



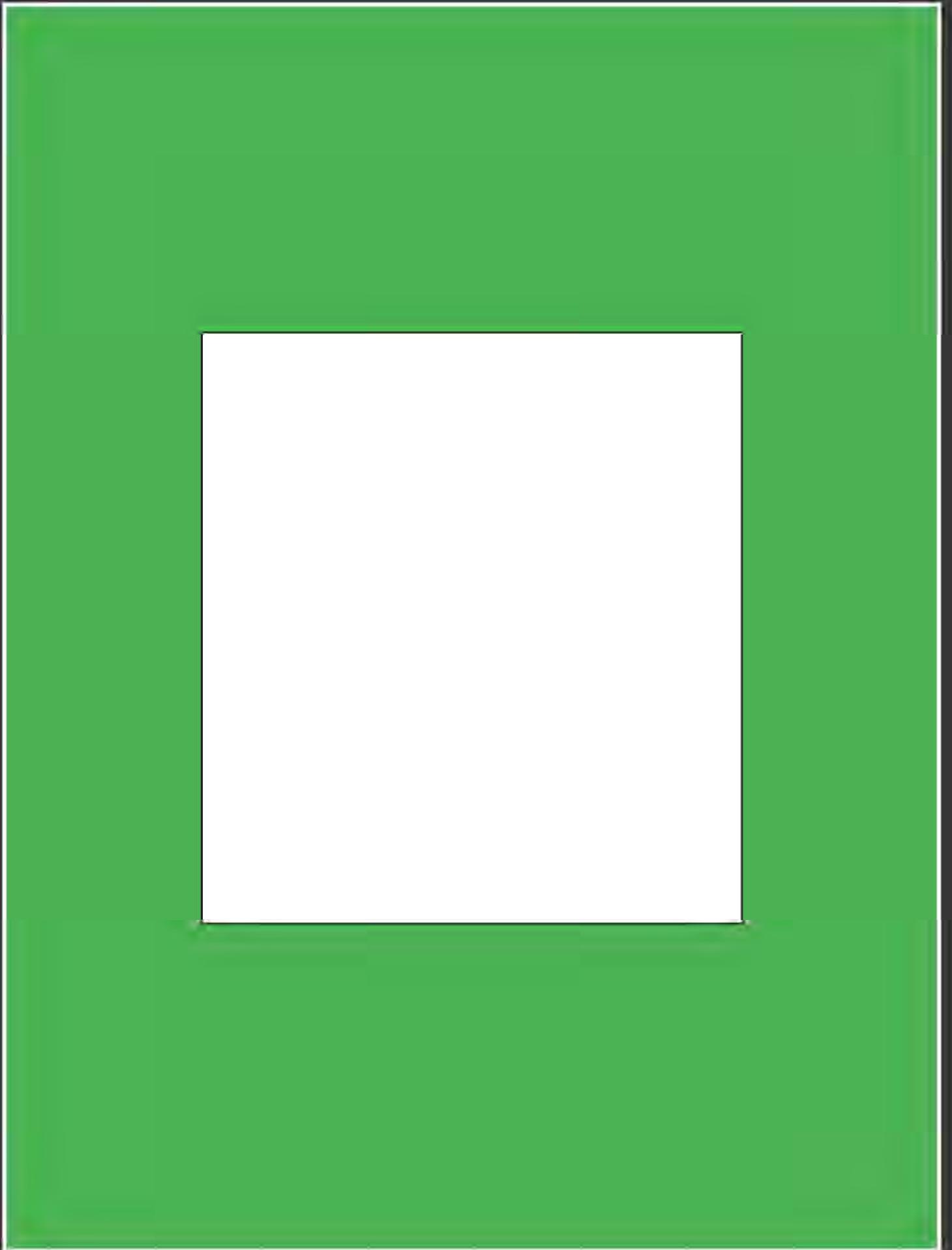
# 2013 Public Works Project of the Year

A W A R D N O M I N A T I O N



Wilders Grove  
Solid Waste Services Center  
City of Raleigh, North Carolina

March 1, 2013





A m e r i c a n P u b l i c W o r k s A s s o c i a t i o n

**PUBLIC WORKS PROJECT OF THE YEAR**  
**City of Raleigh**  
**Wilders Grove Solid Waste Services Center**  
A W A R D N O M I N A T I O N

**Award Division** – Projects of \$5 million, but less than \$25 million

**Category** – Environment

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# Introduction

The Wilders Grove Service Center is located on a 27-acre site adjacent to the closed Wilders Grove Landfill. The project includes a 24,000 SF Solid Waste Services Administration Building, Vehicle Wash Facility, Vehicle Fueling Facility, SWS Vehicle Parking, Roadways, and Site Utilities.

The project incorporates many renewable, sustainable, and efficiency systems and measures reflecting the national interest in building “Green” communities. Raleigh’s Solid Waste Services Center is anticipated to achieve LEED Platinum, the first such facility in the nation to do so.

## Background

Raleigh’s Solid Waste Services Department operated for over 40 years out of a cramped facility, built on a site subject to occasional flooding. The old facility suffered operational inefficiencies so severe that required training and other staff activities involving more than a dozen or so personnel had to be conducted in the parking lot.

During its service life, the old facility had seen the management of municipal solid waste grow to include extensive recycling programs, greater mechanization of collection, and the closing of landfills.

Raleigh’s Solid Waste Services Department collects over 85,000 tons of garbage, 25,000 tons of recycling, and 17,000 tons of yard waste annually. A new facility was envisioned to accommodate a growing community with a modern, cost efficient, and environmentally friendly solid waste management program.

Today the Department employs 223 staff members, serves over 400,000 residents, across 143 square miles. Services are delivered at a cost of only 4 cents of every dollar spent.



# Completion Date

At award of Contract, the project was to be completed within 460 calendar days. Subsequent change orders increased contract time by 234 calendar days, to 694. Substantial completion was obtained on day 694, in accordance with the Contract.

**Notice to Proceed** – March 29, 2010

**Groundbreaking** – April 7, 2010

**Original Contract Completion Date** – July 5, 2011

**Substantial Completion** – March 2, 2012

Extensions of contract time were evaluated and granted as follows:

**Programmatic enhancements via change orders** – 44 days

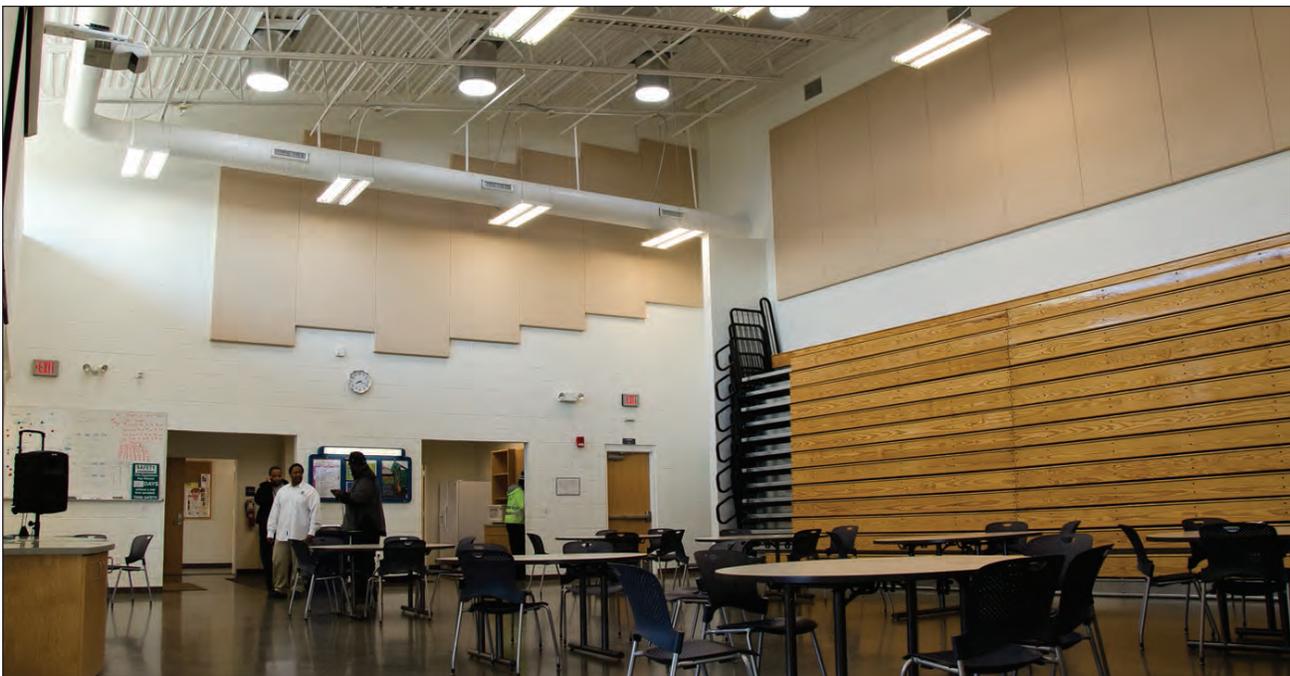
**Permit review and acquisition** – 43 days

**Weather delays** – 54 days

**Code revisions** – 18 days

**Material theft and damage** – 75 days

**Miscellaneous site changes and utility relocations** – 30 days



*Multi-Purpose Assembly and Breakroom*

# Safety Performance

## **Zero Accidents**

Health and safety are principal considerations for every project and this was a prominent component in our list of project goals. Our General Contractor, T. A. Loving was a leader in workplace safety, with an active, integrated, and ongoing effort to assure project safety. With a total of 142,560 man hours, there were zero recordable accidents, zero restricted day cases, and zero lost-time accidents.

## **Safety Training**

The General Contractor developed site-specific safety training for every subcontractor and their labor force prior to start of work on the project. No employee was allowed to work on site without successfully completing safety orientation. This training was identified, with stickers on hard hats, to assure compliance.

## **OSHA Training**

Specialized training was provided, including 10-hour OSHA training for foremen and lead carpenters, traffic control, fire extinguishers, forklift, and 30-hour OSHA training for management. All personnel, at the foreman level and above received first aid and CPR certification.

## **Substance Abuse Policy**

The General Contractor enforced a Substance Abuse Policy, which was utilized for all workers on the job. Copies of the Substance Abuse Policy were provided in both English and Spanish.

## **Weekly Safety Meetings**

All workers were encouraged to openly discuss and actively participate in safety meetings. T. A. Loving employed a system of educating all supervisors through regularly scheduled safety meetings and OSHA training seminars. They in turn, relayed information obtained at these training sessions to their field employees at weekly meetings that were attended by all staff and subcontractors on the project.

Each meeting was documented and attendees signed a form stating that they attended the meetings and agreed to abide by the safety rules and guidelines.

With steady dialogue established at these weekly meetings, every worker had the opportunity to openly discuss situations encountered during the week and offer solutions to improve safety conditions.

# Construction Schedule, Management, & Control Techniques

## Design/Bid/Build Delivery Method

The project utilized a standard Design/Bid/Build delivery method which required extensive team participation and management of the project schedule. Soon after awarding the construction contract, a Department of Energy (DOE) grant afforded an opportunity for inclusion of a geothermal HVAC and hot water system. Design revisions to accommodate this, along with other site and facility enhancements presented the project team with ongoing challenges to efficiently maintain the project schedule and budget.

## Enhanced Commissioning

Enhanced commissioning activities were incorporated into the project to provide oversight and testing of the energy systems, controls, and building envelope. The enhanced commissioning allowed the project team to locate and troubleshoot the systems during design and construction, minimizing potential issues during final system startup and occupancy.



## Material Resource Coordination

A main goal of the project sought to incorporate local sourced materials with recycled content. In order to achieve this goal with minimum interruption of the project schedule suppliers were engaged early to find local sources of recycled content to incorporate in building materials.

*Durable Terrazzo Flooring  
Utilizes Recycled Glass Aggregate*



## Unique Code Regulations

The unique nature of public facilities sometimes did not neatly fit building and development code regulations. This project employed combinations of newer technologies to achieve high standards of efficiency and sustainability. Careful coordination and continuous interaction with reviewers and inspectors was required. Even so, competing interpretations were encountered requiring quick, but thorough consideration of the implications and their impact on schedule, budget, and operation.

*Required Code Regulation*

# Environmental Considerations

## Energy Conservation

Energy conservation and the application of Green Building techniques and technologies was a major consideration from the beginning of the project. Expectations were that the new solid waste management facility would set an example for recycling, efficiency, and environmental stewardship. Energy usage is anticipated to be about 40% of a typical facility of this size. LEED Platinum certification is anticipated through the U.S. Green Building Council.

## Re-Use Water

Concerns over drought and projected growth, led Raleigh to expand its distribution system of a reuse, or non-potable, water system for commercial and industrial users, to address environmental concerns. Reuse water is wastewater treated to a high standard and re-used instead of being discharged into a waterway. The new SWS facility incorporated extensive reuse water for toilet and urinal flushing loads, and equipment washing. Reuse water is expected to reduce potable water use by over 130,000 gallons per year.

## Geothermal

A closed loop system of sixty geothermal wells, each 330' deep that utilized constant ground temperatures to assist the facility's heating, cooling, and hot water needs. Savings of 30 percent for HVAC and 20 percent for hot water should afford a six-year payback.

## Heat Island effect

Concrete paving in all equipment areas in lieu of asphalt, in conjunction with white metal roofing reduced the Heat Island Effect.

## Divert Waste From Landfill

One of the main goals of this facility was to be an example of how to divert waste materials from landfills. As a result approximately 94 percent of the waste materials were recycled and thus diverted from landfills. The adjacent closed landfill is a constant reminder of the importance of diverting waste from landfills.



*Vehicle Wash Recycles 85% Of Wash Water, Make Up Water Is Supplied With Reuse Water*



*Interior view of multi-purpose space natural light and solar tubes supplement lighting*



*Solar tube skylights and clearstory windows providing natural light (Note: solar photovoltaic panels share roof space)*

### **Healthy Interior Environment**

The project incorporates a number of measures to improve the interior environment for personnel; such as natural lighting, via high efficiency glass windows, and solar tube skylights, low Volatile Organic Compound (VOC) paint and adhesives. The HVAC system monitors air quality to adjust fresh air volumes as required to maintain optimum levels.

### **Advanced Mechanical Systems**

Mechanical systems employed advanced control devices to maximize efficiency and provide constant monitoring, to assure a comfortable work environment for staff. The building's Facility Management Control System (FCMS) is a combination of building level controls and communications systems that control, monitor and report in real time automatically over the internet to the City's operations and maintenance staff FCMS and / or local area network via a standard web browser. The City's FCMS is the Niagara Fx Framework which is a JAVA based system. The system provides an open automation infrastructure that integrates diverse systems and devices into a unified platform. The system controls and monitors the buildings geothermal heat pumps and loop pumping system, HVAC system and controls, hot water heating and circulation pumps, interior and exterior lighting, emergency power systems, cameras, gate and building access controls, solar photovoltaic system, building energy consumption, alarms, security and various other systems for the facility. The FCMS system is also being utilized to provide real time information to the Department of Energy for the geothermal energy grant.



*Advanced automation system is displayed. Note: Interior masonry and terrazzo floor containing recycled glass aggregate.*



*Solar photovoltaic roof panels generating 12.5 percent of electricity*

### **Solar Photovoltaic Roof Panels Generate 12.5% of Electricity**

A 50KW array is mounted on the Solid Waste Administration Building and a 25KW array is mounted on the Vehicle Wash Facility. Together these panels provide a minimum of 12.5 percent of the facility's needs. On days when the facility is closed or minimally occupied, excess energy is produced that is not used by the facility equipment. A net metering agreement was negotiated and established with the local utility company to "sell" this excess energy back to the utility grid.

### **Water Quality**

Water quality, from stormwater runoff, was addressed by a combination of methods, including: a 55,600 cf wet retention pond, 16,000 sf of permeable paving, bioentention, oil/water separators, and vegetation. These measures resulted in a reduction of overall runoff from pre-development levels.



*Two Stage Wet Retention Pond*

### **Drought Tolerant Plantings and Compost**

Landscaping throughout incorporated drought tolerant plant material and compost mulch from material diverted from the landfill. A demonstration garden provides a real world example of the advantages of such practices.



*20 percent biodiesel blend fuel with diesel exhaust fluid dispenser*

### **Use of Diesel Exhaust Fluid**

Raleigh's truck fleet ran on a blend of 20 percent biodiesel fuel. During construction, the EPA mandated the use of Diesel Exhaust Fluid (DEF), a urea fuel supplement for new engines, and the project team moved quickly to accommodate this feature into the fueling station.

### **Alternate Transportation Provisions**

Provisions for encouraging alternate transportation with inclusion of bike racks, reserved spaces for alternative fuel and carpool vehicles, and a Plug in Electric Vehicle charging station for public use.



*Standard and decorative bike racks*



*Locally sourced recycled glass aggregate, incorporated into locally produced block*

### **Use of Locally Produced Blocks**

A primary project goal sought to incorporate materials with locally sourced recycled content. In order to achieve these goals with minimum impact on the project schedule suppliers were engaged early to find local sources of recycled materials. As an example the design team, and the concrete block manufacturer worked with the City of Raleigh to incorporate locally sourced recycled glass as aggregate for the polished and split-face block.

### **LED Lighting**

Extensive use of LED lighting, both interior and site lighting, along with low flow plumbing fixtures enhanced resource conservation. Site location, and an efficient operational layout, reduced annual fleet mileage by over 100,000 miles with an estimated \$250,000 annual savings on fuel, along with decreased maintenance cost, increased equipment service life, and reduced carbon emissions.



*Interior LED lighting*

# Community Relations

The site is bounded by interstate highways and a closed landfill on three sides and an industrial area on the fourth side. This allowed essentially no public inconvenience, but did require upgrading a commercial access roadway.

Interest in recycling and conservation afforded an opportunity to include an educational component to the project. The facility was set up for schools and other groups to visit and learn about many aspects of solid waste management. There was a demonstration of rainwater collection methods, recycling, composting, drought tolerant plantings, and real world examples of how to combine such practices to maximize benefit. Rain barrels and compost bins were also sold from the facility, at reduced cost. The facility hosts several recycling bins, with demonstrations and displays of the many products produced from recycled materials.



*Rain Barrel Demonstration*



*Pervious Paving With Recycled Glass Aggregate*

## **Small Disadvantaged Minorities and Women Owned Business (SDMWOB)**

Raleigh has a 15 percent goal for participation of Small Disadvantaged Minorities and Women Owned Business in construction projects. The project team was able to meet this goal.

## **Public Art**

During the early stages of the project, the City of Raleigh was beginning to implement a program of public art in City projects. This had not been a consideration when work began, but later became an element for inclusion. A local artist has been selected and is creating a recycled themed art piece for the facility.

# Unusual Accomplishments

## LEED Platinum

The goal was to achieve LEED Silver, a City Council mandated requirement for all new Raleigh projects. After inclusion of many energy and sustainable building practices, the project was within reach of LEED Platinum.

Particular effort was placed on achieving the extra LEED points required to meet the Platinum level. These included solar photovoltaic roof panels, efficient plumbing fixtures, carpool & alternative fuel parking spaces, measurement devices to track actual performance and utility usage, and enhanced commissioning services. Achieving LEED Platinum will be the first for such a facility in the nation.

While operationally ideal, 60 percent of the Project Site had been used as a borrow pit for the landfill. This required identifying, acquiring, and placing nearly 160,000 cubic yards of suitable fill. This was assembled from excavation generated by several City, State, and County construction projects. This heavily weather dependent task was further complicated by Hurricane Irene and a tornado which affected Raleigh during construction.

## Retaining Wall

Unforeseen conditions, after start of construction, required redesign of a critical retaining wall, complicating the schedule and budget process.



*881 foot long retaining wall,  
up to 20 feet in height*

## **Aged Transmission Poles**

Supporting poles for an electrical utility transmission line dated to the 1940's, bisected a portion of the site. Close coordination with the Transmission Facilities Group was necessary. Still, some utility relocation and site redesign was necessary to accommodate the utility company and to protect their aged poles.



## **Geothermal Wells and Heat Pumps**

A closed loop system of sixty geothermal wells, each 335' deep, that utilized constant ground temperatures to assist the facility's heating, cooling, and hot water needs. Savings of 30 percent for HVAC and 20 percent for hot water should afford a six-year payback. The facility also has twenty eight heat pumps that supply different zones in the building to improve operational efficiencies. The zones are designed around various areas of the building that are occupied full time on a daily basis, as well as those areas of the building that are occupied on a rotational or periodic basis as field staff come and go during the day. Carbon dioxide sensors are also utilized to help manage the interior air quality of the building and improve operational efficiencies of the HVAC system. A geothermal heat harvester heat pump is also used to generate the hot water supply for the building. The hot water is generated during off-peak early morning times and is stored in a tank for the buildings hot water supply and staff locker room showers during the day.

# Additional Considerations

## Buy America

Department of Energy grant requirements included strict “Buy America” provisions, which involved an extensive search and compliance effort for products and systems manufactured in the United States.

## Theft and Vandalism

Remoteness of the site, coupled with high copper prices, resulted in crippling theft and vandalism events. Primary electrical service entry cables and copper water lines were stolen after installation. Further, twelve geothermal pump units were damaged so badly by removal of internal copper coils and wiring that new units had to be manufactured, delivered, and installed. The entire HVAC system had to be reconnected and rebalanced.

## State and City Regulations

The facility is located on a closed landfill and is subject to state permit requirements and regulations. To construct the facility, the City had to first obtain the approval of the State Solid Waste Department to ensure compliance with the landfill permit requirements. The City of Raleigh also has a robust Tree Conservation Ordinance, which challenged the project team to meet compliance. As noted, the project site was a small part of the 220-acre closed landfill for which State regulations controlled and prevented tree planting on the majority of the site. Tree buffer requirements also affected the construction of a key retaining wall along the west access road and parking lot for the site. Ultimately, the team was able to maintain 4 acres of tree conservation areas within the 27 acre project site.



*Site re-graded in areas to accommodate over 20 feet of suitable material*

## Efficient Organization

SWS Center has now organized for 7 - 8 crews, varying in size from 10 to over 30 employees, depending on function. The new facility will accommodate 4 full size crews in each of the 4 class rooms. Those crews rotate out and the other crews rotate in for their meeting. New parking lots are designed to allow free traffic flow and provide adequate parking space.



*Existing unsafe parking*



*Adequate parking space*



*Free traffic flow*



*New parking lots*

## Multi-Purpose Training and Break Room

As noted, the old facility suffered severe operational meeting and work space inefficiencies that hampered and even prevented daily crew meetings and operationally critical route assignments, limited inter- department communications and morale, affected staff training and impacted department meetings. To help with these items, multi-purpose class rooms were designed to allow for four (4) simultaneous crew meetings to be conducted so staff could efficiently meet with their supervisors for feedback and route assignments on a daily basis. This room arrangement helped to improve crew efficiencies and department communication. The multi-purpose class rooms also provided much needed training and meeting space for the Solid Waste Department, other City Departments and the public community. Further, the break room was designed with roll out bleacher seating so the entire department could meet in a very space efficient manner.



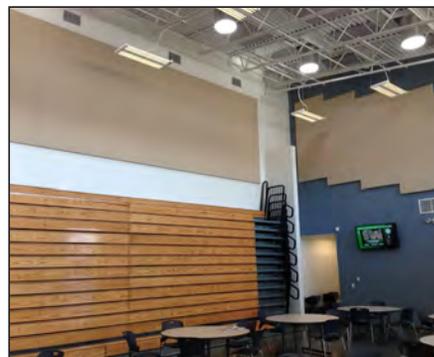
*Old SWS meeting space and conditions*



*New training classrooms*



*New Multi-Purpose Training and Break Room*



*New Assembly Room with Pull-Out Bleachers*





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