GASTON COUNTY, NORTH CAROLINA
Solid Waste and Recycling Division
200,000 County Residents Served
$6,000,000 budget

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Executive Summary

Gaston County, North Carolina owns and operates a municipal solid waste landfill, construction and demolition landfill, six recycling/convenience sites, yard waste facility, household hazardous waste facility, power generation facility, and a newly constructed Eco-Industrial Park. The mission of Gaston County Solid Waste and Recycling Division is to protect the residents and natural resources of Gaston County by providing an environmentally friendly and educational atmosphere. Gaston County achieves this mission through extensive recycling programs, reuse opportunities and commodity management of landfill gas. Minimization of the environmental impacts resulting from solid waste management operations is typically achieved through an integrated approach of waste reduction, recycling and disposal. Using this backdrop, the County developed a strategy to conserve existing resources by reducing the quantity of material disposed and by developing renewable resources from the municipal solid waste managed at the Gaston County Landfill and the resultant products of waste decomposition and recycling.

Flow Chart of Gaston County Solid Waste and Recycling operations
Table of Contents

1. Site Overview
   • Site History
   • Yardwaste, HHW and Convenience Sites
   • Capacity and Tonnage
   • ISWM Plan

2. Siting, Design and Construction
   • Design Elements
   • Community

3. Equipment/Systems and Technologies
   • Equipment
   • Maintenance Schedule
   • Recovery Plan

4. Environmental Controls and Monitoring
   • Environmental Monitoring
   • Landfill Gas Control and Monitoring

5. Regulatory Compliance

6. Planning and Operations
   • Materials
   • Effectiveness and Efficiency

7. Employee and Customer Safety

8. Public Acceptance, Appearance and Aesthetics
   • Site Appearance
   • Community Outreach
   • Customer Service
   • Awards
1. Site Overview

Site History

Gaston County is located in the South-Central Piedmont of North Carolina and is the third-largest county in the Charlotte Region. By operating through an enterprise fund, Gaston County Solid Waste and Recycling exhibits some autonomy to allow growth and exploration into future sustainable efforts through our landfill, recycling centers, yard waste facility, renewable energy center, and our energy park. With all of these facilities and resources we will continue to grow new programs throughout the county in efforts to promote sustainable practices as we serve our 200,000 county residents, including the municipalities of Gastonia, Dellview, Cherryville, High Shoals, Stanley, Bessemer City, Kings Mountain, Spencer Mountain, Mount Holly, Ranlo, Lowell, McAdenville, Belmont, and Cramerton.

The County owns and operates a 400-acre + integrated solid waste management facility located just North of Dallas, NC where the County conducts MSW disposal, construction and demolition debris disposal, yard waste, and recycling operations. The facility was opened in 1987 and, on average, disposes of approximately 130,000 tons/year of MSW and 50,000 tons/year of C&D. In addition to soundly running their landfill facility, Gaston County Solid Waste and Recycling Division also maintains and runs 6 convenience site throughout the county, Household Hazardous Waste Collection Facility, and a Yard Waste Facility.
Yard Waste Facility

The County owns and operates a yard waste facility located across the street from the landfill. Along with yard waste debris, clean wood can be separated and added to the yard waste program. Gaston County currently conducts mulching of yard waste, which is provided to county residents at minimal cost. The County yard waste programs have been very successful in providing a useable product from the waste disposed and will be continued as a component of the long-term solid waste management plan.

Household Hazardous Waste and Special Waste

The County established a permanent HHW collection facility in Dallas, located approximately 8 miles from the landfill. The facility has operated four Saturdays per year for collection of HHW from County residents. This has created a safe, economical, and convenient location to collect HHW more frequently. Overall, the County’s HHW program continues to be well received by the public as being a needed outlet for disposal of common household items which could be hazardous to our local environment if not properly handled.

At each HHW event, latex and oil based paints, aerosols, cleaning supplies, batteries, mercury, fluorescent lights, pesticides, antifreeze, used oil, and oil filters are among items collected from county residents.

Convenience Sites

Gaston County operates six recycling drop-off centers located throughout the county and available for use by all county residents. Residential solid waste and recyclables are collected at five recycling/convenience sites; the sixth drop-off center accepts recycling only. Solid Waste that is brought to these centers is taken for a nominal fee depending on the amount and size of the materials. Credit is given for recyclable products, while tires off the rim and white goods are taken free of charge. The recyclable materials collected at these facilities include newspaper, mixed paper, toner cartridges, corrugated cardboard, cans (aluminum, steel and tin), assorted colors of glass, plastic bottles, motor oil and filters, antifreeze, used cooking oil, lead-acid batteries, white goods, scrap metal, electronics and tires. These centers are staffed to provide residents with information on recycling and materials preparation.
Capacity and Tonnage

Landfill

Gaston County’s landfill facility has approximately 2,650,000 tons of municipal solid waste disposed in Area C and Area D, Unit 1, and Unit 2, Phase 1 MSW landfill units. Daily landfill operations include compaction and cover of trash, environmental control upkeep, and recycling.

<table>
<thead>
<tr>
<th>FY2014 Quarter</th>
<th>Yard Waste</th>
<th>Demo</th>
<th>Commercial</th>
<th>Total</th>
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<tr>
<td>First</td>
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<td>14,328.78</td>
<td>39,825.12</td>
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<tr>
<td>Second</td>
<td>542.17</td>
<td>14,653.00</td>
<td>41,005.63</td>
<td>56,200.80</td>
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<td>Third</td>
<td>410.48</td>
<td>12,492.61</td>
<td>40,850.94</td>
<td>53,754.03</td>
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<tr>
<td>Fourth</td>
<td>533.65</td>
<td>13,916.75</td>
<td>43,491.51</td>
<td>57,941.91</td>
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<tr>
<td><strong>Total</strong></td>
<td>2,023.03</td>
<td>55,391.14</td>
<td>165,173.20</td>
<td><strong>222,587.37</strong></td>
</tr>
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</table>

Recycling

Liquid cooking oil does pose a challenge with regard to disposal. Residents cannot pour it down the drain because it eventually clogs sewer drain lines, and liquid wastes are not allowed in the Gaston County Landfill. In light of these disposal challenges, Gaston County Solid Waste and Recycling has initiated a partnership with Gaston County Schools and City of Gastonia Wastewater Treatment to collect used cooking oil for use in the school system’s biodiesel production program. Cooking oil is collected at the recycling/convenience sites and is then transported to the County school garages, where it is processed into biodiesel fuel to be utilized in the school buses.
Integrated Solid Waste Management Plan

Goals

Gaston County began to explore sustainability practices that could be implemented in conjunction with its existing solid waste management and landfill operations. The major challenge of the County’s sustainability initiative was to provide what is best for the citizens of Gaston County and the environment both now and in the indefinite future. Thus, the County established these goals:

- To provide comprehensive Solid Waste Management programs which maximize protection of the environment and efficiently utilize the disposal system.
- To provide Educational programs to the public on responsible waste management, with an emphasis on source reduction, re-use, recycling and environmental awareness.
- To provide attractive and well-maintained facilities and equipment in order to provide waste disposal services promptly to users, to enhance the image of waste management in the service area.
- To improve air quality by reducing greenhouse gas emissions.
- To generate a stable revenue stream from the production of renewable energy and associated environmental attributes.

2. Siting, Design and Construction

Design Elements

MAJOR DESIGN ELEMENTS

- Engineering
- Permitting
  - Solid Waste Permit
  - Air Permit
  - NPDES Permit
- Liner
- Leachate
- Monitoring
  - Ground Water
  - Air Quality
- Methane
  - Purchase Power Agreement (PPA)
  - Utility Interconnect Agreement
  - Financing
  - Design and Bidding
  - Construction
  - Marketing of Carbon Credits
  - Climate Action Reserve (CAR) Registration
In 2008, Gaston County began to explore sustainability practices that could be implemented in conjunction with its existing solid waste management and landfill operations. The major challenge of the County’s sustainability initiative was to provide what is best for the citizens of Gaston County and the environment both now and in the indefinite future. Given recent concerns regarding global warming, the County also wanted to insure that appropriate stewardship practices were in place or being developed for their existing landfill operation to reduce greenhouse gas emissions. The County established three primary sustainability objectives: (1) to reduce greenhouse gas emissions from the decomposition of waste occurring in the landfill; (2) to produce renewable energy from the capture of biogas; and (3) to provide the infrastructure for development of a green Eco-Industrial Park.

Although Gaston County was not required by regulation to collect and control the gases released from its landfill site, the county installed a passive venting system that was comprised of 9 wells and a cut-off trench in 1995. After a landfill gas feasibility study, the passive system was converted to an active system with a blower and candle stick flare. Additional wells were installed in 2008 along with a new blower/flare system and continuous monitoring equipment. Currently, approximately 1,000 standard cubic feet per minute (SCFM) of landfill gas is being collected by 72 wells, and is either destroyed through a flaring system or sent to the Renewable Energy Center where 2 GE Jenbacher J 420 engines are running full time, producing power.

It was determined that program implementation could best be accomplished through a phased construction approach to take advantage of the opportunity to generate a revenue stream from the destruction of methane (carbon offsets) while the power generation and Eco-Industrial Park components were being implemented. In addition to realizing an early verified emission reduction (VER) revenue stream, this phased construction approach allowed confirmation of landfill gas quality and quantity characterizations for power generation design and also facilitated required permitting, licensing, and financing activities.
3. Equipment/Systems and Technologies

Equipment
Gaston County Solid Waste and Recycling has proven to be on the forefront with many innovative technologies over the past several years, alternative fuel technology in heavy equipment, SCADA technology in the landfill gas to energy project, and frequent maintenance and training courses. The landfill owns and operates over 40 pieces of heavy equipment, with the most recent purchase a Caterpillar D8 Dozer.

Alternative Fuels
Our landfill was the first in the state to convert all 14 pieces of heavy duty off-road equipment to B-20 biodiesel in the fall of 2006. We have expanded our storage capabilities with the help of several grants and are dedicated to using approximately 100,000 gallons of biodiesel per year. The general use of biodiesel was only our first step.

Gaston County Landfill has also provided engine repowers and replacements in some of our aging equipment. This, along with our anti-idling policy, has had a significant impact on our air quality by displacing at least 20,000 gallons of traditional diesel annually. Gaston County has been and continues to be a leader in green energy/infrastructure ideas and implementation not only in our region, but our state.

SCADA System and Technology
The entire gas collection and extraction system, including all blowers, flares, generators, and associated mechanical and monitoring equipment are tied into a SCADA system that allows operators to view, analyze, and control the system via computers located in the generator building and the scale house. The SCADA system is also equipped to phone generator operators should there be any alarms or system failures/shutdowns. Due to the increased maintenance costs from high levels of siloxanes in the LFG, the County sought out expertise in the area of gas clean-up technologies to reduce these costs.

A dual core heat exchanger and chiller system was installed to provide basic clean-up of the landfill gas. Through this system, the exchanger passes the chilled outgoing gas along the hot incoming gas; this cools the incoming gas and reheats the outgoing gas. The water contained in the extracted gas stream carries a significant amount of siloxane compounds which dramatically increase wear in the engines, causes a buildup of siloxanes on internal engine parts requiring increased maintenance to remove and significantly decreases engine oil life. Early calculations show that we are removing close to 300 gallons of water from out gas stream daily, while the most recent gas analysis indicates that we are removing about 20% of the siloxane load in the gas stream.
**Maintenance Schedule**

Gaston County Landfill employees a shop supervisor, two shop mechanics, and an additional operator responsible for fueling and greasing all equipment at the landfill. The mechanics use manufacturer maintenance schedules, and have a computer program in place that includes all pieces of equipment, and their subsequent maintenance schedules. The mechanics have 250, 500, 1000, 1500, and 200 hours checks that are logged and include things such as oil changes, filter changes, grease, wear and tear checks for all aspects of the equipment including transmission, hydraulic, engine, and differentials. By keeping up with preventative maintenance, the mechanics are able to keep the landfill equipment up and running with minimal down time.

Generator operators and county personnel perform all of the maintenance to the equipment except for calibrations. The county hires a third party to inspect, clean, and calibrate all components of the landfill gas system on a quarterly basis. This includes everything from calibrating flow meters and analyzers to loop checking the SCADA system to cleaning and blowing out lines going to monitoring equipment. Calibration and maintenance records are archived and kept on site for reference.

Two generator operators, a wellfield operator, and several landfill supervisors are all trained and assist with general and preventative maintenance of the landfill gas collection and extraction components. The wellfield operator has a daily checklist and visually inspects components at the extraction site every morning. The generator operators provide generator maintenance that ranges from sparkplug changes and valve adjustments at 1,000 hours to major overhauls at 20,000 hours.

All responsible personnel were trained by Perennial Energy, the installation company, after construction of the new system was complete and before it was commissioned. Several employees have successfully completed SWANA’s LFG Systems and Operation and Maintenance Course, while other employees have been factory trained on GE Engines in Austria. Personnel have all been trained on not only the generators but also the support equipment of pumps, drives, controls, and breakers and continue training on safety and new technologies pertaining to this industry as they develop.

All landfill personnel have all been trained on not only the heavy equipment and generators but also the support equipment of pumps, drives, controls, and breakers and continue training on safety and new technologies pertaining to this industry as they develop.

**Recovery Plan**

There are multiple back-up plans and equipment throughout the landfill. First, there are back up generators at the scale house, LFG extraction, and power plant so that both the scales and the LFG system can run in case of power failure. There are also multiple pieces of equipment that can be used for essential landfill duties, such as trash compaction and dirt hauling if a piece of equipment should unexpectedly go down. There are also emergency shut off valves throughout the LFG and the leachate systems in case of a failure or malfunction to the system. The leachate collection system also has two 250,000 gallon tanks that have the potential to collect leachate if needed.
4. **Environmental Controls and Monitoring**

**Environmental Monitoring**

As part of landfill management practices, groundwater and gas monitoring wells are monitored quarterly by a third party consultant. 27 groundwater wells and 10 gas monitoring wells located on site at locations dependent on site geology, depth to groundwater, surface water features, on-site and off-site structures and sensitive receptors to minimize the risk of groundwater pollution and gas migration.

Leachate management is also an important practice at Gaston County Landfill, as leachate is monitored, collected, and re-circulated back into the landfill. Leachate recirculation is used to enhance the rate and extent of decomposition in the landfill, thus increasing the rate of gas production. Recirculation has played a large part in the viability of the landfill’s gas to energy project, and careful monitoring of leachate produced and re-circulated is vital for optimal performance of the LFGTE system. Both leachate produced and leachate re-circulated are monitored and recorded on a daily basis and aggregated monthly in conjunction with methane flow and concentration to view both long and short term trends.

**Landfill Gas Control and Monitoring**

Although Gaston County was not required by regulation to collect and control the gases released from its landfill site, the county installed a passive venting system that was comprised of 9 wells and a cut-off trench in 1995. After a landfill gas feasibility study, the passive system was converted to an active system with a blower and candle stick flare. Additional wells were installed in 2008 along with a new blower/flare system and continuous monitoring equipment. In 2011, the power generation facility opened with three GE Jenbacher J 420 generators at 1.4 megawatts (MW) each.
5. Regulatory Compliance

Gaston County Landfill holds all required permits for all facilities, including MSW Landfill, C&D Landfill, HHW facility, Renewable Energy Center, and Eco-Energy Park. These permits include:

- Solid Waste Operating Permit
- Significant Industrial User Permit
- NPDES Stormwater Permit
- Air Permit

Compliance Standards

Gaston County Landfill maintains environmental compliance as documented by Solid Waste, Air Quality, Water Quality, and Land Quality inspections from NCDENR. Gaston County’s LFGTE project is also listed and producing credits on the Climate Action Reserve, which holds strict environmental compliance standards. In order for the county to have their carbon credits accepted and listed on the Reserve, the landfill must provide annual proof of environmental compliance.
6. Planning and Operations

Materials

Gaston County Landfill on average, disposes of approximately 130,000 tons/year of MSW and 50,000 tons/year of C&D. The landfill is also recycling other recoverable materials associated with construction and demolition debris. Block, brick and concrete is being crushed and used on site for roadbed material. Cardboard is baled and shipped with other fiber products collected through our convenience sites. A metal bin is easily accessible for our customers to place metal into a recycling container. The County is presently talking with local poultry agents to determine the feasibility of used crushed/ground drywall for the poultry industry.

Effectiveness and Efficiency

Gaston County Solid Waste and Recycling Division is structured as an enterprise fund, thus pushing the collection and management of trash, recyclables, and special waste to be both effective and efficient. The County measures and tracks amounts of all MSW, C&D, Yard waste, Recyclables, and Special Waste that is collected through all programs, convenience sites, yard waste facility, and landfill. The County also compares yearly recycling rates to help determine where emphasis in programs and public education need to go for the following year. Continued community outreach and education through programs, publications, and professional relationships have lead to large increases in recycling from 2010-2012: 10% increase in yard waste collection/mulch production, 15% increase in pesticides collection, 23% increase in collection of motor oil, 31% increase in corrugated cardboard, 54% increase in the collection of O.T.C. and prescription medications, 61% increase in the collection of plastic, 65% increase in collection of cooking oil, 113% increase in collection of mixed paper, 114% increase in collection of oil filters, and 174% increase in collection of electronic waste.

The performance measures we utilize to gauge the success of our program are:

- To divert at least 200 tons of mixed recyclables per month to be kept out of the landfill.
- To maintain and abate litter on an average of 100 miles of County roads per month through our roadside clean-up program.
- To maintain a minimum of 1,100 lbs/yd³ as compaction rates for the garbage disposed of in the landfill as to optimize air space usage.
- To reduce emissions generated county-wide – to be measured and submitted in annual greenhouse gas emission survey submitted to NC DENR.
- To maintain at least 97% up-time on the generator operations, and measure through kwh produced and delivered to electrical grid.
### Costs

#### Total Landfill Costs

<table>
<thead>
<tr>
<th>County Residents Served</th>
<th>Tons collected</th>
<th>Total Cost</th>
<th>Cost/Ton Managed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landfill (all materials)</td>
<td>200,000</td>
<td>177,742.35</td>
<td>$137,718.00</td>
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</tbody>
</table>

#### Convenience Sites Costs

<table>
<thead>
<tr>
<th>Households Served</th>
<th>Tons collected</th>
<th>Total Cost (including overhead)</th>
<th>Cost/Ton Managed</th>
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</thead>
<tbody>
<tr>
<td>Municipal Solid Waste</td>
<td>75,000</td>
<td>9,686.75</td>
<td>$137,718.00</td>
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<tr>
<td>Recycling Program</td>
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<td>2,559.12</td>
<td>$103,701.00</td>
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<tr>
<td>Yard Waste Program</td>
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<td>$69,000.00</td>
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<tr>
<td><strong>Calculated Totals:</strong></td>
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<td><strong>$241,727.00</strong></td>
<td><strong>$17.00</strong></td>
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</tbody>
</table>

### 7. Employee and Customer Safety

#### Training

All employees at Gaston County Landfill receive various safety training, depending on job duties. All landfill operators attend a weekly safety meeting led by the Landfill Director. There are also posters located in the break room, shop, scale house, and power generation facilities outlining what to do to prevent accidents and steps to be taken in response to an emergency.

Several staff members are HAZWOPER certified and equipped to handle hazardous materials during collection events. Generator operators have continued training on safety and new Technologies as they develop.

Other safety measures are in place throughout the landfill: all heavy equipment has a fire extinguisher located in the cab, all employees in the field are required to wear steel toed boots, etc...
8. Public Acceptance, Appearance and Aesthetics

Site Appearance

Gaston County Landfill & Renewable Energy Center are state-of-the-art facilities and the County takes pride in keeping both the landfill and the Renewable Energy Center looking its best. The entrance of both facilities have beds of shrubs and red maples lining the driveways. The landscape surrounding the landfill is comprised of various perennials to give the facility color throughout the seasons. The scalehouse, power plant facility, which includes an atrium, conference room, bathrooms, an office, and control room to go along with the generator room are cleaned daily, and even the generator room and shop are clean and in top shape. Other various locations surrounding the landfill are kept neat and clean as well. At the LFG extraction site, a fenced in gravel lot keeps both unwanted visitors and animals out of the equipment, while minimizing the mud around the area. Daily maintenance such as running the water truck to minimize dust, and trash pick up, as well as continual maintenance, such as cutting grass, weeding, shoveling gravel, and spreading mulch is done by county employees to maintain a neat and clean appearance.

Community Outreach

Educational programs and pamphlets describing the what, where, how, and why of recycling and trash are continually produced and distributed throughout the County. Programs about the landfill, power plant, and recycling are presented to various civic groups including Rotary, Optimists, Lions Club, church organizations, nursing homes, and a host of other groups by the Division’s staff. A traveling display has been developed for County buildings, schools and libraries. The display is used to relay a variety of waste information to residents, such as recycling opportunities, waste reduction techniques, household hazardous waste information and buy-recycled opportunities. In addition, the City of Gastonia has a local “Keep America Beautiful” program with staff members that make presentations in all the City and County schools on the importance of waste reduction and recycling. The education of the community is an integral part of the success of a County-wide solid waste and recycling program.
Litter Pick Up

Gaston County Solid Waste and Recycling addresses many different issues and problems that arise throughout the county and the region. The Solid Waste and Recycling Division is always on call to help other county departments in need, whether it is using heavy equipment and operators to clear county roads and sidewalks after a storm or lending a helping hand to surrounding park and recreational area grading and development projects. Aside from helping other departments, Gaston County Solid Waste and Recycling is also eager to help out with other community issues, including litter pick-up.

Since rural areas are more susceptible to the illegal disposal of waste and bulky trash, as well as roadside litter, the County established a program to address these issues. The County utilizes a private contractor and inmate crews to provide roadside clean-up of litter and small quantity wastes dumps. Gaston County has also implemented a charge of $52 for each load entering the landfill that is unsecured to encourage residents and businesses alike to comply with the law.

Customer Service

Gaston County Solid Waste and Recycling prides itself on its customer service approach. Whether staff is dealing with vendors, contractors, engineers, truck drivers, or everyday citizens, the County has a “customer first” approach that is evident by the smooth operations of the landfill and other facilities. Multiple staff members have won County Employee of the Year awards for the dedication and work, highlighted by their customer service approach and willingness to help other employees and departments. The Solid Waste and Recycling Administrator, Landfill Administrator, Material Handling Supervisor, and Scalemaster employees have all been awarded “Gaston County Employee of the Year.”

Awards and Recognition

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<tr>
<th>Year</th>
<th>Award</th>
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<tr>
<td>2014</td>
<td>SWANA ISWMS Excellence Award</td>
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<tr>
<td>2014</td>
<td>SWANA LFG Utilization Award</td>
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<tr>
<td>2014</td>
<td>EPA LMOP Community Partner of the Year Award</td>
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<tr>
<td>2013</td>
<td>CRA Local Government Award</td>
</tr>
<tr>
<td>2013</td>
<td>CRA Recycler of the Year Award</td>
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<tr>
<td>2011</td>
<td>Mobile Care Award</td>
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