Sustainable Reuse of a Former Gas Station and Supermarket, Greenville, SC: A U.S. EPA Brownfields Sustainability Pilot

By Christopher De Sousa and Lily-Ann D'Souza

SITE HISTORY

The Greenville Brownfields Sustainability Pilot site is located on a 1-acre former commercial property in Greenville, a city in the Piedmont Region of South Carolina. The property is situated in the western quadrant of the city, 1 mile southwest of the city center, in the Green Avenue neighborhood.

The history of the western part of the city is reminiscent of the boom and bust economic cycles that brought commercial and residential development, supported by industrial growth, to predominantly agricultural settlements beginning in the late 1800s. Following the end of the Civil War, warehouses and textile mills increased in number in this area as cotton came into production on upstate farms. In response to general economic decline and the relocation of textile mills outside the central city at the turn of the century, commercial activity gradually shifted to the production and packaging of soft drinks. The invention and widespread proliferation of the automobile in the early 1900s encouraged the creation of service stations and repair shops that also enhanced economic activity in the western quadrant. The Great Depression, however, affected this renewed economic development until World War II, when the construction of an Air Force base in South Greenville contributed to an improvement in the city’s economy. The allure of suburban development near the city in the 1950s-1960s claimed both residents and businesses and led to economic decline in this area that persisted into the 2000s.

1 Methodological note: Information for the present case study was obtained from available project reports and from a telephone interview with the project coordinator. The project is ongoing and the information here is current up until June 2012. For any questions, please contact Christopher De Sousa, Associate Professor, Director, School of Urban and Regional Planning, chris.desousa@ryerson.ca.


3 No Author, 2012.

4 No Author, 2012.
Economic decline and the community’s industrial past resulted in a concentration of brownfield properties in the western part of the city. Many of these properties sat vacant or under-utilized due to the uncertainty regarding their environmental condition and the potential cost of environmental remediation. This uncertainty acted as a disincentive to prospective commercial or industrial redevelopment, as developers base their decisions on market transparency.

In addition to brownfields, land use in the western part of the city is characterized by the limited availability of affordable housing in good repair and infrastructure that is outdated. This area is also home to a struggling resident population. Demographic data indicate that “40 percent of families are living at or below the poverty level, and the area’s unemployment rate is 12 percent. Minorities, primarily African-Americans, make up 66 percent of residents.” The decline of the industrial sector in the city not only contributed to economic decline, it also eroded social stability.

Following the successful revitalization of downtown Greenville, the city refocused its attention and in the early 2000s began investigating strategies to renew the western part of the city. The city was primarily concerned with the brownfield sites in this area, and secured funding through a combination of granting programs offered by the U.S. Environmental Protection Agency (USEPA) to finance the administrative and technical costs of environmental assessments. In this regard, the proposed Green Avenue redevelopment is part of a larger coordinated effort by the City of Greenville to remediate brownfield properties and encourage urban revitalization in the area. The majority of assessed properties did not require remediation, bringing an end to the uncertainty that precluded redevelopment in the community.

PROJECT VISION

Initial plans for this site consisted of affordable workforce housing with sustainable landscape features adjacent to a detention pond to increase the city’s stormwater infrastructure. This pilot project was part of a larger, coordinated effort by the city to transform the project site and the surrounding properties into a residential area to achieve consistency with the existing neighborhood Master Plan. The City of Greenville had slowly been acquiring the properties surrounding the McLeod Street and Green Avenue intersection, with the intention of converting the former commercial node into a residential community. Indeed, the city had acquired all the properties on all four corners by the spring of 2010. As residential units were built in other areas of the Green Avenue neighborhood, the city and the Green Avenue Civic Association determined that the pilot site and one directly across the street from it would provide a wonderful opportunity to introduce a passive park and green space into the community. Plans were developed in late 2011 to develop a park and green space on the site instead of the proposed housing. Construction of the Green Avenue Park began in mid-April 2012 and is slated to be completed by June 15, 2012. The write-up below outlines the Sustainability Pilot process that initially focused on a mix of affordable housing and landscape features, and then the community park project that was ultimately developed.

From the outset, the City of Greenville was motivated to incorporate sustainable design features into the project vision for a variety of reasons. The first was to remediate the brownfield property and enhance its appeal to

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5 No Author, 2012; United Stated Environmental Protection Agency [A]. Brownfields Sustainability Pilots Fact Sheet, Greenville Workforce Housing Project. (EPA Region 4 Brownfields Team, July 2008, EPA 560-F-08-276).
6 United States Environmental Protection Agency [B]. In Greenville, SC, Coordinating Resources from two EPA Programs Maximizes Their Effectiveness and Results. (EPA Region 4 Brownfields Team, March 2008, EPA-560-F-239).
7 United States Environmental Protection Agency [B], March 2008.
8 Interview; United States Environmental Protection Agency [C], October 2009.
9 Refer to Appendix A to view the proposed site plan configuration.
10 Interview.
promote sustainable design and energy efficiency on the property was initially considered to be a way of reducing energy and water consumption and their associated costs, both of which contribute to affordable living.\textsuperscript{11}

The integration of more intensive sustainable design features in the site plan to deal with stormwater was also used to increase the property area available for development. Sustainable landscape features such as grass pavers, bioswales and rain gardens would make it possible to reduce the size of a detention pond, which would otherwise have occupied half the site.\textsuperscript{12}

Tetra Tech, the consultant for the Brownfields Sustainability Pilot, developed a conceptual residential and sustainability plan for the site based on the parameters put forward by the city (i.e., appropriate residential design, stormwater pond, maintaining 18 on-site monitoring wells). The initial site plan consisted of six detached single-family houses overlooking green space and specifically designed to provide sustainable and environmentally friendly living. Each house had two levels within approximately 1,000 square feet, and one assigned parking space.\textsuperscript{13}

The significant sustainable landscape features proposed in Tetra Tech's site plan included “community gardens, a passive park with a plaza and native landscaping, rain gardens, a bioswale, infiltration trenches, filter strips, pervious paving, rain barrels, and solar panels.”\textsuperscript{14} From the outset, however, implementation of the sustainable design features recommended in Tetra Tech's conceptual plan depended on the approved site plan and economic feasibility of the plan.

In terms of the development of the larger area, the intention is to encourage walkability and social interaction between residents, particularly children walking to nearby schools. The city is also planning for the addition of 40 single-family homes to the neighborhood as a whole. The houses will be a mix of affordable and market residences that range from $95,000 to $150,000. The diversity and mix of residents will contribute to a vibrant community.

\textbf{PROJECT CHARACTERISTICS AND DEVELOPMENT}

Environmental tests on the Greenville Workforce Housing Project site revealed the presence of a range of contaminants from previous land uses. The land designated for the project was originally two adjacent, but separately owned, properties that were combined when the City of Greenville acquired them in 2007.\textsuperscript{15} One property was formerly a BP service station and the second property was occupied by a Thriftway supermarket. Each property was approximately half an acre. The BP service station began operating in 1964 and included a service garage, station, fuel oil dispenser island, nine underground storage tanks (USTs) for petroleum fuel products, one above-ground storage tank (AST), parking areas, and an office building.\textsuperscript{16} The Thriftway supermarket consisted of a

\textsuperscript{11} Interview; Tetra Tech, August 2009.
\textsuperscript{12} Interview.
\textsuperscript{13} Tetra Tech, August 2009, p. 4.
\textsuperscript{14} Tetra Tech, August 2009, p. 4.
\textsuperscript{15} Interview.
\textsuperscript{16} Tetra Tech. EPA Brownfields Sustainability Pilot, Conceptual Site Design for Sustainable Redevelopment Green Avenue Sites, Greenville, SC. (Reston: Virginia, August 2009), p. 2.
6,250-square-foot building, which also opened for business in the 1960s. Both the BP service station and the Thriftway supermarket ceased their operations sometime in 2002.¹⁷

A Phase 1 Environmental Assessment completed by the City of Greenville in November 2002 found asbestos in the former Thriftway building structure and recommended further testing on both sites. ¹⁶ Soil sampling was performed in December 2006, followed by groundwater sampling in February 2007. ¹⁹ Analysis of the groundwater indicated the presence of several contaminants of concern, including benzene/toluene/ethylbenzene/xylenes (BTEX), methyl tertiary-butyl ether (MTBE), ethylene dibromide (EDB), and naphthalene. Concentrations above detection limits were localized, with a significantly high concentration of 26,000 micrograms per liter (μg/L) for MTBE found at one sampling location on the site near Green Avenue. Soil samples were collected and analyzed for BTEX and MTBE. BTEX field screening results ranged from 5.5 to 621 μg/L, and MTBE results ranged from 5 to 9,700 μg/L. Several field screening soil samples were located at dry holes and others were found to be below detection limits for BTEX and MTBE. ²⁰

Working with the U.S. Environmental Protection Agency and the South Carolina Department of Health and Environmental Control, the City of Greenville determined that monitored natural attenuation, permitting naturally occurring processes to filter the toxic potential of present contaminants, was the remedial course of action for the site. ²¹

The sustainable design features originally proposed by the team of consultants from Tetra Tech were selected to minimize stormwater runoff and its associated impacts, as requested by the City of Greenville. Onsite stormwater management can be achieved through low-impact development practices designed to absorb or distribute the runoff. Collectively, the proposed design features encourage sustainability by reducing energy and water consumption while providing space for public gathering and interaction.

The conceptual site plan proposed the following sustainable design interventions:

- **Stormwater Management**
  - Erosion and sediment control practices, infiltration trenches and filter strips, pervious pavement, downspout disconnects and rain barrels.
  - Dry (retention) pond, bioswales, vegetated curb extensions, soil amendments and native landscaping.

- **Public Amenities**
  - Community gardens

- **Energy Conservation**
  - Solar panels

- **Waste Reduction**
  - Compost bins

The City of Greenville was receptive to most of the recommendations put forward by Tetra Tech. Implementation, however, would depend on economic feasibility and buy-in from developers, as well as educating

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¹⁷ United States Environmental Protection Agency [C]. Sustainable Housing and Stormwater Infrastructure on a Former Gas Station and Supermarket. (EPA Region 4 Brownfields Team, October 2009, EPA-560-F-09-506).
¹⁸ Tetra Tech, August 2009.
¹⁹ Tetra Tech, August 2009; United States Environmental Protection Agency [C], October 2009.
²⁰ Tetra Tech, August 2009, p. 2.
²¹ Tetra Tech, August 2009.
²² Tetra Tech, August 2009, p. 5.
residents to the benefits of employing sustainable design practices. In this regard, the city acknowledged early on that it may not be possible to implement all of the proposed sustainable design features.

While the original vision for the Greenville Workforce Housing Project initially proceeded without difficulty and was the product of a collaborative effort between local residents and city staff based on the 2001 neighborhood Master Plan, its implementation was ultimately affected by economic realities of the housing market. 23 Indeed, the city had identified a developer for the site, but the decline in the housing market forced the company out of business.

As the city contemplated next steps, a review of the 2001 Green Avenue Master Plan revealed that plans for parks and green space had not been adequately addressed. The city and the Green Avenue Neighborhood Association worked together to design a passive park space that would allow long-time Green Avenue residents and new neighbors to create a gathering place for events, picnics, and neighborhood activities. Although there was consensus that the new homes would make a wonderful addition to the community, residents really wanted a beautiful space where they could socialize with their neighbors, take their children and grandchildren, and re-introduce green spaces into the neighborhood.

The City of Greenville secured financing for the environmental assessment and technical site plan assistance through a combination of US EPA grants. The first grant, awarded in 2000, an EPA Brownfields Assessment Grant with a value of $200,000, was used to complete environmental assessments on several brownfield properties in West Greenville, including the Green Avenue site. The removal of underground storage tanks (USTs) in West Greenville, including the Green Avenue site, was made possible through an EPA grant of $100,000 to the South Carolina Department of Health and Environmental Control under the Agency’s USTfields Program in July 2002.24 The technical assistance provided by Tetra Tech to develop a site plan with sustainable design features was also financed by EPA through a $25,000 Technical Assistance grant. The City effectively and efficiently used the available grants by coordinating the assessment and remediation of multiple brownfield properties simultaneously.

Acquiring the project site in 2007 was paid for by the city; the combined cost of the properties was $225,000. The cost of constructing the passive park is estimated at $100,000, which will also be borne by the city.

**BENEFITS, BARRIERS, AND LESSONS LEARNED**

Implementing the proposed site plan for the Greenville Workforce Housing Project presents opportunities and challenges that may prove to be insightful to other cities interested in initiating similar projects.

The redevelopment of an underutilized brownfield property in West Greenville will provide the surrounding

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23 Interview.
24 United States Environmental Protection Agency [B], March 2008, EPA-560-F-239.
community with a variety of benefits. To begin with, the environmental assessments and the demolition of dilapidated structures initiated by the City of Greenville eliminated the uncertainty of the property’s condition and opened the way for future redevelopment.

The intersection on which the project site is located is an important node within the community. Urban revitalization at the intersection should stimulate further development and investment in the neighbourhood. This in turn would support the local economy through job creation and an increased tax base.

The inter-related benefits of this Brownfields Sustainability Pilot project have enabled the City of Greenville to encourage sustainable community development in the Green Avenue neighborhood. The demolition of under-utilized and dilapidated buildings has put an end to illegal activities on the property and contributed to an increased sense of security in the neighborhood. Given that the proposed redevelopment is part of a larger city effort to re-urbanize the Green Avenue neighborhood, the realignment of the McLeod Street and Green Avenue intersection as well as the addition of sidewalks and crosswalks will make it safer for pedestrians.

The sustainable design features that will contribute to environmental and social sustainability are also expected to have long-term economic benefits. In addition to creating jobs in the skilled trades sector (housing construction), the proposed development was expected to improve real estate in the Green Avenue neighborhood and increase the City’s tax base. It was expected that adjacent properties would also appreciate in value.

Community development on a larger level was achieved, as the project vision and design process required collaboration between several stakeholders including the U.S. EPA, the U.S. Department of Housing and Urban Development, the Green Avenue Neighborhood Association, the City of Greenville and Upstate Forever (a nonprofit organization that advocates species protection and smart growth).

The important lesson, however, is that despite technical support, community buy-in, and progressive planning, brownfield plans cannot be implemented if market conditions are unfavorable. From the outset, the city was cognizant of the market challenges and how this might affect the implementation of sustainability features in both the housing and green space components of the original vision. An interview with a city employee who worked on the project noted that to encourage buy-in from developers, the costs of the project need to be maintained at a reasonable level. Sustainable design interventions are not necessarily affordable and can escalate project costs, which are in turn transferred to the homebuyer.

At the time of the interview with the project coordinator, the city had not priced the recommendations made by Tetra Tech. The continued malaise in the housing market eventually resulted in a rethinking of that component, but the sustainability visioning and technical support did seem to “plant a seed” in terms of envisioning a greener future for the property. Indeed, the central location of the property, the availability of other buildable lots throughout the neighborhood for residential uses, and the need for pervious surfaces for stormwater management all seem to support the park function that was ultimately developed at the site.

25 Interview.
## TIMELINE

<table>
<thead>
<tr>
<th>YEAR</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960s to 2002</td>
<td>Property functioned as a gas station and a supermarket.</td>
</tr>
<tr>
<td>2002</td>
<td>Nine underground storage tanks and one above ground storage tank were removed from the site.</td>
</tr>
<tr>
<td>11/2002</td>
<td>City of Greenville conducted a Phase I Environmental Assessment</td>
</tr>
<tr>
<td>12/2006</td>
<td>Soil and groundwater sampling</td>
</tr>
<tr>
<td>2/2007</td>
<td>Soil and groundwater sampling</td>
</tr>
<tr>
<td>2009</td>
<td>Structures demolished; natural attenuation chosen as method of remediation.</td>
</tr>
<tr>
<td>2011</td>
<td>Plans developed for the park</td>
</tr>
<tr>
<td>2012</td>
<td>Construction begins on the park in mid-April, with completion anticipated by June 15, 2012.</td>
</tr>
</tbody>
</table>

## REFERENCES


United States Environmental Protection Agency [A]. *Brownfields Sustainability Pilots Fact Sheet, Greenville Workforce Housing Project.* (EPA Region 4 Brownfields Team, 2008, EPA 560-F-08-276).

United States Environmental Protection Agency [B]. *In Greenville, SC, Coordinating Resources from two EPA Programs Maximizes Their Effectiveness and Results.* (Solid Waste and Emergency Response, March 2008, EPA-560-F-239).

United States Environmental Protection Agency [C]. *Sustainable Housing and Stormwater Infrastructure on a Former Gas Station and Supermarket.* (EPA Region 4 Brownfields Team, October 2009, EPA-560-F-09-506).

## ACKNOWLEDGEMENTS

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The Sustainable Brownfields Consortium is an interdisciplinary group of researchers and technical advisors who are analyzing best practices for sustainable redevelopment of brownfields and the environmental, economic and public health benefits that can result. Funded by a grant from U.S. EPA, the project is a collaboration of the University of Illinois at Chicago (where it is based), University of Illinois at Urbana-Champaign, University of Wisconsin-Milwaukee, Ryerson University, Resources for the Future, Kandiyo, and Hellmuth + Bicknese Architects. The project website is at www.brownfields.uic.edu.