RAY AND JOAN KROC CORPS COMMUNITY CENTER

PHILADELPHIA, PENNSYLVANIA / SALVATION ARMY OF GREATER PHILADELPHIA

2015
RUDY BRUNER AWARD
PROJECT DATA

RUDY
BRUNER
AWARD

FOR URBAN
EXCELLENCE

PROJECT DATA

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Project Name: Ray and Joan Kroc Corps Community Center | Location | City: Philadelphia | State: PA

Owner: The Salvation Army of Greater Philadelphia

Project Use(s): Community Center

Project Size: 12.4 Acres Site/130,000SF Building | Total Development Cost: $49M

Annual Operating Budget (if appropriate): $7.8M (incl. operating budget, program budgets, and grants)

Date Initiated: 2004 | Percent Completed by December 1, 2014: 100%

Project Completion Date (if appropriate): 1 November 2010 | Project Website (if appropriate)

Attach, if you wish, a list of relevant project dates

Application submitted by:

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Please indicate how you learned of the *Rudy Bruner Award for Urban Excellence*. (Check all that apply).

- ☐ Direct Mailing
- ☐ Online Notice
- ☑ Direct Email
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- ☐ Social Media
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Signature: Jose Alminana

Digitally signed by Jose Alminana
DN: cn=Jose Alminana, o=Andropogon Associates, ou, email=alminanaj@andropogon.com, c=US
Date: 2014.12.09 14:49:25 -05'00'

Date: 9 December 2014

2015 RUDY BRUNER AWARD **PROJECT AT-A-GLANCE**

RUDY BRUNER AWARD

FOR URBAN EXCELLENCE

PROJECT AT-A-GLANCE

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This sheet, the Project Data sheet, and the representative photo will be sent to the Committee in advance as the *Project Overview*.

Project Name: Ray and Joan Kroc Corps Community Center

Address: 4200 Wissahickon Avenue City/State/ZIP: Philadelphia, PA 19129

1. Give a brief overview of the project. Approximately 500 words.

On November 1, 2010, The Salvation Army Ray and Joan Kroc Corps Community Center opened its doors to the community at 4200 Wissahickon Avenue in North Philadelphia. Designed by MGA Partners Architects, in association with PZS Architects and landscape architects Andropogon Associates, and built by T.N. Ward Company, the 130,000-square foot super community center is situated on a 12.4-acre, former brownfield site located at the junction of several of North Philadelphia's most troubled neighborhoods. Today, the Kroc Center boasts a total membership of 6,800 individuals and serves 1,000 each day. True to The Salvation Army's approach of "ministering to the whole person," the Kroc Center houses an array of programs designed to address the economic, educational, health, recreational, and spiritual needs of the neighboring community. These programs are provided in an inclusive manner, regardless of ability to pay, religious, or ethnic background.

The Kroc Center was designed to meet key challenges in the lives of local residents by offering high-quality, affordable child care facilities for working families; providing safe havens where children can play, learn, and grow free from the dangers of violence and crime; providing after-school programs that simultaneously provide children with the extra help they need to succeed in school and keep them out of harm's way; offering resources and support for single parents; providing safe places in which seniors can be cared for and enjoy the fellowship of their peers; providing job training and adult education experiences; providing community-based links to key social services; providing affordable facilities for improving and maintaining physical fitness; providing opportunities for participation in and exposure to the performing and creative arts; and providing accessible, safe green space.

The Philadelphia Kroc Center goals were to not only provide the necessary services, but also to inspire the community by showing that even neighborhoods with limited resources deserve the best design can offer. Using a comprehensive, sustainable landscape approach, the project dramatically transformed an abandoned, brownfield site with contaminated soils into a productive community center with an expansive, green oasis that captures, filters and reuses rainwater, restores native habitat, and supports urban agriculture. The richly programmed landscape creates a hierarchy of activities arrayed around a central green, including sports fields, picnic area, play zone, formal gardens, and a horticultural zone.

The building and landscape are closely integrated with the indoor facility designed around a light-filled, curved civic space from which entrances to all major program facilities are accessed, including the fitness center, childcare center, and places for worship. Wrapped in south-facing glass, this 2-story grand hallway extends outdoors, connecting interior programs with the central green and campus. The building supports community enrichment programs with a fully-equipped performing arts center, music and dance studios, computer lab, film editing room, and a café and kitchen. The first-class fitness facilities include a gymnasium and two-story fitness center and an indoor aquatic center, featuring a family water park, therapy pool, and a 10-lane competition pool, which houses programs headed by renowned swim coach and youth advocate, Jim Ellis.

2. Why does the project merit the *Rudy Bruner Award for Urban Excellence*? (You may wish to consider such factors as: effect on the urban environment; innovative or unique approaches to any aspect of project development; new and creative approaches to urban issues; design quality.) Approximately 500 words.

The Philadelphia Kroc Center serves as a beacon for how to transform our most challenging urban areas with high-quality facilities that are carefully designed to treat the whole person, their community, and environment. The project chose to redevelop a contaminated brownfield site located at the intersection of several underserved neighborhoods with high poverty levels and limited resources. Both programming and facility design were developed with a holistic approach to not just provide services, but to enrich lives; to not only reuse vacant land, but to heal it and make it productive. The redevelopment took a ground up approach, looking to the existing site and its surrounding community to find the resources to facilitate its own transformation. The scale of the programs offered and the regenerative approach to the project declared that the community deserved the best that design could offer.

Programming for the Kroc Center was developed through a two-year dialogue with multiple stakeholders to ensure that services were tailored to meet the needs of the adjacent neighborhoods. The Kroc Center interpreted the community's desires to protect and support both their children and their seniors in the broadest sense possible, providing an array of services that nourish both body and mind at all age levels. While understanding that these communities require many basic services, such as access to education, food, and jobs, the Kroc Center strives to augment these services by bringing people together, enriching lives with music, art, and sports, and providing relief from the urban grid with a safe, open space where the community can play and grow their own food.

The Philadelphia Kroc Center redevelopment has bridged adjacent residential neighborhoods, long divided by the blighted industrial corridor, and rejuvenated community pride and cohesion. Many members and commentators on the Kroc Center project have remarked on the diverse mix of people who are drawn to this facility. The location is most accessible to struggling neighborhoods, but it is within reach of more affluent neighborhoods, where individuals can pay full membership dues that help sustain the Center. There is a sense that this northwest Philadelphia community now has something special to offer to the broad cross-section of city residents that gather here.

The Philadelphia Kroc Center is an environmentally progressive, brownfield redevelopment, integrating the building and the landscape with a comprehensive, sustainable approach to site development. During construction, a zero-waste approach resulted in nearly all of the site's existing pavements being recycled and reused on-site. The site design responds to the city's most stringent stormwater codes by using cost-effective strategies that manage rainwater using a combination of capture, reuse, evapotranspiration and infiltration of the first three inches of stormwater runoff on site, through a system of cisterns, bio-swales, rain gardens, pervious pavements, and engineered soil mixes. The landscape now supports biodiversity through the use of native plant communities to create upland, lowland, and wetland habitats. The project provides measurable ecosystem benefits that can be used as an example for the design and benchmarking of other urban brownfield redevelopments.

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PROJECT DESCRIPTION

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1. Describe the underlying values and goals of the project. What, if any, signifcant trade-offs were required to implement the project? Approximately 500 words.

The Salvation Army Kroc Corps Community Center in Philadelphia is part of a national initiative to use the best in design to promote health and wellness and provide enrichment programs in underserved communities. Though the Kroc Center initiative is national in scope, each center is designed to respond to the challenges of its surrounding community. The Philadelphia Kroc Center was conceived as a super center tailored to meet the needs of the adjacent northwest Philadelphia neighborhoods. Hit hard by the collapse of its manufacturing base, the declining population in predominantly black with more than a third of residents lives at or below the poverty level. With the loss of industry, this part of the city was also left with vast tracts of vacant brownfields. Through the redevelopment of an abandoned industrial site at the crossroads of several underserved communities, the Philadelphia Kroc Center provides needed services, while restoring a contaminated, vacant site to productive use.

The goals of the Philadelphia Kroc Center were determined by a community assessment process that met with representatives of the community to ensure that the Kroc Center would provide facilities and services that are priority needs as identified by the community itself; and to eliminate possible duplication of local service provision. The Kroc Center responds to the local residents desire to "prepare the next generation" by offering "a beacon of positive hope for young people," while "respecting and honoring the seniors" who have remained committed to this community (from B.J. Cohen, "Assessment of Community Needs," 2005). The Kroc Center goals were to not only provide the necessary services, but also to inspire the community by showing that even neighborhoods with limited resources deserve the best design can offer.

The Philadelphia Kroc Center also addressed the challenge of how to redevelop a contaminated brownfield site to transform it into a productive, neighborhood amenity. This "beacon" for the community was designed to heal the site from the ground up, to integrate the building and the landscape to create an urban oasis, and to layer multiple functions to maximize the project's potential benefits. The approach to the Kroc Center project was to view the existing site as a potential resource for its own transformation. Existing site materials were recycled and reused in the new construction. Contaminated soils were capped to the greatest extent possible using a complex grading scheme that provided both universal accessibility and stormwater management benefits. The landscape was restored with groups of plants to recreate native habitats and a volunteer-tended urban farm. The building was sited and formed to maximize the views of the landscape, while creating a more human-scale along the urban street. Whenever possible, design challenges were resolved to provide multiple benefits.

Several trade-offs were made during the design process, including the reduction in the seating capacity of the Performing Arts Center and the Conference and Training Center. In addition, the size of the parking lot was minimized to allow space for an athletic field for lacrosse and soccer.

2. Briefly describe the project's urban context. How has the project impacted the local community? Who does the project serve? How many people are served by the project? Approximately 500 words.

The Kroc Center is located at the junction of some of Philadelphia's most distressed and underserved neighborhoods. This section of the city has suffered from the loss of its manufacturing economy and a subsequent decline in population, loss of shopping areas, and lack of new investment. In the neighborhood to the south of the Center, a recent planning study identified 345 acres of vacant land and almost 4,000 vacant buildings. For the 185,000 individuals living in the six neighborhoods surrounding the Kroc Center, approximately 35% live at or below the poverty level, higher than the city average. Even before the economic downturn, the unemployment rate for the zip codes immediately surrounding the Kroc Center averaged about 20%, almost three times greater than that of the Philadelphia metropolitan area. Up to 93% of the approximately 8,000 school-age children in these neighborhoods qualify for free or reduced lunch. A 2004 report found that 51.3% of Philadelphia children ages 2 to 17 were "at risk for obesity," nearly three times higher than the national average. Adjacent neighborhoods are deemed as having low food access, where at least a third of the population lives more than ½ mile from the nearest supermarket.

The Kroc Center has made a profound impact on Philadelphia's economy as well as on that of the adjoining neighborhood. A recent study, conducted by Partners for Sacred Places and the University of Pennsylvania School of Social Policy and Practice, quantified the economic impacts of the Center at approximately $33 million through direct spending, day care programs, and a range of catalyzing economic values. When it comes to hiring, the Center privileges those who reside in the area. Since its inception, the Center has created 192 jobs, with 28% of employees living within a two-mile radius of the site. Direct spending on operations and maintenance add $7.8 million to the local economy. The Early Childhood Education Center has a capacity for 78 children. Assuming that for each child enrolled, one parent is free to work, this results in an economic impact of nearly $2 million annually. The remaining $23.8 million is based on the values of an improved environment and lower energy costs, visitor spending, reduction in government spending for individuals, and the promotion of holistic health. More than a third of this remaining amount comes from subsidizing fitness membership. Of the 6,800 Kroc Center members, 46% live within a two mile radius of the site. A total of 758 members received need-based scholarships in 2014 at a value of $88,633.

The Kroc Center continues to have a halo effect, sparking investment in the immediate area. Just prior to opening, Kroc Center management met with developers interested in creating a shopping center just blocks from the Kroc Center that will be complete with a supermarket, retail shopping, and eateries. Prior to the construction of the Kroc Center, there were no plans to develop businesses in the vicinity of the Kroc Center.

3. Describe the key elements of the development process, including community participation where appropriate. Approximately 400 words.

The Philadelphia Kroc Center was built as part of a national initiative made possible by a historic bequest from the late Joan Kroc to The Salvation Army in 2004. Each Kroc Center is developed through a rigorous proposal process to ensure appropriate site selection, local commitment through matching funds, and participation by the people each center will serve. The National Kroc Center Initiative Request for Proposal process requires that each potential site compete to secure a Kroc Challenge Grant. Each grant provided 50% costs for construction and 50% for an endowment, with the remaining costs to be covered by matching funds. Two years of planning between 2004-2006 leading up to the submission the Philadelphia proposal included regular committee meetings, a real estate search, a two-phase environmental study, an economic impact study, a community needs assessment, and community engagement sessions. The community engagement meetings included leaders and members from multiple departments of the City of Philadelphia, the School District of Philadelphia, the Archdiocese, and the local community. In addition, the committee needed to develop a pro-forma outline of programming, staffing, facility components, budget, as well as meet key fundraising milestones.

Before finalizing the location of the Kroc Center and determining what facilities and programs it should house, the Army conducted a comprehensive community needs assessment (led by Elliott Associates Architects and Hill and Associates), which included numerous interviews and two focus groups with community leaders and residents from the six neighborhoods that surrounded the proposed site. The focus groups were convened by community partners. Needs assessments that were conducted by two organizations in the neighborhoods adjacent to the Kroc Center (Tioga United and Allegheny West) were also reviewed. The areas of need identified in these assessments are reflected in the types of programs that are operating at the Kroc Center.

Events were helpful for educating people and setting the stage for individual follow up and for cultivation as members. Some of the events included Groundbreaking, Women's Cultivation Luncheons, a Halfway Point Celebration, an African American Leadership Luncheon, a Community Garden event, and a Topping Off Ceremony.

4. Describe the financing of the project. Please include all funding sources and square foot costs where applicable. Approximately 400 words.

The late Joan Kroc, widow of McDonald's Corporation founder, Ray Kroc, made a historic bequest of nearly $1.6 billion to The Salvation Army nationally in January 2004 to build approximately 25 state-of-the-art super community centers in underserved neighborhoods throughout the nation. In 2006, The Salvation Army of Greater Philadelphia was awarded the Kroc Challenge Grant - a $72 million award, restricted for 50% capital and 50% endowment. We were fortunate to receive increases in the Kroc Grant Award from $36 million to $49 million for capital and from $36 million to $44.5 million for endowment. These increases were the result of additional funds becoming available, replacing funds that would have been received through New Markets Tax Credits (which did not work out) on the capital side, and offsetting market losses in endowment after the stock market plunge.

Planning, site development and construction costs were $73 million, $24 million in excess of the capital funds allocated from Mrs. Kroc's gift. The majority, but not all, of the balance of construction costs were addressed through private philanthropy, as well as through city, state, and federal funding. The $93.5 million from Mrs. Kroc that has been allocated to the Salvation Army in Philadelphia fulfilled 66% of our total goal to build and endow the Kroc Center. Construction costs for the Kroc Center were approximately $354/SF for the building and $19/SF for the site.

The $44.5 million portion of Mrs. Kroc's gift designated for endowment generates interest that funds only about 21% of what it will cost to operate the Kroc Center annually. In response to this challenge, in early 2007 the Salvation Army launched a fund-raising campaign with a goal of securing $30 million in private philanthropic support to add to the Kroc Center's endowment and address remaining capital needs. As a huge boost to the Center's fundraising, the Kresge Foundation awarded a $1 million Kresge Challenge, conditional upon the Campaign reaching $29 million by September 30, 2010. The challenge was met within the deadline. This challenge included over 450 gifts under $1,000 each, totaling $75,000.

In Philadelphia, the Center spends 90 cents of every $1 of income directly on the provision of services. This compares to 75 cents – the figure commonly held up nationally as a benchmark for non-profit efficiency.

5. Is the project unique and/or does it address significant urban issues? Is the model adaptable to other urban settings? Approximately 400 words.

The Kroc Center as a national initiative is unique in its scope and in its approach in providing high-quality design and facilities in underserved communities. Any community, regardless of income levels, would be excited to have one of these superior centers nearby. Kroc Centers are designed to "treat the whole person" in a holistic manner, providing enrichment that can transform not just a person, but a whole community. Through programming and design, the Kroc Centers seek to address significant health and social needs while inspiring members with further possibilities in music and the arts, athletics, and education. Kroc Centers have already been built in multiple locations across the United States. The rigorous Kroc Challenge Grant proposal process has helped to ensure that each Center is strategically located to succeed and designed to meet the demands within each community.

The Philadelphia Kroc Center is unique within the national initiative for its multiple, quantifiable environmental benefits derived from the former brownfield site, particularly with the inclusion of an urban farm, known as the Horticultural Zone. In the planning phase of the Horticultural Zone, the most frequently uttered words were "we must address food insecurity." The Horticultural Zone does just that with its 14 beds for planting vegetables. It is an oasis of green against the backdrop of an urban landscape. A partnership with the Pennsylvania Horticultural Society, one of the oldest and most respected horticultural organizations in the United States, was instrumental in launching the Zone's programs and activities. Members of the Kroc Center are introduced to locally grown produce and flowers. They learn about eating healthy and are introduced to hands-on garden concepts so that they can grow produce at home. A hallmark feature of the Zone is its programming for the Kroc Center summer camp. Children dig, plant, weed, water, learn about recycling and composting, and make their own salads from crops they harvested. Volunteers consume most of the Zone's crop. However, the on-site café and family resource center, and nearby ShopRite supermarket, all receive produce from the Zone. A hoop house extends the spring and fall growing seasons by several weeks, making it possible to grow nutritious food almost all year round. Last growing season, the Zone produced more than 31,000 pounds of produce as well as culinary herbs and fruit.

2015 RUDY BRUNER AWARD COMMUNITY REPRESENTATIVE **PERSPECTIVE**

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COMMUNITY REPRESENTATIVE PERSPECTIVE

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This sheet is to be filled out by someone who was involved, or represents an organization that was involved, in helping the project respond to neighborhood issues.

Name Ronald Hinton Jr. Title President

Organization Allegheny West Foundation Telephone (215) 226-0130

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Signature Ronald Hinton Date 11/9/2014

1. How did you, or the organization you represent, become involved in this project? What role did you play? Approximately 400 words.

The Allegheny West Foundation (AWF) was a strategic partner in the planning process of the Kroc Center beginning in 2005. AWF assisted The Salvation Army (TSA) with selecting a site for the Kroc Center in North Philadelphia. Together we looked initially at 17th Street and Allegheny Avenue. The major issue with that site was that residences would have to be relocated and that was not acceptable for either TSA or AWF.

AWF had completed its strategic plan in 2004 which consisted on an extensive community analysis of vacant industrial sites and input from a significant number of community members. AWF's strategic plan was shared with the Kroc Center project team. The strategic plan identified needs of the community: community safety, services to youth, education, drug and alcohol treatment services, city services, local businesses and job training. Key learning from AWF's community assessment helped to inform the Kroc Center's approach in its own community assessment. We were instrumental in advising the Kroc Center's project team on the vast potential for development of the vacant industrial site that was previously occupied by Tastykake and the former Bud Company.

AWF and TSA continue to have an ongoing partnership. I served for a period of time on the first Kroc Center Advisory Council. The Director of Kroc Center Programs is a current member of AWF's Board. The Kroc Center provides summer work opportunities for AWF teens.

2. From the community's point of view, what were the major issues concerning this project? Approximately 400 words.

The community was hurting because of de-industrialization and suburban flight with the closure of the Bud Company and it was seeking an infusion of resources. It rejected a proposal for a Trump Casino to be built on the former Bud Company site just prior to the Salvation Army expressing an interest in the site. The major concern for community members was that the casino would increase crime, result in traffic jams and cause deeper poverty instead of bringing social services and resources that the community so desperately needed. Around the same time, a scrap yard was proposed. That too was rejected; the people were interested in businesses or services that would spur revitalization.

One major issue that the Kroc Center faced was to transition the site from an industrial site to a site that would provide the social services and vital community resources. AWF believed that it was a vision that could work. TSA is known as an organization that would bring all its services to any community in need. Even though there were vacant industrial buildings surrounding the Kroc Center, TSA still built it.

Another major issue that the Kroc Center faced was the ongoing negotiations between Trump Casino and the city. The community was tired of the fight. Because the negotiations were ongoing, the Trump Casino management could not bring any monetary resources to the community. The Salvation Army entered the community at a time when the community members were ready to hear something different other than what Trump Casino was proposing.

COMMUNITY REPRESENTATIVE PERSPECTIVE (CONT'D)

3. Has this project made the community a better place to live or work? If so, how? Approximately 400 words.

The Kroc Center has made the community a better place to live. It spurred the revitalization that the community sought. ShopRite build a major supermarket in the community. The presence of the Kroc Center has brought neighborhoods together culturally. It does not matter where you live or how much you earn, the Kroc Center is a regional destination where the lives of people touch, where racial and economic barriers are broken down. There was a time when people stayed in their neighborhoods but on any given day, one will see a diverse group of people at the Kroc Center.

4. Would you change anything about this project or the development process you went through? Approximately 400 words.

Though not feasible, I would recommend increasing the size of the Kroc Center. During the development phase no one anticipated the great demand. People travel ten miles to the Kroc Center. The complement of services is tremendous.

The development process was all encompassing in that it brought together community members, leaders, and representatives from city government and businesses. No one was left out of the process. There is not anything I would change about the development process.

2015 RUDY BRUNER AWARD PUBLIC AGENCY **PERSPECTIVE**

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PUBLIC AGENCY PERSPECTIVE

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This sheet is to be filled out by staff representative(s) of public agency(ies) who were directly involved in the financing, design review, or public approvals that affected this project.

Name Alan Greenberger | Title Deputy Mayor for Economic Development

Organization City of Philadelphia | Telephone (215) 683 4600

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Signature | Date December 1, 2014

1. What role did your agency play in the development of this project? Describe any requirements made of this project by your agency (e.g., zoning, public participation, public benefits, impact statements). Approximately 400 words.

The Kroc Corps Community Center is primarily a privately funded and developed project. It is located on a property that was formerly owned by the Budd Company (rail car manufacturers) and subsequently by a private developer who sold it to the Salvation Army. During the time when the current Mayor of Philadelphia - Michael Nutter - was the District Councilman for the area, the Salvation Army regularly discussed with him the opportunity for the development of the Kroc Center. He both urged and facilitated the sale of the property to the Salvation Army, believing that this opportunity could revitalize this former industrial area as well as provide direct services and benefits to the neighboring communities. Partial funding for the project was also provided by both the City and State, specifically for the non-religious community support functions that were to be housed in the Center.

Typical for a large project, several other City agencies played small but vital roles in the development of the project. The Water Department was responsible the oversight and approval of a unique storm water management system that collects all of the storm water from the site in underground cisterns, reusing much of it for site irrigation and, when necessary, slowly lets water flow into the city sewer system. The Department of Streets cooperated with the Salvation Army on the installation of a mid-block traffic light to ensure traffic calming and safe crossings at the facility's main entrance. Lastly, a blighted property across the street from the Center, owned by the regional transit authority, was torn down in time for the opening of the Center and was subsequently leased to the Center for additional parking. The latter improvements were greatly facilitated by the Deputy Mayor for Economic Development.

As a result of the development of the Kroc Center, a new plan for the area was done by the City Planning Commission and involved the participation of several neighboring community groups. The near-neighbors stressed the need for a supermarket in what was otherwise a 'fresh food desert'. Working closely with the local Councilman, the Deputy Mayor's office rezoned much of the nearby properties to allow for a major new shopping center, anchored by one of the city's most community-minded supermarket operators. Again, State funding and high levels of cooperation between the public and private sector enabled a major new development.

2. How was this project intended to benefit your city? What trade-offs and compromises were required to implement the project? How did your agency participate in making them? Approximately 400 words.

The mission of the Kroc program is to provide under-served neighborhoods with superior community services, housed on grounds and in buildings that conform to a high level of design excellence.

The Salvation Army went through a methodical process to identify a location for the Kroc Center that would be accessible to such neighborhoods, have reasonable transit access for those coming to the Center from greater distances, and have sufficient land to create the outdoor activities needed to complement the services inside the facility. They found just such a site in this former industrial area, thus providing them not just with the space to fulfill the Kroc mission, but to also 'plant a flag' of physical and spiritual renewal in an area that had been a major source of employment but was now a major source of blight.

A stated objective of the project was to create a 'green oasis' from the remains of an industrial brownfield, and a 'spiritual oasis' from the remains of a once-vibrant piece of the Philadelphia economy. There was nothing about this area to suggest that this would be possible. The site is surrounded by industrial uses, many shuttered in massive, empty buildings, but some active in typical industrial facilities. Perhaps symbolic of the effort that was to be undertaken, the use immediately before the Salvation Army's acquisition of the site was an impoundment lot for the Philadelphia Parking Authority. Cars seized in drug raids, foreclosures or otherwise abandoned found a home here until they were sold.

In addition, the area was criss-crossed by rail lines. Many are active today, both freight and commuter. There was even a freight rail spur that ran through the site in order to service a neighboring property. That spur had to be removed to make the site developable.

3. Describe the project's impact on your city. Please be as specific as possible. Approximately 400 words.

The neighborhoods that surround the Kroc Center range form those that are significantly impoverished to those that house a mix of income groups. It is very clear on visiting the Kroc Center that all of these groups are represented in the membership of the Center and that they equally share in the community services provided there. Facilities like this sometimes suffer from the stigma of being solely a social services operation. This is the not case at the Kroc Center. From the extraordinary diversity of the membership to the range of programs offered. the Kroc Center is truly a place that welcomes all who seek its services, facilities or spiritual guidance. It is an incomparable gift to the city that could only be the result of exceptional vision and commitment.

In addition to its own core functions, the Kroc Center is an anchor of redevelopment in an area that is undergoing a renewal. That renewal will necessarily be slow because the reuse of massive industrial structures around the Center is not imminent. However, the development of the nearby supermarket and shopping center are an indication that investment is possible and that such investment can further benefit the surrounding communities.

The Kroc Center is across the street from a vast industrial property that is owned by the regional transit authority. At the far rear of the property, a thousand feet back from the street, the transit authority operates a regional bus and train maintenance yard. However, in between this and and the street, the property houses miscellaneous, inactive storage areas. While the redevelopment of this property is not yet clear, it is clear that the presence of the Kroc Center is a catalyst for planning for a better future. The Kroc Center has established an urgency that simply did not exist before it.

4. Did this project result in new models of public/private partnerships? Are there aspects of this project that would be instructive to agencies like yours in other cities? Approximately 400 words.

The Kroc Center is a phenomenon - a gift of the vision of Joan Kroc, manifested by the singular vision and purpose of the Salvation Army. The Army enjoys an extraordinarily good working relationship with the City of Philadelphia at the highest ranks - the Mayor - as well as through the various elected and public services entities of city government. These relationships are certainly institutional but they are cultivated and strengthened every day by good people who share a vision of betterment for the citizens of Philadelphia. These relationships has been tested by tragedy - the collapse of a building in 2013 on a Salvation Army store, killing six people and injuring many others. But through it all, the City and the Army have worked together with shared values, albeit one civic and the other religious.

Accomplishments at the Kroc Center are a reminder that civic and religious organizations can find common purpose when both parties clearly delineate their goals and not let religious interests infuse the civic interests with undue influence. Their is a certain selflessness in doing so, especially for a religious organization like the Salvation Army, who are explicitly an evangelical Christian mission, but who offer their services at the Kroc Center to anyone, without regard to religion or affiliation.

5. What do you consider to be the most and least successful aspects of this project? Approximately 400 words.

The success of the Kroc Center cannot be overstated.. It has several thousand members who come from diverse neighborhoods of people of different race, religion and income. They come together under the welcome canopy of the Salvation Army and find common ground, whether through exercise, child care, education, music or spirituality. From the perspective of the City of Philadelphia, the Kroc Center is a completa success that regrettably cannot be easily replicated in other neighborhoods with similar needs.

2015 RUDY BRUNER AWARD PROFESSIONAL CONSULTANT **PERSPECTIVE**

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Signature F. J. Elliott AIA **Date: 8 December 2014**

Ray & Joan Kroc Corps Community Center, Philadelphia, PA
Professional Consultant Perspective

1. **What role did you or your organization play in the development of this project?**

Elliott Associates Architects and Planners work primarily with non-profit organizations in the Eastern United States. The firm was engaged by the Salvation Army to prepare a Program Planning Study for their mission in Philadelphia.

The consultant offers a unique type of Program Planning Study, which combines demographics, community needs assessment, program analysis, and recommendations with the potential physical impact on the facilities. The facilities are analyzed in terms of space utilization, quality of the facility, location and availability to service the recommended programs. Included in the study were ten Corps Community Center buildings located in Philadelphia and the proposed Ray & Joan Kroc Corps Community Center on Wissahickon Ave.

For the Ray & Joan Kroc Center the consultant's services included the following:

- Community needs research and study – prepared recommendations for community outreach programs and Kroc Center programs
- Analyzed potential sites in Philadelphia and guided the site selection process to the Wissahickon Ave. location
- Using the selected programs, prepared basic building concept designs for the site on Wissahickon Ave.
- Prepared and guided the architects selection process

What is the vision?

The Salvation Army programs are a vital component in the human service landscape of Philadelphia, a diverse city of almost 1.4 million people.

The Salvation Army, founded in London in 1865 opened the first facility in the United States in Philadelphia in 1895. In 1965 Dwight Eisenhower wrote, "The Salvation Army has symbolized around the world a deeply religious concern for the welfare of the human individual, whatsoever his race or creed."

The changing demographic conditions – economic, social and population – are creating a new living environment for many in Philadelphia. The middle class is struggling to maintain their standard of living. Those living in poverty are struggling to survive and create a life of dignity. The population is surrounded by a deteriorating environment, both physically and spiritually. Human service programs are being restructured to meet these changes in our society.

The Program Planning Study has three basic questions:

- What are the community needs?
- Whom is the Salvation Army serving?
- Whom should the Salvation Army serve?

The answers to these questions resulted in recommendations for community programs and the development of building space planning requirements.

The extensive community process included neighborhood demographics, family and youth at-risk issues, community meetings, social service needs, health and recreation issues, and review of other agencies' programs. Elliott Associates Architects prepared for the Ray & Joan Kroc Corps Community Center the program and space needs manual, which incorporated recommendations for specific programs and spaces required to implement the mission.

2. Describe the project's impact on its community. Please be as specific as possible.

A community service-related building has so many variables in the definition of its function and use. Different activities and social programs put vigorous claims on the building spaces. Space ownership and space flexibility are often in conflict due to program attendance and function schedule. Finances are limited and flexibility of space, where possible, can produce areas that are compatible with programs that can change over time.

The Program Planning Study program recommendations for the Kroc Center defined a wide range of specific space needs. Many of these selected program spaces were a result of community and neighborhood input.

Many of the areas surrounding the Kroc Center have the highest poverty levels in Philadelphia, the highest level of youth at-risk problems and the highest school dropout rates. The family unit needs major social system support to survive or thrive.

The Kroc Corps Community Center became to the adjoining neighborhoods a beacon of hope, a place of safety, a place for learning and a place for fun and recreation.

The Salvation Army is known for its integrity. In today's world this is an immeasurable value, particularly when related to programs for children and youth.

The Kroc Center is a safe haven, a rare place to find in some neighborhoods. It is also a quiet place to dream and perhaps to discover that dream through attending Kroc Center programs.

When asked, "What do you want to see in the Kroc Center," the responses were expansive:

- Can we have a gym? How big?
- A pool maybe. There are almost none in Philly.
- Can anyone go there?
- Where did you get the money?
- We need a quiet safe space for homework. I don't have one at home.
- Locate near my bus route
- What is a water park? I've never seen one.
- We need job training
- We have no supermarket in our neighborhood
- Can I go there for help?
- Day care?
- We have no parks in my area. Nothing to do.

In the final program development stage many of the comments became a reality in the new Kroc Center complex. Some Kroc program titles illustrate this:

- Young women's mentoring group
- Public speaking class
- Adult boxing
- Youth self defense
- Water dancing
- Musical instrument instruction
- Family resource center
- Chapel
- Social services w/ case worker
- Tween center (10-12 age)
- Building self esteem program
- ESL for African women
- Outdoor walking track
- Early childhood education center
- Fitness center
- Nearby charter schools use gym during the day
- 1/3 acre community garden
- Outdoor recreation
- Cooking/nutrition classes

The Ray & Joan Kroc Corps Community Center program directly responds to the neighborhood's identified needs. The neighborhood's request for a local supermarket was answered this year. A Shop Rite supermarket opened near the Kroc Center.

3. How might this project be instructive to others in your profession?

The planning, design and construction of a new facility is often completed on a "let's get it done now" emphasis. Sometimes the process produces buildings that meet the client's and perhaps also the community's needs. Sometimes they do not.

The Salvation Army, in developing the Ray & Joan Kroc Corps Community Center, chose to carefully prepare a response to the questions, "why are we building this? What is the long-term strategy and impact on the neighborhood? How can we be a partner to the community?"

A community service-related building has so many variables in the definition of its function and use. Different activities and social programs put vigorous claims on the building spaces. Space ownership and space flexibility are often in conflict due to program attendance and function schedule. Finances are limited and flexibility of space, where possible, can produce areas that are compatible with programs that can change over time.

Planning community-related facilities requires a short- and long-term strategy. Identifying and listening carefully to all participants in the planning process is fundamental; to the development of a quality project, with successful outreach programs that contribute to the life of the community.

4. What do you consider to be the most and least successful aspects of this project?

The success of a complex community-related project has many definitions that all interconnect to achieve a final goal. The Kroc Center's success is the composite of many outreach programs being offered to the community.

The planning for the Kroc Corps Community Center focused on the people to be served – what do they need that would help the change their lives? Is it the English as a Second Language (ESL) program that is directed toward women coming from Africa, or the young women's mentoring program, or the great sports facilities?

The Ray & Joan Kroc Center in 2014 has grown to become a dynamic neighborhood asset that is changing lives in Philadelphia.

The Salvation Army is known for its innovative approach to programs and space development. If a less successful program develops in the future, adjustments will be made as part of the flexibility of the long-range strategy for the Ray & Joan Kroc Corps Community Center project.

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1. Describe the design concept of this project, including urban design considerations, choice of materials, scale, etc. Approximately 400 words.

The Salvation Army Kroc Center is a model for both future transformations of industrial landscapes and for community centers across the country. Once recognized as “The World’s Greatest Workshop”, Philadelphia struggles with its vast districts of vacant industrial landscapes and the dense communities these industries used to support. The vision for the new Center became a goal to transform the industrial site to create a green jewel in the dense urban environment, connecting a new facility to the reclaimed site, and establishing the return of wildlife while providing safe access to and education about the outdoors.

A cross in the central gathering space is visible from all parts of the building and campus, and acts as a simple iconographic symbol of the spiritual mission of the Salvation Army. The curved glass wall may be the most notable example of this ideal by gently linking inside and out, but also revealing program spaces in an indirect, welcoming engagement with the community.

The Center’s identity is articulated in the beacon tower and the 25 foot high stone cross on site. Bright white during the day and illuminated at night, these iconic symbols create a strong visual presence both in the neighborhood and throughout the campus. Continuing this vocabulary into the entrance loggia, the customized inset bricks have a white metallic glaze and are angled in shape, reflecting light from the sun. This combination of functionality, simple iconography, and use of ambient and reflected light establishes the visual, spiritual vocabulary for the community center, including the chapel and worship space inside.

2. Describe the most important social and programmatic functions of the design. Approximately 400 words.

The symbiotic site and building design expresses The Salvation Army’s mission and holistic approach to supporting personal growth by integrating programs and spaces for social, physical and spiritual well-being throughout. The Center’s campus offers landscaped gardens, walking trails, playgrounds, gathering spaces, recreation areas and a horticulture zone. Its synthetic turf Athletic Field is the only one of its kind in the area, and is designed for a variety of league and varsity sports. The adjacent wood pavilion provides amenities as well as a sports-education meeting room. Aiming to be economically self-sustaining, the .3-acre working farm provides produce to both the community and the Center’s café. Horticulture education and food preparation training programs assist youth with job readiness and cultivate Philadelphia’s next generation of small-scale urban farmers. The Salvation Army Kroc Center’s campus also offers places of repose in a dense urban neighborhood. The elliptical central green, which is shaped by the Center’s monumental curved wall and the created woodland, functions both as an outdoor assembly room and an urban sanctuary.

The integration of programs and spaces for social, physical, and spiritual well-being continues inside the Center. The building is designed around a light-filled curved civic space from which entrances to all major program facilities are accessed, including the fitness center, childcare, and places for worship. Wrapped in south-facing glass, this 2-story grand hallway extends outdoors, connecting interior programs with the central green and campus.

The design of both the chapel and the worship and performing arts space further illustrates The Salvation Army’s comprehensive approach to well-being. In the wood paneled chapel, a translucent laminated glass wall provides a connection with the activity of the community center, and the diffused light coming through the wall establishes a presence for the chapel within the Center. The worship and performing arts space is designed to specifically accommodate religious services as well as musical performances, films, dance, and theater. The luminous barrel vault ceiling, custom maple furniture and wall-length patterned light boxes create an atmosphere of repose that is consistent with the Center’s visual spiritual vocabulary. The wood paneled space has a flexible seating design that can comfortably accommodate 70 to 300 people. Pivoting wood panels can be retracted to expand the worship platform into a stage, and with a control room and backstage facilities, the space is fully equipped technically for performances.

3. Describe the major challenges of designing this project and any design trade-offs or compromises required to complete the project. Approximately 400 words.

The ultimate selection of a former industrial site, with issues of soil contamination and relics of past infrastructure, was a primary challenge for the project. These existing conditions, combined with the historic creek that once ran through the site challenged the team, but also provided a solution for how to orient the building. The location of the creek, and the desire to create an expansive landscape pushed the building to the edge of the site, forming an urban edge to the project.

The Salvation Army is an evangelical part of the Christian Church, but is not an organization with a history of specific religious iconography, apart from the cross. This posed a good challenge in the design of the worship space, which has a dual function as the performance venue. Through a working process with the Salvation Army, a motif of wheat was developed, symbolizing life and the organization's comprehensive approach to well-being. Glass light boxes were designed to illuminate the side walls of the space, with an abstracted imaged of wheat shafts that were backlit to provide a glow to the room for service or performance.

Similar to most non-profit projects, an economical approach to the budget was a consistent struggle. As the design for the Center was underway, the programmatic mission and needs were evolving. As the first of its kind in the region, and one of the first for the Salvation Army in the country, the approach to how the facility would be used was still in development as the design was developing. It was anticipated that the facility would serve over 1,000 people daily and likely require over 100 employees to facilitate a wide range of social and educational services, recreation and fitness facilities, an aquatics center, an early childhood education center, an urban farm, an educational café, and worship and performing arts spaces. It was therefore necessary to create a variety of spaces that would serve the community at the moment, and anticipate future uses that could evolve and expand with time.

4. Describe the ways in which the design relates to its urban context. Approximately 400 words.

Built on an abandoned industrial estate in one of the city's poorest neighborhoods which once exemplified the nation's manufacturing might, the community center is the largest in scale in the East and serves over 1000 people daily. Successful transformation of the formerly derelict site has bridged adjacent residential neighborhoods long divided by the blighted industrial corridor, rejuvenated community pride and cohesion, and has spawned a new city planning study of the area, streetscape improvements, and proposals for surrounding development.

The design responds to The Salvation Army's evangelical identity, its core mission to meet social, physical, and spiritual needs through service, and its tradition as a prudent, conscientious organization. The building is designed around a light-filled curved civic space from which entrances to all major program facilities are accessed, including recreation & fitness facilities, an aquatics center, an early childhood education center, café, and worship and performing arts spaces. Wrapped in south-facing glass, this 2-story grand hallway extends outdoors, connecting interior programs with the central green and campus. Its identity is articulated in the beacon tower and the 25 foot high stone cross on site.

A green jewel in a dense urban neighborhood, the campus includes landscaped gardens, walking trails, playgrounds, gathering spaces, recreation areas and a large community farm. Through a combination of construction and site waste recycling strategies as well as aggressive water management techniques, the 12.4-acre campus is one of the region's most environmentally progressive brownfield redevelopments.

The Salvation Army's commitment to an urban location is smart growth that supports existing public transit, city infrastructure, and neighborhood services. The Center has been successful in establishing a bus stop directly in front of its entrance and has helped spur adjacent development, including the construction of a new supermarket, which is much needed in this food desert.

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Date 9 December 2014

1. Describe the design concept of this project, including urban design considerations, choice of materials, scale, etc. Approximately 400 words.

Our approach to the site design for the Kroc Corps Community Center was to maximize the benefits of the site for both the community and their environment. From the ground up, the 12.4 acre, former brownfield site was designed to be regenerative, transforming an abandoned industrial site with contaminated soils into a productive, safe, green oasis for the neighboring community. The Kroc Center project provides measurable ecosystem benefits that can be used as an example for the design of other urban brownfield redevelopments. The site now provides healthy soils, native habitats, and rainwater management, in addition to supporting a rich program for users, including walking paths, sports fields, a picnic area, play zone, formal gardens, and an urban farm.

The landscape design creates a hierarchy of activities arrayed around a central green. Separation between formal and informal activities is established both physically and visually. For example, the bio-retention basins physically separate the active recreation zone from the central green, while trees planted within the basins and along steep slopes provide a visual buffer between the formal and informal uses. The design responds to the city's most stringent stormwater codes by using cost-effective strategies, including rain gardens, bioswales, porous asphalt, porous unit pavement, and rainwater cisterns. The stormwater management is made visible with a set of decorative runnels that make artful expression of rainwater.

The landscape design began with a comprehensive site analysis and contamination review to understand the urban context and site constraints. These analyses laid the foundation for developing a comprehensive set of sustainable landscape interventions to accommodate the diverse demands of the site and facility. We looked at the existing site as a resource with the potential to facilitate its own transformation. We developed a zero-waste site design approach that included the practical implementation of cost-saving site strategies, such as salvaging and recycling the existing steel structure, on-site processing of concrete walls and slabs, and reusing the existing site asphalt and railroad ballast. These materials were recycled and integrated into the construction of the parking areas, synthetic turf base, lawn base, paths, and structural fill. By determining the equivalent performance capabilities of the type of aggregate debris, each could be specified for maximum benefit at the site. This effort saved $575,000 in disposal fees and prevented 12,500 cubic yards (17,500 tons) of material from entering landfills.

2. Describe the most important social and programmatic functions of the design. Approximately 400 words.

The Kroc Center in Philadelphia provides much-needed services for the surrounding neighborhoods with places for fitness, play, learning, gathering, and gardening. Additionally, the site has mitigated a former brownfield site with contaminated soils and impervious surfaces, restoring the site to a healthy, productive landscape that provides benefits for the entire ecosystem. Ultimately, the site functions to achieve the project's goal of treating the whole person, their community, and environment.

The site fosters social interactions with comfortable outdoor courtyards that provide spaces for social gatherings and community events. Safe, outdoor walking and running paths, and athletic fields for lacrosse, football, and soccer leagues, complement the indoor fitness facilities. A community-built, children's playground sits next to a pavilion that serves as an outdoor classroom. These two areas are adjacent to an urban farm that supplies food for the on-site cafeteria, and allows neighborhood residents to get dirty and experience the joys of growing their own food. The proximity of these functions promotes social interaction and builds community strength.

The site is designed to manage stormwater runoff on-site, rather than diverting it to the city's sewer system. The work reduced impervious surfaces on the site by 43%, from 9.26 acres to 5.30 acres. The first inch of stormwater runoff from the site and building roof is captured, reused, and infiltrated on site, reducing the rate of stormwater runoff by 98%, 97%, and 64% for the 2-, 10-, and 100-year storms, respectively. A series of gravity-fed cascading bio-retention areas were constructed along an old rail bed spur, efficiently cleansing and conveying runoff, resulting in no off-site discharge for the 95th percentile of rainstorms.

The landscape now supports biodiversity through the use of native plant communities, including several rare or endangered plant species, to create upland, lowland, and wetland habitats, rather than assemblages of individual plants. This former brownfield is now host to a diverse landscape that comprises 563 native trees and shrubs. The established native plant communities have increased the ecological quality of the project area by 34 times that of the former site, as measured by the Plant Stewardship Index (PSI). The PSI rating of 33.72 is high for comparable urban sites, and particularly noteworthy for a former brownfield site (Mary Myers, "Multivalent Landscape: The Salvation Army Kroc Community Center Case Study" in Landscape Journal, 32:2 (2013): 183-198.)

3. Describe the major challenges of designing this project and any design trade-offs or compromises required to complete the project. Approximately 400 words.

The existing site conditions provided many challenges to the design of the Kroc Center. Many of these challenges compelled the design team to find new solutions that turned these limitations into opportunities. Large, regional waste and stormwater infrastructure, which had replaced an old creek, bisected the parcel and limited the opportunities for siting the new building. However, this limitation pushed the new building to the edges of the parcel towards the street, creating an expansive green space beyond. The final building location at the northern edge of the site was formed to take advantage of the southern exposure. Its shape and program distribution maximizes the views to the landscape, providing a green oasis in the city. Solar gains during the summer months are mitigated by an alee of deciduous trees along a walkway that parallels the glass enclosed public circulation areas of the center.

The redevelopment of this large brownfield site was required to meet stringent stormwater requirements by the Philadelphia Water Department. Recent mandates require that newly developed sites manage an inch of rainfall on site. However, the former industrial site had contaminated soils that required mitigation and had a limited ability to handle stormwater runoff. The existing soils contained toxins, such as benzo-pyrene and various metals. In order to meet (an ultimately exceed) the stormwater requirements, while limiting the amount of material to be sent to the landfill, the site was carefully layered to bury specific contaminated soils deeply on the site through a creative and complex grading scheme preventing stormwater infiltration through the contaminated soils and the export of site pollutants. Some soils had to be capped on site with an impervious material and, where soil contaminant levels were too high, the soils had to be removed for disposal offsite. In the end, the site regrading allowed the team to maximize the reuse of existing construction debris and to provide universal access throughout the site.

The need for year-round use of the sport fields demanded the use of an artificial turf system, which was costly and limited the implementation of a more robust outdoor program of community activities. The artificial playing field also became a large rainwater capture area that increased the amount of runoff generated by the site. The solution was to use the captured rainwater to passively irrigate and sustain the newly planted wooded slopes that separate the central lawn from the playing fields. This multipurpose strategy is exemplifies our comprehensive 'economy of intervention' approach to site development that allowed the project resources to yield significant environmental, social, and economic benefits.

4. Describe the ways in which the design relates to its urban context. Approximately 400 words.

The site design for the Kroc Center in Philadelphia provides an example of how our vast tracts of abandoned, urban brownfields can be successfully reclaimed and transformed into productive community amenities, specifically designed to meet the needs of the existing residents. This large, former industrial site sat unused in a neighborhood with few resources, with many families living below the poverty level (35-38% of families), with high rates of childhood obesity (ranging from 17.6% to over 21.4%), and limited access to safe, outdoor spaces and fresh food. The design for the Kroc Center was tailored to meet the needs of the adjacent community, using a comprehensive, sustainable landscape design approach. The site was designed to mitigate the problem of contaminated soils, to create a safe, community gathering place, to provide green space for both active and passive recreational uses, to restore ecosystem services, including human health and well-being, to provide opportunities for biophilic connections throughout the building and site, and to offer an opportunity for urban farming and build community capacity to grow their own food. The project not only brought an active new use to an abandoned site, but it also provided a regenerative landscape designed to support activities that have the potential to revitalize individuals and their community.

The former void in the urban fabric is now a community magnet. While no formal behavior mapping or public perception studies have been undertaken, the Kroc Center has been lauded for attracting "a polychrome sampling of the city's diversity" with its transformative design that "can reshape a neighborhood" (Inga Saffron, Changing Skyline, March 25, 2011). On opening day, local residents lined up outside the doors, eager to see the new facility that provides "a path to new possibilities for kids from the nearby neighborhoods" (Patrick Cobbs, "Kroc Center hums with hope and promise," Newsworks, November 15, 2010).

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1. What role did you play in the development of this project? Approximately 400 words.

During the development phase of the project, I participated in informational sessions with the Kroc Center project team and consultant. Additionally I was asked by the project team to speak with local politicians and community leaders on the benefits and impact that the Kroc Center would have on the community. I have worked in the community for many years; the Wissahickon Charter School is one block away from the Kroc Center.

2. Describe the impact that this project has had on the your community. Please be as specific as possible. Approximately 400 words.

The impact has been astronomical. From an educational perspective, students receive academic support through the Sunoco Foundation Learning Center. A significant number of students, including 7 to 8 students from Wissahickon Charter School, participate three days a week in an intensive music program learning an instrument of their choosing. From a health perspective, members have a vast array of fitness options including the gym, classes, and the pool. Qualified instructors talk with members not only about workout techniques but also about maintaining good health. From a youth development perspective, the Kroc Center is an outlet for kids. On weekends, young people can hang out until 9pm. It is a place where the same youth return every year.

3. What trade-offs and compromises were required during the development of the project? Did you participate in making them? Approximately 400 words.

While I did not participate in making trade-offs or compromises during the development of the project, I was engaged in conversations from the beginning of the project. As a result I can surmise that budget constraints led to trade-offs in a couple of areas. First, most gyms have a steam/sauna room. The Kroc Center does not – a possible trade-off.

Second, the location of the Kroc Center is in an area where there is not much else around it. However, the cost for the space that the Kroc Center occupies in a more populated area of the city would have been prohibitive.

4. What do you consider to be the the most and least successful aspects of this project? Approximately 400 words.

One successful aspect of the Kroc Center is the level of community engagement. From kids in basketball leagues to seniors in water aerobics, the engagement is far-reaching. Another successful aspect of the Kroc Center is its ability to reach a variety of demographics.

Regarding the least successful aspect, I have heard a few members state that their income is right on the line of not being low enough to be eligible for a scholarship and therefore it becomes difficult to afford the membership fee.

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Signature Michele Mack | Date 12/8/14

1. What role did you play in the development of this project? Approximately 400 words.

I did not play a role in the development of the Kroc Center. I am an active member of the Kroc Center and have been a member since November 2011.

2. Describe the impact that this project has had on the your community. Please be as specific as possible. Approximately 400 words.

My initial reason for joining the Kroc Center was to work out, lose weight and pursue a healthy living lifestyle. It did not take long for me to realize upon joining the Kroc Center that it is far more than a gym. It is a community center, a gathering place, a hub for people from all walks of life and all ages. The Kroc Center surpasses any facility of which I have been a member. I have heard these sentiments expressed by many other members.

The impact on the community has been tremendous. The Kroc Center has transformed a location that was not the most desirable. People feel safe and comfortable going to the Kroc Center. The membership is affordable. There are members of the community who are unable to afford the membership fees at fitness centers in the city. The affordable rates make it possible for low income individuals to become members. The Kroc Center draws people with various health issues. Recently I met a man who suffered a stroke. Now he is able to walk without a cane because he has a place where he can work on his health issues. Others that I've met have talked about having their blood pressure under control. Also impactful are the multipurpose and multigenerational aspects of the Kroc Center. There are a wide range of programs and services for youngest to the oldest. I often see community transportation services dropping off seniors who are going to the fitness center, pool or their group meetings.

In summary, the Kroc Center is a wonderful facility and community center. Obviously others feel the same because the parking lot always full.

3. What trade-offs and compromises were required during the development of the project? Did you participate in making them? Approximately 400 words.

Since I was not part of the development of the Kroc Center, I cannot speak to trade-offs and compromises.

4. What do you consider to be the the most and least successful aspects of this project? Approximately 400 words.

I believe that the most successful aspects of the Kroc Center are (1) there are so many things under one roof; (2) it is a place for members to address their health issues; (3) it helps seniors to combat isolation because they have a place to fellowship; (4) people from various ethnic and economic backgrounds gather in the same place; and (5) members feel safe and are drawn by the affordable membership fee as well as the services offered.

I have not encountered any aspects of the Kroc Center that I would consider "least successful". The one concern that I and others had was around the security of the lockers. The Kroc Center addressed this issue by changing all the lockers.

☒Send to Contact

OTHER PERSPECTIVE

Please answer questions in space provided. If possible, answers to all questions should be typed or written directly on the forms. If the forms are not used and answers are typed on a separate page, each answer must be preceded by the question to which it responds, and the length of each answer should be limited to the area provided on the original form.

Name Michael Kuritzkes | Title Consultant

Organization Coronado Advisors LLC | Telephone (215) 205-4039

Address 132 Fairview Road | City/State/Zip Narberth, PA 19072

Fax ( ) | E-mail MKur710@gmail.com

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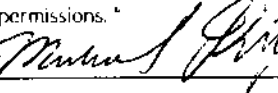
Signature  Date November 19, 2014

1. What role did you play in the development of this project? Approximately 400 words.

At the time the Kroc Center was being developed, I was Executive Vice President and General Counsel of Sunoco, Inc. Our operations had consisted of refining and marketing, chemicals, logistics and metallurgical coke. Our headquarters was in Philadelphia, and the company had established a foundation that was focused on a few areas including education. With many customers and over 3,000 employees within the city of Philadelphia, we were seeking opportunities to make meaningful contributions to our local community.

I was introduced to the Kroc Center by Ray Welsh with whom I'd served on another board. As I learned what was being planned I was extremely impressed by the care that was being put into plans for the Center as well as the scope of the project and many ways in which they were addressing important needs in the community. What really struck us at Sunoco was the opportunity to participate in the creation of a safe haven for children where they could study, learn and have fun after school. In addition, we saw opportunities for our employees to participate in a learning center that would enable them to give back to the community. We were also very pleased at the quality of the facilities being developed. In particular, we felt it was terrific for children to experience tutoring in classrooms with state of the art equipment and for they and their families to be able to use the rest of the excellent facilities being contemplated.

The Sunoco Foundation was pleased to commit to $1 million for an education center, and we were quite excited to see the project launched and working so well for community children.

2. Describe the impact that this project has had on the your community. Please be as specific as possible. Approximately 400 words.

I have been able to see wonderful interactions between community students and their tutors at the Sunoco Learning Center. Through this project, we have been able to provide a safe environment for study and I have seen many enthusiastic students working with excellent tutors on their homework and augmenting their learning.

In addition, students and their families have had the opportunity to experience the many other programs at the Center that support the entire family. I have seen people who have never exercised enthusiastically doing water aerobics or working out in the gym. Children have been introduced to music and performaing arts through the "Let's Play" program. Families have received counseling and guidance, and new programs are being developed such as the agricultural program that teaches people how to grow food and maintain gardens.

I have also seen a change in the community around the Kroc Center. Businesses are being developed and people are taking more pride in the area as they realize what is possible.

3. What trade-offs and compromises were required during the development of the project? Did you participate in making them? Approximately 400 words.

I am not aware of any trade-offs or compromises that were required during development. I do recall that we increased the scope of the project to add to the acquatic facilities and this proved to be a very important initative.

4. What do you consider to be the the most and least successful aspects of this project? Approximately 400 words.

I think the impact that the Kroc Center on the community has been tremendous. The Center serves more than 10,000 people and impacts individuals and families in wonderful ways. The Sunoco Learning Center has been a great success serving I believe the quality of the Center and its programs has brought hope and raised expectations for many who might not have had the chance to be exposed to the types and quality of services offered by the Center. In addition, the meticulous way in which the Center's staff and the community have cared for the facilities has been a testament to the respect people have for this terrific place.

The Kroc Center has done tremendously well. One issue that they face is finding the time to continue to reach out to its supporters and keep the development pipeline going. There has been great focus on operations, and there has been little time to cultivate and follow up on donors. I believe that this issue is being addressed as the Center is starting to go back to original donors and show them what a terrific project this has been.

RAY AND JOAN KROC CORPS COMMUNITY CENTER

PHILADELPHIA, PENNSYLVANIA / SALVATION ARMY OF GREATER PHILADELPHIA

The Ray and Joan Kroc Corps Community Center located in north Philadelphia is a 130,000 sf highly diversified community center offering recreational facilities, job training, and educational and spiritual programs for the surrounding neighborhoods.

The project location, a 12.4-acre contaminated brownfield, was an industrial site and parking lot. The site now includes an urban farm, synthetic turf field, playground, and a network of rain gardens and cisterns.

RECYCLING LAND

‘THE LAND RECYCLING [ENCOURAGES THE] PUBLIC SECTOR CLEANUP OF CONTAMINATED, VACANT OR OTHERWISE UNDERUTILIZED PROPERTIES AND RETURN THEM TO PRODUCTIVE USE’

-PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
HTTP://WWW.PORTAL.STATE.PA.US/PORTAL/SERVER.PT/COMMUNITY/LAND_RECYCLING_PROGRAM/20541

FOUND CONDITIONS

ACTIVE
INFRASTRUCTURE

INDUSTRIAL
LEGACY

NON-DESCRIPT
REMNANTS

EMERGENT
NATURE

PREPARING GROUND

NEARLY ALL OF THE SITE'S EXISTING PAVEMENTS WERE REUSED ON-SITE, SAVING $575,000 IN DISPOSAL FEES.

THIS PREVENTED 17,500 TONS OF MATERIALS FROM ENTERING LANDFILLS.

ON-SITE MATERIALS

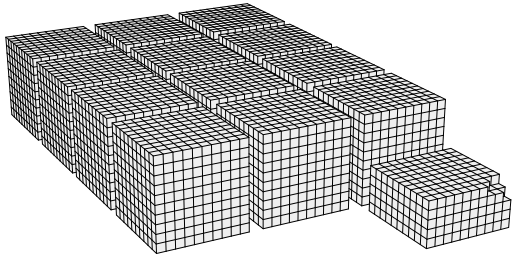
ASPHALT
2,692 CY

RAIL BALLAST
375 CY

AGGREGATE STONE
7,022 CY

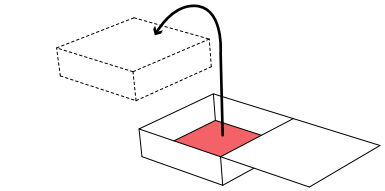
CONCRETE
2,406 CY

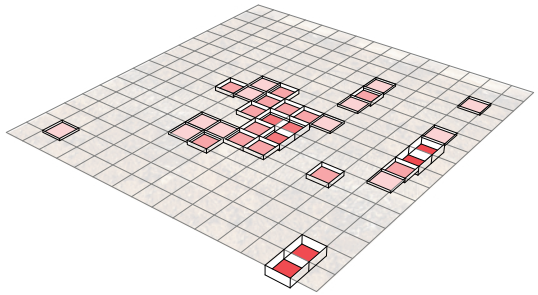
12,495 CUBIC YARDS OF ON-SITE MATERIALS KEPT:



EARTHWORK STRATEGY

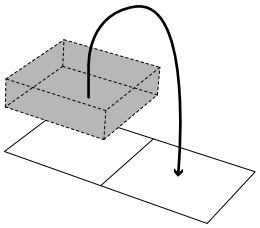
CUT
IMPERVIOUS SURFACES

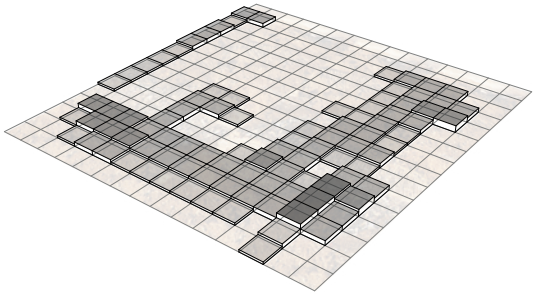




\- 0'-1' 1'-2' 2'-3' 4'+

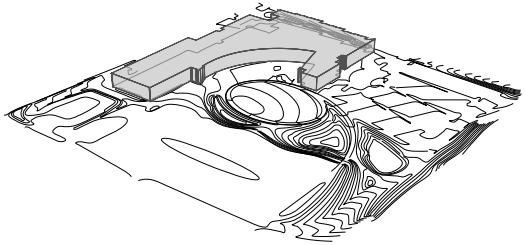
FILL
WITH ON-SITE MATERIALS



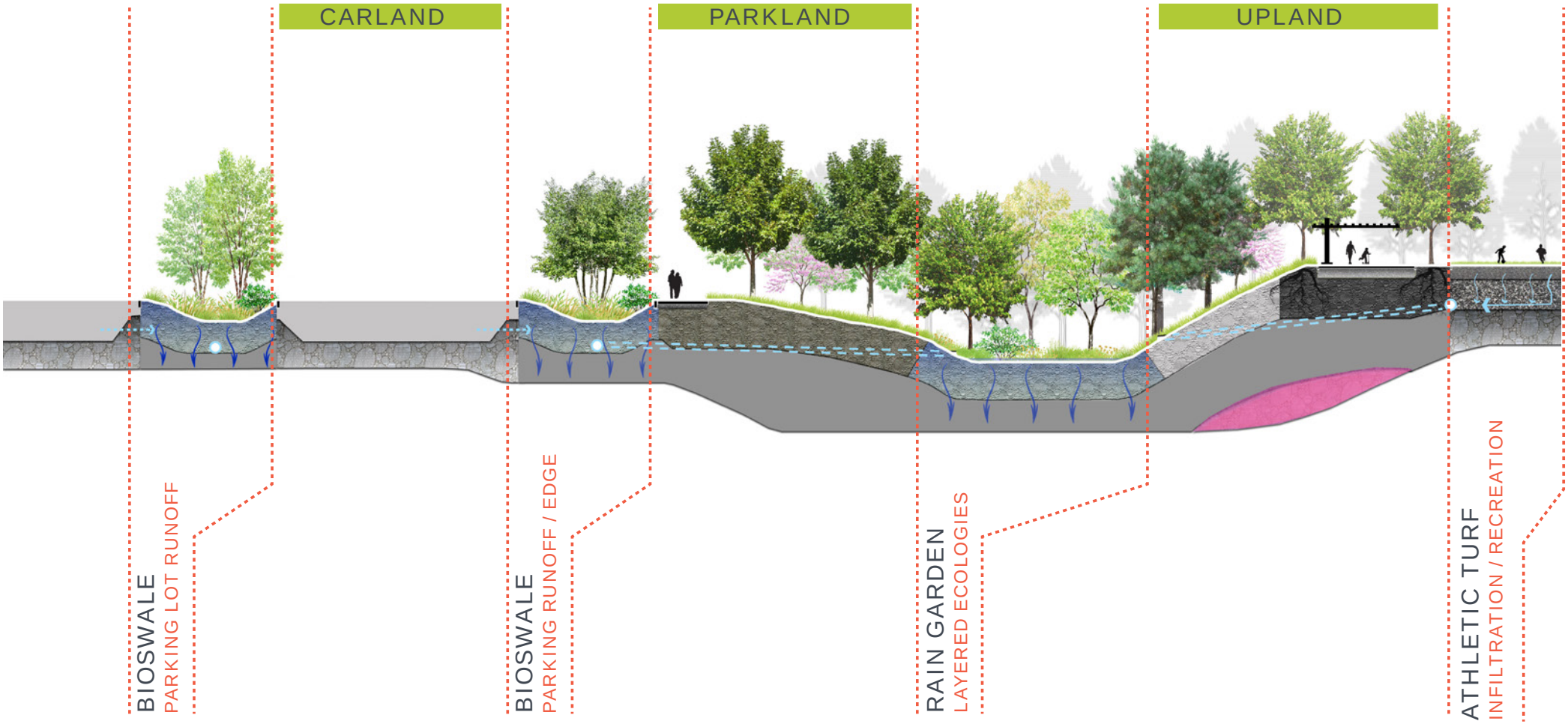


\+ 0'-1' 1'-2' 2'-3' 4'+

GRADE
A PERFORMATIVE PLATFORM



SITE PERFORMANCE STRATEGY



REVISITING ECOLOGY

HOW MUCH STORMWATER STAYS ON SITE?*

100 YEAR STORM
64%

10 YEAR STORM
97%

2 YEAR STORM
98%

*MULTIVALENT LANDSCAPE: THE SALVATION ARMY KROC COMMUNITY CENTER CASE STUDY // MARY MYERS

ECOLOGICAL VALUE

INCREASED ECOLOGICAL QUALITY BY **34X** THAT OF FORMER SITE

*AS MEASURED BY THE PLANT STEWARDSHIP INDEX:
MULTIVALENT LANDSCAPE: THE SALVATION ARMY KROC COMMUNITY CENTER CASE STUDY // MARY MYERS

ECOLOGICAL VALUE

15,293 LBS OF CARBON DIOXIDE

SEQUESTERED BY THE 562 NEW TREES AND SHRUBS PLANTED ONSITE*

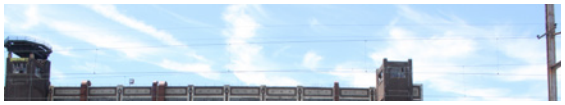
*AS MEASURED BY TREE BENEFIT CALCULATOR

LAYERED VALUE

BEFORE

AFTER

FOSTERING SOCIAL FRAMEWORKS

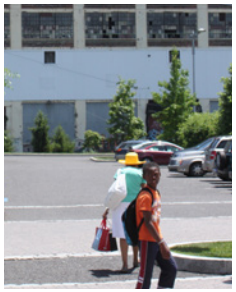
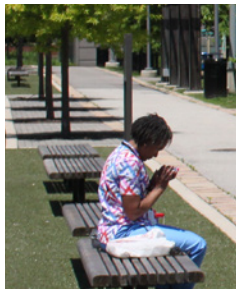




REVITALIZING AN UNPRODUCTIVE INDUSTRIAL SITE

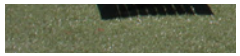


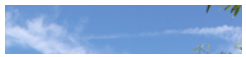
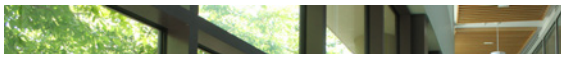
MULTI-LAYERED LANDSCAPE

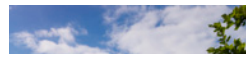
ECOLOGY/COMMUNITY/CITY


PROVIDING SOCIAL SERVICES TO A PHILADELPHIA COMMUNITY

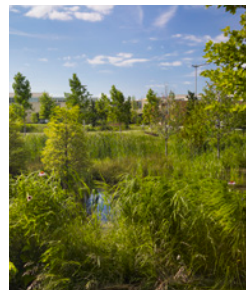





CONNECTING WITH THE LANDSCAPE




THE ECONOMIC IMPACT OF THE KROC CENTER IS VALUED AT $33 MILLION
© Halkin Architectural Photography, LLC

A CONNECTION TO THE SITE IS ALWAYS PRESENT

THE KROC CENTER PROVIDES FACILITIES AND SERVICES THAT ARE PRIORITY NEEDS AS IDENTIFIED BY THE COMMUNITY ITSELF


ANY COMMUNITY, REGARDLESS OF INCOME LEVELS, WOULD BE
EXCITED TO HAVE ONE OF THESE SUPERIOR CENTERS NEARBY
1 FT 0 IN
© Halkin Architectural Photography, LLC

‘WHAT MAKES IT SPECIAL IS THE CONVICTION THAT EVEN PEOPLE OF SMALL MEANS DESERVE THE BEST’

-INGA SAFFRON, INQUIRER ARCHITECTURE CRITIC/MARCH 25, 2011

IN THE PLANNING PHASE THE MOST FREQUENTLY UTTERED WORDS WERE “WE MUST ADDRESS FOOD INSECURITY”

Photos courtesy of the Salvation Army Kroc Center and Andropogon Associates

AN OASIS OF GREEN AGAINST THE BACKDROP OF AN URBAN LANDCAPE

Photos courtesy of the Salvation Army Kroc Center and Andropogon Associates


THE SITE FUNCTIONS TO ACHIEVE THE
PROJECT'S GOAL OF TREATING THE WHOLE
PERSON, THEIR COMMUNITY, AND ENVIRONMENT

The Philadelphia Inquirer
philly.com
181st Year, No. 298 • City & Suburbs Edition
Friday, March 25, 2011 ★ Philadelphia Media Network ★ $1
$1.25 in some locations outside the metro area

Changing Skyline *By Inga Saffron*

A minimum of glitter, but it's a real gem

Sometimes the most familiar-looking works of architecture produce the most radical results. Such is the case with the Salvation Army's Kroc Center, which opened its doors this winter in one of those hollowed-out, industrial-era exclusion zones that pockmark so much of North Philadelphia.

New Kroc Center fills lots of needs for North Phila.

Driving by on a dreary, underpopulated stretch of Wissahickon Avenue, you might not recognize the Kroc Center as a brand-new building; from the road, it appears that ordinary. If you bothered to give the low-slung, sandy-colored brick structure more than a glance, its exact function might not be apparent either. School? Church? Rec center? Social-services agency? The Kroc Center, designed by Philadelphia's MGA Partners, is all the things mentioned above, and yet it is far more than the sum of its parts.

For the hundreds of people who troop in every

See **SKYLINE** on E5

The Salvation Army's Kroc Center and its athletic fields are adjacent to two long-vacant industrial buildings. Landscape architects at Andropogon have integrated the three buildings into the area and made it feel inhabited again.

Kroc Center a boost for N. Philly

SKYLINE from E1

day to pound the treadmills in the glowing, sun-dappled gym or to swim in the warm waters of the Olympic-size pool, the $72 million Kroc Center is surely the most deluxe new fitness center in Philadelphia. For parents who bring their toddlers to frolic in the children's pool, it is an amenity-laden water park. For the students who arrive every afternoon weighted with backpacks, the 12-acre complex provides the expansive sports fields and computer-equipped tutoring center that their schools lack. And yes, once a week, the Salvation Army holds a Christian worship service in the theater, which is otherwise occupied by music students, community meetings, and arts groups.

It's a little ironic, of course, that profits from the billions served at Mickey D's are what paid for this Big Mac of fitness centers, but so be it. Just before her death in 2003, Joan Kroc, the widow of McDonald's founder Ray Kroc, dropped a check for $1.5 billion into a virtual red kettle so the Salvation Army could build community halls in 27 poor neighborhoods around the country. Philadelphia's center is the ninth to open, and it's got all the *fixins* imaginable.

When I said the building was familiar-looking, I meant that in the best possible way. Most people won't pay close attention to the exterior architecture, although it is as precise, thoughtful, and generous as any of the fancy college buildings that MGA principal Daniel Kelley has designed for the likes of the University of Pennsylvania and Bryn Mawr College.

The lightbulb moment, when you realize this is not just another make-do, cinderblock, municipal box, occurs when you step into the grand two-story-high lobby, sheathed in glass and pale, anigre wood panels. The space unwinds around a garden plaza like a silk ribbon as it directs members to the training rooms, pools, basketball courts, and yoga studios, all designed in collaboration with Philadelphia's PZS Architects. Because those rooms face the curving glass wall, they receive natural light most of the day, making exercise more pleasure than pain.

SHARON GEKOSKI-KIMMEL / Staff Photographer

The two-story-high lobby of the Kroc Center is an inviting place to linger, with its gas-fired hearth and high-end furniture.

Although the Kroc Center is a gift of charity, what makes it special is the conviction that even people of small means deserve the best. There can't be many private fitness clubs — never mind rec centers — that have lobbies furnished with Knoll benches and Platner tables. The pieces are grouped around a gas-fired hearth that encourages people to linger over coffee from the center's cafe.

And people do linger. Not just locals, who are eligible to receive subsidized memberships, but also people who have decent-paying jobs and drive to the center from East Falls, Germantown, and other nearby neighborhoods to produce a polychrome sampling of the city's diversity.

Despite McDonald's contribution to the country's obesity epidemic, Joan Kroc understood how such exercise facilities could transform poor neighborhoods. And because the Salvation Army is committed to healing the soul and the mind, it also included space for drug and alcohol counseling, as well as a small chapel and day care.

The Kroc Center was built in the middle of what used to be the sprawling Budd Co., which manufactured train cars well into the '70s and once employed 10,000 people, operating in three shifts. Those industrial jobs are never coming back, but the placement of the community center in the old factory complex suggests that the neighborhood (Nicetown, now being rebranded as West Hunting Park) just might.

In fact, the best thing about the design isn't the lavish exercise facilities, but the way the Kroc Center has been arranged on the site by MGA and the Manayunk landscape architects at Andropogon. The new building bookends a gutted, but classically muscular, factory loft where Budd sold automotive parts. At the far end, the site is bounded by another industrial-era staple, a long, sawtooth workshop, completing a cozy U-shaped block. SEPTA trains run through the site, alongside the playing fields, and they infuse the ensemble with the promise of urban energy.

While both factory buildings have been empty for years, the Kroc Center's arrival fires the imagination. The loft could easily be converted to apartments, the sawtooth building to studios for artists and fabricators. Similar factory lofts litter North Philadelphia, but too often they're stranded islands. This pair has been pulled back into the living city.

Andropogon has done a wonderful job of integrating the three buildings into the new landscape and making it feel inhabited again. It has layered the site with walking paths that lead up to sports fields and gardens, which have been designed to absorb large quantities of rain and keep it from flowing into city sewers. Sculpted stone runnels, which help channel the water, even create a network of man-made brooks around the site and will surely inspire many children's games.

The Salvation Army project isn't the kind of eye-candy design that makes it into the glossy magazines, or advances architecture, but it just might be the sort that can reshape a neighborhood.

Contact architecture critic Inga Saffron at 215-854-2213 or isaffron@phillynews.com.

Multivalent Landscape
The Salvation Army Kroc Community Center Case Study

Mary Myers

ABSTRACT This case study research uses quantitative methods to assess the contributions of landscape components to the delivery of multiple ecosystem services at the Salvation Army Kroc Community Center (SAKCC), a 12.4-acre former brownfield site located in Philadelphia, Pennsylvania. The term valence is used to describe the quantitative measure of a design component's capacity to contribute to the production of ecosystem services, such as water regulation, air quality maintenance, and pollination. The selection and use of multivalent materials in design may have direct and measurable benefits on the production of ecosystem services in multifunctional landscapes. To this end, construction waste mitigation, stormwater mitigation, carbon sequestration, and plant stewardship were calculated using site-specific calculations or online calculators.

KEYWORDS Valence, ecosystem services, design components, multivalent

Landscape Journal 32:2 ISSN 0277-2426

INTRODUCTION

This case study research uses quantitative methods to assess the landscape performance benefits of the Salvation Army Kroc Community Center (SAKCC), a 12.4-acre brownfield site located in Philadelphia, Pennsylvania. To the extent that this study finds measurable benefits that support ecological services it can serve as an example for design of other urban brownfields.

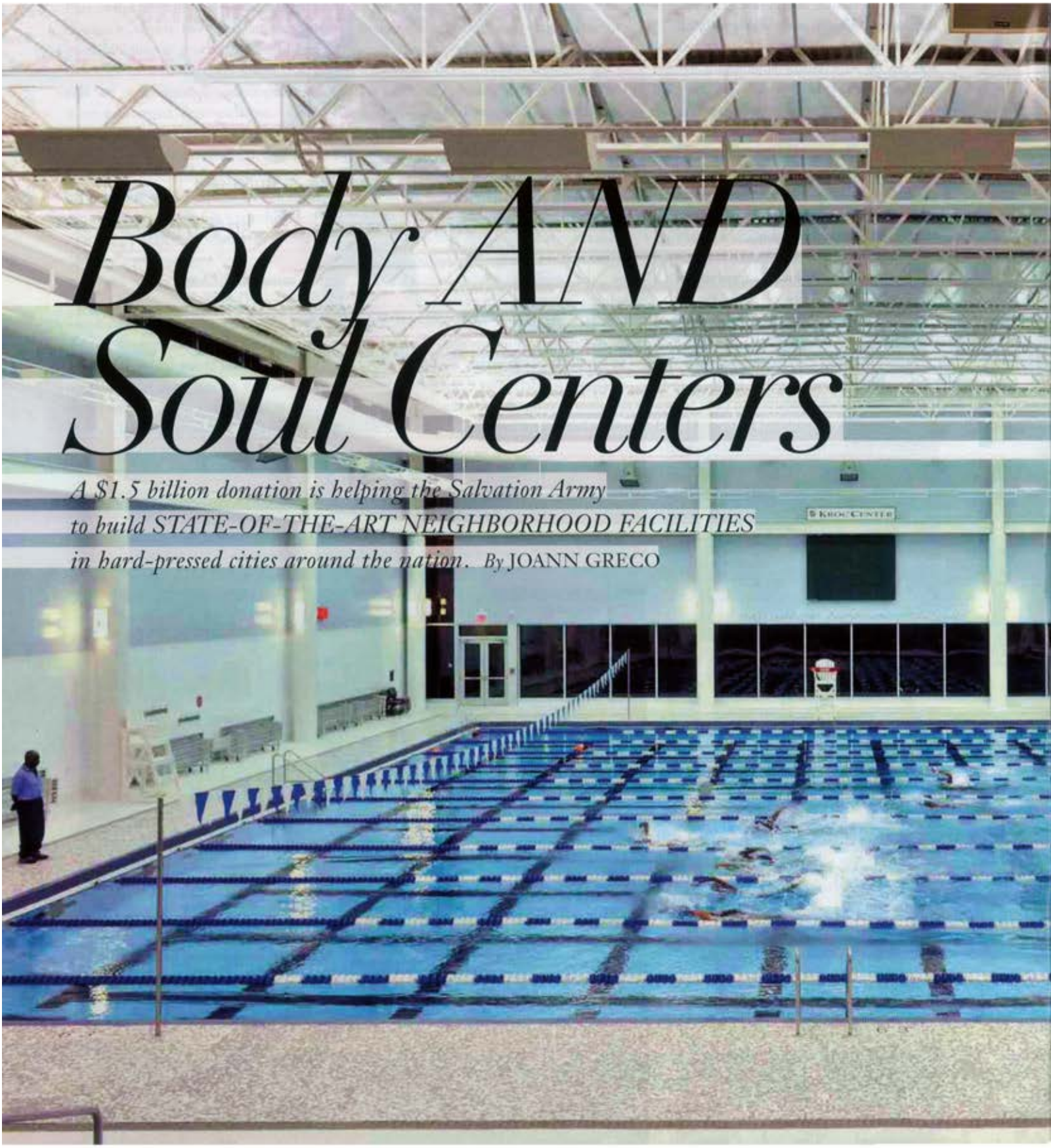
The research was conducted as part of Landscape Architecture Foundation's 2011 Landscape Performance Series Case Study Investigation (LAF 2011, 2013).[1] In 2011, the Landscape Architecture Foundation (LAF) initiated a case study investigation series (CSI) to assess landscape performance based upon quantification of environmental, social, and economic benefits. LAF defines landscape performance as "the measure of efficiency with which landscape solutions fulfill their intended purpose and contribute toward achieving sustainability" (Ashby 2012). This article uses the following definition of sustainability: "'(S)ustainability'…means to create and maintain conditions, under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of present and future generations" (Executive Order 13514 2009). LAF asks researchers to quantify benefits as measures of performance, using empirical data assessed through on-site measurement and/or computer modeling software.

Landscape Performance and Provision of Ecosystem Services

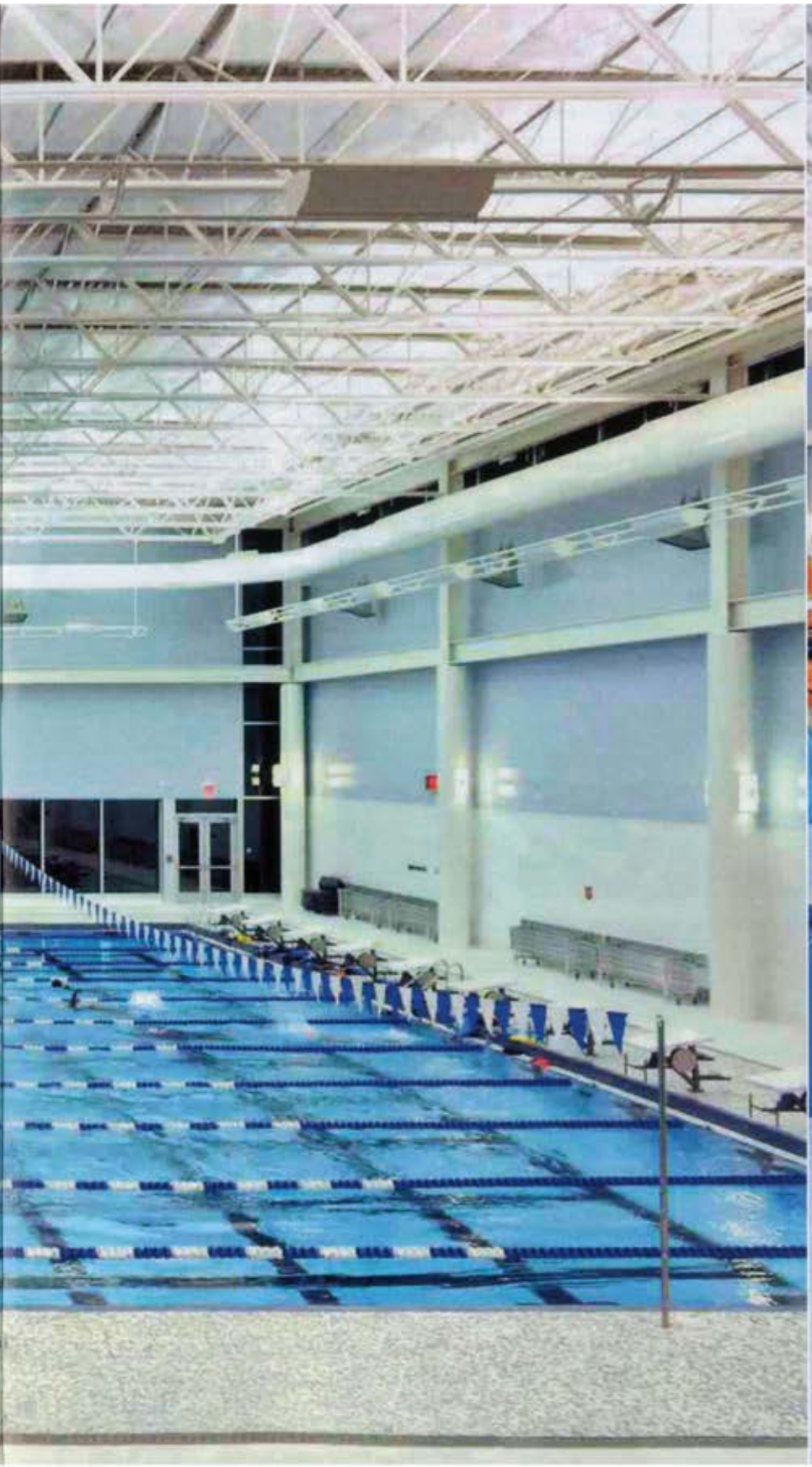
Landscape performance is linked to ecosystem services, which can be defined in a utilitarian way as "components of nature, directly enjoyed, consumed, or used to yield human well-being" (Boyd and Banzhaf 2006, 8). The term "ecosystem services" describes "the functions of nature, such as purification of air and water, which

Body AND Soul Centers

A $1.5 billion donation is helping the Salvation Army to build STATE-OF-THE-ART NEIGHBORHOOD FACILITIES in hard-pressed cities around the nation. By JOANN GRECO



In Philadelphia, the Salvation Army's Kroc Center was been woven into the city's fabric by being located near a major subway line and several commuter rail stops. A new bus stop was installed across the street as well. The center is one of 16 built around the U.S. since 2008.



The Philadelphia center includes an aquatics facility that would be the envy of a five-star resort. Above: the Competition Pool; right: the Family Water Park.

AMIDST THE RUINS of industrial Philadelphia, there's a surprise: a low-slung brick and stucco building whose facade gives it the air of a civic monument—something definitely at odds with the abandoned factories and swathes of vacant land that surround the building's 12-acre campus of athletic fields and rain gardens. It's hard to believe that the parcel was, most recently, the site of a city-owned car impound, and that Donald Trump once eyed it for a casino.

And, moving inside, it's hard to believe that this multimillion-dollar building belongs to the Salvation Army, and that it comes courtesy of another billionaire, Joan Kroc, of McDonald's fame. MGA Partners Architects, a local firm, designed the building with sweeping expanses of glass windows, anigre wood ceilings and walls, and slate floors. Another local design team, PZA Architects, designed an aquatics center with a competitive swimming pool, a leisure pool, lap lanes, a children's area, and a current river.

Opened in October 2010, the Philadelphia Salvation Army Ray and Joan Kroc Corps Community Center, as it's known, is one of 16 similarly outfitted centers that have debuted since 2008. Patterned after one in San Diego that was funded by Kroc and opened in 2001, the centers aim to offer state-of-the-art recreation services to impoverished communities at reasonably priced (about $30 or $40 a month for adults) and often subsidized rates. They bring jobs to those neighborhoods and, it's hoped, they'll serve as stimuli for further economic development in struggling areas.

Some of that can be seen in Philadelphia, where the planning commission retained Wallace Roberts & Todd to prepare a study of the redevelopment potential of the Hunting Park West neighborhood in which the Kroc Center now sits. Ground has been broken for a 30-acre, 220,000-square-foot community shopping center, to be anchored by a ShopRite supermarket.

Elsewhere on the site, the remains of a 460,000-square-foot Tasty Baking production factory building will be preserved and redeveloped with retail, educational, and institutional spaces, and possibly a parking structure to hold about 350 cars. Bakers Square, as the project is known, will actively seek smaller businesses.

Concurrent with these developments, the city's streets department has made some major improvements to intersections to address pedestrian safety issues, and across from the Kroc Center, a new bus stop was added.

"We see this as an area of great potential," says Gary Jastrzab, executive director of the Philadelphia City Planning Commission, adding that the city's commerce department has sponsored presentations and tours of the area for developers. "We wanted to open their eyes," he says.

A different kind of mission

When she died in 2003, Kroc, the widow of McDonald's founder Ray Kroc, willed $1.5 billion to the Salvation Army, with instructions that the fortune be doled out evenly among its four geographic territories to create more community centers like the early one in San Diego. Although each is individually designed, they bear certain similarities.

Typically built on large sites in former industrial areas, they feature not only fitness and pool facilities, but auditoriums and worship spaces, outdoor fields, and often cafes, libraries, and other gathering spaces. Boasting the striking contemporary design and landscaping of the best suburban high schools, they are, in short, a couple of million bucks away from Salvation Army thrift stores and basement meetings.

"There's sometimes a feeling that the money could be going toward services. But Mrs. Kroc argued that architecture can uplift souls," says Daniel O. Kelley, a partner at MGA.

Standing in the Philadelphia center's parking lot, Kelley points to the graffiti-covered walls and broken glass windows of the defunct Budd plant, where passenger train cars were manufactured into the early 1980s. This area, just five miles or so from downtown, is home to some 200,000 people, a third of whom live below federal poverty levels. Soul-lifting is desperately needed.

Making the match

Eventually, there will be about two dozen centers, winnowed down from a larger pool of applicants to those that could meet the program's stringent requirements, including a solid plan to raise supplemental funds to

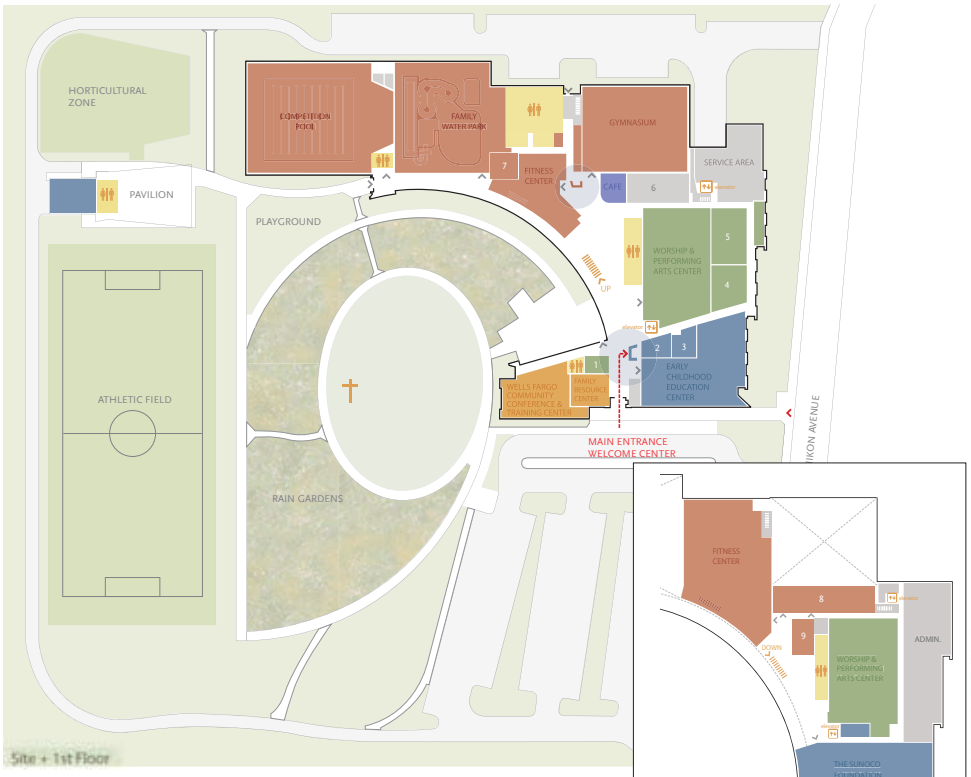


Photo courtesy of MGC PARTNERS

Philadelphia's new Kroc Center sits on a 12-acre, $74 million campus that includes athletic fields and rain gardens. The centerpiece: a light-filled building with luxury touches.

build and endow the project. (On that note, plans for a Detroit Kroc center fell through in 2009, after a faltering economy and lack of support for what some donors deemed a more flashy effort than traditional Army services. Similar problems befell planned centers in St. Paul, Minnesota; Long Beach, California; and Massena, New York.)

Applicants also needed to prove that they had found the right locale. "The demographic data had to show both a low-income population in the immediate neighborhood and a higher level of affluence within a few miles," says Derek Dugan, who as a coordinator for the Augusta, Georgia, center worked on issues of site selection and property acquisition. "The site also had to be located in an area with a highly visible thoroughfare and one with a demonstrated potential for new investment," he adds.

Although the local Salvation Army had considered a recently closed mall as a potential site, once the specs came in, Dugan says, the only choice was the site where the city's new center is located. The $34 million Augusta facility opened last summer on a 17-acre site in a blighted canal-side mill village about a mile from the city's central business district. It's too soon to tell what impact it will have on the neighborhood, says George Patty, the city's director of planning and development. "It has, however, interested some investors who are securing multiple properties in the general area for future development or rehab," he adds.

Take a larger city, and the possibilities are commensurately larger. In Chicago, some two dozen locations were considered before a 32-acre site in the West Pullman neighborhood, 13 miles south of downtown, was selected for a new Kroc Center, scheduled to open this spring. Part of an industrial corridor that once housed big operations, the specific site was previously occupied by an AmForge steel facility that closed several years ago.

According to Peter Strazzabosco of Chicago's Housing and Economic Development department, the city acquired the land in the late 1990s and had already proceeded with some demolition and environmental remediation by the time the Army approached it in 2006. Strazzabosco notes that the area had been designated with planned development zoning and that a TIF district was in place in the hopes of spurring private investment. Although there's still a lot of vacant land in the area, recently completed projects within a few blocks of the coming Kroc Center include the country's largest urban solar farm.

Plans are also under way, he adds, for expanded industrial uses, such as a new food processing plant. "Development can go in a variety of directions, more industry or more mixed use," Strazzabosco comments. "The area is surrounded by residences, including some nearby suburban areas. Bringing in an institutional use like the Kroc serves as a nice buffer between industry and residential."

Part of a bigger picture

The situation is similar in Phoenix, where a $32 million Kroc Center is scheduled to open in May. Located in a neighborhood known as South Mountain, not far from downtown, this project came ready-made with a locale since it's positioned as a dramatic expansion and enhancement of an Army facility already on the site. The new complex will measure 130,000 square feet and include a two-story climbing structure, an indoor running track, several pools, and outside, four new athletic fields.

"There's a substantial amount of vacant land in the area," says Joshua Bednarek of the Phoenix planning and development department. "It abuts the Rio Salada Beyond the Banks Area Plan, which has a zoning overlay to limit more intensive uses and which is in the process of a $100 million restoration of its habitat." Historically, light industry like auto salvage and sand and gravel operations has clustered along the river, but the area has transitioned to residential uses.

"We think having the Kroc nearby to what we hope will become a significant recreation area is a good match," Bednarek adds. The Salvation Army has been acquiring vacant land near its current facilities for a few years, so no public funding or land transfers were involved. Because the project is located near the area targeted by the river plan and inside a redevelopment area, it received the few zoning variations (such as an extension of height limitations for a basketball court) that it requested, says Bednarek.

That Kroc centers locate in districts often slated for special focus by their host cities is proving to be a win-win situation for all parties involved. Because the centers typically feature large central buildings set on campus-like lots, fading industrial neighborhoods offer the right fit. At the same time, the centers' presence or promised presence can generate interest among developers.

In most cases, it's too early for cities to see any correlation between the opening of a Kroc Center and subsequent redevelopment. But the organization notes that the Rolando neighborhood of east San Diego, home of the flagship Kroc Center, saw a 200 percent increase in local commercial and retail occupancy during the first five years of its operation. For now, more direct results have been seen in the attendant projects that sometimes come with the building of a center.

In Greenville, South Carolina, where a 72,000-square-foot Kroc Center recently opened on a 20-acre site in a warehouse district on the western edge of downtown, an elementary school with an engineering focus was erected in tandem with the facility. The Salvation Army's established boys and girls club in the area had a long-range facility plan in place when the Kroc program was announced, according to Jean Pool, the city's planning and economic development manager.

"They approached us about available land and we thought this would be a great opportunity for a public-private partnership since we knew the school district was also looking to build a new school in the area," Pool says. "So they were built adjacent to each other and share a lot of facilities. The school has access to the Kroc's gym and fields, Kroc has access to the school library."

Since then, other businesses have started opening in the area, and the city is hoping to proceed with its own plans to build a large park that would tie into existing green spaces. "The advent of the Kroc Center has increased our interest in moving forward with that," Pool says.

And in Augusta, the Kroc Center's First Stop Family Service Center is a separate 10,000-square-foot facility to which several other social service agencies, such as the local United Way, have moved. The idea is to coordinate efforts and ease visits for clients, with the Salvation Army doing initial client assessments to determine which partner agency can offer the most relevant services.

Preserving neighborhoods

In addition to its main building and the Family Service Center, the Augusta project also involved the relocation and rehabilitation of several 1930s factory workers' cottages for use as administrative offices and gathering places. And, in Dayton, Ohio, the $30 million Kroc Center campus, which opened in 2010, features 100,000 square feet of recreation, worship, and education space in three new buildings, as well as the renovation of a 160-year-old mansion.

Interestingly, however, such preservation efforts are rare. "Initially, we did suggest that they reuse some of these former factory buildings," says Kelley of MGA Partners about the Philadelphia project. "But they wanted to do it from scratch."

The reasoning might have been practical, Kelley says, pointing out that older buildings don't often offer the right kind of space for things like indoor swimming pools and basketball courts. But, he says, the mandate might also have to do with Kroc's belief that architecture—especially new architecture—can raise spirits.

For cities, then, the Kroc centers are an impetus to get moving on their own preservation efforts, and on their own bigger plans for overall development.

"The Kroc Center has given us a site that could begin to fulfill some of the requests for better services and amenities in the area," says Jastrzab of the Philadelphia City Planning Commission. "We'll continue to look at the area for opportunities to make use of historic factory buildings for new light industry, to improve streetscapes and traffic flows, to enhance retail services, and to continue the strong green theme that is so much a part of the city's major planning efforts."

JoAnne Greco is a Philadelphia-based freelance writer.

RESOURCES

CITY SOURCES: Philadelphia City Planning Commission: www.phila.gov/cityplanning. Augusta Planning and Development Division: www.augustaga.gov. Chicago Housing and Economic Development Department: www.cityofchicago.org/dpd. Phoenix Community and Economic Development Department: www.phoenix.gov/econdev. Greenville Planning and Development Department: www.greenvillesc.gov/PlanningZoning.

ORGANIZATIONS: MGA Partners Architects: www.mgapartners.com; Salvation Army: www.salvationarmy.org.

Multivalent Landscape
The Salvation Army Kroc Community Center Case Study

Mary Myers

ABSTRACT This case study research uses quantitative methods to assess the contributions of landscape components to the delivery of multiple ecosystem services at the Salvation Army Kroc Community Center (SAKCC), a 12.4-acre former brownfield site located in Philadelphia, Pennsylvania. The term valence is used to describe the quantitative measure of a design component's capacity to contribute to the production of ecosystem services, such as water regulation, air quality maintenance, and pollination. The selection and use of multivalent materials in design may have direct and measurable benefits on the production of ecosystem services in multifunctional landscapes. To this end, construction waste mitigation, stormwater mitigation, carbon sequestration, and plant stewardship were calculated using site-specific calculations or online calculators.

KEYWORDS Valence, ecosystem services, design components, multivalent

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INTRODUCTION

This case study research uses quantitative methods to assess the landscape performance benefits of the Salvation Army Kroc Community Center (SAKCC), a 12.4-acre brownfield site located in Philadelphia, Pennsylvania. To the extent that this study finds measurable benefits that support ecological services it can serve as an example for design of other urban brownfields.

The research was conducted as part of Landscape Architecture Foundation's 2011 Landscape Performance Series Case Study Investigation (LAF 2011, 2013).[1] In 2011, the Landscape Architecture Foundation (LAF) initiated a case study investigation series (CSI) to assess landscape performance based upon quantification of environmental, social, and economic benefits. LAF defines landscape performance as "the measure of efficiency with which landscape solutions fulfill their intended purpose and contribute toward achieving sustainability" (Ashby 2012). This article uses the following definition of sustainability: "'(S)ustainability'…means to create and maintain conditions, under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of present and future generations" (Executive Order 13514 2009). LAF asks researchers to quantify benefits as measures of performance, using empirical data assessed through on-site measurement and/or computer modeling software.

Landscape Performance and Provision of Ecosystem Services

Landscape performance is linked to ecosystem services, which can be defined in a utilitarian way as "components of nature, directly enjoyed, consumed, or used to yield human well-being" (Boyd and Banzhaf 2006, 8). The term "ecosystem services" describes "the functions of nature, such as purification of air and water, which

support life and human economies" (Miller and Spoolman 2009, 8) and "goods and services of direct or indirect benefit to humans that are produced by ecosystem processes involving the interaction of living elements, such as vegetation and soil organisms, and non-living elements, such as bedrock, water and air" (SSI 2009, 6). Both definitions use ecological "functions" and "processes" as descriptors of the services. Boyd and Banzhaf (2006) suggest that ecosystem services must be defined in a manner that recognizes the ecological processes and functions that are responsible for their production. Ecosystem services fall into several categories: provisioning services, which are the products obtained from ecosystems that are of direct utilitarian value to humans, such as food, fuel wood, fiber, and fresh water; regulating services that make it possible for humans to inhabit the earth, including climate regulation, water regulation, water purification, and pollination; cultural services which are nonmaterial benefits, such as spiritual, recreational, educational, or aesthetic benefits; and supporting services, such as the production of soil which supports the production of other ecosystem services (Millennium Ecosystem Assessment 2005).

This paper uses Boyd and Banzhaf's (2006) definition of ecosystem service measurement, which defines landscape performance as an end product of intermediate ecological processes. While the concept of landscape performance measures end products, such as the total amount of stormwater retained, or the amount of carbon sequestered by a site, rather than the processes of stormwater mitigation or carbon sequestration, it is assumed that these intermediate ecological processes are included in the end product.

Landscape design seeks to create sites that provide an optimal mix of ecosystem services. To understand the optimization of ecosystem services based on landscape performance, a set of metrics is needed. The metrics used in this paper are: construction waste mitigation, storm water mitigation, carbon sequestration, and plant stewardship. These metrics are used because they measure the delivery of ecosystem services in redevelopment of formerly derelict sites such as SAKCC. For example, re-using construction and demolition debris provides provisioning services in creating a "new" construction material whose production reduces energy impacts associated with extracting, converting, and transporting resources. It also keeps matter from being transported to and buried in landfills. Storm water mitigation provides regulating services by reducing, holding, and infiltrating storm water on site and thereby reducing flooding (Millennium Ecosystem Assessment 2005, 58). Carbon sequestration provides regulating services that reduce atmospheric carbon dioxide, help maintain or improve local air quality, and potentially help to regulate local and global climate.[2] Plant stewardship increases native plant biodiversity facilitating supporting services, such as pollination and water quality.[3]

Additional metrics might have been used to measure other ecosystem services. For example, water quality (both a provisioning and regulating service) could be measured through onsite measurement and laboratory analysis. However, the parameters of this study limited the time and resources necessary to adequately pursue such an investigation. Multiple samples gathered over several months or a year would be required to draw conclusions about SAKCC's effect on water quality (Toran 2011). Resources available for the conduct of this study precluded pursuit of these longer-term activities. Cultural services related to aesthetic benefits might have been measured through a survey/questionnaire of site visitors (Barbosa et al. 2007; Cooper Marcus and Barnes 1995). However, construction of SAKCC was completed in Fall 2010. Conduct of visitor surveys during a period of low visitation to the site (summer 2011 the time during which this research was conducted) precluded the opportunity to generate a large enough sample to support valid conclusions.

Ecosystem Services and the Production of Multivalent Landscapes

Architect and landscape architect Charles Jencks (1973) used the term "multivalent" to describe buildings that have multiple or pluralistic meanings. Jencks described multivalent as the capacity of buildings to perform and attract in various combinations, resulting in a range of responses from their users (1998, 306). Multivalent architecture includes "the imaginative creation of [building] parts in a new way… and linkage between the parts … [allowing] the parts to modify each other "(Jencks 1973, 14). Creative combinations of elements result in the capacity of a building to have multiple meanings. Each meaning can be viewed as a form of building performance. The multiple array of meanings associated with experiencing the structure can be viewed as performance metrics of a building. In this sense, a multivalent building is one whose characteristics perform in such a manner as to deliver multiple types and levels of meaning for users.

Jencks' notion of "multivalent" is translatable to landscape architecture. I replace meanings to assess performance of buildings with ecosystem services as criteria to assess performance of landscape. Historically, landscape design conceptualized and created landscape as a static entity requiring incessant management and grooming to retain its singular meaning. The notion of designers creating static landscape systems have been superseded by an understanding of landscape as dynamic ecosystems containing complex relationships among multiple components and processes.

Multivalent landscapes are those in which interaction among components provides multiple types and levels of measureable ecosystem services. For purposes of this article, valence is defined as a criterion that evaluates the performance of a landscape component(s) operating in a dynamic system toward the production of a measurable level of a specific ecosystem service.

The range and magnitude of ecosystem service production varies with the nature of the system's components. For example, specifying native plants in a tree planting could result in a high carbon sequestration valence and plant stewardship valence whereas specifying exotic plants might result in a high rating for carbon sequestration but would not contribute to plant stewardship. Likewise, assuming constant physiographic conditions, in comparison to a plant community containing diverse vegetation, a monoculture may produce comparable hydrologic flow regulating services but reduced biodiversity provisioning services. Multivalent can be defined in terms of number and magnitude of ecosystem services a landscape produces, and it provides another means of defining the concept of multifunctional landscape. In the sense that valences are analogous to functions, multivalent landscapes are also multifunctional. Figure 1 diagrams the relationships between landscape components affected by design at the SAKCC site, the nature of the valence metric, and the ecosystem service to which the metric applies.

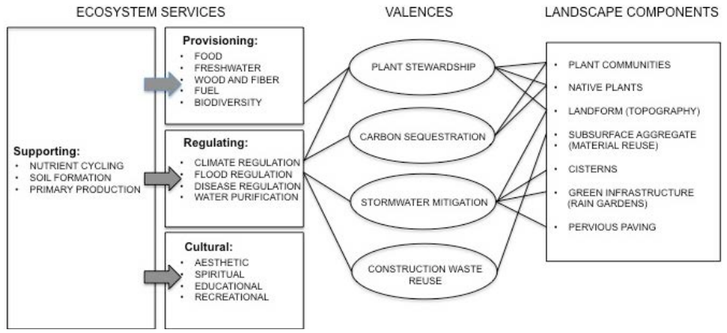

Figure 1
Chart showing relationship of ecological services, valences and design components (after Millennium Ecosystem Assessment Report on Ecosystems and Their Services 2005, 57).

Figure 2
SAKCC site prior to design. Former warehouse building foundation is located on the site's west side with a railroad spur cutting diagonally through the site's center. Wissahickon Avenue is on east perimeter. A railroad viaduct occurs south side and an elevated railroad line is on the west side of site. (Courtesy of Andropogon Associates, Ltd. and Google Earth)

Figure 3
Site plan shows building located in the upper right corner of site leaving approximately 9.4 acres for recreation fields, porous parking and rain gardens. Contaminated material is buried in the area at the lower left corner of the site, between the recreation field and access road/path. (Courtesy of MGA Partners)

Site Location, Characteristics, and Background

SAKCC is located in a derelict industrial area in north Philadelphia (Figure 2). Budd Company, a manufacturer of steel rail cars and automobile bodies owned the site from approximately 1915 to 2002, using it as a site for manufacturing pulleys (Spaulding 1990, 1). Budd Company closed its Philadelphia operations in 2002, whereupon the city began to use the site as a parking impoundment. In October 2010, the site was re-opened as the Salvation Army Kroc Community Center (SAKCC). The center provides social, educational, recreational, and spiritual services. The design program includes: a 150,000 square foot building, a large multi-purpose athletic field, walking paths, a children's play area, community gardens, and outdoor gathering spaces. The flat 12.4-acre site contained a large foundation of a former warehouse on one side and an impervious parking lot on the other (Figure 2). Railroads lined the south and west sides of the site and a railroad spur traversed the center of the site. A sewer line also bifurcated the site.

Soil contamination, a legacy of the site's industrial past, resulted in designation of the SAKCC site as a brownfield. Major contaminants include Benzopyrene (ranging from < 2.6–130 mg/kg) and Arsenic (ranging from 20.2–28.2 mg/kg). Where the levels exceeded 30mg/kg, soils were removed for disposal offsite (Kleinfelder Consultants 2008). Some contaminants remain on the site and are capped with an impervious material. The landscape was designed by Andropogon Associates and the building by MGA Partners in association with PZS Architects (Figure 3). Duffield Associates (2008), a civil engineering firm, calculated storm water runoff and Kleinfelder Consultants (2008), an environmental sciences consulting firm, measured soil toxicity.

METHODS

This case study measures four valences using separate quantitative metrics. The four valences are: construction waste mitigation, stormwater mitigation, carbon sequestration, and plant stewardship. The measured outcomes are indicators of landscape performance and ecological services at the site scale. Tools used in measuring performance include: the application of site-specific calculations to estimate existing waste materials and stormwater flows and use of on-line calculators to measure tree benefits and plant stewardship.

Construction Waste Tool

Policy makers, engineers and designers are becoming increasingly concerned about the resources and energy associated with construction waste (including residual materials associated with demolition of landscapes and structures). Disposal of construction waste places significant pressure upon landfills. In the US construction waste generated from site and building demolition was estimated to be 325 million tons per year in 2003 (the last year comprehensive data was available), with most of it entering landfills (EPA 2004, 3). In 2005, 2.25 million tons of construction and demolition waste, amounting to 17.5 percent of Pennsylvania's total municipal waste stream, was disposed of in landfills

Figure 4
Stormwater on the site drains from the building to two cisterns which are connected to a series of linked rain gardens. The permeable parking lot and surface landscape features, including the recreation field, also drain into the rain garden system. Crushed aggregate from construction was used as drainage flows beneath the athletic field and porous parking lots. The subsurface drainage feeds the ground water, planted slopes and rain gardens. (Courtesy of Andropogon Associates, Ltd.)

(DEP 2013). Philadelphia's 2010 Sustainability Plan seeks to divert at least 30 percent of solid waste from landfills by 2015 (City of Philadelphia 2010).

Designers of the SAKCC site viewed construction debris as a possible resource that could be used in the new landscape. Existing pavement on SAKCC site was crushed in-situ and reused as subsurface base layers below the new building, sidewalk, and parking areas. The landscape architect, civil engineer, and contractor calculated volumes of materials and determined where they might be reused.

Existing pavement depths were estimated based upon pre-construction on-site investigations. Each pavement type was equated to an aggregate type useful for a particular purpose (for example, beneath parking lots or buildings). Pavements were then crushed and sorted before being incorporated into the proposed construction. Areas for each pavement type were multiplied by the depth to calculate waste volume in cubic yards (yd^3). Existing facilities at SAKCC contained approximately 2,700 yd^3 of asphalt, 2,410 yd^3 of concrete, 7,020 yd^3 of aggregate stone sub-base, and 370 yd^3 of railroad ballast (crushed stone used to support railroad ties and rails). These materials were multiplied by an estimated weight of 1.4 tons per yd^3 to arrive at the total tonnage recycled on-site.

Disposal costs were calculated to measure the economic savings associated with keeping construction debris from being disposed of in landfills. Waste calculations were limited to costs of disposing of waste construction materials and debris at a regional recycling center, the standard practice for disposing of such material. These calculations included costs for intake of the material by the recycling center, as well as transportation costs to the center. They did not include costs associated with crushing and spatially locating the debris in the new landscape. Cost estimates were derived from price schedules provided during July of 2011 by a commercial construction demolition debris recycling operation. Quoted costs for disposal were $30/ton for asphalt, $23/ton for concrete or stone, and $98/ton for general construction debris (containing wood, steel, and other materials). The location of the nearest waste material recycling facility in Southampton, PA was plotted relative to the site. An average round trip of 30 miles with an average speed of 35 mph and a 15 minute load and unload time were assumed as was a cost of $12/ton for hauling (Spencer, Babbitt, and Baker 2010).

Stormwater Tool

The stormwater metric estimated the volume of runoff that did not enter the city stormwater sewer system as a result of implementing the new design for SAKCC. Post-construction stormwater performance for varying rainfall events was estimated by applying standard hydrologic and hydraulic engineering calculations using HydroCAD™ software. This software uses "simplified procedures for estimating runoff and peak discharges in small watersheds" (NRC 1986, 2). The Philadelphia Water Department requires this methodology for flood control calculations and it "is the most widely-used methodology in southeast Pennsylvania

for the design of stormwater infiltration/detention systems" (Meier 2013). Philadelphia Water Department stormwater management regulations in effect in 2006, required infiltration of the first inch of runoff generated from a storm event from all impervious surfaces. Cisterns, bioswales, rain gardens, porous pavements and engineered soil mixes are elements used to capture, infiltrate or store and reuse the site's stormwater. Figure 4 illustrates the stormwater design.

The effects of various retention structures on reducing stormwater discharge into the storm sewer system were estimated using HydroCAD™. The three-acre rooftop of the SAKCC building is the site's largest generator of stormwater runoff. On-site retention of the rooftop's stormwater runoff occurs in four rain gardens fronting Wissahickon Avenue as well as three additional rain gardens and underground cisterns. The bottom of the rain gardens fronting on Wissahickon Avenue are sealed with 45 mil ethylene propylene diene monomer (EPDM) rubber liner as they are located over benzopyrene contaminants which were not removed or relocated. These rain gardens also contain subsurface drain outlets to prevent movement of water into underlying contaminated soil (Meier 2013). The street-side rain gardens are designed to treat 54 percent of the building roof area. The remaining 82,609 square feet of storm water from the roof, along with condensate from the building's air conditioning system, is directed to granite runnels that are connected by pipe to two underground cisterns located in the large green area behind the building. When the cisterns fill to capacity, the excess runoff overflows to three infiltrating rain gardens. The total volume of water from the condensate and stormwater directed into the cisterns is approximately 33,770 gallons. This water is used to irrigate the landscape.

Rainfall that is intercepted by the porous pavement parking areas infiltrates through the porous pavement into an underlying stone sub-base. Precipitation and surface drainage directed into the three rain gardens located at the rear of the site infiltrates into the underlying soil. Precipitation falling on the athletic field infiltrates into a crushed sub-base layer and travels laterally through the soil to water the plants on the adjacent slope.

Carbon Sequestration Tool

Carbon sequestration refers to "the annual rate of storage of carbon dioxide (CO2) in biomass over the course of one growing season" (McPherson 1998 cited in Aguaron and McPherson 2012, 45). Trees act as a sink for carbon dioxide by "fixing carbon during photosynthesis and storing excess carbon as biomass" (Nowak and Crane 2001, 381).

Carbon sequestration of on-site vegetation at SAKCC was measured using the Tree Benefit Calculator, an online tool developed by Casey Trees and Davey Tree Expert Company. The Tree Benefit Calculator employs i-Tree Streets software to estimate carbon sequestration from the biomass of street tree populations. Carbon sequestration for specific plant species is estimated based on diameter at breast height (dbh) for plant species

The i-Tree Streets software is based on STRATUM (Street Tree Resource Analysis Tool for Urban Forest Managers) software. From regionally specific data, "STRATUM uses growth curves modeled for significant urban tree species within each of 17 national climate zones" to calculate carbon sequestration along with several additional environmental and economic benefits of urban vegetation (PSWRS nd).

Aguaron and McPherson (2012) assessed variability among four different approaches to calculating carbon storage and carbon sequestration: i-Tree Streets, i-Tree Eco, Center for Urban Forestry (CUFR) Tree Carbon Calculator (CTCC), and Urban General Equations (UGE). Among these strategies, i-Tree calculated more conservative estimates of carbon sequestration. Input for applying the Tree Benefit Calculator to estimate carbon sequestration was obtained from landscape construction documents for the SAKCC design and post-installation field visits.

Plant Stewardship Tool

Plant stewardship was measured using the Plant Stewardship Index (PSI), an on-line calculator provided by Bowman's Hill Wildflower Preserve (BHWP) in New Hope, PA (2011). A list of plants for the site was created (based on plant lists provided by the landscape architect and checked in the field). Plants on the list (n = 66) included herbaceous plants, shrubs, and trees. They were entered into the PSI calculator that assigned a coefficient of conservatism for each plant then automatically computed the mean C value PSI index values.

PSI is defined as "a 'thermometer' reading of the ecological quality of open land by seeing what plants live there" (BHWP 2011). The PSI evolved from the

Figure 5
Perspective showing stormwater flow from building roof to cisterns. (Courtesy of Andropogon Associates, Ltd.)

Floristic Quality Assessment Index (FQAI or FQI), developed by Swink and Wilhelm (1979). FQI assesses the conservation value of flora. Both FQI and PSI use coefficients of conservatism (CC) numbers assigned by leading botanists and ecologists to native plants.[4]

> "The assignation of a CC score is based on two evolutionary and ecological assumptions: (i) plant species differ in their tolerance to disturbance and (ii) [they] distribute according to their degree of fidelity to habitat. The CC score summarizes the autoecological features of a species; the higher the values, the higher the fidelity to a certain habitat and it is independent from the geographical distribution, since species may be widely distributed but restricted in habitat preferences" (Andreas and Lichvar, 1995 cited in Landi and Chiaruccio 2010, 270).

PSI differs from FQI in that it includes non-native plants whose presence impacts ecological quality. Non-natives (including invasive or introduced species) and most generalist species, tolerant of disturbance are assigned a CC value of zero. "Ten represents the most conservative species having the most specific habitat requirements to which they have a high degree of fidelity (that is they will not thrive in the absence of these conditions.

Species having a high CC score include many rare and endangered state-listed native plants that require special habitats and do not re-grow after disturbance" (BHWP 2011).

BHWP has published the methodology behind the PSI calculations: Botanists, ecologists and other experts:

1. Compile a plant list of the species within the assessment area.
2. Assign the Coefficient of Conservatism (CC) to each [species] documented on the plant list.
3. Calculate the Native Mean Coefficient of Conservatism value by totaling the CC's and divide the sum by the number of native plant species within the assessed area. OR
4. Calculate the Total Mean Coefficient of Conservatism value by totaling the CC's and divide by the sum of the total number of plants (native and introduced) within the assessed area.
5. Multiply the Native Mean Coefficient of Conservatism OR the Total Mean Coefficient of Conservatism by the square root of the total of the number of native plant species (BHWP 2011).

Thus:
FQI = (WCC_n/N_n) x $ffIN_n$
and PSI = WCC_i/N_i) x $ffIN_n$
where:
FQI = Floristic Quality Assessment Index
PSI = Plant Stewardship Index
WCC_n = The sum of the CC values for all native plants (n)
N_n = Total number of native plants (n)
WCC_i = The sum of the CC values for native and non-native plants (i)
N_i = Total number of native and non-native plants (i)

Table 1. Construction Waste Re-use in the SAKCC Design

Existing pavement	Quantity	Re-use	Quantity
Ballast	370 yd^3	Parking (9" base course)	370 yd^3
Aggregate Stone	7,020 yd^3	Parking, (9" base course) Synthetic turf (9" base course) Lawn (4" base course)	2,306 yd^3, includes ballast); 2,000 yd^3
		Ramp (rough grading)	1,111 yd^3
Asphalt	2,700 yd^3	Ramp (rough grading)	5,866 yd^3, includes aggregate stone
Concrete	2,410 yd^3	Paths (4" base course) Storage under Building	450 yd^3 700 yd^3

Source Andropogon Associates LTD., 2007.

Table 2. Stormwater Runoff Calculations for 2, 10, and 100 Year Storms: Pre and Post Development Conditions

Development Condition	2 Year Storm	10 year storm	100 year storm
Pre Development	42.2 ft^3/sec	70.9 ft^3/sec	119.0 ft^3/sec
Post Development	0.8 ft^3/sec	2.2 ft^3/sec	43.5 ft^3/sec
Percent Reduction	98%	97%	64%

Source: Duffield Associates Report 2008, 11.

At the present time, CC values have been developed for 2000 plant species found in Pennsylvania and New Jersey. Thus, use of the PSI calculator is limited to these states. Other states, including Ohio, Colorado, Florida, Mississippi, the Dakotas, Illinois, Michigan, Virginia, West Virginia, Missouri, Michigan, Iowa, and southern Ontario have also assigned Coefficients of Conservation to their flora (Pennsylvania Land Trust 2013).

BHWP maintains records of sites that have recorded PSI data which allows researchers to enter baseline data, as was done for SAKCC. PSI estimates can be compared across time to describe vegetative changes in a landscape. This feedback permits use of management strategies that can be revised based on variability in vegetative performance.

FINDINGS

Construction Waste Mitigation

On-site recyling of construction waste and debris resulted in the reuse of 370 yd^3 of railroad ballast, 7020 yd^3 of aggregate stone, 2700 yd^3 of asphalt, and 2410 yd^3 of concrete (Table 1). Reuse of the 12,510 yd^3 of materials resulted in a savings $575,000 in associated disposal fees.

Stormwater mitigation

At SAKCC, impervious surfaces were reduced by 43 percent, from 9.3 acres to 5.3 acres. The first inch of stormwater runoff is captured, reused, and infiltrated on site using a combination of cisterns, bioswales, rain gardens, porous pavements, and engineered soil mixes. Figure 5 shows the stormwater flow from rooftop to cistern.

SAKCC's rate of runoff was significantly reduced for the 2- and 10-year storms. . Andropogon's design for the SAKCC site converted impermeable surface to permeable pavements as well as rain gardens and other planted areas. As described above, runoff was managed through a series of interconnected swales and cisterns. Table 2 indicates that runoff volume in the SAKCC design was reduced by 98 percent, 97 percent, and 64 percent for 2-, 10-, and 100-year storms, respectively.

Carbon Sequestration

An online calculator was used to assess the potential of the 562 new shade trees to sequester carbon dioxide. Table 3 indicates that the new trees will sequester an estimated 15,443 pounds of atmospheric carbon dioxide annually. This benefit is expected to increase as the trees grow and are capable of sequestering more carbon dioxide.

Plant Stewardship

Plant stewardship is an indicator of ecological quality and is associated with ecosystem services that relate to biodiversity. Biodiversity has a key role in ecosystem service delivery (Mace, Norris, and Fitter 2012).

SAKCC's increased PSI indicates the site's potential to improve pollination because native plants provide habitat for pollinators.[5] Increases in PSI over time can be associated with cultural ecosystem services such as

Table 3: Pounds of Carbon Sequestered Annually by Tree Plantings in SAKCC Plan, 2011

Botanical Name	Common Name	Diameter (in.)	Quantity	CO2 (lb/tree/yr)	Total CO2 (lb/tree planting/yr)
Deciduous Trees					
Acer rubrum	Red Maple	3	13	52	676
Acer rubrum	Red Maple	2	9	44	396
Acer saccharum	Sugar Maple	2	4	24	96
Betula populifolia	Gray Birch	1.5	18	9	162
Celtis occidentalis	Common Hackberry	3	15	53	795
Celtis occidentalis	Common Hackberry	2	10	24	240
Fagus grandiflora	American Beech	1.75	9	16	151
Liquidambar styra.	Sweetgum	2.5	8	17	136
Liriodendron tulip.	Tulip Tree	3	14	53	742
Nyssa sylvatica	Black Gum	3	15	53	795
Platanus occidentalis	Sycamore	3	25	53	1325
Platanus occidentalis	Sycamore	2	4	24	96
Populus deltoides	Cottonwood	2.5	7	38	266
Quercus alba	White Oak	2	2	19	38
Quercus bicolor	Swamp White Oak	3	12	53	636
Quercus coccinea	Scarlet Oak	3	19	53	1007
Quercus coccinea	Scarlet Oak	2	13	24	312
Quercus coccinea	Scarlet Oak	1	15	6	90
Quercus palustris	Pin Oak	3	1	53	53
Quercus phellos	Willow Oak	3	38	40	1520
Tilia Americana	Basswood	3	6	53	318
Taxodium distichum	Bald Cypress	1.5	8	9	72
Ulmus americana	American Elm	3	35	53	1855
Subtotal			**296**		**11,777**
Coniferous Trees					
Juniperus virginiana	Eastern Red Cedar	1.5	11	3	33
Juniperus virginiana	Eastern Red Cedar	1.25	11	3	33
Juniperus virginiana	Eastern Red Cedar	1.0	7	2	14
Pinus strobus	White Pine	1.5	5	5	25
Pinus strobus	White Pine	1.25	31	5	155
Subtotal			**65**		**260**
Understory Trees					
Amelanchier laevis	Allgy. Serviceberry	2.5	65	30	1950
Carpinus caroliniana	Ironwood	2.5	10	30	300
Cercis canadensis	Redbud	2.5	8	30	240
Cornus florida	Flowering Dogwood	1.5	15	12	180
Magnolia virginiana	Sweetbay Magnolia	2	27	9	243
Populus tremuloides	Quaking Aspen	1	6	6	36
Rhus glabra	Smooth Sumac	.5	39	4	156
Sassafras albidum	Sassafras	1.5	17	9	153
Viburnum prunifol.	Blackhaw Viburnum	1.5	9	12	108
Viburnum prunifol.	Blackhaw Viburnum	1	5	8	40
Subtotal			**201**		**3406**
Total			**562**		**15,443**

Table 4: Coefficient of Conservatism for Plant Species Included in SAKCC Design

Genus	Species	Common Name	Coefficient of Conservatism
Acer	saccharum	Maple, sugar	5
Amelanchier	laevis	Shadbush, smooth	6
Amsonia	hubrectii	Bluestar, Arkansas	not available
Andropogon	glomeratus	Broom-sedge	8
Andropogon	virginicus	Broom-sedge	2
Anemone	canadensis	Anemone, Canada	0
Asclepias	tuberosa	Butterfly-weed	6
Aster	cordifolius ssp. cordifolius	Aster, blue wood	not available
Aster	novi-belgii	Aster, New York	not available
Betula	populifolia	Birch, gray	2
Calamagrostis	canadensis	Bluejoint, Canada	0
Carex	scoparia	Sedge, broom	2
Carex	vulpinoidea	Sedge	2
Carpinus	caroliniana	Hornbeam; Ironwood	5
Cercis	canadensis	Redbud	7
Chasmanthium	latifolium	Sea-oats; River-oats	7
Clethra	alnifolia	Pepperbush, sweet	8
Cornus	florida	Dogwood, flowering	5
Cornus	sericea	Dogwood, red-osier	3
Deschampsia	flexuosa	Hairgrass, common	8
Diervilla	lonicera	Honeysuckle, bush	8
Dryopteris	marginalis	Fern, marginal wood	5
Echinacea	purpurea	Coneflower, purple	0
Eragrostis	spectabilis	Lovegrass, purple ; Tumblegrass	1
Eupatorium	maculatum	Joe-pye weed, spotted	4
Fagus	grandifolia	Beech, american	6
Helenium	autumnale	Sneezeweed	4
Hibiscus	moscheutos	Rose-mallow, swamp	7
Hydrangea	quercifolia	Hydrangea, oak-leaf	not available
Ilex	glabra	Inkberry	0
Ilex	verticillata	Winterberry	4
Iris	versicolor	Blue flag, northern	7
Itea	virginica	Sweetspire, Virginia	0
Juncus	effusus	Rush, soft	0
Juniperus	virginiana	Eastern red-cedar	2
Liatris	spicata	Blazing-star, dense	8
Liquidambar	styraciflua	Sweet-gum	5
Liriodendron	tulipifera	Tuliptree; Yellow poplar	2
Lobelia	siphilitica	Lobelia, great blue	5
Magnolia	virginiana	Magnolia, sweetbay	8
Monarda	didyma	Bee-balm	4
Muhlenbergia	capillaris	Hairgrass/Long-awned Hair-grass	0
Nyssa	sylvatica	Black gum; Tupelo	4
Panicum	virgatum	Grass, switch	1
Panicum	virgatum (blue cultivars)	Blue-leaved switch grass	1
Phlox	divaricata	Wild blue phlox	8
Pinus	strobus	Pine, Eastern white	7
Platanus	occidentalis	Sycamore	3
Populus	deltoides	Eastern cottonwood/ Cottonwood	4
Populus	tremuloides	Quaking aspen	4
Quercus	alba	Oak, white	4
Quercus	bicolor	Oak, swamp white	7
Quercus	coccinea	Oak, scarlet	4
Quercus	palustris	Oak, pin	3
Quercus	phellos	Oak, willow	8
Rhus	aromatica	Fragrant sumac	0
Rhus	glabra	Sumac, smooth	3
Rosa	palustris	Swamp rose	7
Rudbeckia	fulgida var. fulgida	Coneflower, orange	8
Sassafras	albidum	Sassafras	1
Spiraea	tomentosa	Steeple-bush	6
Sporobolus	heterolepis	Dropseed, prairie	10
Taxodium	distichum	Bald cypress	0
Ulmus	americana	Elm, american	4
Vaccinium	angustifolium	Blueberry, low sweet	8
Viburnum	prunifolium	Viburnum, blackhaw	2

Source: www.bhwp.org/psi Salvation Army Kroc Community Center Plant

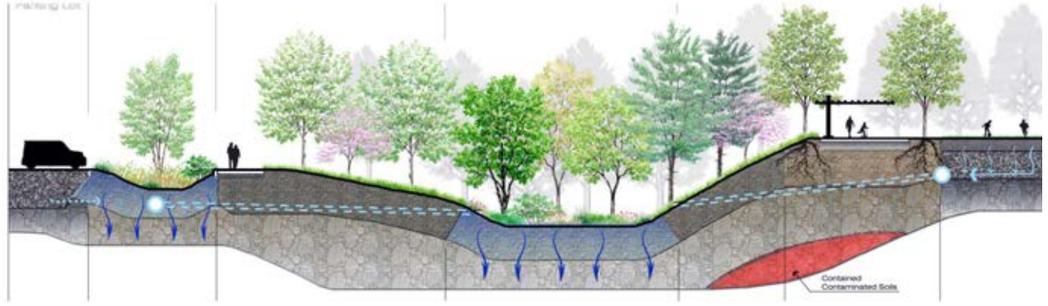

Figure 6
Site section shows varied topography with low areas associated with stormwater infiltration. Note the zone beneath the highest elevation on the right. This is the burial site of contaminated soils. (Courtesy of Andropogon Associates, Ltd.)

educating visitors about the role of native plants to ecosystem quality and health, as well as supporting ecosystem services related to soil production.

The PSI for SAKCC is 33.72. While PSI can theoretically achieve a score of 100, scores this high are rare. In the Philadelphia metropolitan area, scores of 10 to 20 are common. A score above 30 is a high score for this location (Brennan 2011).

As shown in Table 4, several plants received high CC scores. Some are also classified as rare, endangered or threatened by the state of Pennsylvania. *Andropogon glomertus* (broom-sedge, CC = 8) is listed on the Pennsylvania Rare plants list. *Chasmanthium latifolium* (river sedge, CC = 7), *Quercus phellos* (willow oak, CC= 8), and *Sporobolus heterolepis* (prairie dropseed, CC = 10) are listed on the Pennsylvania Endangered plants list. *Magnolia Virginia* (sweetbay, CC = 8) is on the Pennsylvania Threatened plants list.

The FQI, which measures presence of native plant species is 35.1. The difference between the PSI and FQI, is 1.38, suggesting that the impact of non-natives is relatively low.

In interpreting PSI findings for SAKCC, it is helpful to review the assignment of coefficient of conservatism (CC) values. Plants assigned a coefficient value of 0–3 are plants with a "high range of ecological tolerances/found in a variety of plant communities; 4 –6 are plants with an intermediate range of ecological tolerances/associated with a specific plant community; 7–8 are plants with a poor range of ecological tolerances/associated with advanced successional stage; 9–0 are plants with a high degree of fidelity to a narrow range of pristine habitats" (BHWP 2011).

The Pennsylvania Land Trust has a narrower interpretation of plants in the 0–3 range, stating that "species ranked as 0–1 are adapted to severe disturbances, while species ranked with a C-value of 2–3 are associated with somewhat more stable, though degraded, environments" (Pennsylvania Land Trust 2013).

Both PSI and FQI were established to measure the ecological quality of "natural " sites. SAKCC demonstrates the potential for designed sites to contribute to improving ecological quality.

The pre-existing site was at least 75 percent paved. The project landscape architect described the existing vegetation as scant with a high percentage of exotic invasive plants, such as *Paulonia fortuneii*, princess tree, and *Polygonum cuspidata*, Japanese knotweed. Existing plants were removed during SAKCC construction. It is assumed that the PSI for the site before construction would have been very low, perhaps zero, since invasive species are assigned a zero value using this methodology.

DISCUSSION

Design Choices and Their Valences

An objective of this research is to show that there is a relationship between design choices, valences of these choices, and the provision of ecosystem services. At SAKCC, design decisions related to topography, plant species selection and building location resulted in overlapping benefits to create a multivalent landscape. These multiple valences resulted in the provision of multiple ecosystem services in the SAKCC design.

For nearly a century, the site was entirely paved for industrial use or for parking. Implementation of the SAKCC design altered several landscape components

Figure 7
Rain gardens behind the building are located to take advantage of the gradient of the former rail spur. Slope on the right is fed by storm water infiltrated from the recreation field. (photo by K.Daryl Carrington, May

of previous site conditions. Existing topography was altered and existing vegetation was removed. Some of the on-site contaminants were capped and buried deeply underground on the southeast side of the site, out of the path of stormwater. A 15-foot elevation (115 ft to 130 ft at the highest point) change accommodated recreational fields, as well as, a major pathway with stairs, ramps, and different views. The rain garden was located at the lowest elevation on the site, an area previously occupied by a railroad spur (Figure 6). The gentle grade of the former rail spur provided an opportunity for locating three gravity-fed and interconnected rain gardens. The level foundation of a previous warehouse was reused as the location for an athletic field (Mendel 2013).

The rain gardens provide significant detention capacity though surface ponding. The aggregate beds located beneath the athletic field and porous parking lot provide subsurface storage during peak storm events. The integrated stormwater system provides on-site handling of most of surface runoff occurring on the site as a result of various types of storm events, following Patchett and Wilhelm's (1999) directive that sustainable design should retain water where it falls.

When the site came into the current owner's hands, much of the stormwater drained to the adjacent railroad bed and then to off-site locations. Off-site routing of runoff has been considerably reduced for the 2- and 10-year storms. However, 36 percent of the stormwater runoff for 100-year storms continues to discharge to the municipal storm sewer system.

Climate change projections for Pennsylvania forecast a continuing trend of increased rainfall. "Average precipitation for the state rose from just under 38 inches in the early part of the 20th century to nearly 44 inches by its end. Projections show this trend continuing under both higher- and lower-emissions futures.... Should the state follow the regional trend, extreme rainfall events would be expected to produce more flash flooding, which threatens lives, property, and water-supply infrastructure" (Union of Concerned Scientists 2008, 11). Continued monitoring of runoff from the site would enable an in-depth understanding of the ability of on-site stormwater retention elements, such as rain gardens, to accommodate extreme rainfall events and whether they should to be paired with other features, such as cisterns, for optimal function.

Seeking to portray stormwater as a resource and to give it visibility, the designers drained roof runoff using granite runnels rather than discharging it into underground storm sewer systems.

The SAKCC site design includes varied topography with gentle as well as steep slopes and swales to manage stormwater on site. Variation in topography conditions also creates settings for different plant communities. The rain gardens were designed as hydric plant communities rather than simple assemblages of reeds and other water loving plants (Figure 7). Other parts of the site were designed based guidelines for terrestrial and palustrine plant communities within Pennsylvania to create upland, meadow, or mixed plant communities (Fike 1999). Some of the plants are classified as rare, threatened, or endangered in Pennsylvania. The approach to vegetation results in biological diversity and may aid in restoring/conserving native plant species.

The siting of the building along Wissahickon Avenue created a more continuous streetscape fabric, while pushing the building to the northern edge of the site provided space to create a small park containing multiple recreation features and a variety of topographic conditions and plant species. The resulting 9.4-acre landscape is large enough to be planted with 68 different plant species organized in communities. Using species representative of the freshwater wetland, forest, and meadow habitats of southeastern Pennsylvania, the planting design simulates native plant communities. This approach resulted in a PSI of 33.72, a high figure for an urban brownfield site.[6]

While every species from particular plant communities is not represented on the site, key components are used. For example, *Quercus alba* (white oak), *Celtis occidentalis* (common hackberry), and *Cornus florida* (flowering dogwood) are components of the dry oak-mixed hardwood association used in the drier, upland zones of the SAKCC site. *Pinus strobus* (white pine), *Betula populifolia* (gray birch), and *Nyssa sylvatica* (black gum) depict the Hemlock-mixed hardwood palustrine forest association. Maximizing the area of a naturalized plant community provides greater opportunity for enhancing biological diversity. If the building were located at the center of the site—the landscape would have conventional front, back, and side yards, creating four small patches of landscape instead of a single larger patch. These smaller areas would result in different storm water and biodiversity benefits.

A double row of fast growing *Ulmus americana*, American elm "Liberty" was planted on the south side of the building. The trees shade the tall glass windows, allowing winter sun inside while shading and cooling the interior space in summer.

Measurements

PSI is a tool that allows land managers to measure the "naturalness" of a site and to see how land management practices affect naturalness over time. The use of PSI in conjunction with i-Tree and stormwater metrics permits on-site monitoring of multivalent landscape performance over time. Integrated use of these metrics will allow SAKCC managers to modify site management practices to maximize performance of landscape valences and produce a desired mix of ecosystem services. Known as adaptive resource management (Runge 2011), this concept facilitates adjustment of site management policies based on performance monitoring of various site components.

The concepts of adaptive management can also be applied to design. As alternative design scenarios are formulated, the integrated application of stormwater, PSI, and i-Tree metrics can be used to estimate multivalent performance levels of each scenario from the perspectives of plant stewardship, stormwater mitigation, and carbon sequestration. In this context, designers can adjust scenarios to find an optimal mix of ecosystem services.

Meta-analysis Across Multiple Designs

SAKCC is a single case study. A limitation of the single case study approach is assessing the generalizability of case findings to other settings. Generalization of findings from an individual study is complicated by the potential idiosyncratic nature of the case. The unique nature of a single case may introduce biases in interpreting the validity and reliability of findings and extending these findings to other situations.

Francis and Griffith (2011) developed a framework consisting of four domains of physical and spatial landscape features to evaluate and compare five successful farmers market spaces. Meta-analysis (Yin 1994) of findings across the five case studies enabled development of more generalizable market design strategies than could have been formulated from any one of the cases.

The research described in this article was funded under auspices of the Landscape Architecture Foundation's Case Study Investigation (LAF-CSI) program. The program commissioned case studies of exemplary high-performing landscape projects that deliver environmental, economic, and social benefits in multiple settings in the USA (LAF 2013). Meta-analysis of findings from the multiple case studios emanating from the LAF-CSI initiative would enable comparative evaluation of performance among multiple design scenarios toward provision of desired mixes of ecosystem services. The performance of rain gardens, porous pavements, bioswales, and cisterns at SAKCC could be compared with that of other sites in a similar setting and climatic regime as well as across settings and

regimes. Assessing comparative evaluations of carbon dioxide sequestration quantities with acreage and density of planting could guide designers in selecting among multiple sizes of canopy and understory trees in their projects. Case studies could be organized and compared in terms of: size (large, medium, and small sites), setting (urban, suburban, and rural); and age. Replication of studies would enable development of evidence-based design principles for maximizing performance and the creation of multivalent landscapes in different contexts.

Limitations

Each of the four tools used to measure landscape performance has limitations. The waste calculation tool does not measure the energy used to crush the existing pavements for re-use. Avoidance of the energy costs of transporting construction debris to a landfill may be offset by economies of scale that make crushing operations at a processor more efficient than in an on-site operation?

The stormwater tool relies solely on calculations projecting mitigation benefits. The calculations are based upon standard formulae developed from empirical data. (Davis and McCuen 2005). Monitoring outflows would be a more accurate means of evaluating stormwater mitigation. Follow up monitoring requires multiple measurements over time (usually about a year or more) and was beyond the scope of this research (Toran 2011). Similarly, water quality sampling would aid in understanding if the quality of stormwater improved due to the mitigation measures. However, sampling for quality should also be conducted over a longer period of time and analyzed in a laboratory for the presence of specific chemicals. The time and expense associated with laboratory analysis was beyond the scope of this research.

Several tree species are not included in the Tree Benefit Calculator categories. Canopy width differences between multiple and single stem trees are not considered in the calculator's algorithms. We erred on the side of being conservative and entered multi-stem trees as having only a slightly larger diameter than single stem trees, which might result in a lower carbon sequestration figure.

PSI relies upon scientists' personal knowledge and observation of plants and habitats in assigning coefficient of conservation scores. This can be subjective, based on knowledge of "the narrowness or breadth of a plant's ecological tolerances" (BHWP 2011). Assignment of coefficient of conservation scores is not consistent among experts (Landi and Chiarucci 2010, 270). While the FQI (which is the basis of PSI) is an accepted practice by the Environmental Protection Agency and the Army Corps of Engineers for wetlands measurement, it has the same issues of subjectivity.

CONCLUSIONS

This research examined the performance of landscape components in a designed setting in terms of their valence or ability to contribute to the delivery of specific ecosystem services. It is clear that design components, which are a manifestation of design choices, have a direct and measurable effect on ecosystem services. Components that contribute to several services simultaneously are considered multivalent. In the SAKCC example, on-site reuse of construction waste exemplified the multivalent design components in a landscape that delivers multiple ecosystem services. On-site reuse prevented disposal of the waste material in a landfill, mitigated on-site stormwater issues by reducing discharge into the Philadelphia storm sewer system, and provided a structural base for recreational and transportation land uses. Plantings of *Ulmus americana* along the south facing glass windows of the building contributed to climate regulation by sequestering carbon dioxide, and cooling of the interior of the building in summer months (although the latter was not measured as part of this research). The plantings also provided habitat for avian and small mammal species.

Siting and grading approaches constitute important purviews of landscape architectural opportunity (for any project). At SAKCC, locating the building at the edge of the site resulted in generous space for multiple functions: recreation, stormwater mitigation, and creation of plant communities. Changing the flat site to one with 15 feet of topographic change accommodated multiple gravity-fed rain gardens at the low points and high benches or plateaus (the athletic field) at the high point. The site could be vegetated with mesic and hydric plant communities because of the varied topography, and the diversity of plant types resulted in a high plant stewardship index for an urban brownfield site. The quantity and variety of trees in the plant communities also resulted in higher quantities of carbon sequestration.

This paper explored the valence of design components in the landscape—that is their ability to generate measurable effects in the delivery of ecosystem services. Multivalent components deliver multiple sets of ecosystem services. From that intersection, one may see the delivery of ecosystem services as involving the hand of the designer and the performance of nature.

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NOTES

1. Measurement of performance is becoming more important in landscape architecture. Planning agencies, water departments and regional concerns mandate minimum performance levels, especially in the area of on site stormwater management. Certification bodies, such as Leadership in Energy and Environmental Design (LEED, rating system issued in 2000), rate a building's level of sustainability based upon measureable criteria. The Sustainable Site Initiative (SITES, rating system issued in 2009) establishes land performance benchmarks giving point credit in specific design, construction, and maintenance areas. In 2011, the LAF initiated CSI to assess landscape performance based upon quantification of environmental, social, and economic benefits.
2. The Millennium Ecosystem Assessment states "Ecosystem changes can have an impact on local or global climate over time scales relevant to human decision making (decades or centuries)" (Millennium Ecosystem Assessment 2005, 60). Additional area and time would be needed to be able to assess this site's value in regulating climate change.
3. "Vegetation, microbes, and soils remove pollutants from overland flow and from groundwater through various means, including: physically trapping water and sediments; adhering to contaminants; reducing water speed to enhance infiltration; biochemical transformation of nutrients; absorbing water and nutrients from the root zone; stabilizing eroding banks; and diluting contaminated water (Kumar 2010, 60).
4. Leading botanists and ecologists in the Pennsylvania/New Jersey Delaware Valley Region—Ann Rhoads, Jack Holt, Janet Ebert, Bill Rawlyk, Emile DeVito, Mary Leck, Leslie Jones Sauer, and others, used their collective knowledge to develop the CC's used for PSI calculation (Arnott 2012).
5. "Ecosystem changes affect the distribution, abundance, and effectiveness of pollinators "(Millennium Ecosystem Assessment 2005, 58).

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