Solid Waste Authority of Palm Beach County
North County Resource Recovery Facility

SWANA Landfill Management Excellence Award Nomination

West Palm Beach, Florida
North County Resource Recovery Facility, Palm Beach County, Florida
Executive Summary

The Solid Waste Authority of Palm Beach County (SWA) owns and operates an integrated solid waste management system at its North County Resource Recovery Facility (NCRRF). The NCRRF is comprised of Class I (municipal solid waste [MSW]) and Class III (construction and demolition debris [C&D]) landfills, a waste-to-energy facility, yard waste processing facility, composting facility, hazardous waste facility, and materials recovery facility.

The Class I and Class III landfills are the backbone of this integrated solid waste management system, providing reliable and economical disposal of MSW and C&D for Palm Beach County, as well as other surrounding areas. SWA’s approach to the design and operation of the landfills is one that protects the environment, promotes being a good neighbor to adjacent communities and neighbors, and maximizes the use of available resources in its operations.

This document is organized according to the categories established by SWANA’s Landfill Management Technical Division for Landfill Management Excellence Award. The main categories and subcategories were all addressed in the text of this report. Supplemental materials at the end of this document include a support letter and a list of awards SWA has received.
Section 1: Design and Construction

1.1 Siting, Preparation, and Design

The North County Resource Recovery Facility (NCRRF) is located near the intersection of S.R. 710 and Jog Road in Northern Palm Beach County. The Solid Waste Authority of Palm Beach County (SWA) owns over 1,300 acres at this site, which has allowed them to develop an integrated solid waste management facility along with sufficient buffer zones and conservation areas that can be enjoyed by the general public.

Consisting of over 50 million cubic yards (cy) of airspace and with a footprint of approximately 330 acres, the landfill opened in 1989 and is currently expected to provide disposal capacity through the year 2048. The site consists of two landfills – a municipal solid waste (MSW) landfill and a construction and demolition debris (C&D) landfill.

The final build out of the MSW landfill will contain approximately 41 million cy of air space. This landfill accepts garbage, sludge, and other special wastes that require landfilling in a Class I landfill in accordance with federal, state, and local regulations.

SWA has aggressively managed the timely design and construction of new landfill cells to meet the needs of Palm Beach County's solid waste generation (Figure 1). To accomplish this, SWA has implemented a phased approach to cell design and construction. This approach ensures that adequate disposal capacity is available while minimizing landfill cell open areas. It has also allowed SWA to use areas within the footprint of the landfill for other solid waste management and recycling activities such as yard waste processing, material recovery of commercial and household items, recycling of metals, and use as laydown areas for construction activities.

The Class I landfill cells are double-lined cells consisting of several layers of impervious material to prevent the landfill from impacting the underlying groundwater. The landfills are constructed in cells, which average approximately 10 acres each. Typical cell construction starts with highly compacted sand and is followed by a geosynthetic liner system. A layer of geosynthetic clay liner is installed. This is followed by a layer of 60 mil high density polyethylene (HDPE) plastic liner (secondary liner). Next is a layer of plastic geonet, which promotes water flow between the liners to detect any leaking in the primary liner. A second layer of 60 mil HDPE liner is installed (primary liner) above the secondary liner. Finally, a second layer of plastic geonet with geotextile material is installed to promote leachate flow to the leachate collection pipes.

The Class III landfill accepts materials that are not required to be disposed of in a Class I landfill. Typical items include furniture, construction debris, roofing material, wood, carpet, and vegetative debris. There are a variety of items that are prohibited from disposal in the Class III landfill such as whole tires, automotive batteries, and appliances containing refrigerant or combustible gas such as propane. SWA has constructed 72 acres of Class III landfill capacity consisting of approximately 9 million cy of air space. These are single-lined cells.

1.2 Site Soils, Geology and Hydrogeology

Pre-development studies for the site were conducted in the late 1980s to determine the suitability of the site for development of the landfill. The studies involved surficial probing of organic soil deposits, deep subsurface exploration by test borings, laboratory examination and testing of
soil samples collected, and engineering evaluations of foundation soil conditions. The studies indicated a fairly uniform and very competent subsoil stratigraphy with a profile that consisted of thick, medium dense sands. It was determined that the sands could provide a solid base with sufficient bearing capacity to suitably support the proposed 165-foot high landfill.

The geology of the site has been the subject of several investigations by consultants and public agencies. Collectively, the results of the soil borings, well cuttings, and published data revealed three distinct hydrogeologic units in the surficial aquifer, each having different lithologic and hydraulic properties. The shallowest unit consists of the sand and shell of the Pamlico Formation. The intermediate depth unit is composed of the sand, shell, and limestone of the Turnpike aquifer. The deepest hydrogeological unit consists of shell, sand, limestone, and marl of the Fort Thompson and Caloosahatchee Formations, underlying the Turnpike aquifer.

1.3 Landfill Design Evolution

The design of the landfill cells has evolved over time in response to technology, regulations, advancements in geosynthetics, and to ease operations and maintenance. Figure 2 illustrates how the landfill has evolved.

The latest landfill cell designs have taken advantage of the latest Computer Aided Design (CAD) tools and advances in Global Positioning Systems (GPS) to improve the quality of the design and expedite the construction of the cells and the required quality assurance/quality control (QA/QC) activities during construction. Design plans are now prepared using the latest AutoCADCivil 3D software to create a 3D model of the new cells. The 3D cell design model allows the engineers to create a coordinate point system throughout the cell’s subgrade that allows the construction contractor to grade the cells using GPS-guided grading equipment (Figure 3). The coordinate point system developed conformed with the project specifications, which required that the contractor provide an as-built survey of the cells’ subgrade, processed sand protective layer, leachate collection system, and drainage systems.

Design Evolution at SWA’s NCRRF Class I Landfill

1900s: Impacts on airspace considered in design. Landfill cells were designed to improve construction for added landfill airspace. For example, Cells 6-10 incorporated a breakpoint within the slope of the leachate collection system, reducing fill material while adding airspace.

MID-2000s: Innovative technology used in the designs to reduce costs and construction time. Starting with Cells 11 and 12, the landfill is designed using 3-D models to develop the subgrade of the leachate collection system. This has expedited design, reduced construction submittal review time, and expedited construction.

TODAY: Design alternatives to reduce operations cost. For cells 15, 16 and 25, an economic evaluation was used to determine the most cost effective leachate collection system design from an operations perspective. The results of this evaluation, including reduced number of pipes and increased pipe spacing, were implemented in the design of Cells 15, 16 and 25.

1900s - 2000s: Design for advancements in the geosynthetic market. For Cells 7-10, due to geosynthetic advancements, a geosynthetic clay liner was incorporated in the cell design in lieu of a compacted clay sub-base. This reduced project construction costs and duration. For Cells 11-12, a double geocomposite was used instead of a single geocomposite in the leak detection system due to product improvements. This also reduced construction costs.

1900s - 2000s: Design optimized for ease of construction. Reduction in the number of slope changes in the grading of the leachate collection system made construction easier.

MID-2000s: Understanding future regulatory drivers. Proposed future regulatory requirements were proactively used in the design of Cells 13 and 14. This eased permitting of the two new cells in a changing regulatory environment.

TODAY: Design modified to ease landfill operations. Cells 15, 16 and 25 were designed to improve pipe access (i.e. sizing, connections, etc.) for ease of annual cleaning and maintenance. In addition, the design of Cells 15 and 16 included a leachate collection system design to protect the existing landfill scalehouse from excessive stormwater runoff.

Figure 2: The design of the landfill cells has evolved over time in response to technology, regulations, advancements in geosynthetics, and to ease operations and maintenance.
In recent years, SWA has worked in coordination with designers and contractors to improve on the construction techniques of new cells.

collection and leachate detection pipes, and top of the 2-foot protective cover at a frequency of every 50 feet along the low points and high points of the cells’ “saw tooth” configuration.

1.4 Construction Techniques

In recent years, SWA has worked in coordination with designers and contractors to improve on the construction techniques of new cells, and has even partnered with the contractor to self perform portions of the latest landfill partial closure.

The use of GPS-guided equipment has facilitated the grading of new cells and has improved the overall conformance of the cell construction to the project design plans (Figure 4). The latest cell expansions were graded using a software developed by Agtek®. This system creates a 3D model that is transferred to GPS equipment mounted on machines such as motor graders and scapers to provide operators a clear representation of the job site with accurate grade information anywhere on site.

The combination of the 3D model software and the GPS receivers mounted on the grading equipment allow the operators to guide the machines to the required final grade with great accuracy and efficiency. An interface between the control system and the machine’s hydraulics can also be implemented to automatically position the blade as the final grade is approached.

SWA has always been a good neighbor and works hard to maintain this relationship with the local community by protecting the environment. For this reason, SWA has adopted a close-as-you-go approach at the Class I Landfill. This approach helps SWA reduce potential odor impacts to nearby communities, control landfill gas (LFG) emissions, and reduces the amount of precipitation entering the landfill, therefore reducing leachate generation.

During the latest partial closure performed at the Class I landfill, SWA partnered

Figure 4: The use of GPS-guided equipment has facilitated the grading of new cells and has improved the overall conformance of the cell construction to the project design plans.
The North County Resource Recovery Facility as a whole is a clear example of a truly integrated solid waste management system.

with the closure construction contractor to self perform portions of the work. In this manner, SWA saved on the total construction cost and took advantage of their internal operations staff to self perform a major component of the closure. SWA self performed the following:

- Rough grading of the cells
- Installation of an inside toe-drain for leachate control and collection

SWA’s direct involvement with this latest partial closure helped reduce potential change orders due to different site conditions, expedited the construction, and yielded savings over $500,000 in the total construction cost.

1.5 A State-of-the-Art Sanitary Landfill

SWA is the governmental agency responsible for providing an economical and environmentally-conscious integrated solid waste management system for the County (Figure 5). SWA is committed to providing the County with safe disposal methods now and for future generations. This is accomplished through state-of-the-art facilities, high standards of operation, and environmental management systems.

SWA is constantly looking to improve on the designs and operations of the landfill system. The phased approach for constructing landfill cells allows SWA to take advantage of the latest geosynthetic and make adjustments based on operating experience. SWA has systems in place that monitor leachate generation and collection within each of the cells and has implemented an extensive groundwater monitoring program. SWA has been proactive with LFG management by providing active gas collection systems well in advance of regulatory deadlines. In 2009, SWA started using most of the LFG generated at the Class I landfill to fuel a Biosolids Pelletization Facility (BPF) located adjacent to the landfill to offset the natural gas needs.

The NCRRF as a whole is a clear example of a truly integrated solid waste management system.

1.6 Planning and End-Use Planning

SWA’s primary long-range planning tool is the Landfill Depletion Model. The Landfill Depletion Model is intended to forecast the estimated life of SWA’s North County landfills to assist with facility planning decisions and to assess the impact of alternatives and alternative states of nature on landfill life. As a planning tool, the model is useful in identifying the point or points in time at which a decision is required to ensure the availability of disposal capacity. The Landfill Depletion Model considers the dynamic interrelationships between the available processing and disposal options, population projections and growth rates, per capita generation rates, recycling rates, diversion rates, incineration capacity and reduction effectiveness, landfill compacted densities, and cover material requirements, and produces a projected date of landfill depletion. With this date established and the anticipated lead time known, the latest date at which a decision must be made can be determined. Because of the many factors impacting the rate of landfill depletion and to minimize the possibility of falling behind on the critical path, the Landfill Depletion Model is run on an annual basis when the latest population projections become available.

Current planning efforts for the site’s end use include passive recreational areas and trails around the site that could be tied into the existing trail ways.

Figure 5: SWA provides Palm Beach County with safe disposal methods through the use of state-of-the-art facilities, high standards of operation, and environmental management systems.
Section 2: Environmental Controls

2.1 Groundwater and Leachate

The NCRRF currently has 37 water quality monitoring wells installed in and around the site. These wells are used for water quality sampling, water level measurement, and collection of field data. The wells are installed in clusters of two or three to layer the surficial aquifer. The clusters serve to detect any variations in water quality with depth and to measure vertical hydraulic gradients. SWA monitors groundwater semi-annually in accordance with 62-160, Florida Administrative Code (F.A.C.) to meet the requirements of 62-701.510, F.A.C., for the parameters listed in 62-701.510(8)(a), F.A.C., and 40 CFR 258, Appendix I.

Additionally, the original design of the site included an industrial supply well system that withdraws water along the down gradient boundary system to ensure that potential and existing degraded groundwater will be contained within the vicinity of the landfills. This system provides an additional level of environmental protection and helps to manage compliance with groundwater regulations.

The NCRRF landfill design includes a gravity leachate collection system. The leachate flows by gravity to one of four pump stations. The Class I and Class III landfills experience combined flows on average of 270,000 gallons per day. The leachate collected is then disposed of through deep well injection. The two injection wells are at a depth of approximately 3,000 feet, and they have multiple well casings sealed with sulfate-resistant cement to protect the shallow aquifer. Annual leachate monitoring is conducted in accordance with 62-160, F.A.C. in order to meet the requirements of 62-701, F.A.C. The leachate is monitored for the parameters in 62-701.510(8)(c), F.A.C., and 40 CFR 258, Appendix II.

SWA conducts surface water monitoring semi-annually for the parameters indicated in 62-701.510(8)(b), F.A.C., and 40 CFR Part 258, Appendix I. A map of groundwater, surface water, and leachate monitoring locations can be seen in Figure 6.

2.2 Environmental Protection

The Class I landfill employs a double-liner system, and the Class III landfill employs a single liner system. The design of the landfill cells’ liner and leachate collection systems has continuously evolved to meet future regulatory drivers, advances in geosynthetic products, and to ease construction and operations as discussed in Section 1. Additional protection is provided by the industrial supply well system discussed in Section 2.1

2.3 Overall Impact

SWA is an active participant in environmental protection, committed to providing Palm Beach County with safe disposal methods now and for future generations.

SWA is an active participant in environmental protection, committed to providing the County with safe disposal methods now and for future generations. SWA is charged with providing for the environmentally-sound management of the County’s solid waste. This is accomplished through state-of-the-
art facilities, high standards of operation, and environmental management systems. At the same time, SWA is committed to pollution prevention, seeking continuous improvements in environmental performance and a policy of meeting or exceeding all federal, state, and local regulations.

SWA provides over 300 acres of wetland habitat in a Conservation Area at the NCRRF landfill site. The Conservation Area includes a trail system that is open to the public and contains educational kiosks. This Conservation Area harbors thousands of Florida wading birds, as well as two endangered species, the Snail Kite and the Wood Stork. Each year these birds seek refuge in the SWA Rookery, which is just across the street from the landfill, to nest and raise their young.

The SWA Rookery has been monitored by SWA staff since 1987. This rookery is a mixed wading bird colony that provides a roosting and nesting habitat for White Ibis, Great Egrets, Little Blue Herons, Glossy Ibis, Tricolor Herons, Snowy Egrets, Cattle Egrets, and Anhingas (Figure 7). Following are some facts about this rookery:

- Monitoring involves bimonthly dawn counts, monthly evening counts (Snail Kites only), breeding bird census (nest counts), and egg/nestling census (egg/chick counts).
- Part of a 600-acre conservation area that will remain as a preserve.
- Wood Storks started nesting here continuously since 1995. The greatest number of Wood Stork nests observed was 508 nests, recorded in 2007.
- Snail Kites have nested on site from 1991 through 1997 with a peak number of 25 nests in 1993.
- The SWA Rookery serves as a drought refugee habitat for Snail Kites.
- The highest number of Snail Kites recorded at the SWA Rookery was 212 in 1989.
- Over 14,000 total birds were recorded as a peak number in 1989 (drought year).
- Assisted with radio tagging program of Snail Kites in late 1990s (birds were caught and banded from the SWA Rookery).
- Working with USFWS Wood Stork Working Group since 2003; participating in the recovery program by conducting visual monitoring of Wood Stork young (productivity data).
- Assisted University of Florida graduate students with trapping, banding, and satellite tagging Wood Stork young from the SWA colony.
- Roseate Spoonbills have been observed nesting in the SWA Rookery over the past few years.
- The NCRRF landfill is also adjacent to Grassy Waters Preserve, a wildlife sanctuary and drinking water reservoir. These conservation efforts all demonstrate SWA’s commitment to environmental stewardship and how the NCRRF landfill is compatible with its surrounding environment.
Section 3: Regulatory Compliance

3.1 Role in Integrated Solid Waste Management System

SWA has built an award-winning integrated system of facilities that combines recycling, composting, converting waste to energy through incineration, and landfilling to effectively manage the County’s waste. SWA’s system includes a waste-to-energy plant, a landfill, a vegetation processing facility, a compost facility, two materials recycling facilities, household hazardous waste collection facilities, and a network of five transfer stations.

3.1.1 Source Reduction

Source reduction addresses product manufacture, purchasing habits, and product use. Options available in implementing source reduction efforts include product reuse, increasing the recycled content of products or packaging, reduction in material volume of either product or packaging, increasing the usable life of a product, and decreasing the total quantity or toxicity of products used. Source reduction begins in the design, manufacture, and packaging of products by businesses and industries, and continues through selective buying and reuse of products by individuals or businesses.

SWA acknowledges that public information and education programs are key components for successful source reduction efforts. Therefore, SWA sponsors a variety of community awareness and educational programs, including:

- Neighbor to Neighbor Volunteer Program
- Green Team Volunteer Program
- Community Service Programs
- Litter Abatement “Adopt-A-Spot”
- Administrative Support Volunteers and Non-Paid Internship Volunteers
- School Recycling and Educational Programs.

3.1.2 Waste Recycling

3.1.2.1 Curbside Recycling

Curbside recycling collection is provided one time per week. Two types of bins are provided for the consumer.

A yellow bin is used for magazines/catalogs, unwanted mail, school/office papers, phone books, paper bags, and all cardboard boxes.

A blue bin is used for plastic containers #1 through #7; steel cans; aluminum cans, foil, and pie plates; drink boxes; milk and juice cartons; and glass bottles and jars.

3.1.2.2 Recovered Materials Processing Facility

The SWA Recovered Materials Processing Facility (RMPF) opened in October 2009, replacing both the Residential Materials Recycling Facility (RMRF) and the Commercial Materials Recycling Facility (CMRF) that were previously located in the footprint of the landfill. The RMPF, operated by a private contractor (FCR, Florida, Incorporated), is a key component in the County’s extremely successful recycling program. The RMPF receives, sorts, processes, and prepares for market materials collected through the SWA’s recycling program (Figure 8).

The following materials are accepted at the RMPF: containers, plastic containers #1 through #7; steel cans; aluminum cans, foil, and pie plates; drink...
The Residential Materials Recycling Facility is capable of storing about 1,300 bales.

The facility is capable of storing about 1,300 bales. It has a processing capacity of 975 tons per day, five days a week. The facility currently handles approximately 15 tons per hour of containers, 15 tons per hour of commercial fiber, and 35 tons per hour of residential fiber. In 2009, the RMPF processed approximately 117,200 tons of paper and commingled containers. The purpose of the RMPF is to take recyclable items and process, package, and ship them to paper mills, metal smelters, glass, and plastic manufacturers. The recycled items are then remade into new products for sale. With the new RMPF, commercial materials of cardboard and paper are now being handled by the RMPF operator as opposed to SWA operations.

The RMPF has three tipping floors—one for residential fiber on the east end of the facility, one for commercial fiber on the east end of the facility, and one for containers on the west end of the facility. The facility stores all of its bales of recycled material inside and is capable of storing about 1,300 bales.

3.1.2.3 Ferrous Processing Facility
Ferrous metal that is recovered at the Resource Recovery Facility, the Materials Recycling Facility, and the landfill is prepared for market at the Ferrous Processing Facility. CFC (Freon) containing white goods recovered from the Class III landfill are inspected prior to processing, and any CFCs are removed. The white goods are then crushed by hydraulic grapples, loaded into trucks, and hauled off-site for further processing. The mixed ferrous material from the Resource Recovery Facility is size-reduced by a vertical shredder and passed through an air classification system, which is coupled with magnets to separate the ferrous material from the non-ferrous tramp material. The tramp material is returned to the Resource Recovery Facility to be processed into RDF and burned. The compacted white goods and clean ferrous material are then taken by truck to a railroad spur at the north end of the SWA property. The ferrous material is...
Vegetative mulch is composted with wastewater residuals from several Palm Beach County utilities to produce compost that is suitable for agricultural and horticultural uses.

transported by railcar to manufacturers who melt it down to make new steel products. SWA recovers and sells more than 30,000 tons of ferrous metals per year.

### 3.1.2.4 Woody Waste Recycling Facility

SWA receives more than 250,000 tons of yard waste per year, approximately 100,000 tons of which is processed at this facility. Approximately half of the mulch produced is delivered to the compost facility. The rest is used as a boiler fuel or as a soil amendment.

The Woody Waste Recycling Facility process includes receiving, drying, contaminate removal, grinding, and screening prior to end use.

### 3.1.3 Composting

#### 3.1.3.1 Second Nature Compost Facility

Vegetative mulch is composted with wastewater residuals from several Palm Beach County utilities to produce compost that is suitable for agricultural and horticultural uses.

Faced with a Florida ban on landfill disposal of yard trimmings and a need to find an alternative to landfilling wastewater residuals, SWA designed and constructed the Second Nature Compost Facility (Figure 9). This facility, which opened in 1991 as a four-bay pilot facility, was expanded to 36 bays in 1994. The compost facility accepts wastewater residuals generated primarily by the City of West Palm Beach and mulch produced by SWA from vegetative debris from curbside collection routes. Through a 14- to 21-day process, the material is converted into compost. SWA compost is an exceptional quality product approved for all horticultural applications.

For odor control, the compost facility utilizes three 12,000 square-foot lined “biofilters,” each servicing 12 reactors. The biofilters contain a media that consists of a 4-foot deep mixture of 50 percent southern pine chip and 50 percent southern pine bark mulch, with 6 inches to 1 foot of southern pine mulch on top to optimize moisture conditions. The exhaust air from the compost building is passed through the biofilters to eliminate odors. The composting system is equipped with an exhaust system that ventilates the interior of the enclosed compost building. Twelve, 60-horsepower fans control the movement of odorous air from the compost facility to the biofilters.

### 3.1.4 Energy Recovery

#### 3.1.4.1 North County Resource Recovery Facility

The NCRRF is an RDF waste-to-energy facility. It was opened in 1989 and processes over 850,000 tons per year of solid waste into RDF. This fuel is burned to produce electricity that is sold to Florida Power and Light. The facility is owned by SWA and operated by Palm Beach Resource Recovery Corporation, a subsidiary of Babcock and Wilcox Corporation.

The facility successfully provides a 60-percent reduction by weight in the quantity of landfilled waste. In the absence of the NCRRF, SWA’s landfill, which is currently projected to last until 2021, would have been depleted by 2005.

Figure 9: Faced with a Florida ban on landfill disposal of yard trimmings and a need to find an alternative to landfilling wastewater residuals, SWA designed and constructed the Second Nature Compost Facility.
In the absence of the North County Resource Recovery Facility, SWA’s landfill, which is currently projected to last until 2021, would have been depleted by 2005.

### 3.1.4.2 Facility Highlights

The NCRRF consists of a tipping floor, an RDF processing plant, an RDF storage building, two boilers, a turbine generator, pollution control equipment, and associated facilities and equipment. The design capacity is 2,000 tons per day (624,000 tons per year), although the facility has consistently surpassed this. The design capacity is based on two of the three processing lines operating at any one time, but, by operating all three lines on peak days, the operator is able to process at a rate up to 3,000 tons per day for a limited period of time.

The plant has state-of-the-art pollution control equipment, consisting of two dry scrubbers and two electrostatic precipitators that ensure compliance with all environmental regulations.

### 3.1.5 Biosolids

#### 3.1.5.1 Biosolids Pelletization Facility

SWA, in conjunction with five major utilities, developed a biosolids pelletization facility (BPF) to help eliminate a portion of the phosphorous loading entering the Lake Okeechobee, Everglades, and Indian River Lagoon basins (Figure 10). The BPF was constructed to convert approximately 600 wet tons per day of biosolids, combining aerobic and anaerobic digested sludges with undigested sludges, into a high-value end product that is used as a fertilizer additive.

During project planning, it was determined that the LFG at the adjacent SWA Class I Landfill could be beneficially used as fuel for the sludge dryers. At project inception, the BPF was the first of its kind to be designed with the flexible fuel system of both natural and LFG. Utilizing renewable LFG has reduced operating costs, reduced flaring of LFG, and created a sustainable facility. The features of this project have made it a showcase for innovative concepts and successful regional partnerships.

### 3.2 Environmental Compliance

The NCRRF is monitored for compliance with the Florida solid waste management regulations as promulgated in 62-701, F.A.C. This compliance includes regulations for air and water.

SWA is proactive with LFG management. Through this proactive approach, SWA has expanded the LFG collection and control system before required by regulation. SWA monitors the compliance of the LFG system by conducting surface emissions monitoring quarterly at the Class I landfill and annually at the Class III landfill. SWA has worked to correct any exceedances in methane emissions proactively and to expand the LFG system as required.

The water quality monitoring program for the site was discussed in Section 2. For the past three years, the NCRRF has been meeting the regulatory requirements except for some exceedances on sodium. However, SWA has been proactively working to mitigate the problem and has been using controls on the site to remediate the situation. SWA actions include the following:

![Figure 10: SWA’s Biosolids Pelletization Facility, with its use of both natural and LFG, is a showcase for innovative concepts and successful regional partnerships.](image-url)
• Modifying the industrial supply wells, their pumping schedules, and flow rates.
• Final closure of Cells 1 through 6 and the partial closure of Cells 7 through 10 have helped to reduce sodium levels.
• Monitoring leachate in the secondary leachate collection system monthly in order to verify that the liner system is within its design leakage rates. The results have indicated that the sodium levels are not a result of the landfill’s liner system.
• Cleaning the stormwater system.

Based on the actions already taken, SWA has determined that the high sodium levels are not the result of the liner system. They are looking at the entire site and area out of the influence of the landfill to determine if the high sodium levels are a result of a hydrogeologic issue unrelated to the landfill.

3.3 Award Letters and Facility Inspection Data

SWA has received numerous awards for its facilities and programs. A list of the awards received is provided in the Supplemental Materials.
Section 4: Planning, Operations, and Financial Management

4.1 Operation Program

The operating program for the landfills at SWA revolves around the final build-out design and SWA’s commitment to being a good neighbor. Since the nearest community to the landfill is located to the northwest of the facility, SWA has planned landfilling activities of MSW to start on the southern edge of the Class I landfill and expand to the north. This allows SWA the greatest offset from the filling activities and the neighboring communities. SWA also has a proactive program for dust and litter control and, as mentioned previously, proactively expands the LFG collection system to reduce the potential for objectionable odor generation.

Since the LFG is now being sent to the BPF, SWA operates the LFG collection and control system to optimize the quality and quantity of the collected gas to increase its net heating value.

The landfill is operated to maximize LFG production. This is critical since the LFG is utilized in the BPF.

4.2 Operating Budget

SWA is committed to providing high levels of service to the residents of Palm Beach County at the lowest possible cost. In developing SWA’s financial plan, or budget, attention is primarily given to ensuring that the budget reasonably includes all projected revenues and expenses of the solid waste system for the fiscal year.

For Fiscal Year 2010/11, the estimated operational cost for landfill management services is $6.25M (Figure 11).

4.3 Expansion and Future Programs

SWA’s phased approach to the landfill has allowed the facility to adapt to changing needs and trends. It has also allowed SWA the use of available areas within the landfill footprint to perform other related solid waste management activities.

As part of the long-term planning that SWA’s Governing Board approved, SWA will be constructing a new Renewable Energy Facility (REF#2). When completed, this facility would handle in excess of 3,000 tons of MSW per day. The facility is expected to be online by 2015. At this time, landfilling operations will most likely SWA is committed to providing high levels of service to the residents of Palm Beach County at the lowest possible cost.
SWA continues to look for ways to reduce its dependence on landfills by means of alternative processes that are environmentally safe and conserve our natural resources.

shift from primarily MSW to ash and rejects from the two REFs. SWA is already planning the required changes to the cell designs to accommodate the change in the materials disposed.

SWA continues to look for ways to reduce its dependence on landfills by means of alternative processes that are environmentally safe and conserve our natural resources.

4.4 Health and Safety Training

SWA has a Risk and Safety Management Division that is responsible for providing a comprehensive insurance program for all SWA assets and properties. Additionally, it is charged with maintaining compliance with Federal Occupational Safety and Health laws, including CFR 29, 40 and Department of Transportation CFR 49, State of Florida mandated safety regulations, local laws and statutes. Risk Management is accountable for overseeing Worker’s Compensation, maintaining property casualty insurance coverage, safety inspections, safety training, and incident/accident investigations. This unit also maintains a comprehensive program of security officer services, property access control, and fire monitoring services and systems.
Section 5: Utilization of Equipment/Systems and Technologies

5.1 Equipment in Use

Landfilling operations at the NCRRF landfills are performed using compactors, bulldozers, and backhoes with grapples (Figure 12). The main operations equipment assigned to the Class I landfill are two bulldozers, one compactor, and one backhoe with a grapple attachment. Similarly, the Class III landfill is operated with one compactor, one bulldozer, and one backhoe with a grapple attachment.

The operation of these two adjacent landfills at the site creates a redundant system for SWA in terms of the operating equipment. If and when any of the landfilling equipment is in need of repair, SWA shifts all landfilling activities to the Class I landfill and dedicates all available equipment to this operation until the damaged equipment is repaired and ready.

Shared equipment between the two landfills consists of two water trucks for dust control, two off-road vehicles for hauling and transporting cover material to the working face, and one loader.

Each of the landfills has its own dedicated active LFG collection and control system. The Class III LFG is managed through an 1,800 standard cubic feet per minute (scfm) candlestick flare. The Class I LFG is managed through a 3,500-scfm candlestick flare and a 3,000-scfm LFG compression skid system that dries and compresses the LFG per the requirements of the BPF.

Leachate is collected and transported via gravity from each of the landfill cells to a network of four pump stations strategically located within the site. The leachate pump stations then send the leachate to two deep injection wells where it is combined with cool down water resulting from the REF#1 operations.

5.2 Routine Maintenance and Employee Training

SWA owns all of the equipment used for landfill operations. Employee training on the equipment is provided onsite by the manufacturers upon purchase of the equipment.

In order to maintain all equipment operating at the site, SWA has an Equipment Maintenance Division that is responsible for the professional repair and maintenance of all mobile equipment within SWA. This function is conducted in an efficient manner thereby ensuring maximum availability of the equipment. This division is responsible for the repair and maintenance of over 1,000 SWA owned units. Maintenance Support Services is also responsible for SWA’s inventory system that accounts for parts, fuel, oil, and labor charge off. The total operating expense budget for Fiscal Year 2010/11 is $5.5M.

Figure 12: Landfilling operations at the NCRRF landfills are performed using compactors, bulldozers, and backhoes with grapples.
Section 6: Public Acceptance, Appearance and Aesthetics

6.1 Appearance of Site
Due to the site’s proximity to residential communities and adjacency to Florida’s Turnpike system, SWA strives to make the aesthetics of the landfill as pleasing as possible. The implementation of the “close-as-you-go” approach is a proactive step that improves the overall appearance of the site and minimizes the visible impact of the landfill’s working face.

SWA maintains a strict program of litter control, which employs laborers dedicated to installing litter control fences around the landfill, and ensuring that windblown materials are collected in a timely manner. SWA also has a grounds maintenance crew that ensures that the site’s landscape is well maintained and provides adequate buffer with surrounding public areas and roads. SWA has two water trucks dedicated to site dust control activities. The operation schedule and route of the water trucks is adjusted based on the dust control needs on any given day.

SWA recently completed the construction of a new landfill operations administration building, which was designed to achieve U.S. Green Building Council Leadership in Energy and Environmental Design (LEED®) certification (Figure 13).

6.2 Community Education and Customer Service
6.2.1 Administrative Support Volunteers and Non-Paid Internships Volunteers
Volunteers assist SWA with a wide range of duties in several departments, including recycling, media arts, customer information services, and management information systems.

6.2.2 Internships
An internship is available to Palm Beach County high school and college students. Selected students work at SWA as non-paid interns to assist SWA departments. The SWA volunteer coordinator monitors and coordinates the interaction between the intern and the departments. Students are eligible for community service volunteer hours, if applicable.

6.2.3 Litter Abatement “Adopt-A-Spot”
Following the philosophy that a cleaner community is generally a safer community, SWA’s Adopt-A-Spot Groups play an important role in environmental stewardship. While most household debris is collected curbside, other areas such as road rights-of-way and vacant lots tend to collect unsightly, unsanitary debris that will continue to accumulate if not cleaned.

Adopt-A-Spot groups can conduct beautification projects in their area to compliment their cleanup efforts. Administered by the SWA’s Customer Information Services Department (CIS),

Due to the site’s proximity to residential communities and adjacency to Florida’s Turnpike system, SWA strives to make the aesthetics of the landfill as pleasing as possible.
SWA provides recycled paint to groups to assist in beautification efforts within their communities.

the Adopt-A-Spot program is one in which any size group can participate. Making a difference in the environment through Adopt-A-Spot is one of the most rewarding volunteer efforts available!

6.2.4 Community Service Programs

SWA provides recycled paint to groups to assist in beautification efforts within their communities (Figure 14). Community service hours are available as well. Along with several governmental agencies, including the Palm Beach County Sheriff’s Office, Palm Beach County Code Enforcement, and Palm Beach County Road and Bridge, SWA partners with a variety of non-profit agencies to promote a safer, cleaner environment through cleanup, beautification, and education projects. These entities include Keep Palm Beach County Beautiful, Paint Your Heart Out Palm Beach County, and Rebuilding Together of the Palm Beaches.

6.2.5 Green Team Volunteer Program

Green Team volunteers assist SWA staff with community actions and special events. Volunteers help educate residents about SWA’s waste prevention and recycling programs.

6.2.6 Neighbor to Neighbor Volunteer Program

The SWA’s Neighbor-to-Neighbor recycling volunteer program’s foundation is based on neighbors teaching neighbors about recycling and waste prevention in their own multi-family development (Figure 15). This program is open to all Palm Beach County residents who are interested in volunteering in their own community. The volunteers L.E.A.D. by example:

L – Landfill Space is Valuable
E – Educate Your Neighbors About Recycling
A – Ask Your Neighbor if They Need Recycling Bins
D – Distribute Educational Brochures.

6.2.7 Volunteer Recognition Program

The SWA celebrated its volunteers at the
11th Annual Volunteer Recognition Luncheon on March 22, 2006, at the West Palm Beach Marriott in honor of National Volunteer Week.

The theme was “You’re an Essential Piece and Together We Can Make a Difference.” The SWA volunteers did make a difference by contributing 13,271.25 hours of service, which saved the SWA $228,136. Special awards were given to deserving volunteers in four categories, including Stanley Samuelson Outstanding Volunteer of the Year, which went to Frank Gorkowski. Other awards given were Green Team Family Volunteer of the Year, which went to Julia and Murrill Maglio; Jennifer Lynn Baker Outstanding Youth Volunteer of the Year, which was awarded to Cameron Walker; and the Anita Lankler Outstanding Participation Award went to The Vickers House North and South.

6.2.8 School Recycling and Educational Programs
Through SWA’s Education Outreach Program, SWA is actively involved in educating children about the importance of recycling and reducing waste (Figure 16). SWA offers the following:

- Classroom presentations
- Facility tours
- Educational CD and DVD offerings
- Lesson plans
- Activity sheets
- Reference materials.

6.2.9 Classroom Presentations (Grades K-12)
The SWA will come to you! Elementary lessons are presented in an assembly format to each grade level. The assemblies are informative, entertaining, sequential learning experiences. After being given an overview of SWA, students are encouraged to grasp the importance of recycling! Middle and high school presentations are scheduled to allow for changing classes, when possible. Science teachers may want to join together for certain projects, such as students devoting a day to making their own recycled paper. The emphasis of these presentations is always the promotion of proper recycling. At the end of each lesson, students are given a recycling certificate and a promotional item that contains a recycling message.

6.2.10 Facility Tours (Grades 4-12)
Field trips provide the opportunity for students to learn first-hand about a subject area and visiting the SWA facilities is no exception! The goal of the SWA tour is to expand students’ knowledge of integrated solid waste management systems and to help students gain an understanding of the importance of reducing waste. At the end of each tour, students are given a recycling information card and a promotional item that contains a recycling message. SWA has created lesson plans for both before and after the tour.

6.2.11 “Educational Learning Tools” Interactive DVD Offerings
SWA has developed an entertaining and educational DVD for students of all ages. The DVD encompasses three separate presentations that will teach students about the ins and outs of SWA while focusing on the right way to recycle in Palm Beach County.

The first selection is called Recycle in the Park (K-2). This fun and exciting sequential learning tool teaches students the right way to recycle in Palm Beach County.

The second selection is a Puppet Show (K-5). SWA has developed an educational recycling puppet show. The show stars SWA’s recycling characters and aims to teach the students about waste reduction and recycling in an exciting way.

Figure 16: Through SWA’s Education Outreach Program, SWA is actively involved in educating children about the importance of recycling and reducing waste.
The final selection is an Overview Presentation (second grade and up). This provides an in-depth look at SWA's state-of-the-art integrated waste management system.

6.2.12 “Planet SWA Virtual Recycling Tour” Educational CD
SWA has developed an interactive CD that is a great in-class tool. Students in kindergarten through fifth grade explore SWA land by listening to a tour hosted by the SWA’s puppet show characters. The tour is grade specific and is followed by a group of questions where virtual tokens are given for correct answers. After five tokens are collected, games are played to finish up the session. There is also a teacher’s corner, which allows them the chance to get support materials for their own lessons. The interactive CD could be a whole class lesson if staff was not available.

One of the co-hosts of the “Big Tour” is a SWA staff member who gives presentations and tours to students. The other host is Curby, the Recycling Robot, who is well received in the community when he makes special appearances at events (Figure 19). This duo brings life and excitement to the video, for viewers of all ages.

6.2.13 “The Big Tour” Interactive DVD
The “Big Tour” is an interactive DVD written and produced by SWA. This DVD takes an in-depth look at each facility that makes up SWA’s integrated waste system, including the waste-to-energy plant, the compost facility, the two materials recycling facilities, the landfill operations, and more.

6.2.14 Lesson Plans
In order to maximize the benefit of the classroom presentations and tours, SWA has developed lesson plans to be presented by the classroom teacher both before and after the presentation. These lessons are grade specific and meet at least one of the Sunshine State Standard objectives.

6.2.15 Activity Sheets
SWA has developed fun activity sheets to enhance the educational process.

6.2.16 Customer Service
SWA is committed to public partnership and encourages customers to contact the Customer Service Division with questions and/or concerns. This can be done through SWA’s website at http://www.swa.org/site/contact_customer_service/contact_customer_service.htm, or by phone at 561.640.4000, ext. 4210.
Section 7: Innovation and Creativity

The Class I and Class III landfills are truly unique and important components of SWA’s integrated solid waste management plan. The use of available areas within the landfill footprint allows SWA the flexibility to adapt its operations depending on ever-changing needs and challenges. Innovation and creativity are evident in the design updates of future cell expansions, the partnerships formed between owner and contractor to perform landfill partial closure constructions, the use of LFG to fuel the adjacent BPF, the use of groundwater extraction wells to supply the needs of the REF while controlling groundwater levels and parameters, and SWA’s commitment to environmental stewardship and customer satisfaction. These elements undoubtedly set this facility apart from the rest.
Supplemental Materials

SWA has received several awards since 2002, including the SWANA Silver Integrated Solid Waste Management Systems Award for its North County Resource Recovery Facility.

### Miscellaneous Organizations

<table>
<thead>
<tr>
<th>Organization</th>
<th>Award Title</th>
<th>Year Received</th>
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<tbody>
<tr>
<td>Solid Waste Association of North America (SWANA)</td>
<td>Gold Landfill Gas Utilization Award</td>
<td>2010</td>
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<tr>
<td>Florida Institute of Consulting Engineers (FICE)</td>
<td>Engineering Excellence Grand award for Biosolids Pelletization Facility</td>
<td>2010</td>
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<tr>
<td>American Council of Engineering Companies (ACEC)</td>
<td>Biosolids Pelletization Facility – National Finalist for Engineering Excellence Award</td>
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<td>Solid Waste Association of North America (SWANA)</td>
<td>Silver Transfer Station Award</td>
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<td>Solid Waste Association of North America (SWANA)</td>
<td>Silver Waste-to-Energy Award</td>
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<tr>
<td>Solid Waste Association of North America (SWANA)</td>
<td>Gold Landfill Reuse Award</td>
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<tr>
<td>Solid Waste Association of North America (SWANA)</td>
<td>Silver Integrated Solid Waste Management Systems Award</td>
<td>2007</td>
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<tr>
<td>International Communicator Award</td>
<td>Four Award of Distinction; Two Honorable Mention; One Crystal Award of Distinction – Recycling Education Campaign Materials</td>
<td>2005</td>
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<td>National Academy of Television Arts and Sciences</td>
<td>Emmy Award – eTV On Screen Talent</td>
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<tr>
<td>Rebuilding Together at the Palm Beaches</td>
<td>Special Recognition</td>
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<td>Recycle Florida Today</td>
<td>Outstanding County/City (Urban) Recycling for Waste Prevention – SWA Business Equipment Reuse Center</td>
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<td>Aurora International Film &amp; Television Association</td>
<td>International Gold Aurora Award (4)</td>
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<td>Florida Festivals and Events Association (FFEA)</td>
<td>TV Advertisements, Community Partnership with Sheriff Drug Farm &amp; Best Promotional Item</td>
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<td>National Purchasing Institute</td>
<td>Achievement of Excellence in Procurement Award</td>
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<td>Treasure Coast Chapter of the National Association of Environmental Professionals</td>
<td>Environmental Excellence Award for Conservation Programs – eTV &amp; Florida’s Future</td>
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<td>Florida Association of Environmental Professionals</td>
<td>Project Award – Adopt-A-Spot</td>
<td>2002</td>
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<tr>
<td>Aurora International Film &amp; Television Association</td>
<td>National Golf Aurora Award (4)</td>
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### Government Finance Officers Associates (GFOA)

<table>
<thead>
<tr>
<th>Award Title</th>
<th>Year Received</th>
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<tbody>
<tr>
<td>Certificate of Achievement for Excellence in Financial Reporting</td>
<td>1987 through 2005</td>
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<tr>
<td>Distinguished Budget Presentation Award</td>
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<td>Distinguished Budget Presentation Award – “Special Capital Recognition”</td>
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<tr>
<td>Distinguished Budget Presentation Award – “An Outstanding as a Communication Device”</td>
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### Advertising Club (Federation) of the Palm Beaches

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<tr>
<td>Five Local Addy’s</td>
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<tr>
<td>Three Silver Addy – Recycling Education Campaign</td>
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<tr>
<td>Two Gold and Seven Silver Addy – Recycling Education Campaign</td>
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</tr>
<tr>
<td>Four Silver Addy – Recycling Education Campaign</td>
<td>2005</td>
</tr>
<tr>
<td>One Gold and Four Silver Addy – Recycling Bin Campaign</td>
<td>2006</td>
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