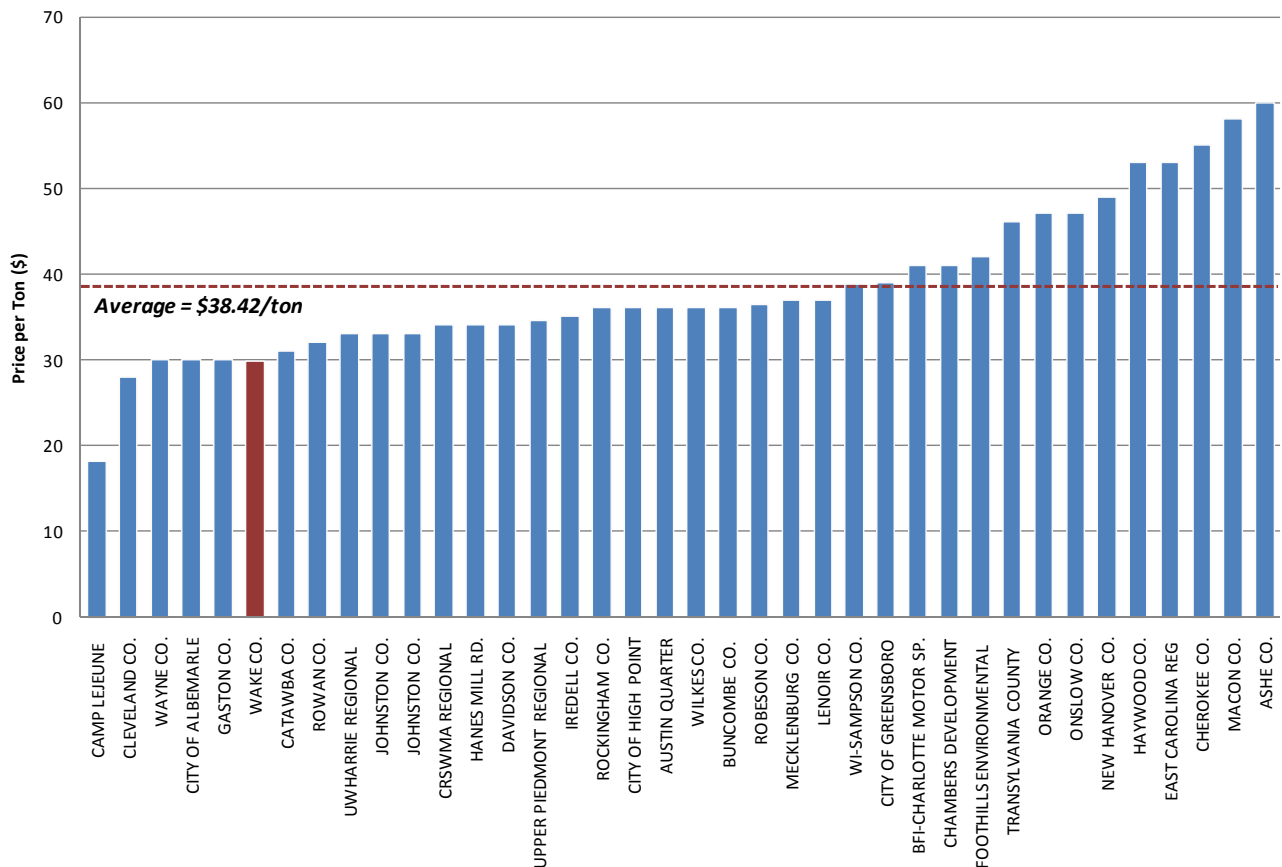
In 2004, prior to developing the South Wake Landfill, Wake County conducted two request-for-proposal (RFP) processes in order to identify the least-cost waste disposal system for residents, businesses, industries, and public institutions. The objective of the first RFP process was to determine the least-cost disposal method by soliciting bids for alternative solid waste disposal and conversion technologies. The first RFP process identified landfill disposal as the least-cost disposal method. The objective of the second RFP process was to determine the least-cost location for landfill disposal by soliciting bids for in-county disposal using the South Wake Landfill and out-of-county disposal using private landfills located in other counties. The second RFP process identified the South Wake Landfill as the least-cost location for landfill disposal.

The South Wake Landfill is located between the Towns of Apex and Holly Springs on NC Highway 55. The landfill is being developed in phases and, upon completion, it is anticipated to have a total footprint of 189 acres and a design capacity of approximately 30 million cubic yards (air space) of municipal solid waste. The operating permit from the State of North Carolina allows the South Wake Landfill to accept municipal solid waste from residents, businesses, industries, and public institutions located within Wake County only. The landfill opened in February 2008, with a tipping fee of \$30 per ton. It is estimated that the South Wake Landfill has a life expectancy of 25 years beginning February 2008.

2.4.3 Current Waste Disposal Costs

As shown in **Figure 2-1**, the public-private partnership approach allows residents, businesses, industries, and public institutions in Wake County to have one of the lowest waste disposal rates in North Carolina at \$30 per ton for the South Wake Landfill (\$36 per ton for the East Wake Transfer Station). The disposal rates are set to recover all costs for personnel, equipment, materials, supplies, and capital, as well as reserves for soil purchases, landfill closure, and future post-closure care and maintenance. The current disposal rate does not include any allowance or reserves for developing the next generation waste management system to replace South Wake Landfill when it is no longer available for service.

**Figure 2-1
North Carolina MSW Landfill Tipping Fees at End of FY 2009 (\$/ton)**



2.5 Recommended Waste Management Strategies

This section presents the recommended strategies for waste management developed by the Sustainability Task Force. The strategies identified by the Sustainability Task Force for waste management are as follows:

- 1) Extend the Financial and Environmental Benefits of the South Wake Landfill.
- 2) Increase Waste Reduction, Reuse, and Recycling for Construction and Demolition Debris.
- 3) Maximize the Financial and Environmental Benefits of Other Landfill Resources.

4) Initiate Investigations for Next Generation Waste Management System.

As directed by the Wake County Board of Commissioners, the Sustainability Task Force has been working together to develop recommended sustainability strategies for waste management that are environmentally and financially sustainable.

2.5.1 Definition of Cost-Effective Strategies

For the purposes of this section, the term “cost-effective strategy” will be defined as a strategy that can be implemented for less than the prevailing tipping fee at the South Wake Landfill, which is currently \$30 per ton. If a waste diversion strategy for a specific material can be implemented to conserve air-space at the South Wake Landfill for less than the prevailing tipping fee, then that strategy should be given careful consideration for implementation because it is less expensive to divert the material than to dispose of the material. If, however, a waste diversion strategy for a given material can not be implemented for less than the prevailing tipping fee, then consideration should be given to continue disposing of the material at the South Wake Landfill until the economics of diverting the specific material can be improved through technology advances, market conditions (demand for the material), operational changes, or changes in law.

2.5.2 Strategy No. 1 – Extend the Financial and Environmental Benefits of the South Wake Landfill

If the community can implement strategies to extend the useful life of the South Wake Landfill, then the financial and environmental benefits of the South Wake Landfill can also be extended beyond the currently planned 25 years.

1) Financial Benefits of Extending the Life of South Wake Landfill

- a) Extends the duration of cost savings associated with the existing low cost and efficient disposal system;
- b) Provides additional time for the community to carefully evaluate the full range of next generation waste management systems, and identify cost-effective options; and
- c) Defers the expenditure of capital, operating, and startup costs required to implement the next generation waste management system.

2) Environmental Benefits of Extending the Life of South Wake Landfill

- a) Defers the need to impact environmental resources to implement the next generation waste management system; and
- b) Provides additional time for the community to carefully evaluate the full range of next generation waste management systems, and identify options that avoid or minimize environmental impacts.

Recommendations

The Sustainability Task Force recommends that the County work with public, private, and not-for-profit organizations to develop and implement cost-effective programs to extend the financial and environmental benefits of the South Wake Landfill beyond the currently planned 25 years. The financial and environmental benefits of the South Wake Landfill can be extended beyond the currently planned 25 years through increased waste reduction, reuse, and recycling.

- A. Adjust Tipping Fee: Continue to adjust the tipping fee at the South Wake Landfill and East Wake Transfer Station to accurately reflect the full cost of service for disposal, including all necessary reserve funds and future costs to develop the next generation waste management system.

- B. Divert High-Volume Waste Materials from Landfill Disposal: Identify and implement cost-effective programs to divert high-volume waste materials from the South Wake Landfill.
 - 1. Conduct a waste characterization study for all waste received at the South Wake Landfill. Collect waste characterization data for residential, commercial, and public institution sectors. Design the study to identify high-volume materials received at the South Wake Landfill.

 - 2. Evaluate the feasibility of implementing waste diversion programs for high-volume materials identified in the waste characterization study. Work with private-sector recycling processors to identify cost-effective options for waste diversion.

 - 3. Identify the collection and processing infrastructure, education, and institutional changes needed to implement the selected waste diversion programs.

 - 4. Implement the cost-effective waste diversion programs for the targeted high-volume materials.

- C. Divert Food Waste from Landfill Disposal: The 1999 Waste Characterization Study conducted by Wake County identified 12.1 percent of the waste received as food waste. If a portion of food waste can be cost-effectively diverted from the landfill, it will help to extend the life of the South Wake Landfill beyond the currently planned 25-year life.
 - 1. Review the findings of the waste characterization study to identify the quantity of food waste disposed of at the South Wake Landfill.

 - 2. Launch a voluntary residential composting program. The program will include:
 - i. Education for citizens on the methods of compost production and alternative end uses for food waste compost.

 - ii. Subsidies to assist citizens with the purchase of compost production equipment, materials, and supplies such as bins, tumblers, etc.

3. Conduct a pilot-scale food-waste diversion composting program for large food-related facilities such as grocery stores, food processors, and cafeterias. The objective of the pilot-study will be to accurately define the full-cost of service to implement a food-waste diversion composting program for large food-related facilities.
 - i. Evaluate the feasibility of implementing a food-waste diversion composting program for large food-related facilities. Work with private sector waste haulers and industrial composting companies.
 - ii. Identify the collection and processing infrastructure, education, and institutional changes needed to implement a food-waste diversion composting program for large food-related facilities.
 - iii. Implement the cost-effective food-waste diversion composting program for targeted facilities.

D. Evaluate Pay-As-You-Throw (PAYT) Pricing for Residential Customers: With PAYT pricing, waste disposal costs are based on the type of waste, the size of the disposal container, and the frequency of waste collection. The PAYT program offers a financial incentive to voluntarily reduce, reuse, and recycle wastes. Currently, businesses, industries, and public institutions in Wake County are subject to PAYT pricing. Under this recommended strategy, residential customers will have the opportunity to reduce their disposal costs by reducing their waste.

1. Evaluate the technical, financial, and institutional feasibility of implementing a PAYT pricing program for single-family residential customers.
2. Develop an implementation plan, based on the findings of the feasibility study, for a PAYT pricing program for single-family residential customers.

E. Offer Developers Incentives to Provide Recycling Facilities:

1. Evaluate options to offer incentives (parking counts, housing density credits, etc.) to developers to provide recycling facilities in new or existing (retrofits) commercial, multi-family residential, and mixed-use projects. This recommendation is intended to increase recycling by increasing the convenience to recycle in commercial, multi-family residential, and mixed-use developments.
2. Develop design information to guide developers on best practices for including recycling facilities in new and existing projects.

F. Evaluate Converting Waste Cooking Oils and Greases to Biofuels:

1. Conduct a pilot-scale program to produce biofuels using restaurant grease trap wastes and residential used cooking oils and greases. Work with local governments, private sector waste haulers, and biofuel producers.
2. Identify the collection and processing infrastructure, education, and institutional changes needed to implement a biofuel production program using restaurant grease trap wastes and residential used cooking oils and greases.
3. Implement the cost-effective biofuel production program using restaurant grease trap wastes and residential used cooking oils and greases.

2.5.3 Strategy No. 2 – Increase Waste Reduction, Reuse, and Recycling for Construction and Demolition Debris

In Wake County, construction and demolition (C&D) debris is most closely associated with home building and commercial building. The typical C&D waste includes concrete/masonry, scrap lumber, asphalt shingles, gypsum-based drywall, carpet, and carpet padding. As of 2007, the current C&D debris generation rate in Wake County was estimated to be approximately 580,000 tons per year and of this annual total, approximately 90,000 tons per year was recycled for a recycling rate of 15.5 percent.

At this time, local governments do not provide any services or facilities for C&D debris disposal. However, there are currently four privately owned and operated C&D debris landfills in Wake County with a permitted capacity of 32 million tons, which equates to approximately 60 years of C&D disposal capacity for Wake County.

Similar to the discussions related to the South Wake Landfill, the goal for these recommended strategies is to extend the useful life of the existing C&D landfills in Wake County. Extending the useful life of existing C&D landfills will benefit the community by deferring the need to impact additional environmental resources required to expand or construct new C&D landfills in the County.

Recommendations

The Sustainability Task Force recommends that Wake County establish a C&D Work Group comprised of representatives from the commercial building industry, residential building industry, not-for-profit organizations (Habitat for Humanity, Builders of Hope, etc.), building material manufacturers, and building material disposal and recycling companies. The C&D Work Group will serve as the forum for Wake County staff and industry leaders to identify impediments to C&D material reuse and recycling, and identify opportunities to increase C&D material reuse and recycling in Wake County. The recommended work plan for the C&D Work Group is as follows:

- A. Identify Potential Pilot Tests. The C&D Work Group will work with County staff to identify pilot tests that can be used to define current impediments to C&D reuse and recycling.

- B. Conduct Pilot Tests for C&D Reuse and Recycling. The C&D Work Group will oversee the conduct of pilot tests selected for implementation. The data from pilot tests will be used to evaluate the cost-effectiveness of full-scale implementation of C&D material reuse and recycling.
- C. Develop Education Materials. The C&D Work Group will work with County staff to create fact sheets and other educational materials to inform developers and builders of the benefits, opportunities and resources availability for C&D material reuse and recycling.
- D. Develop an Outreach Plan. The C&D Work Group will work with County staff to develop an outreach plan to distribute education materials related to C&D material reuse and recycling. The outreach plan will include recommendations for printed materials, workshops, web-based tools, and social media tools.

2.5.4 Strategy No. 3 – Maximize the Financial and Environmental Benefits of Other Landfill Resources

The South Wake Landfill (active landfill) occupies a parcel of land in southwest Wake County that totals approximately 760 acres. The South Wake Landfill will occupy approximately 189 acres when it reaches capacity in 2033.

The North Wake Landfill (closed landfill) occupies a parcel of land in northwest Wake County that totals approximately 260 acres. The North Wake Landfill closed in 2008, and in July 2010 the new North Wake Landfill District Park was opened at the landfill site.

Recommendations

The Sustainability Task Force recommends that the County investigate opportunities to maximize the financial and environmental benefits of the County's available landfill resources through either private or public investment.

- A. Generate Power from Methane Gas Production. A by-product of waste decomposition at a landfill is methane gas. It is possible to collect the methane gas at a landfill and use the gas to generate electricity through combustion in an engine-generator. The North Wake Landfill and the South Wake Landfill currently produce sufficient volumes of methane gas to produce electricity which can be sold to electric utilities as renewable energy. In addition, environmental attributes associated with renewable energy generation and greenhouse gas destruction may also be marketed and sold under certain circumstances. Wake County staff will work with private sector companies to develop methane gas resources for maximum financial and environmental benefit.
- B. Evaluate Other Renewable Energy Options. The South Wake Landfill and the North Wake Landfill have sufficient land resources available to investigate the feasibility of renewable energy using solar and wind resources. Wake County staff will work with private sector companies and university resources to evaluate the technical, financial, and regulatory feasibility of developing solar power and wind power resources at the County's landfill properties.

- C. Evaluate Opportunities to Attract Private Businesses and Industries to the South Wake Landfill. Incentives could include rezoning adjacent properties from residential use to commercial or industrial use. Companies can benefit from the proximity to the landfill's energy resources and material recovery resources. Wake County staff will work with private sector companies and economic development professionals to identify the features and benefits of the County's landfill resources that can be promoted and marketed to attract private sector investment to locate on, or in close proximity to, the South Wake Landfill.
- D. Evaluate Opportunities to Develop Park and Recreation Facilities on Landfill Properties. The County's landfill properties provide unique opportunities to preserve open space and develop active recreation facilities. Building on the success of the North Wake Landfill District Park, Wake County staff will work with community groups (public, private, and not-for-profit) to identify opportunities to integrate park and recreation facilities into the County's landfill properties.

2.5.5 Strategy No. 4 – Initiate Investigations for Next Generation Waste Management System

As demonstrated through the competitive bidding process, the South Wake Landfill is a low-cost, efficient, and environmentally responsible waste disposal system. The time required to plan, permit and construct the South Wake Landfill was 20 years, and the estimated useful life of the South Wake Landfill is 25 years. The next generation waste disposal system has not been identified to replace the South Wake Landfill upon its closure.

Recommendations

Recognizing the time required to develop a waste disposal system, the Sustainability Task Force recommends that the County initiate investigations for the next generation of waste management system for the community. It is further recommended that the County partner with research universities, private industry, and regional local governments to conduct the necessary investigations. The recommended work plan for the investigation is as follows:

- A. In anticipation of the long lead-time that may be required to develop the next generation waste management system, the investigation should start immediately.
- B. Consistent with the selection process for the South Wake Landfill, the investigation of next generation waste management systems should consider:
 - 1. Landfill disposal versus emerging technologies;
 - 2. In-county versus out-of-county options.
- C. The evaluation criteria should include environmental compliance requirements, quality of service factors (reliability, redundancy, etc.), level of service factors (i.e., accommodate long-term population growth projections), cost-of-service factors (i.e., retain relatively low unit cost of service), and social factors (i.e., environmental justice).

- D. The evaluation should include an assessment of mitigation measures that can be offered to address potential adverse impacts to property owners. The mitigation measures will be used to address the potential concerns of property owners that are located adjacent to, or in close proximity to, the next generation waste management system.
- E. The evaluation should also include an assessment of technology advances that provide for energy production from waste materials generated in Wake County. Such technologies include, but are not limited to, the following:
 - 1. Advanced landfill design
 - 2. Waste-to-Energy (produce electricity from combustion of waste)
 - 3. Gasification (produces combustible gas, hydrogen, synthetic fuels)
 - 4. Thermal depolymerization (produces synthetic crude oil)
 - 5. Pyrolysis (produces combustible tar/bio-oil and chars)
 - 6. Plasma arc gasification (produces hydrogen and CO usable for fuel cells or generating electricity)
 - 7. Anaerobic digestion (Biogas rich in methane) for organic waste components such as food waste, and wastewater treatment facility sludge.
 - 8. Fermentation production (ethanol, lactic acid, hydrogen)
- F. An implementation schedule should be developed to identify the various steps necessary to bring the next generation waste management system in service.

2.6 Performance Measures for Waste Management

A second requirement placed upon the Sustainability Task Force by the Board of Commissioners was to identify performance measures that can be used to monitor and report progress toward the achievement of sustainability targets for waste management. There are a number of different performance measures that the community can use to gauge the success of the recommended strategies. Descriptions of recommended performance measures are presented below, and sample calculations are provided in **Table 2-3** for metrics No. 1 through 4.

- 1. Annual per capita tons of municipal solid waste disposed. This metric is calculated using the total tons of municipal solid waste disposed from all sources at all locations divided by the total county population. This metric can be modified using single-family residential units or total residential units to calculate a unit index based on tons of municipal solid waste generated per household per year.
- 2. Annual per capita tons of total waste disposed. This metric is calculated using the total tons of municipal solid waste disposed and total tons of C&D waste disposed from all sources at

all locations divided by the total county population. This metric can be modified using single-family residential units or total residential units to calculate a unit index based on total tons of municipal solid waste and C&D waste generated per household per year.

3. Annual per capita tons of recycled materials collected. This metric is calculated using the total tons of recycled material collected from residential housing units (most readily available data) divided by the total county population. This metric can be modified if recyclable material from businesses, industries, and public institutions can be collected and reported. In addition, this metric can be modified using single-family residential units or total residential units to calculate a unit index based on tons of recycled material generated per household per year.
4. Annual waste diversion rate. This metric is calculated using the total tons of recycled material collected from residential housing units (most readily available data), divided by the sum of the total tons of municipal solid waste and the total tons of recycled material collected. This metric can be modified if recyclable material from businesses, industries, and public institutions can be collected and reported.

TABLE 2-3
Solid Waste Performance Metrics Wake County
2005 to 2010

Performance Metrics	2005	2006	2007	2008	2009	2010
Total Municipal Solid Waste (MSW), <i>tons/year</i>	609,100	633,003	648,170	636,250	634,116	596,565
County Population	757,346	793,401	831,537	866,438	892,409	919,938
<i>Per Capita MSW Generation Rate, tons/person/year</i>	<i>0.80</i>	<i>0.80</i>	<i>0.78</i>	<i>0.73</i>	<i>0.71</i>	<i>0.65</i>
Total Municipal Solid Waste (MSW), <i>tons/yr</i>	609,100	633,003	648,170	636,250	634,116	596,565
Construction and Demolition Debris	426,859	462,405	491,563	502,624	332,586	265,625
County Population	757,346	793,401	831,537	866,438	892,409	919,938
<i>Per Capita MSW/C&D Generation Rate, tons/person/year</i>	<i>1.37</i>	<i>1.38</i>	<i>1.37</i>	<i>1.31</i>	<i>1.08</i>	<i>0.94</i>
Total Residential Recycled Materials, <i>tons/yr</i>	38,043	40,092	44,414	47,596	49,367	53,681
County Population	757,346	793,401	831,537	866,438	892,409	919,938
<i>Per Capita Recycling Rate, pounds/person/year</i>	<i>100.5</i>	<i>101.1</i>	<i>106.8</i>	<i>109.9</i>	<i>110.6</i>	<i>116.7</i>
Total Municipal Solid Waste (MSW), <i>tons/year</i>	609,100	633,003	648,170	636,250	634,116	596,565

Residential Recycled Materials, <i>tons/year</i>	38,043	40,092	44,414	47,596	49,367	53,681
<i>Waste Diversion Rate, %/year</i>	<i>5.88%</i>	<i>5.96%</i>	<i>6.41%</i>	<i>6.96%</i>	<i>7.22%</i>	<i>8.26%</i>

5. Waste characterization data. As the name suggests, a waste characterization study is conducted to define the characteristics of waste disposed of at a landfill. The most recent waste characterization study for Wake County was conducted in 1999, and the results are presented in **Figure 2-2**. The objective is to define the quantity of recyclable and reusable materials disposed by residents, businesses, industries and public institutions in Wake County, with the goal being to have a final waste product from the community that contains predominantly non-reusable, non-recyclable materials.
6. Annual or bi-annual recycling participation rate survey. The County will conduct an annual or bi-annual survey to determine the residential and business participation in recycling programs. The survey can be used to determine the effectiveness of education and outreach efforts.
7. Special events recyclable material collection. For special events such as the North Carolina State Fair, NC State football games, Carolina Hurricane games, Susan G. Komen Race for the Cure, etc., the County will measure the tons of recycled material collected at these events and report the findings through various media sources. The results can be used to determine the effectiveness of education and outreach efforts.
8. Estimated life of landfill. The South Wake Landfill opened in February 2008, with an estimated useful life 25 years. If the community can successfully implement the recommended strategies, then the useful life of the South Wake Landfill can be extended beyond the currently planned 25 years. On an annual basis, the County can report the estimated closure date for the South Wake Landfill.

Figure 2-2

**Composition of Waste
Disposed of at North Wake
Landfill**

(% by weight)

Source: 1999 Waste Characterization
Study for North Wake Landfill

