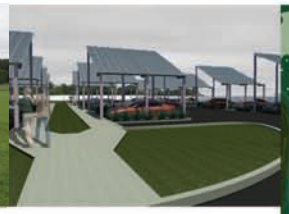
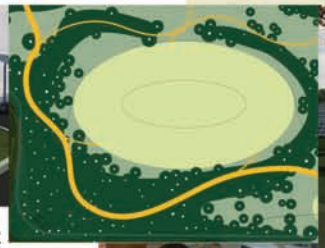
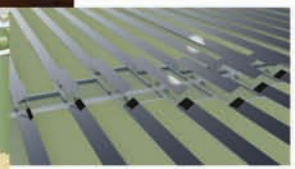
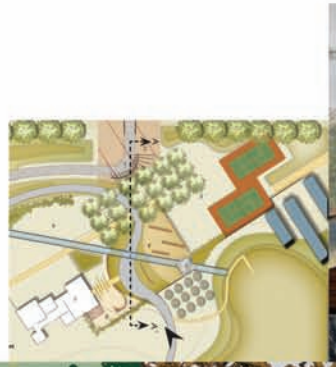
Voorhees Environmental Park


CUES
Center for Urban Environmental Sustainability

Graduate School of New Brunswick
Department of Landscape Architecture
Fall 2011 2nd Year Graduate Studio

RUTGERS
THE STATE UNIVERSITY OF NEW JERSEY

Rutgers, The State University of New Jersey
The Graduate School of New Brunswick
Department of Landscape Architecture
Fall 2011 Second Year Graduate Studio
Voorhees Environmental Park
Voorhees, New Jersey

Instructor: Dr. Wolfram Hoefer

This report is compiled by:

James Bykowski
Adam Cesanek
Kim Nuccio
David Hanrahan
Wanqing Huang
Mukta Jadhav
Kris Kemper
Erik Maietta
Denisse A. Ortiz
Kevin Perry
Alisa Stanislaw
Baewon Suh
Jim Taranto

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Introduction

Wolfram Hoefer

Solar panels and park uses are juxtaposed to each other. A solar panel array is usually a fenced in light industrial area that is not suited for public access. A public park, on the other hand, allows free movement for everybody, providing open spaces for active play, social interaction and enjoyment of nature. Developing a meaningful relationship between solar energy production and in a public park was a main challenge for the Rutgers Landscape Architecture graduate students developing designs for the Voorhees Environmental Park. Voorhees Township found a creative solution for the goal to build a park on top of a closed landfill: designate a substantial portion of the site for a solar array; the incentives from the array shall support the building and maintenance of the park. This challenge has broader impact because financing of public parks is becoming more and more difficult for municipalities.

The objective of this semester-long design studio in the Rutgers Graduate Program of Landscape Architecture was to develop an integrated concept for open space, commercial use (solar panels) and storm water management that generates innovative solutions with regards to the existing social, economic, and ecological situation while allowing active input by the public and major stakeholders. All designs had to respect the cap; it was not considered feasible to disturb the existing cap and grade changes were only considered possible through the addition of fill.

As a way to address the high complexity of the design problem at hand, class instructions were focused on the methodological relation between survey, analysis, and rational decisions feeding the creative design process. The design method "Morphological Box" allows evaluating and integrating inventory and analysis of existing conditions (see chapter 1) as well as planning proposals into the design process, fostering an increased number of possible creative solutions. All design groups were asked to integrate that process in the design documentations, chapter 3 of this report.

Through design explorations we discovered the need for additional research, documented in Chapter 2.

The students formed four groups, each developing a unique design concept:

- *In Solis Pacem*: Dialogue between modern technology and nature is developed through celebrating solar panels and a stylized nature (Asian influence) as end points of a promenade.
- *Nucleus*: For the designers, nature is the nucleus represented by the pond, moving gradually away from nature leads though a large open space towards the solar field, representing man-made technology.
- *Succession by Design*: Ecological succession, defined as the observed process of change of an ecological community over time informs the concept of succession of space, species and energy.
- *Interlock*: Connects the former technological and industrial uses of the site with the potential of reestablishing natural processes once endemic on the site.

Based on these concepts, each group member developed an individual site design.

The first purpose of this report is its function as pedagogical tool; documenting how the available information was analyzed and integrated into the design process forced the students to reflect on the interrelationship between information gathering, processing and design development. Second, the designs are presented to the Voorhees Township and the Voorhees Environmental and Cultural Education Foundation (VECEF) to support the conversion of this former brownfield site into publicly usable open space. This service learning aspect is part of the outreach efforts of the Rutgers Center for Urban Environmental Sustainability (CUES).

We would like to thank all who have provided information and valuable guidance for the class:

- Voorhees Township
- Voorhees Environmental and Cultural Education Foundation (VECEF)
- Stephen Handel, School of Environmental and Biological Sciences, Department of Ecology, Evolution and Natural Recourses, Plant Ecology
- Chris Obropta, School of Environmental and Biological Sciences, Department of Environmental Science, Water Resources Program
- Dunbar Birnie, School of Engineering, Department of Materials Science and Engineering, Solar Panel Research

1 Inventory and Analysis

1.1 Introduction

1.1.1 Location of Voorhees Environmental Park

Kevin Perry

Figure 1. Location of Voorhees in New Jersey

This design study is focused on a 37-acre proposed public park on the site of a former landfill in the suburban community of Voorhees Township, New Jersey. Billed as the Voorhees Environmental Park, the site is located on Centennial Boulevard in the heart of Voorhees Township, a community of over 31,000 residents and a part of Camden County. A suburb of the Philadelphia metro area, Voorhees Township is located in the Delaware River region of New Jersey, situated between the Pinelands to the east and the Delaware River to the west. The community is served by connections to such major arteries as the New Jersey Turnpike, Interstates 95 and 295, and the Atlantic City Expressway. A major hydrological feature, the 3,000 square mile Kirkwood-Cohansey aquifer sits beneath the community as well as the design site.

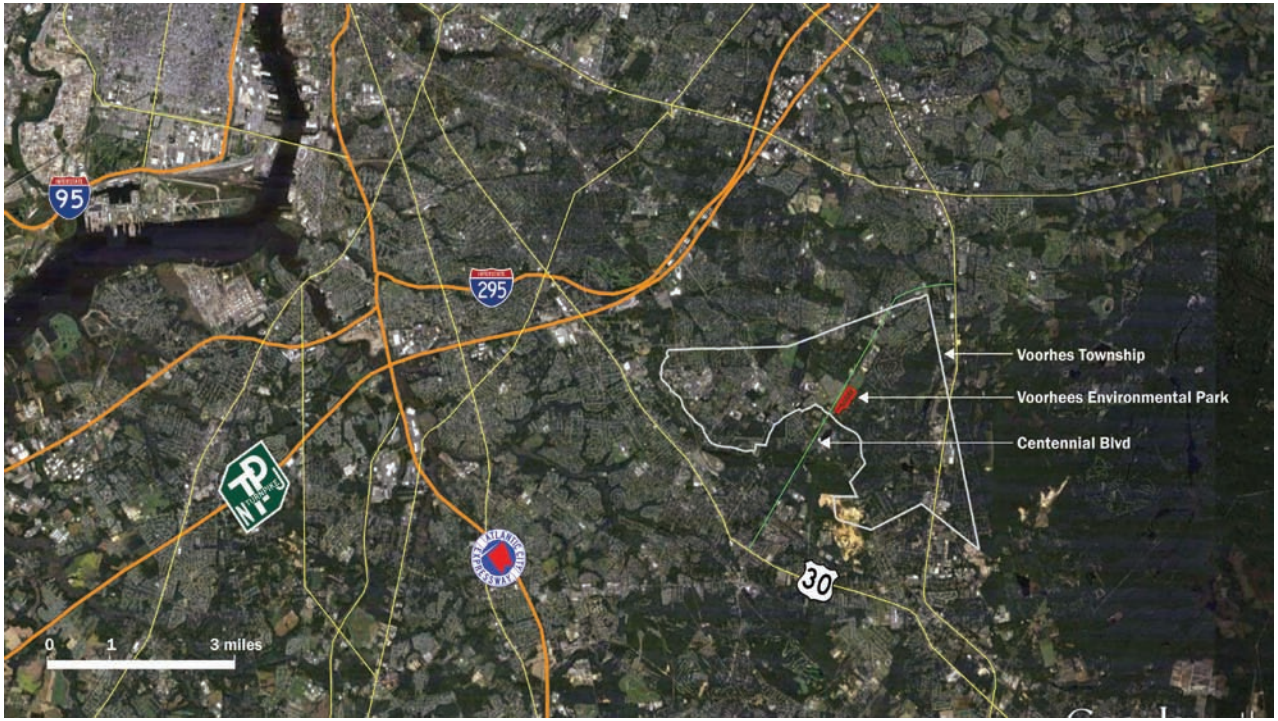
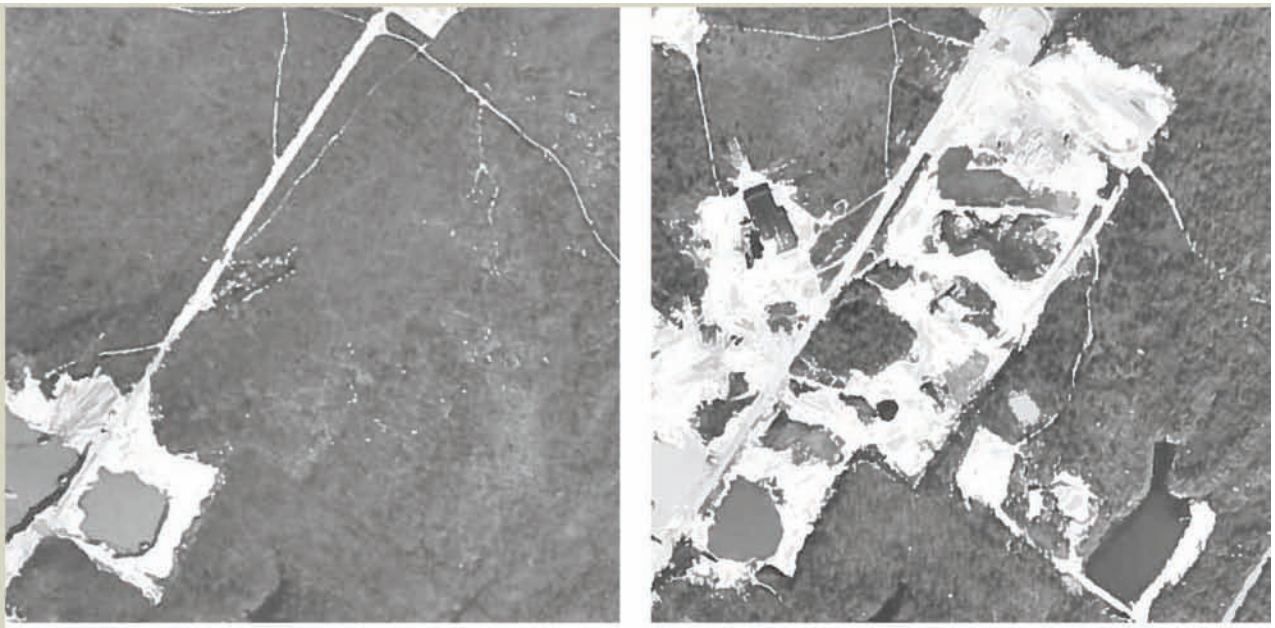


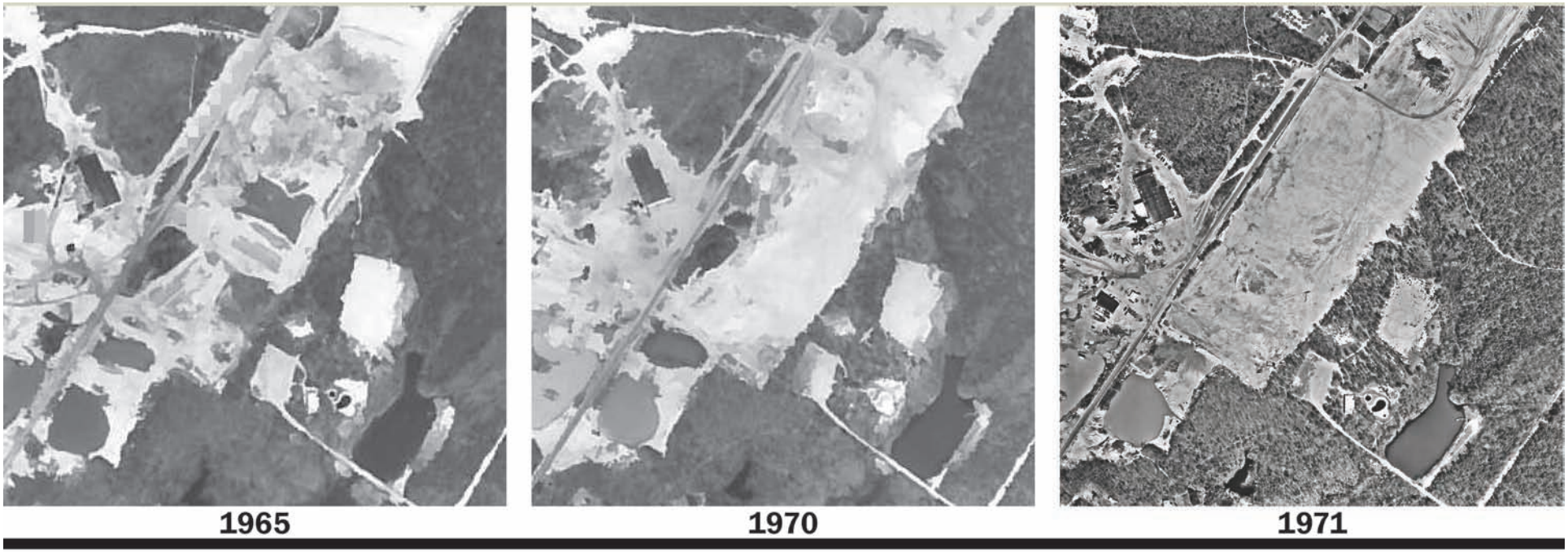
Figure 2. Voorhees Environmental Park and major arterial roads

1.1.2 Site History

David Hanrahan



Since the 1930's, township records categorized the land use of the future site of the Voorhees Environmental Park as pinelands and pastures. In the 1940's, Millard Epley and Albert K. Plone started acquiring hundreds of acres in the area and transferred the rights to their corporation, Buzby Brothers & Co. (Maykuth 1987, "Trouble in Paradise."). The 37-acre site, now owned by Voorhees Township, and the adjacent 19-acre property, now owned by General Electric Corporation, were both initially used as gravel and sand quarries, supplying to concrete manufacturers. According to New Jersey Department of Environmental Protection (NJDEP) documents, Buzby Brothers Material Corporation operated a sand quarry on the 37-acre portion from 1959 until approximately April of 1966. After 1966, the company operated Paradise").



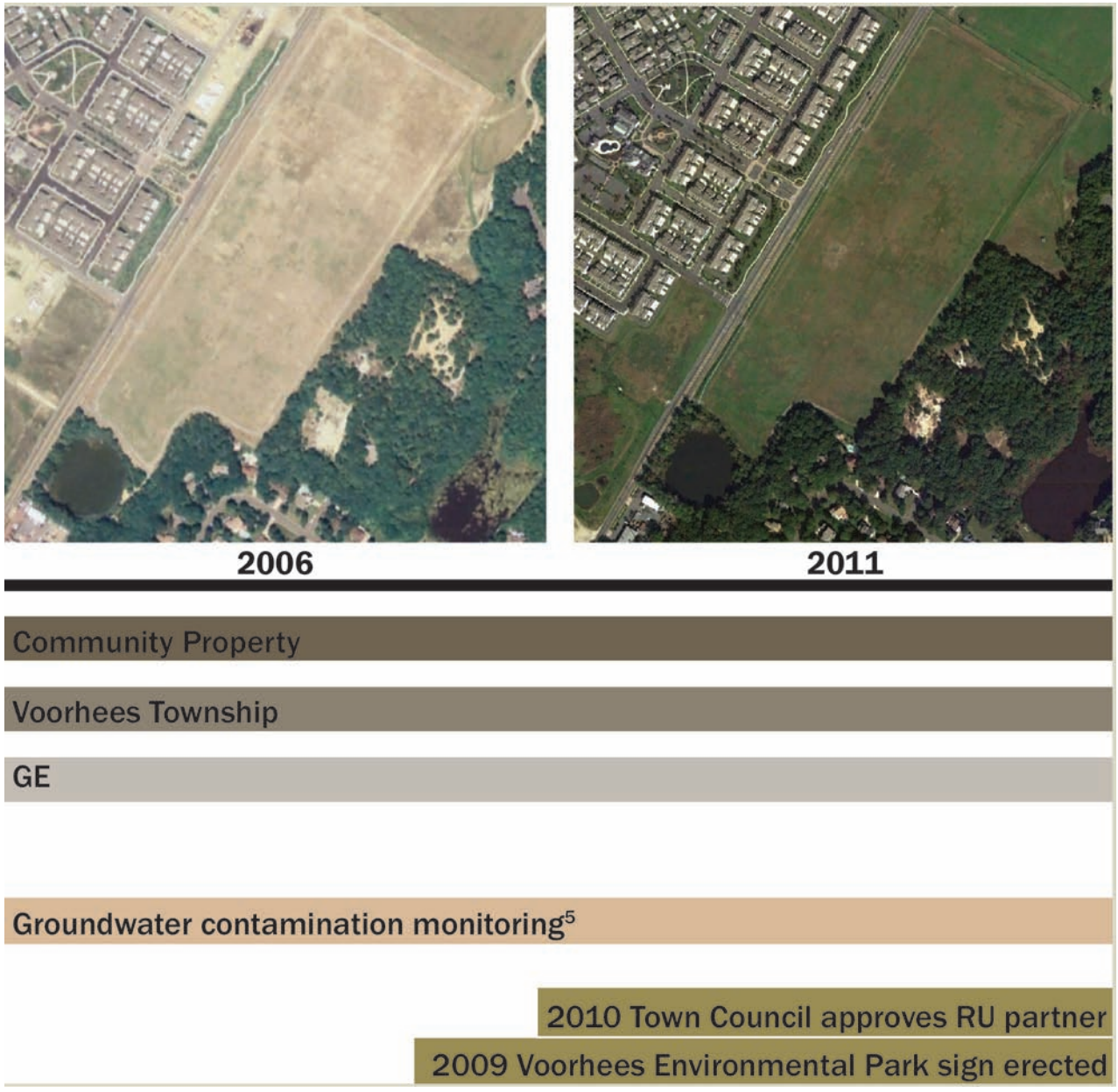
In 1972, the 37-acre portion of the site, operating as a sanitary landfill, reached capacity and the company began landfilling operations on the adjacent property, leasing the land back from RCA. (Maykuth 1987, “Trouble In Paradise”)

According to Department of Environmental Protection Documents, “hazardous substances,” as defined in N.J.S.A 58:10-23.11b., such as volatile organic compounds and heavy metals were “discharged” on both sites a various times from April 1966 until 1978. According to the same documents, unidentified corporations or individuals acting on their behalf, “generated hazardous substances and pollutants” and delivered the waste to the Buzby Sanitary Landfill property for disposal (NJDEP v. GE 2007). In the midst of the period of contamination, in 1975, the NJDEP cited

Buzby Brothers for accepting chemical waste at the RCA-owned site. Buzby Brothers was fined $2,000 (Maykuth 1987, "Trouble In Paradise"; NJDEP v. GE 2007).

Buzby Brothers ceased operations in 1978 and capped the landfills (Maykuth 1987, "Trouble In Paradise"). Some sources indicate that Buzby Brothers declared bankruptcy in 1978 (Hand 1987, "In Voorhees, A Landfill's Grim Legacy"). At that time, president Margaret Epley[1], sold the 37-acre landfill that it directly owned to Voorhees Township for $1. Even at that time, the township had aspirations to open a park on top of the defunct landfill (Maykuth 1987, "Trouble In Paradise").

After the New Jersey Department of Environmental Protection contacted GE and Voorhees Township in the late 1970's and 1980's, the owners of the properties engaged in series of remedial investigations, monitoring and remedial action planning. GE and Voorhees Township worked together to create a remedial action plan across the two sites. In 1989, GE replaced the impermeable plastic cap on liner on their landfill property. A 1990 survey of the site determined that the former landfill did, in fact, contain chemicals and waste "that pose a potential health hazard. The study reported that although there were contaminants in the soil and groundwater beneath the landfill, neither the off-site groundwater nor the municipal water supply had been adversely affected" (Zimmer 1992, "Buzby Landfill"). In 2005, "GE established a 144-acre Classification



Exception Area ("CEA") for the site, which restricts groundwater usage within its boundaries" until 2047 (NJDEP v. GE).

Voorhees Township's remedial investigation was implemented between 1994 and 2001 (Remedy Review). The time line includes the following key events:

- 2003 NJDEP approves the remediation plan.
- 2003 Consent Order for remedy executed by GE and Voorhees Township.
- 2004 Clearing and grubbing of entire site (January).
- 2004 Site survey and delineation of landfill limits.
- 2004 Sampling and evaluation of existing cap (April).
- 2004 Approval of final design of cap.
- 2004 Groundwater monitoring construction.
- 2004 New landfill cap construction completed.

In 2009, Voorhees Township in association with the Voorhees Environmental and Cultural Education Foundation (VECEF)[2], a non-governmental organization with the mission of pursuing the establishment of the Voorhees Environmental Park at the former site of the Buzby Brothers Landfill , erected a sign announcing the future site of the park. In August of 2010, the Voorhees Township committee approved the community-university partnership with Rutgers University to pursue the design and implementation of the public park.

Notes

1. Margaret Epley was the widow of Millard Epley and the sole stockholder of Buzby Brothers. Mrs. Epley became president of the corporation after her husband, Millard Epley, passed away in 1969 (Maykuth 1987, "Trouble In Paradise"). Margaret Epley passed away at the age of 78 in 1997 after being assaulted in her Erial home in an attempted burglary. Her death was ruled a homicide. (Jennings 1997, "Death of Erial Woman has been ruled a homicide").

2. The VECEF mission statement is: “The Voorhees Environmental and Cultural Education Foundation (VECEF) is a non-profit organization committed to fostering an understanding and appreciation of the natural environment through the creation of an environmental park in Voorhees, New Jersey. The park is a unique brownfield to greenfield project that will be an ideal venue for environmental and cultural events and activities that educate and inform the general public about the principles of ecological stewardship and environmental remediation” (VECEF).

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Historical Timeline References

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1.2 Local Scale Environmental Conditions

1.2.1 Local Scale Wetlands and Aquifer

Adam Cesanek

Voorhees Environmental Park sits on the 3,000 square mile Kirkwood Cohansey Aquifer. Two rock formations make up the aquifer, the sandy Cohansey formation and the clayey Kirkwood formation (New Jersey Geological Survey). The aquifer is responsible for capturing 20 out of the 44 inches of rainfall it receives each year (Pinelands Preservation Alliance). Local groundwater wells pull water from the aquifer, which also feeds streams, rivers and wetlands. Since the Kirkwood-Cohansey Aquifer sits relatively close to the surface, it is widely regarded as one of the most ecologically important aquifers in that it provides the necessary conditions for life to most of the Pine-Barrens (Pinelands Preservation Alliance). Figure 1 shows a section cut through many aquifer layers, the Kirkwood-Cohansey would be the aquifer closest to the terrestrial environment. However, the aquifer has a “deltaic deposition” in that clay beds have formed over 30 drainage basins throughout the region which are connected through a system of rivers, streams and tributaries (Pinelands Commission 3). Kettle Run aquifer basin sits closest to our site and provides habitat for many native New Jersey flora and fauna.

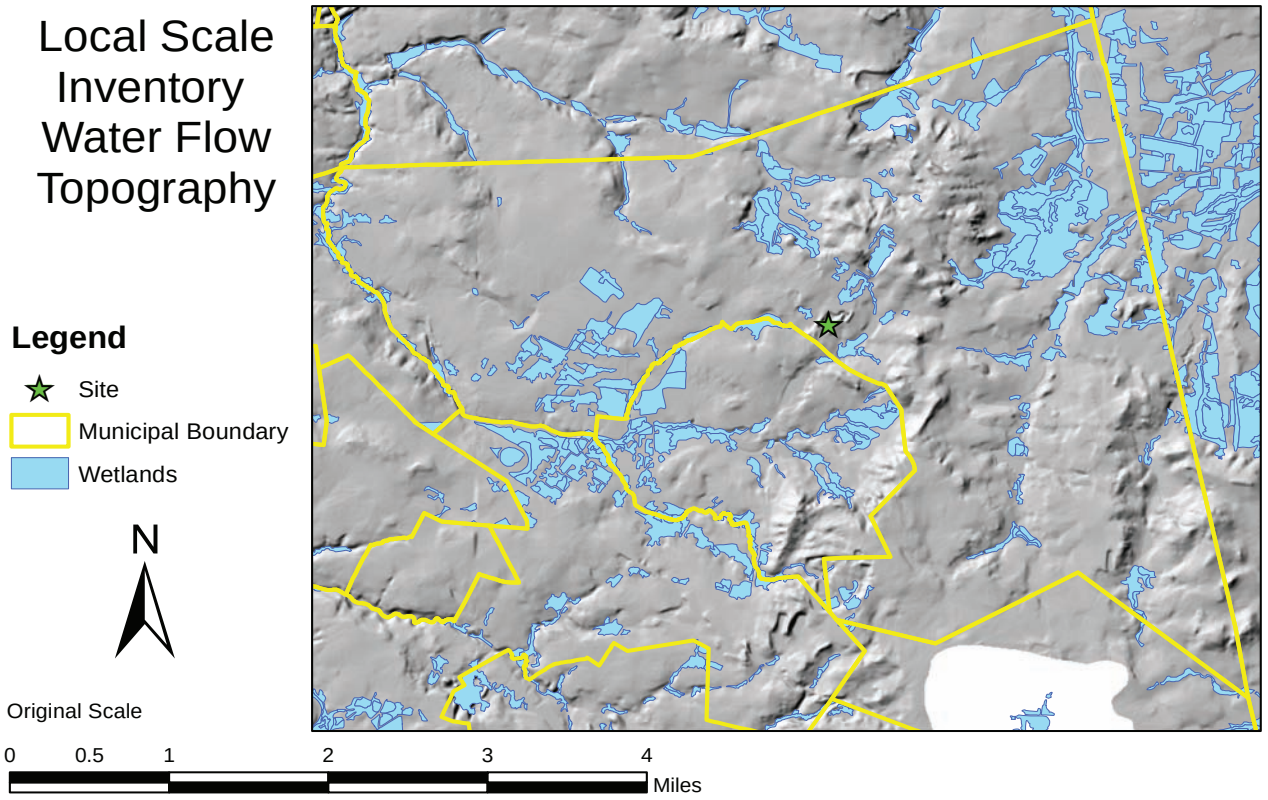

Figure 1. Local Scale Inventory of Wetlands and Elevation

Due to the high water table, Voorhees and the surrounding municipalities are speckled with many wetlands. The Digital Elevation Model in Figure 2 shows that most wetlands are located at lower elevations along streambeds. Such streams and rivers are an important part of the cultural landscape throughout Southern New Jersey. In the neighboring town of Cherry Hill, Evans Pond, Walworth Lake and Cooper Park create an important public recreation area and are part of a larger green corridor that stretches all the way to the Delaware. Similarly, in the neighboring town of Medford the Oakwood lakes are an important public recreation area and also serve to define the historic character of the town. In Figure 2, the Oakwood lakes are characterized by the high density of wetlands in the eastern portion of the frame. We have interpreted from Figure 2 that our site occupies a pivotal area between wetlands created by tributaries of the Delaware versus and

those created by inland water bodies. Straddling the area between these two separate, but connected water-systems, the Voorhees Environmental Park becomes part of a much larger web of connections. Figure 3 shows a distance relationship between our site and the adjacent wetlands. It seems that there is a dramatic increase in total wetland area at a two mile radius of the site, compared to those within one mile of the site. Therefore, the pond located on the site and the adjacent Wilderness Lake, are truly an amenity to the local residents of Centennial Mills and the neighboring residential communities. Overall, the abundance of wetlands give a unique character to Camden County and Southern New Jersey, something which we hope to highlight in our redesign of Voorhees Environmental Park.

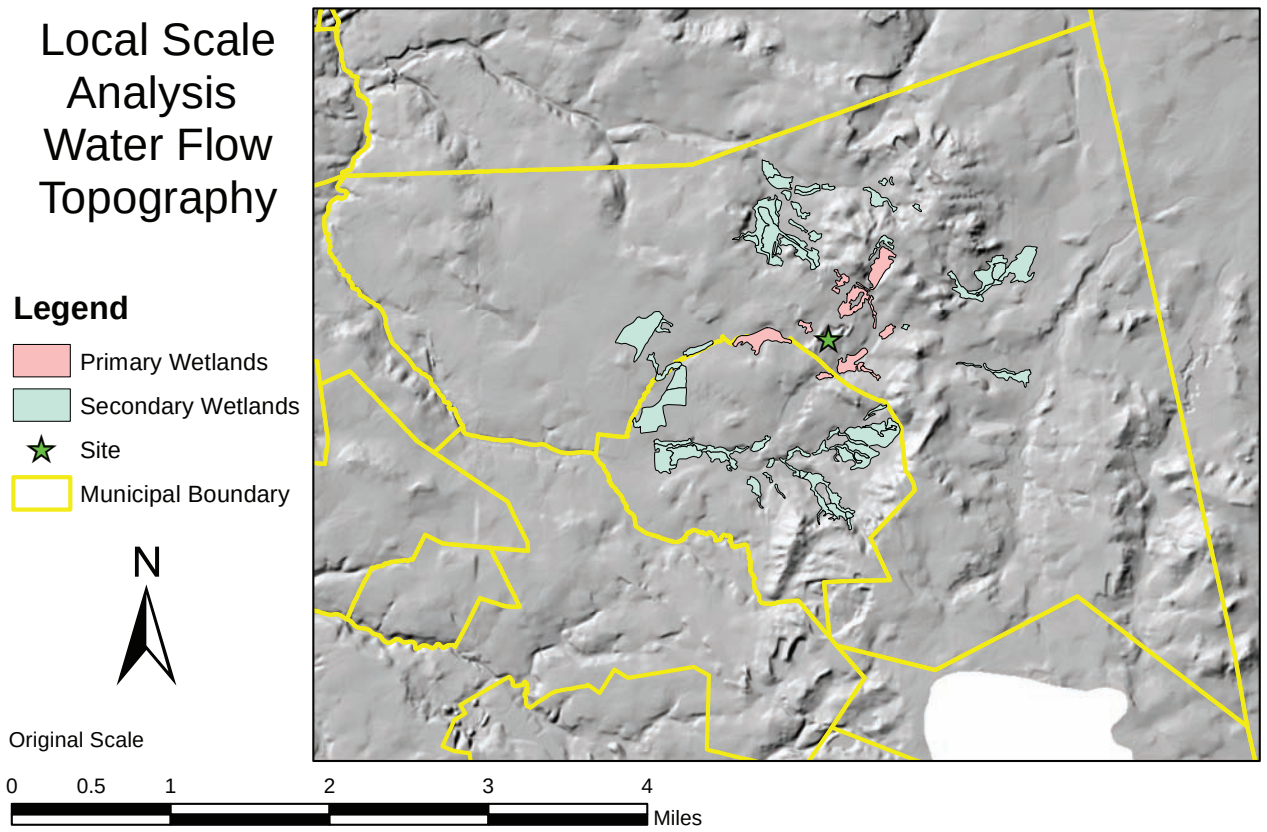

Figure 2. Local Scale Wetlands and Elevation Analysis

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1.2.2 Tree-covered Habitat

Kevin Perry
Mukta Jadhav
Denisse Ortiz
Erik Maietta

Voorhees Township and the surrounding municipalities have a high percentage of land developed for suburban residential, retail, and commercial use. Such land use will be examined in detail in the section to follow. However, as important as it is to understand where things *are* in the landscape, it may be as important to understand where things *are not*. Through an informal survey of Google Earth and *The Central Camden County Bicycling & Multi-Use Trails Master Plan*, a map has been developed showing the tree-covered open space available in the township-scale vicinity of Voorhees Environmental Park. This map is not meant to be scientifically rigorous; instead it is meant to get us thinking about Voorhees Environmental Park in the context of the tree-covered habitat it may provide for avian and terrestrial animals.

Figure 1. Tree-covered habitat

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1.3 Environmental Conditions: Local Scale (Township)

1.3.1 Demographics

Kevin Perry
Mukta Jadhav
Denisse Ortiz
Erik Maietta

Voorhees Township was incorporated in 1899 and has a present day population of over 31,000 residents.

Population Density

As of a 2009 projection, Voorhees Township has a population of 31,847[1] residents spread over a land area of 11.6[2] square miles for population density of 2,745 persons per square mile. That figure ranks higher than the population densities for Camden County and the State of New Jersey at 2,330[1,3] and 1,174[1,3] persons per square mile respectively.

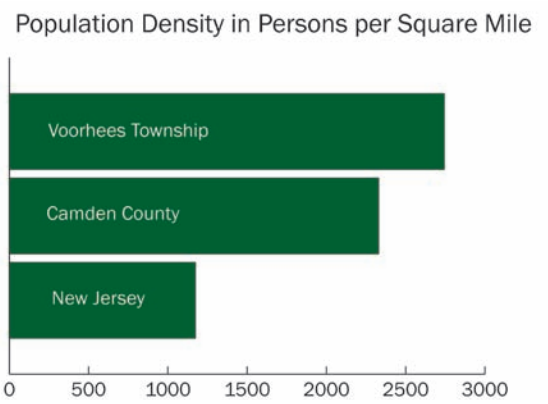

Figure 1. Population Density [1,2,3]

Demographic Diversity

Of the 31,847 residents of Voorhees Township, a majority are classified by a 2009 projection as *White alone*, accounting for 72% of the population. Other large populations within the community are *Asian Alone*, *Black or African American alone* and *Two or more races* at 12%, 8%, and 5% of the population, respectively [4]. Among the total population of Voorhees Township, 4% are of Hispanic or Latino/a descent[6]. In comparison with statewide numbers, the *White alone* and *Asian alone* percentages are higher in Voorhees Township, while the *Black or African American alone* and *Two or more races* are lower[7], while 16% of New Jersey residents are of Hispanic or Latino/a descent[8].

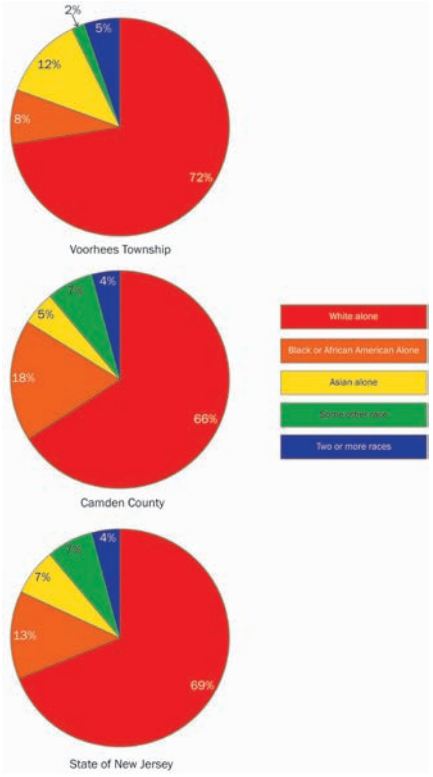

Figure 2. Demographic Diversity [4, 5,7]

Age

It does not appear in U.S. Census spreadsheets, but we know that there is an active adult community located just across Centennial Boulevard from the Voorhees Environmental Park.

In 2009, the median age of Voorhees Township residents was projected at 40.6 years[9]. This is an increase over the result of the 2000 Census, which listed a median age of 37.2[10] years. During the same period, the population of New Jersey saw its projected median age increase from 36.7 [10] to 38.3[9], while in the United States, the median age increased from 35.3 [10] to 36.5[9].

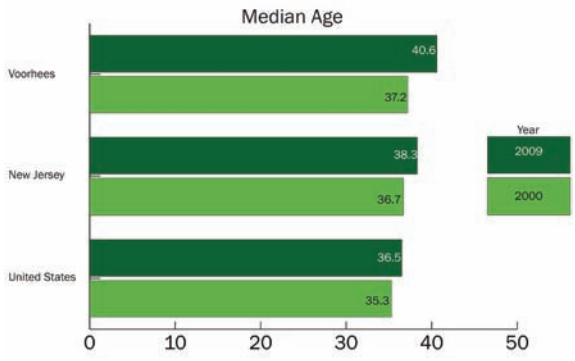

Figure 3. Median Age [9, 10]

Educational Attainment

The population of Voorhees Township displays a high level of educational attainment with 52% [11] of the population having attained either a bachelor's degree or higher. That percentage stands large in comparison to the state and national averages at 35%[12] and 27%[13] respectively. Furthermore, the Voorhees Township population displays a rate of 91% [11] having earned at least high school diploma or equivalent, while that figure at the state and national levels shows as 87%[12] and 85% [13] respectively.

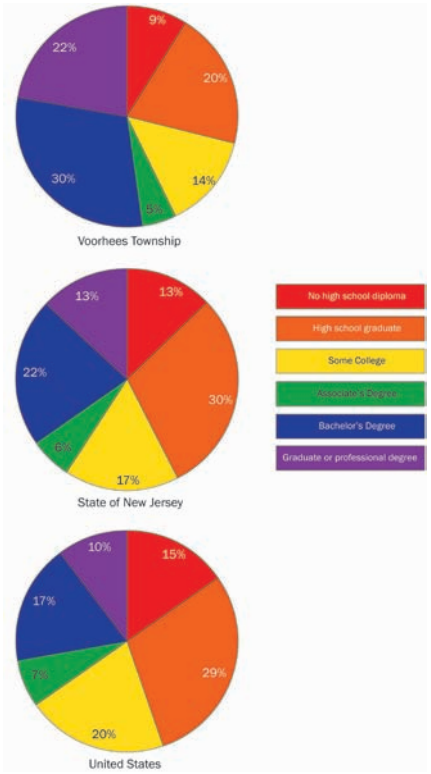

Figure 4. Educational Attainment [11,12,13]

Household Income

The median household income in Voorhees Township is $84,869[14]. This is a higher rate of income than displayed at the county, state, and national levels, showing $60,362[15], $68,981[16], $51, 425[17], respectively. The average household income in Voorhees Township is $111,448[14].

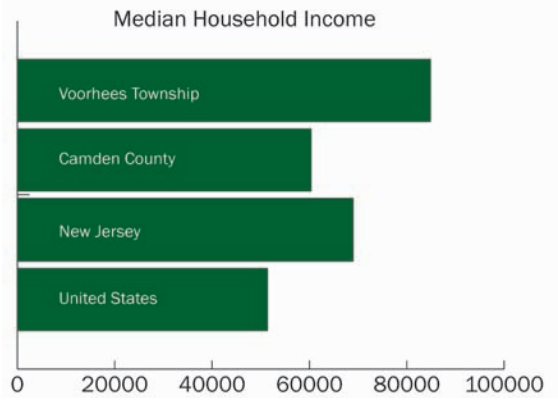

Figure 5. Median Householf Income

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1.3.2 Building Uses

James Bykowski

The building uses in the area surrounding the Voorhees Environmental Park was looked at in a 3.75 mile radius. The radius represents the largest number of potential users of the park. The majority of the buildings are residential homes. These residents will represent the major users of the future park. The largest group within walking distance will be the residents of Centennial Mills located directly to the west of the site across Centennial Boulevard.

The second largest residential area within walking distance is located to the east of the site. Current conditions do not allow access to the site because of a fence on the eastern side of the site.

Retail buildings are the second largest number of building in the radius around the site. Theses buildings show us that employees and shoppers represent some potential users to the site. The employees and shoppers will more than likely not reside in the 3.75 mile radius and come from further away which creates opportunity for more people to find out about the future park.

The remaining building uses mapped are office, medical, and industrial buildings. These buildings represent the smallest number of buildings in the radius. Though there are not a lot of buildings they are the largest and have the most people using them. These people could represent local residents or individuals who will travel the furthest to get to these buildings. Giving the park a further range of potential users.

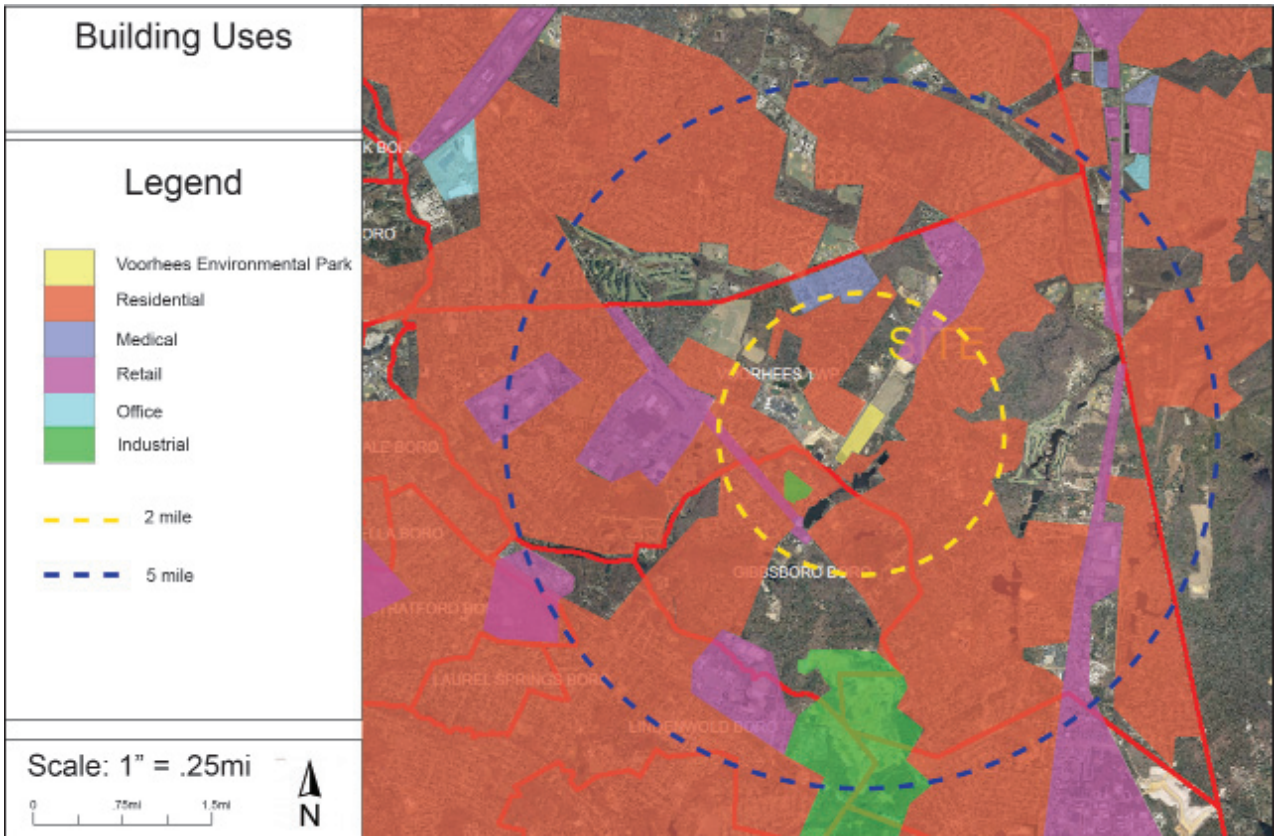

Figure 1. Building Uses Map. (Not to original scale)

1.3.3 Zoning

Mukta Jadhav
Denisse Ortiz

Through the evolution of the research we developed a zoning study for the site and its surrounding within 3 miles radius of its center. The main purpose of this study was to understand the site and its relationship to the town and to locate potential users of Voorhees Environmental Park that will help to frame the programming of the design.

Zoning is done with the purpose of dividing to prevent new projects from interfering with the character of the community. Zoning can reflect regulatory policies in myriad forms such as those suitable to specific lots (i.e. open space, commercial, agricultural, residential and soon), the densities at which these activities can be performed

We developed few analytical maps that helped us understand the factors we needed to consider during the stage of designing. These factors are:

- Users and their location
- Proximity to the site
- Land use in the surrounding areas of the site within walking distance

Analysis:

Zoning categories (Fig. 1) within the township includes Residential, Commercial, Institutional, Recreational, Woodland and Water bodies. Proximate to Voorhees Environmental Site major land uses are Residential and Commercial.

Although there is a mix of zoning and uses, which generally contributes to the vitality of an area, the fact that there is a lack of public space designed to facilitate passive social interaction, and a lack of pedestrian scale and amenities within the areas proximate to the site.

Figure 1. Inventory

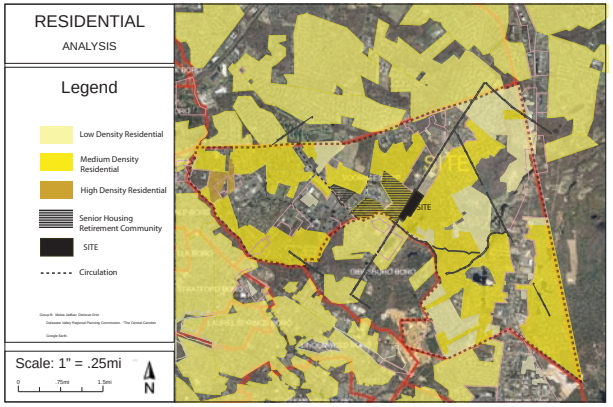

Figure 2. Density of Residential Zones

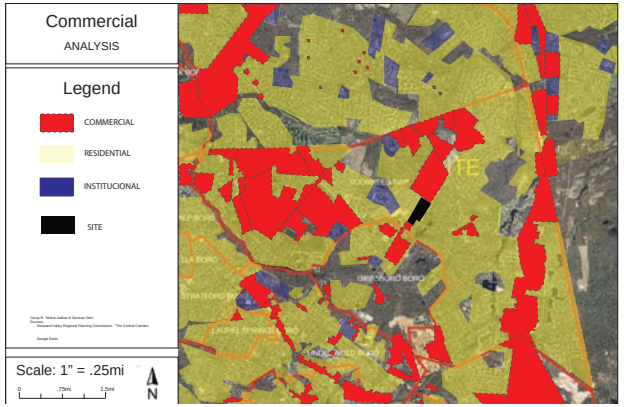

Figure 3. Commercial Zones

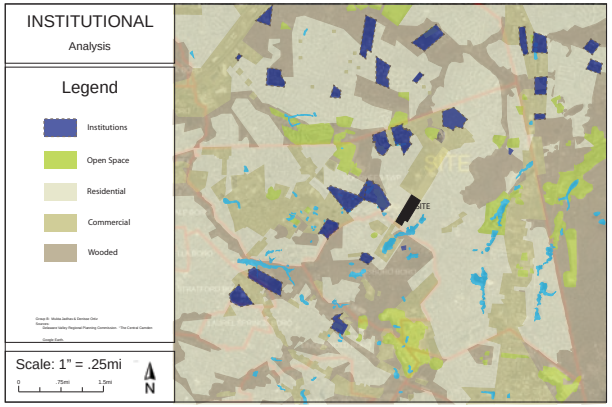

Figure 4. Instituional Zones

The first impression of the site location is its location at the center of the township entirely surrounded by residential land and a proposed residential medium density single family development on the south side of the site

The major residents in the residential zone within close proximity are active adults. All the open spaces and parks in Voorhees offer active recreational facilities. This suggests the need of passive recreational facilities in the township. [Fig.2]

Commercial areas frame the border of the township dominates considerably its appearance. Commercial uses are within walking distance from the site; this increases the possible number of users coming in for leisure activities. [Fig. 3]

As environmental education is also one of the important aspects of Voorhees Park, we expect the students of Voorhees and the neighboring town's educational institutions to visit the park. There are quite a number of educational institutions that will benefit from Voorhees and even from neighboring towns. [Fig. 4]

1.3.4 School Map

Wan Huang

There are four elementary schools and two secondary schools in Voorhees Township. Among them, Eastern Intermediate High School and Eastern Senior High School is one mile away from the site, and five other schools are less than five miles from the site. Currently there is no certified wild school site in Voorhees, which conducts schoolyard habitat projects recognized by the Alliance for New Jersey Environmental Education.

The landfill site and the future installation of solar panels in the park provide a unique and valuable education opportunity to showcase the educational benefits of the remediation process and the cutting edge green energy technology. The site has a great potential in developing as an outdoor education and experiential education center for school students in Voorhees.

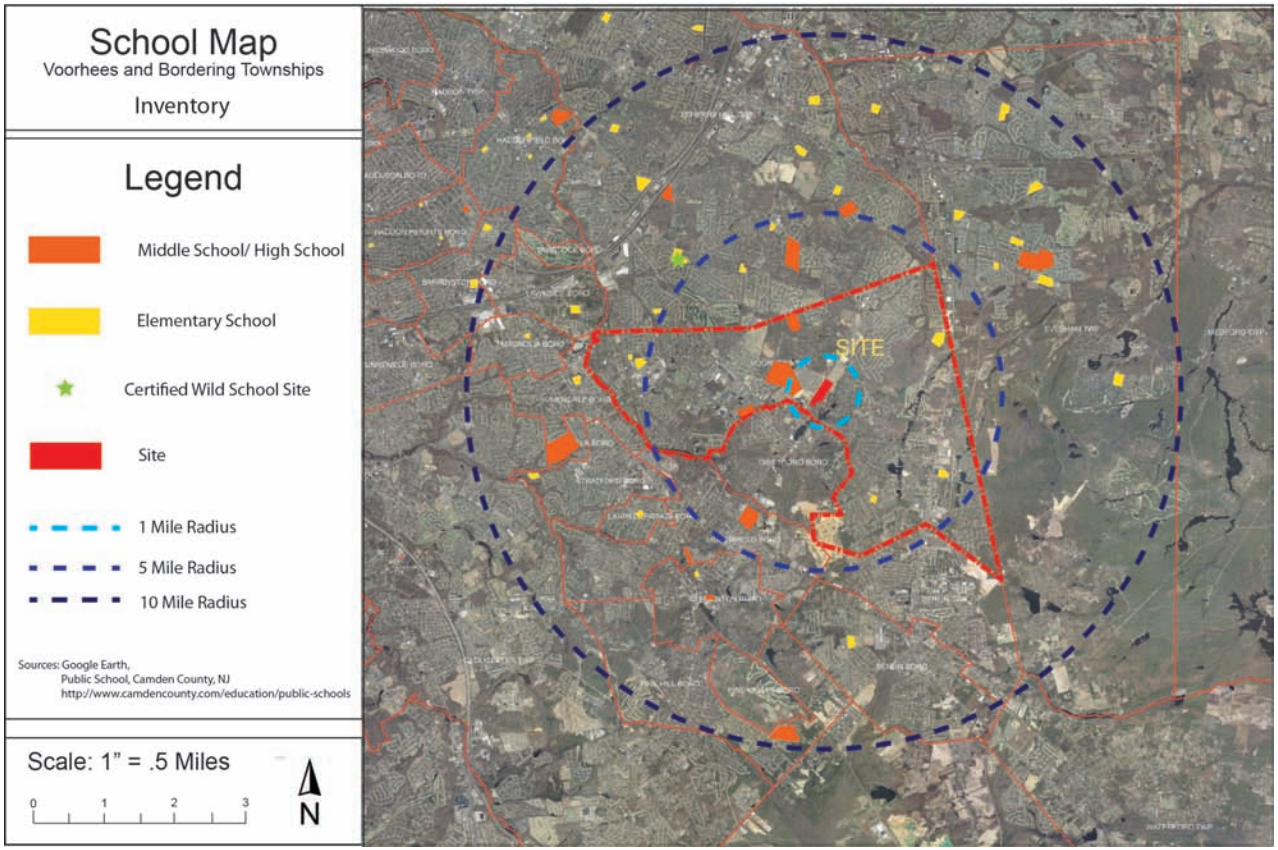

Figure 1 Regional School Map

1.3.5 Circulation

Baewon Suh

Currently Voorhees Township and the surrounding communities, offers several multi-functional trails and bicycle lanes for use by non-motorized traffic. However these existing trails and bike lanes are fragmented and occur mainly around major shopping centers and schools, forcing people to heavily rely on motorized transportation to travel between the various parks and shopping centers. There is currently a major bike lane running along Centennial Blvd. which directly connects Gibbsboro to the project site. Designs which integrate the existing paths within the township are necessary to synergize the functionality of connecting the residents to the amenities offered within the township without using a car.

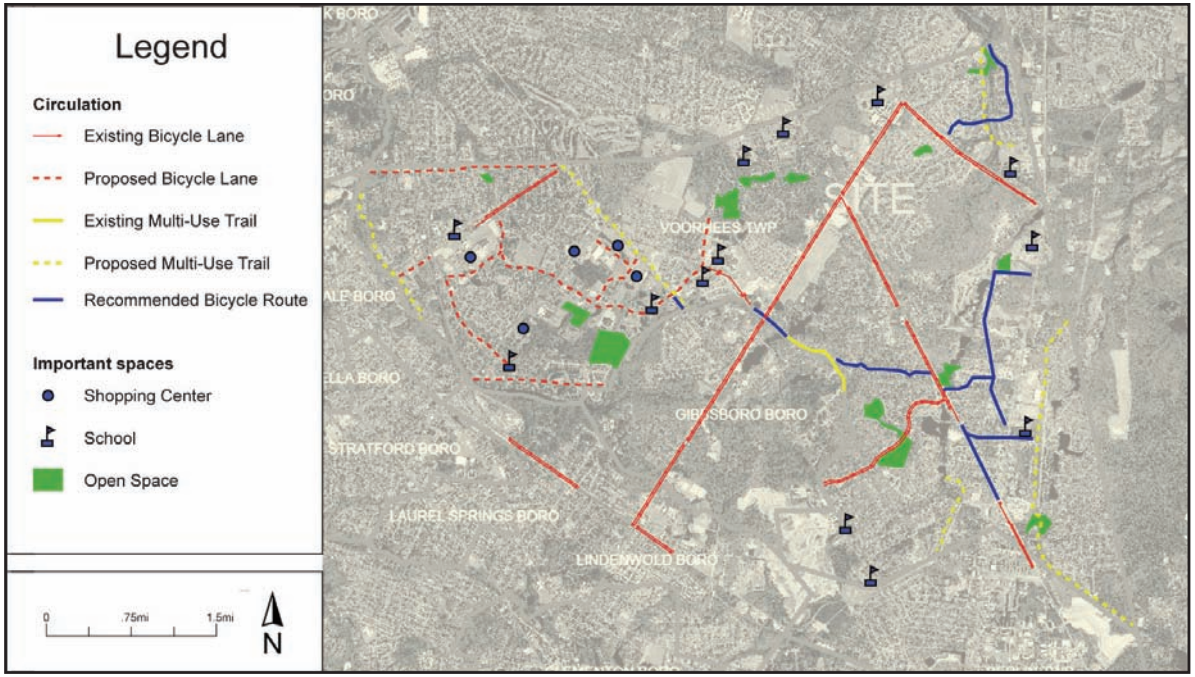

Figure 1. Circulation inventory map

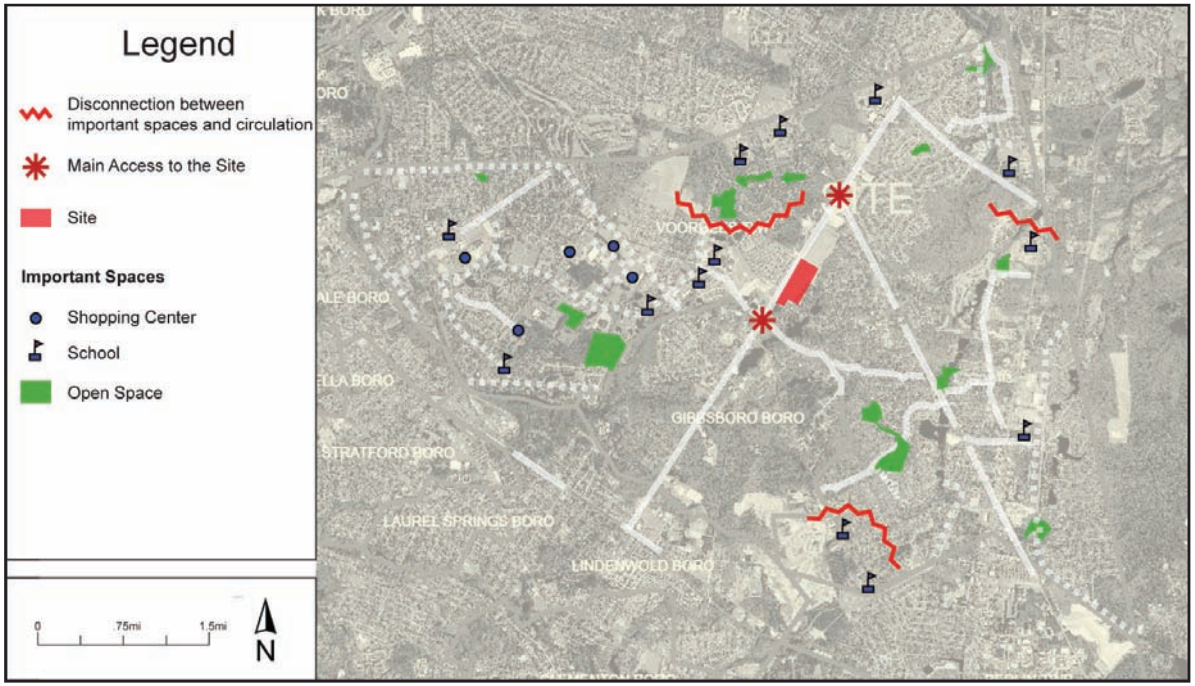

Figure 2. Circulation analysis map

1.3.6 Amenities & Open Space System

Kris Kemper

An inventory of the various recreational amenities offered in Voorhees Township and the surrounding communities, shows that there is an abundance of active recreation but a lack of passive recreation (figure 1). The definition for what classifies an activity as either passive or active recreation was taken from the EPA which defined the terms as following:

Active Recreation- refers to any type of structured individual or team activity which requires the use of special facilities, courses, fields and equipment.

Passive Recreation- refers to activities which do not require the use of prepared facilities such as sports fields or pavilions.

There are many sites, such as the high school just west of the project site, which offer several types of facilities for active recreation like tennis courts, soccer fields and football fields. There are also several athletic field complexes in the township containing similar features. Due to these amenities being located on school grounds or in athletic complexes, there are often scheduled events, making it difficult for a person to enjoy these facilities at their leisure. Also while these sites offer many active recreation activities, they do not offer many passive recreation activities such as nature observation or walking trails.

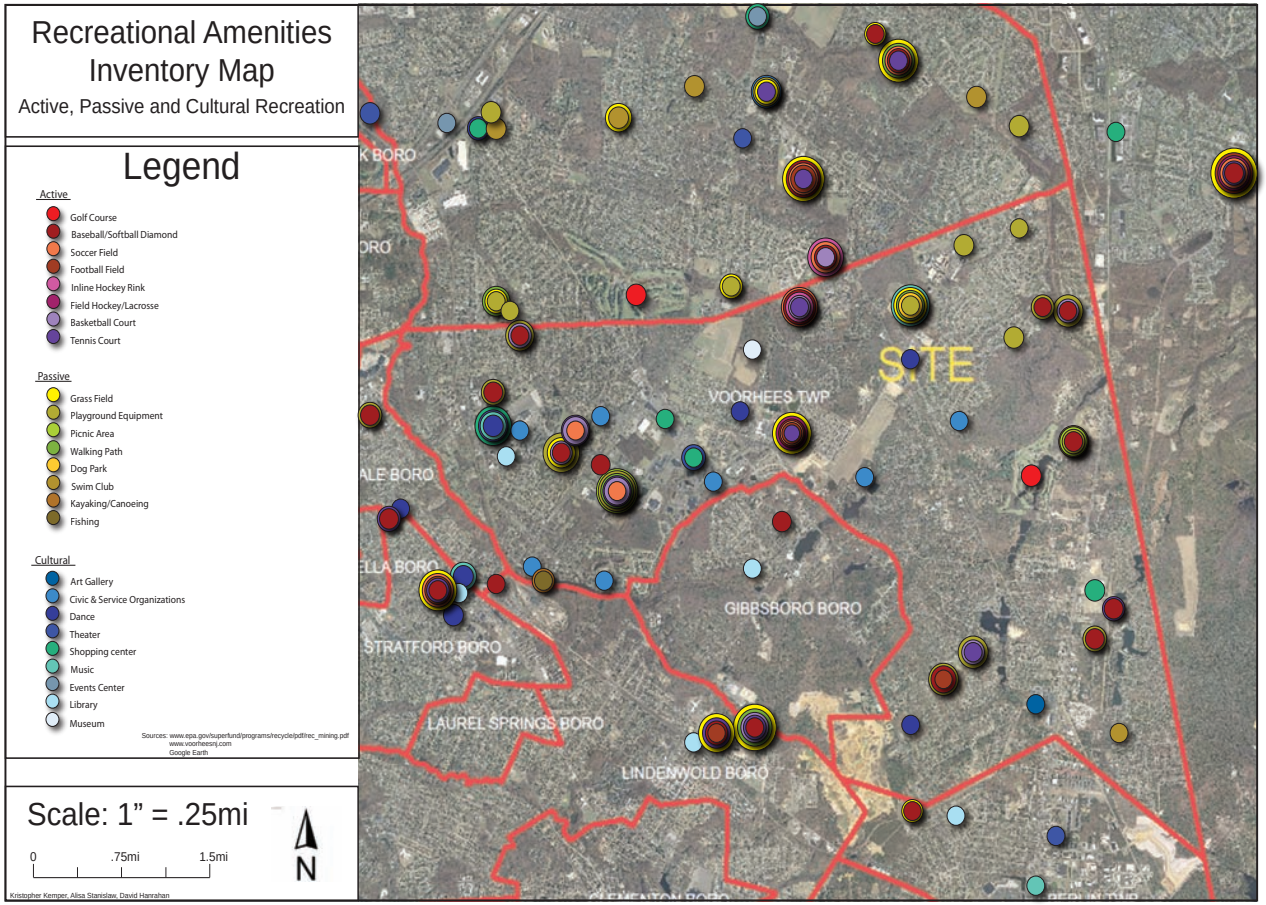

Figure 1. Inventory Map of Recreational Amenities offered in and around Voorhees Township (image not to original scale)

There are a few sites which also have a walking path or open grass field which can accommodate some passive recreation, but overall active recreation abounds. There is one exception which is Connolly Park, located approximately a mile north of the project site. Connolly Park features only passive recreation amenities and contains no athletic fields for structured sports activities. The parks designed in this studio will attempt to accommodate for this lack of passive recreation in the local area.

An analysis of the amenities and open spaces within Voorhees Township shows that many of the sites offering recreation are located near schools and shopping centers. It also shows that the majority of the land within the township and surrounding areas has been developed. There is also a clear void of amenities located to the south and east of the project site which are mostly residential developments. This means that people living in this area will most likely have to drive their car to other areas of the township for recreation. There is also no clear open space system which exists in the township serving to link the various parks. Building a park at this location on Centennial Blvd. will play a vital role in filling in this void, giving the people living in the nearby residential developments a place for recreation within walking distance. A park in this location could also be a key link in creating an open space system given the existing bike lane on Centennial Blvd. as well as the sites close proximity to Connolly Park. As pointed out in the inventory and analysis of the local circulation, the existing open spaces in the township are very disconnected from each other, forcing people to rely on vehicular transportation.

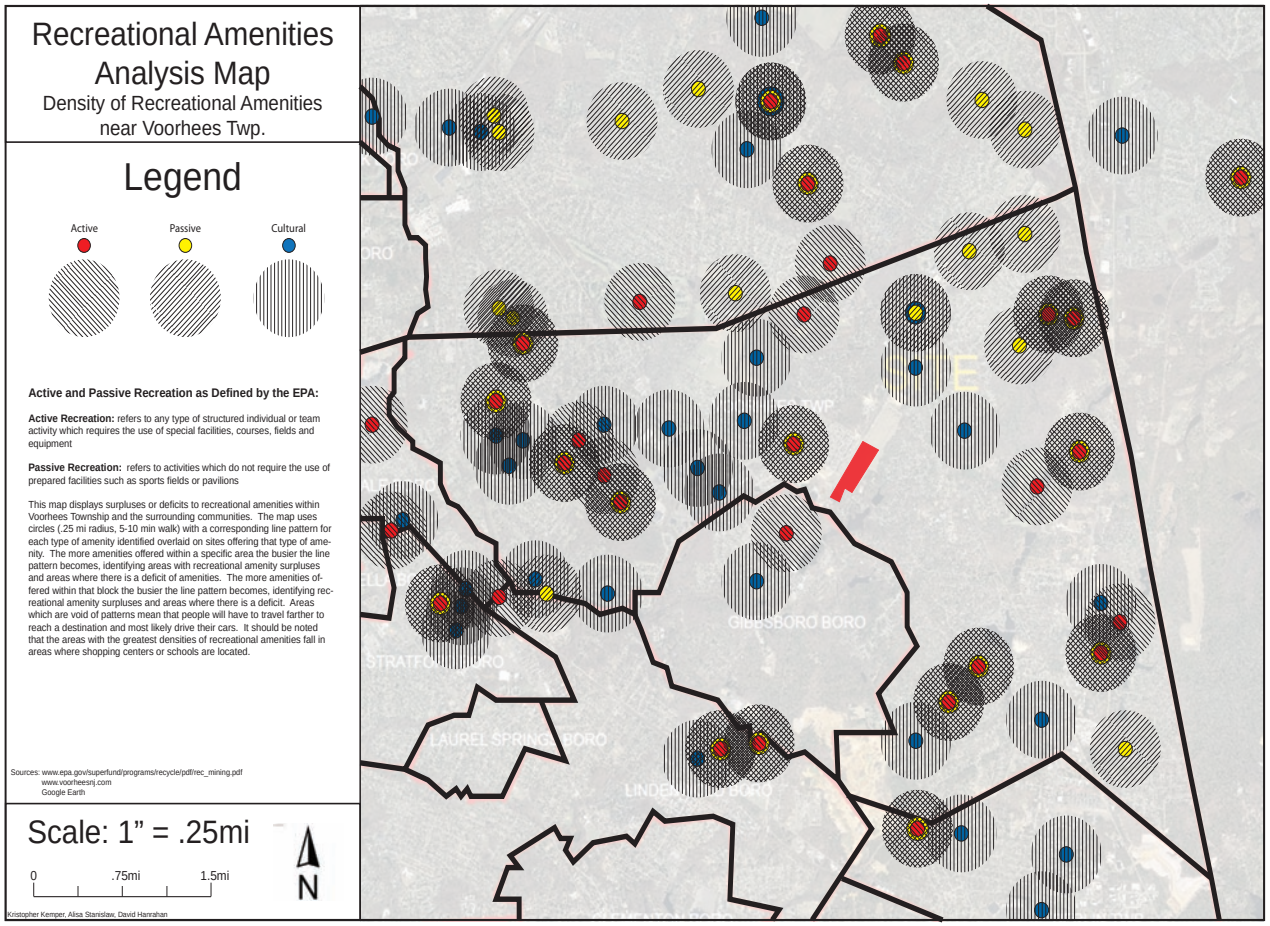

Figure 2. Analysis Map of Recreational Amenities offered in and around Voorhees Township (image not to original scale)

References

Google Earth, Google

www.epa.gov/superfund/programs/recycle/pdf/rec_mining.pdf, accessed on 10/23/2011.

1.4 Environmental Conditions: Site Scale

1.4.1 Character of the Site

Kevin Perry
Kim Nuccio

Successfully transforming this landfill into an Environmental Park requires a thorough understanding of the environmental conditions, risks, and limitations of such a site. The site is essentially void of any tree cover, except in the pond area, which is fenced off; the rest of the site has been clear cut. Remediation of this landfill has two primary components: earth and groundwater. A two-foot soil cap covers the site and at this point is considered stabilized and safe for use. Groundwater remediation is ongoing and continued access to a ring of monitoring wells will be required as part of the final design.

A first step in landscape design is to acquire an understanding of the existing conditions of a site. The photographic spread of Figures 1-17 provides an accounting of the existing conditions of the Voorhees Environmental Park as we have experienced them.

Figure 1. A chain-link fence separates the pond from the rest of the site.

Figure 2. A view of the pond from the high ground of the landfill cap.

Figure 3. Students descend an earthen ramp leading from the landfill cap down to the pond.

Figure 4. Monitoring wells like this one are found around the border of the site, protruding 18 inches above grade.

Figure 5. Owners of adjoining properties were allowed to choose their own fencing materials on the southern borders.

Figure 6. View to the north. The mound in the background is part of the neighboring landfill owned by GE.

Figure 7. A cleared field houses equipment used in the landfill remediation process.

Figure 8. A retention basin collects water shed from the GE landfill and the eastern portion of the Voorhees landfill.

Figure 9. Long stretches of chain link fence define many borders of the site.

Figure 11. A view along the northeastern border of the site.

Figure 13. A stone-bottom swale directs water into a deeper swale which channels water toward the pond.

Figure 17. An aerial view of the current conditions of Voorhees Environmental Park, with image cues keyed to Figures 1-16.

Figure 14. Centennial Mills is an active adult community directly across Centennial Blvd. from the site.

Figure 15. A long view of the street-facing northwestern border of the site with post and rail fencing.

Figure 10. A long view from northeast to southwest.

Figure 12. A long view of the northeastern border of the site.

Figure 16. A view across the site, from the western corner looking eastward.

1.4.2 Climate and site conditions

Jim Taranto

The climate of Voorhees Township is such that is experiences all four season throughout the year. The average temperature in January is 32.9 degrees, in April 53.4 degrees, in July 76.8 degrees, and in October is 56.7. The average annual precipitation is 45.95 inches with a high of 4.52 inches in July and a low of 2.76 inches in February.

The summer solstice, the longest day of the year, occurs on June 21st in the northern hemisphere. On this day the sun rises 23.5 degrees north of east and sets 23.5 degrees north of west. During the summer the sun crosses the southern sky at a higher angle creating longer days, and shorter shadows. During the winter solstice, which is the shortest day of the year and occurs on December 21st, the sun rises 23.5 degrees south of east and sets 23.5 degrees south of west. During the winter months the sun crosses through the southern sky at much lower angle than the summer months creating shorter days and longer shadows.

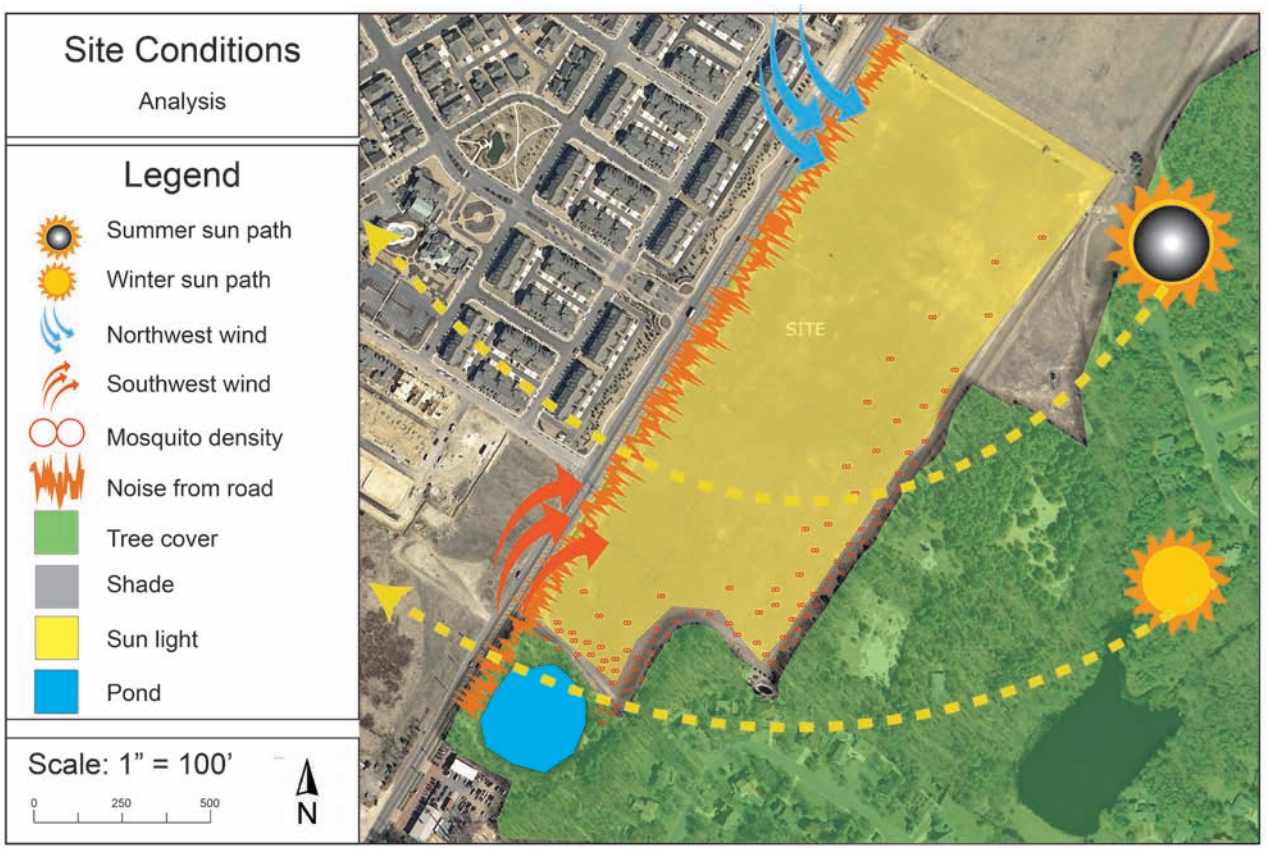

Figure 1. Climate and Site Conditions Map

The sun's trajectory doesn't have much of an effect on the existing conditions of the site but because solar panels are a major part of everyone's designs this information becomes very important and will be explained in further detail later.

The site currently is bordered on all four sides by fencing that varies between chain link and different styles of white post and rail. This creates a physical boundary for the site, but does not do much to create a uniform spatial border.

Both the cool northwest winds and warm south west winds blow across Centennial Boulevard and onto the site. The existing conditions provide no buffer to block the wind which creates both a physical and audible discomfort. We experienced that it was difficult to have a conversation without shouting at the person you were talking to when standing in close proximity to Centennial Boulevard. With no existing buffer in places winds are constantly blowing across the site and there exists nowhere to seek refuge.

As you move further away from the road it becomes audibly more pleasant to be in the space because the noise decreases, but as you move closer to the pond and eastern edge, there is a high density of mosquitoes, due to the standing water in the pond.

With nothing but grass covering the majority of the site, there is very little shade making it an

Month	Average	Max Average	Min Average
January	32.9°	41.2°	24.5°
February	35.5°	44.8°	26.2°
March	43.8°	54.2°	33.4°
April	53.4°	64.7°	42°
May	62.9°	74.0°	51.8°
June	71.9°	82.4°	61.3°
July	76.8°	86.8°	66.8°
August	75.4°	85.4°	65.3°
September	68.2°	78.2°	58.1°
October	56.7°	67.2°	46.2°
November	47.1°	56.7°	37.5°
December	37.7°	46.1°	29.2°

Figure 2. Voorhees Township Average Temperature Chart

ideal location to integrate solar panels and trees into the park design. This presents a tremendous opportunity to fully explore the possibility of these seemingly mutually exclusive ideas.

On the north eastern side of the site near the General Electric landfill exists the high point of the terrain which is roughly 23 feet above the fluctuating water level of pond. The site appears relatively flat to the human eye except for near the pond where the land drops off steeply down to the water level.

Figure Source List

Fig. 2. Data based on Homefacts, “Voorhees-Township Weather Information.” Last modified 2011. Accessed December 7, 2011. http://www.homefacts.com/weather/New-Jersey/Camden-County/Voorhees-Township.html.

1.4.3 Vegetation and Fencing

Alisa Stanislaw

Vegetation

The site is located in the uplands of southern New Jersey bordering the Pine Barrens. The surrounding woodland bordering the site consists of mixed Oaks, Sweetgums, Sourwoods and a variety of Pines including Pitch Pine and White Pine. On the site itself, grass is the dominant vegetation with Mugwort encroaching the space along with other common weeds found in turf grasses.

There are many trees off the site behind the chain link fence that are in poor condition. The trees of highest quality were White Oaks. Around the pond, there are species that seem to be in healthy condition on and off the site. They include a Pin Oak, Sweetgum, Sourwood, Red Oaks, and Sassafras. After performing an inventory of the site, it seems that the White Oaks and Red Oaks thrive over the rest. To promote infiltration the site is covered in grass, however, it demands high maintenance to mow the 37-acre area, taking up to three days in order to mow according to a Voorhees newsletter in 2006.

There are a few species that are identified by National Invasive Species Information Center in Camden County. Although native, in the pond there are Phragmites growing within the water that do not seem to be threatening to spread throughout the site, Mugwort proliferating along the lawn which if given the opportunity, will out compete the grass, and Ailanthus cropping up along the edges of the site. Also, along the northwestern side of the pond there is an unidentified invasive vine twining and shading out the trees in the area.

Figure 1 . Vegetation and Fencing Inventory Map.

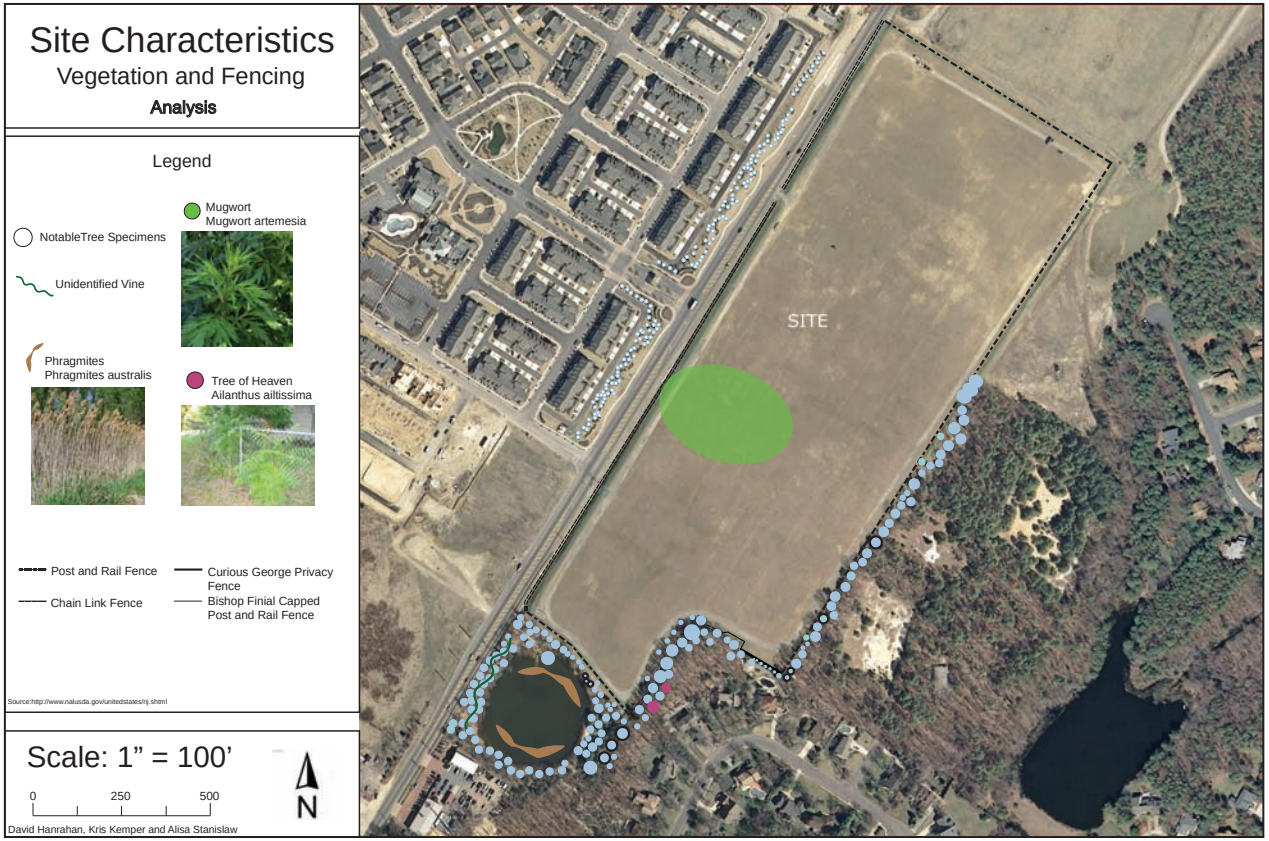

Figure 2 . Vegetation and Fencing Analysis Map.

Fencing

There are four different enclosures fencing in the site. Along the façade is a white plastic post and rail fence parallel to Centennial Avenue, and a chain link extended from it, which is the dominant fence on the site. In its northeast corner, there is a Bishop Finial Capped Post and Rail fence, and a Curious George Privacy fence, which offers privacy for the residence behind it.

When analyzing the fences, the Post and Rail fence along Centennial Avenue gives one a feeling that the site is a field for grazing, while the chain link fence is a sign to stay away. The Bishop finial Post and Rail and the Curious George Privacy fence imply that due to the extra privacy and regal quality there is a residential area behind the fences. Both the residential and Centennial

fences recently replaced the chain link fence, creating a more welcoming environment around the site. The mixture of this industrial looking chain link fence, bucolic horse fence and regal appearing residential fence creates an agglomeration of design languages.

References

http://www.nalusda.gov/unitedstates/njs.html

1.4.4 Site Scale Water Flow

Adam Cesanek

When the Buzby Brothers Landfill was capped, it seems that engineers paid close attention to how the new topography would affect water flow. At a large scale, we can observe that the grading has created a gentle ridge running diagonally across the site from North to South. This allows for water to gently sheet off sides of the site; either running towards the swale along Centennial Boulevard or to the adjacent sparging facility. The slope exponentially increases toward the GE landfill, however, an underground pipe diverts all the water from the neighboring site towards the sparging facility. Due to the vast scale of the site, the drainage relies on a variety of micro-grading tools to prevent stagnant water on the site.

The swale along Centennial Boulevard mitigates the runoff coming from the road and the eastern portion of the site. A gentle ridge is built between the landfill and the swale which is penetrated by rip-rap zones roughly every 500 feet. The rip rap zones give way to gabion walls which ensure that the steep grade of the swale is not lost to erosion. At the southern portion of the site, areas around the pond have been allowed to naturalize and water tolerant perennials decrease the rate of runoff. Due to steep grading near the adjacent residential units, we have observed water pooling at the slope above the pond area. Wilderness Lake, located to the South-East of the site, accepts most of the runoff coming from the sparging facility and neighboring sand borrow pits. A gentle swale running along the eastern portion of the site has naturalized in unmanageable areas around rip-riprap zones, helping to check the flow of water before entering the sparging facility for treatment.

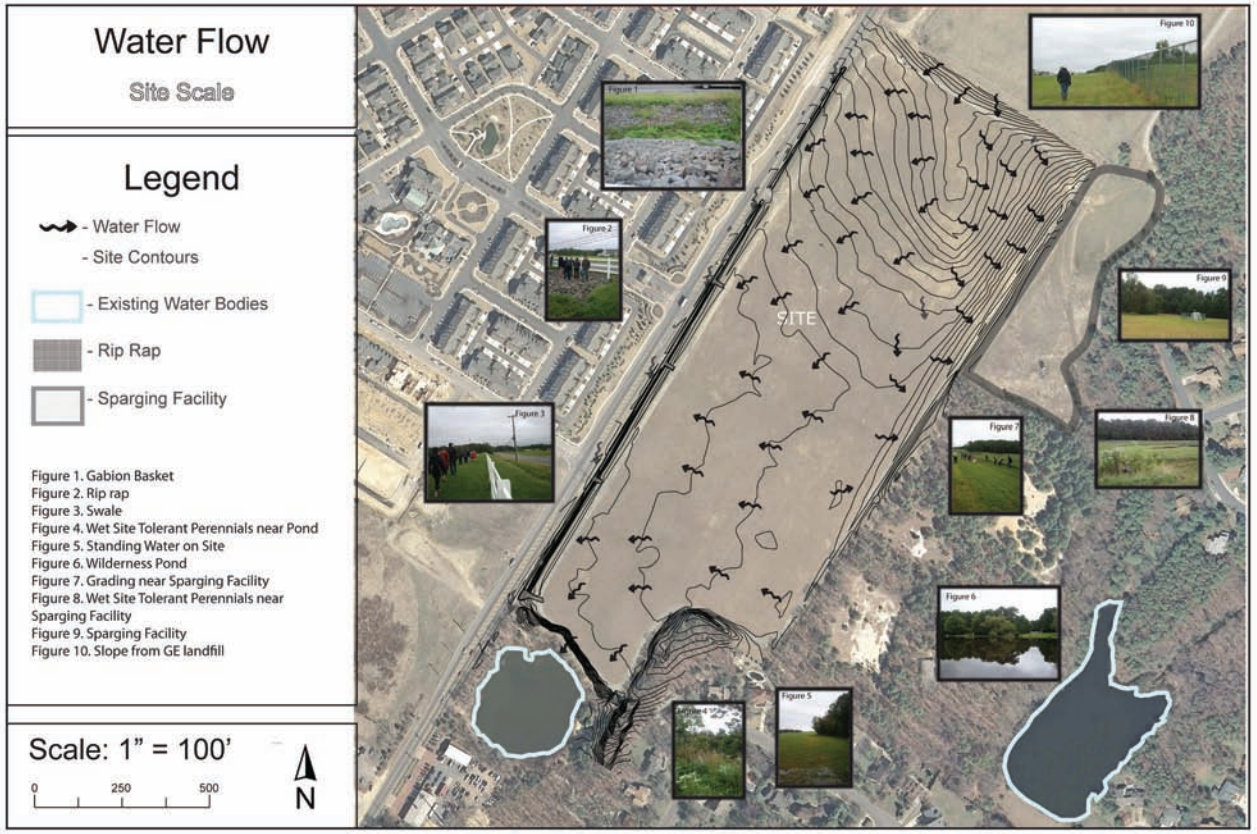

Figure 1. Site Scale Water Flow Inventory

On one of our site visits we happened to have the opportunity of witnessing the storm-water runoff systems in action. It was evident that the swale, sparging facility and other storm water features were functioning quite efficiently, however, certain areas of the site remained inundated and impeded pedestrian circulation. It is our recommendation that a constant grade be applied to areas throughout the southern portion of the site in order to create dry ground for Voorhees Environmental Park.

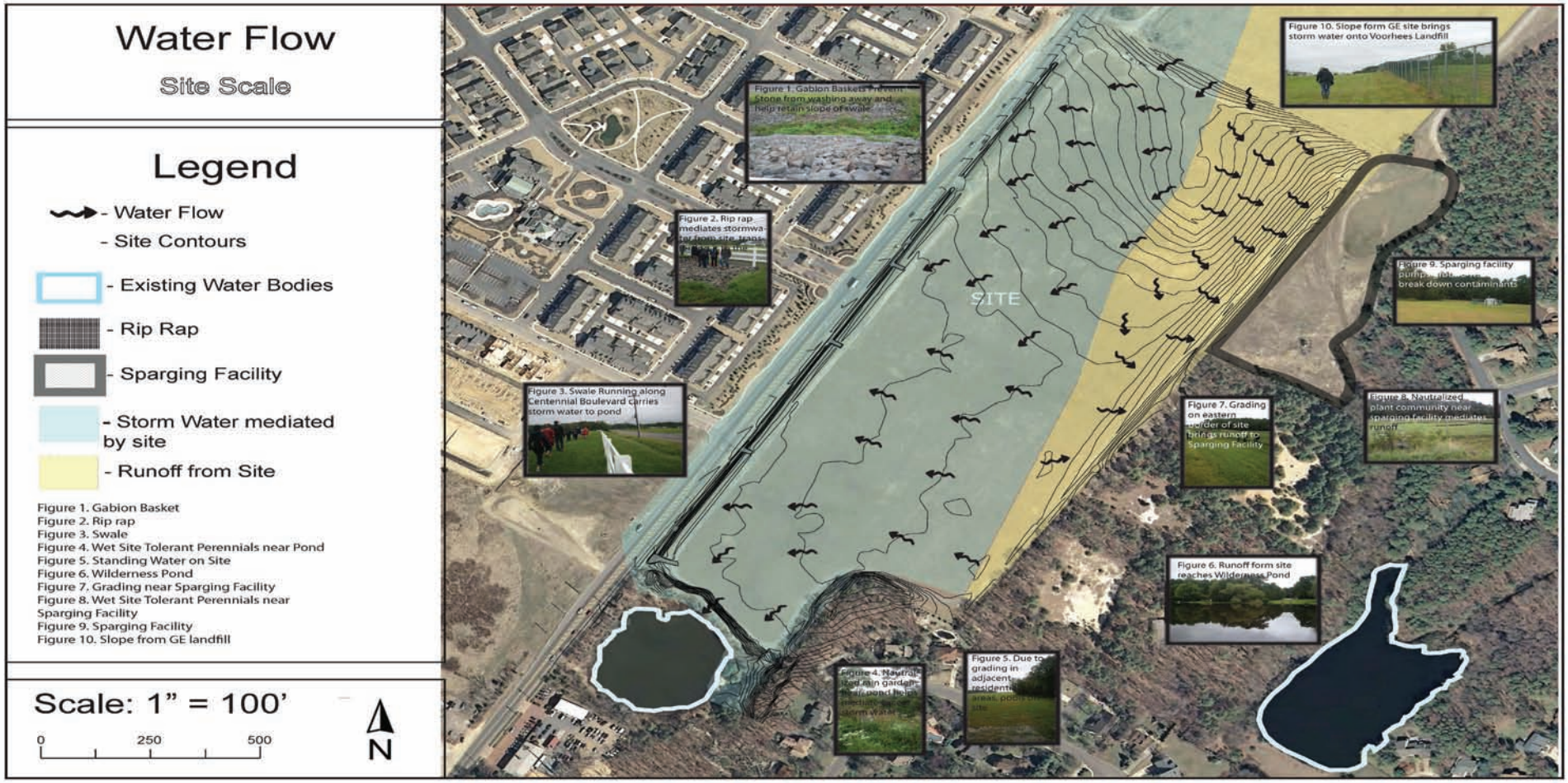

Figure 2. Site Scale Water Flow Analysis

1.4.5 Cap and Contamination

Kim Nuccio

This task included summarizing the environmental and contamination information provided to us by both the environmental consulting firms and the town of Voorhees and to extract information relevant to our project and communicate the findings in the form of maps, diagrams and text.

The approved groundwater remedial action for the site primarily consists of enhanced in situ bioremediation and monitored natural attenuation to address impacts to groundwater and surface water at the Site.

Chemicals in ground water include a variety of compounds known as volatile organic chemicals that continue to be found in concentrations above state standards – this is a known condition with the State and is acceptable as long as an exposure pathway (a way to contact impacted GW) does not exist. Because of this, use of groundwater is not permitted on the site or within neighboring areas.

Groundwater is moving beneath the landfill in an approximate SSW direction, flowing from the GE portion of the LF towards the Voorhees portion of the LF. The retention basin is in an apparent down gradient direction and is fed by GW so it is anticipated that contaminants noted in up gradient GW would impact the retention basin.

Although specific surface water sampling data associated with detention basis does not seem to be present in the report, ground water characteristics at the site (flow direction, and contaminant levels) indicate that public access to the pond should be carefully considered.

As part of the agreement with the State to remediate the site the LF currently operates an active groundwater remediation system, called an enhanced in-situ bioremediation (EISB) system that promotes growth of microbes within the impacted groundwater zone that then feed on the contaminants. This system injects air into this zone to enhance growth of these microbes. This system includes physical structures (wells, headers, filters, etc.) that will require access and maintenance during the life of the system and the park installation will need to ensure this access.

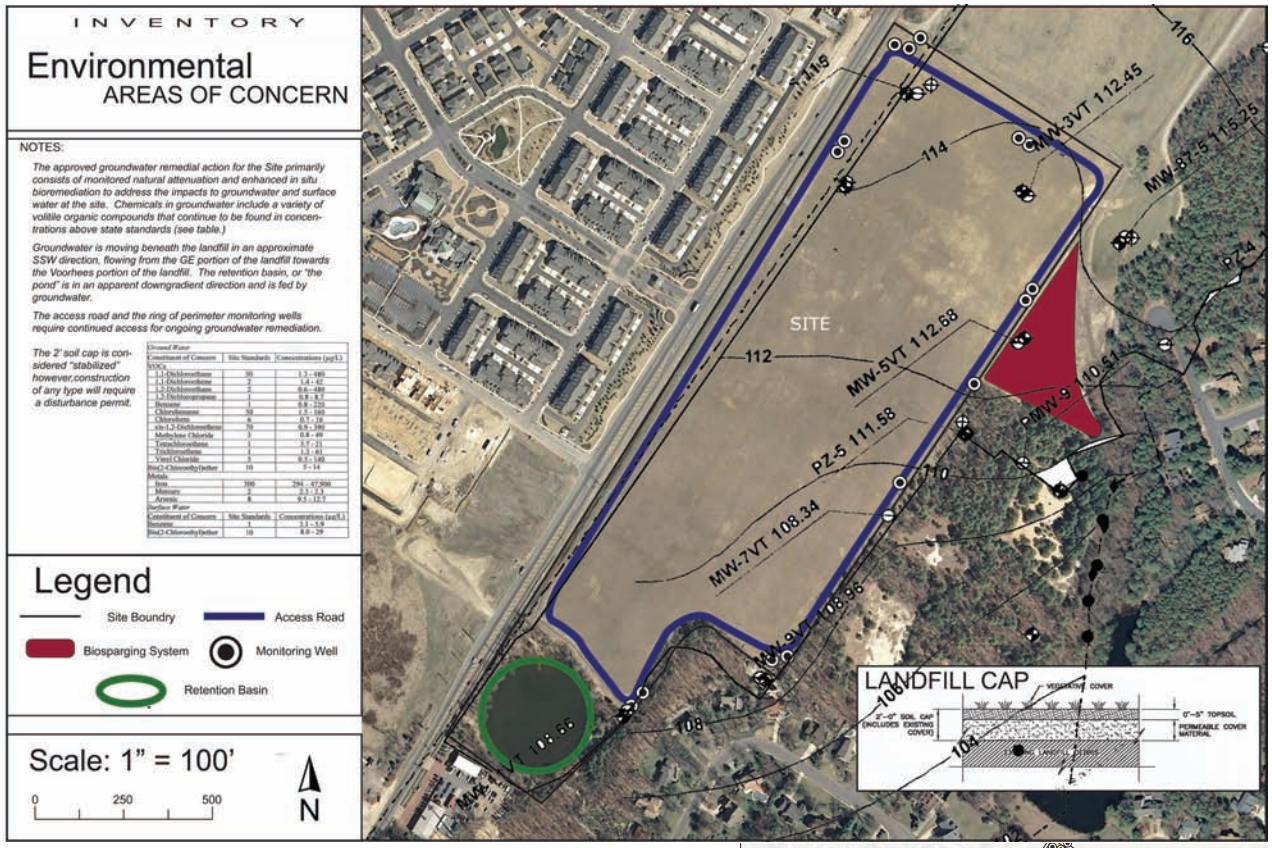

Figure 1. Cap and Contamination Inventory Map

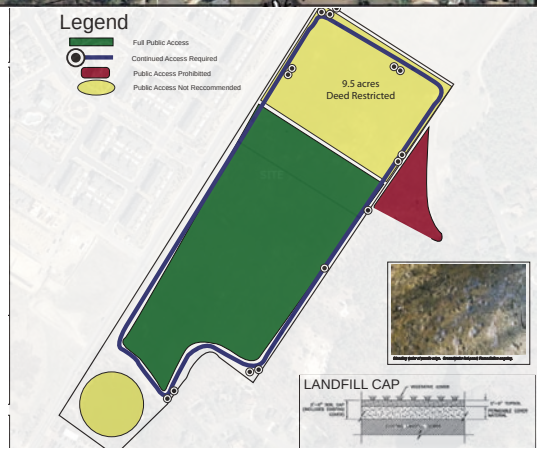

Figure 2. Cap and Contamination Analysis Map

1.4.6 Circulation

Baewon Suh

Currently access to the site is highly restricted. The majority of the site is bordered by a chain-link fence to the north and east sides of the site, with various types of vinyl fencing surrounding the remaining sides. Currently there is one main entrance which sits off Centennial Blvd. approximately 100 feet north of the main entrance to the Centennial Mills active adult community. Access is again restricted due to the gate which is typically locked. Another factor which currently restricts access is the high rate of speed at which vehicles travel down Centennial Blvd.. When designing access to the site it will be important to develop safe access for pedestrians crossing the street from Centennial Mills. It is also important to increase the number of access points since currently only one exists. There is also a proposal to construct a path on the east side of the site which would link the site to proposed and existing residential areas, decreasing the need for vehicular traffic to the site and increasing access. It is important to design that access point with minimal impact on the surrounding forested area.

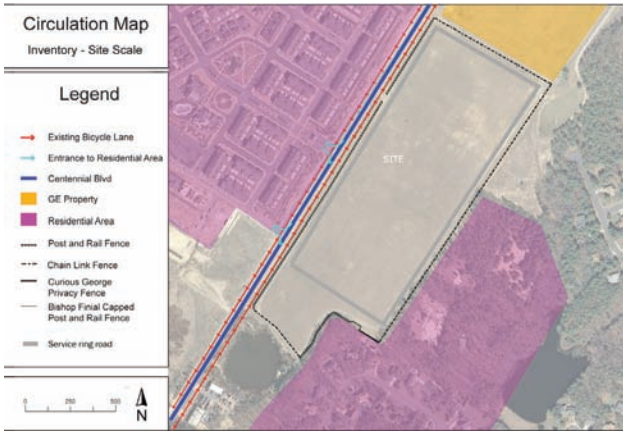

Figure 1 Circulation inventory map

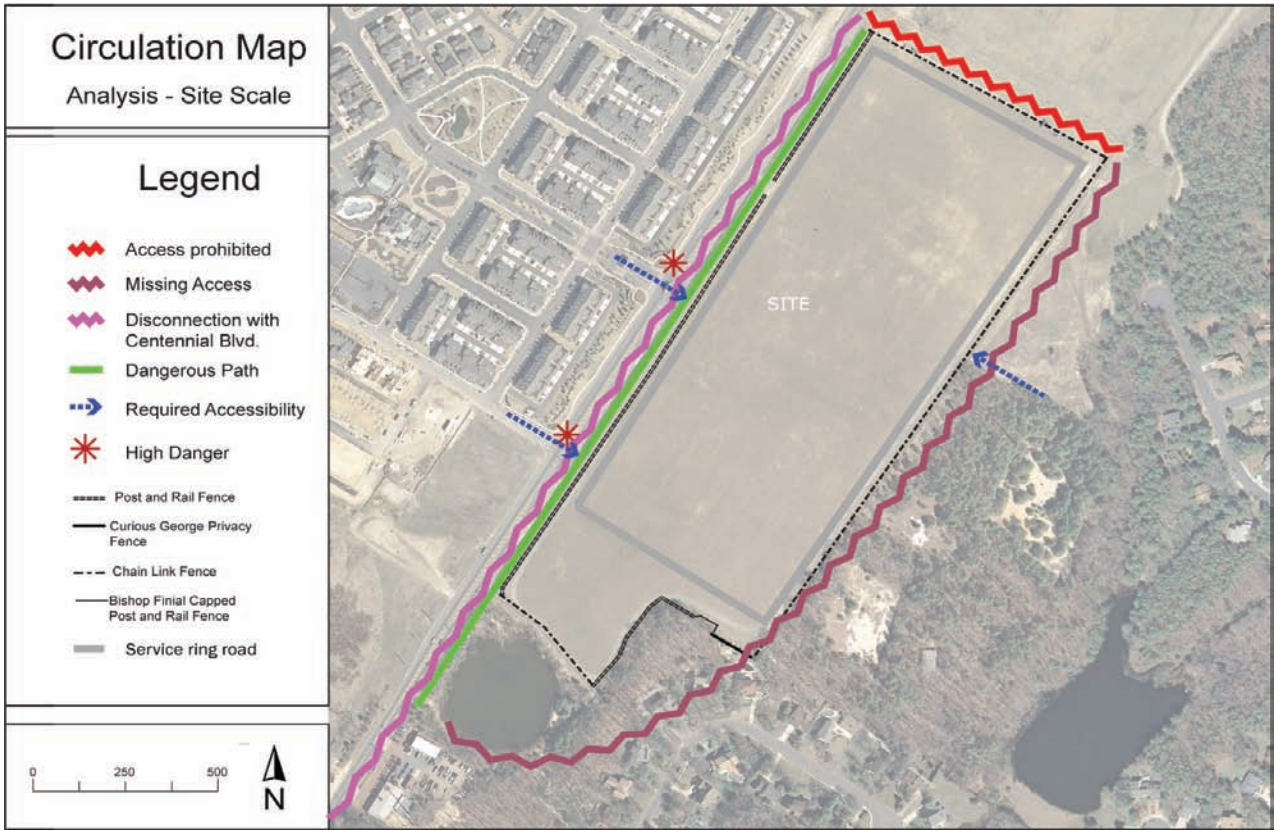

Figure 2 Circulation analysis map

1.5 Outreach

1.5.1 Community Outreach: VECEF Perspective

Erik Maietta
David Hanrahan
Kevin Perry

The Voorhees Environmental and Cultural Education Foundation (VECEF), a non-profit organization consisting of citizens of Voorhees, is undertaking the reuse of a former 37-acre landfill to enhance the quality of life for township citizens and restore vitality to the area surrounding the landfill.

VECEF Participating Members:

Helen Arvin, Acting President & Treasurer
Jim Wellen - Architect
Carol Gratz– Board Member
Doug Gaffney – Landscape Architect
Bob Gallagher – Technical consultant.
Beth Ravit – VECEF Advisory Committee Member
Carol - Representative from the active adult community also in attendance

Figure 1.Voorhees Site Visit

There is a Ground water connection that moves from GE side to Voorhees. Groundwater movement is in contact with contaminants; however, it is not known exactly what is in the land fill. Water samples explain contamination- BCE. 1 acre on upper end is in RFP. GE cap has two layers of plastic and 3 layers of fill. The site consists of 2 feet of fill and 6" of vegetation. Additionally, there is a deed restriction agreement with GE that leaves an 11 acres buffer for solar panel installation that provides the best solar orientation. The solar panel installation (including any other structures) should not penetrate the existing cap and should be incorporated into the existing electric lines running along Centennial Avenue. The reason for berm was to move water toward pond. In this way, the sheet flow maintains a rate that will prevent erosion. However, there is still sand washing into the pond

VECEF Concerns/Provisions for Future Environmental Park:

- Voorhees does not want more housing, so that they can limit the taxes associated with running the schools
- Need attractant to come to Voorhees… but NOT like Connolly Park that is too kid-oriented.
- Currently Voorhees town is built out and only age-restricted housing is being developed because the schools are full and additional expansion would increase taxes.
- Needs Passive Recreation – stroll/walk, bike, meditate
- Little conserved land in Voorhees
- Bike trail in Gibbsboro should connect to Voorhees Park
- Walking Labyrinth – inspired by church uses for spiritual healing and meditation
- Parking – should be scattered to minimize view in one spot.

- Solar panels – concerned with amount of rainwater runoff
- 55+ community disapproves of active recreation… including flood lights with soccer fields on the site
- Prefers incorporation of recycled building materials, walking trails benches, promenade at the pond
- Pedestrian access across Centennial Blvd… make a bridge?
- Asian/Indian garden – not necessarily a Japanese garden although the focus was to create a strong design that included a meditational area to transport visitors to another world
- Sewer Access?
- Low-maintenance design required
- Deer/Geese Issue – how to dissuade grazing?
- Include modern, unique structure – small building for classroom or organizational meetings
- Include solar panels on building, composting toilets, storm runoff, and green roof
- Consider renting to Camden County Soil Conservation or LEED future involvement
- Demo gardens for future master gardener involvement
- Master plan – can be developed in phases
- Wedding photo spot is okay

1.5.2 Voorhees Township Council Perspective:

Participating Committee Members:
Michael R. Mignogna, Mayor
Mario DiNatale
Mike Friedman
Joseph Lovallo, Deputy Mayor
Harry Platt
Joe Hale

Currently, the site is currently fenced off and locked simply as a precaution so that no one vandalizes the site or disrupts the cap by driving all-terrain vehicles for recreational use. Police periodically use it for their dogs. The GE property is an issue due to the concerns over lawsuits – as a result no one is permitted on the land as a precaution (no food service, active recreation for feat of litigation). Also, the methane burners are turned off and only used as needed.

Concerns/Provisions for Future Environmental Park:

- Confirm method of funding to build the park without raising taxes
- Make the park a unique destination from other parks in the area… e.g..: Asian garden, walking paths, passive, educational (GE agreed)
- Original concepts are now 6-7 years old and need to be updated with new inspirational design.
- Park hours of operation = sunrise to sunset
- No childcare or eating facilities
- No big floodlights!
- Passive use recreation is preferred
- Showcase natural vegetation that can grow on the site

Pedestrian safety: A pedestrian light-up cross-walk will be supported by the council as the roadway does not currently quality for a stoplight based on volume of cars (it could be re-evaluated in the future if congestion develops from park usage).

Ground water monitoring: Currently it is considered safe and habitable as long as cap is not disturbed. The landfill had self-attenuated by the time regulations were needed… but now they are confident that it is safe and habitable as long as the cap is not disturbed. Currently only the water that drains from the GE portion into the other lake off the property is being monitored. Runoff into the pond is considered to have "minimal contamination". Additionally, the design must allow access to all monitoring well.

Revenue: A major concern is how will the town pay for construction? Grant funding is difficult to secure… so the site should somehow generate revenue to reinvest in the site. Commercial develop of offices was considered, however, it is unrealistic as there are already many vacant commercial buildings in the town.

Solar field Installation: Leasing land to the electric company was promising until the SREC values dropped substantially. (They also don't want the solar panel field to overwhelm the site). Currently there has been only 1 proposal returned from the Solar Panel RFP developed by the town… this project is considered very small and impractical to most companies

1.5.3 Additional Interdisciplinary Outreach – Rutgers

Dunbar P. Birnie, III, Professor, Department of Materials Science and Engineering. Dunbar served as the Studio Solar Panel Advisor who provided insights on solar array alignment as well as additional solar panel design integrations involving parking. He attended the studio midterm review and also gave a special follow-up solar panel lecture.

Steven N. Handel, Professor, Department of Ecology, Evolution, & Natural Resources. Steven presented the studio with a lecture detailing how best to colonize the landfill with inoculations of appropriate tree species. He also confirmed the tree roots do not grow in anaerobic conditions, and therefore will not penetrate through the cap.

Figure Source List

Fig. 1.Voorhees Site Visit Courtesy of Erik Maietta

2 Special Research Topics

2.1 Solar Panels in the Landscape

Kevin Perry

Solar panels are a major consideration in the design of the Voorhees Environmental Park. The client has expressed the desire to designate a certain portion, approximately 10-15 acres of the 37-acre site of the former Buzby Brothers Landfill to the production of solar energy. The proposed solar array would tie in to the local electric grid, supplying a source of clean energy to local homes and businesses, while providing a revenue source to the Voorhees Environmental Park for maintenance, upkeep, and programming. As responsible designers, we must develop an understanding of the way solar panels function in the landscape, the constraints and opportunities of utility-scale solar array design. Therefore, the purpose of this paper is to provide a brief technical analysis of the way solar panels function in relation to landscape conditions, followed by a design survey of four relevant solar arrays in New Jersey to spark imagination and ideas about the future solar array to be implemented in the Voorhees Environmental Park. In so doing, the goal will be to look deeper into our assumptions and "common sense" ideas about solar panels, things which may seem obvious, in order to gain a deeper understanding of the role solar panels play in the landscape.

To begin this inquiry, the first question that must be asked is, what is a solar panel? We see them all over New Jersey, in large fields, on the roofs of houses and other structures, on the utility poles that line our streets. A solar panel is a photovoltaic device, which generates electrical energy from the sun through the photovoltaic effect. (Boxwell, 4). The prefix photo- comes from Ancient Greek, meaning "light" or "to shine", while the suffix –voltaic derives from the name of 19th century Italian physicist Alessandro Volta, inventor of the battery and namesake of the unit of electrical potential, the volt. (Harper). The photovoltaic effect is "a phenomenon discovered in the early 19th century when scientists observed that certain materials produced an electric current when exposed to light." (Boxwell, 4). Through decades of technological innovation, the photovoltaic effect has progressed from an observed scientific phenomenon to a widespread presence in the form of a man-made device, produced on the industrial scale, for the purpose of generating large amounts of electrical energy to be consumed in our daily and professional lives.

How do solar panels perform and how does the photovoltaic effect work? Here is a brief summary from Gil Knier of NASA Science, in reference to Figure 1:

Solar cells are made of the same kinds of semiconductor materials, such as silicon, used in the microelectronics industry. For solar cells, a thin semiconductor wafer is specially treated to form an electric field, positive on one side and negative on the other. When light energy strikes the solar cell, electrons are knocked loose from the atoms in the semiconductor material. If electrical conductors are attached to the positive and negative sides, forming an electrical circuit, the electrons can be captured in the form of an electric current -- that is, electricity. This electricity can then be used to power a load, such as a light or a tool.

But do Landscape Architects really need to worry about all this action on the sub-molecular scale? Probably not, since Landscape Architects are not Physicists. However, the maxim that we can derive from an understanding of the photovoltaic effect is that for a given solar panel, the greater the level of exposure to the sun's energy, the greater the return of production in usable electrical energy (Boxwell, 406).

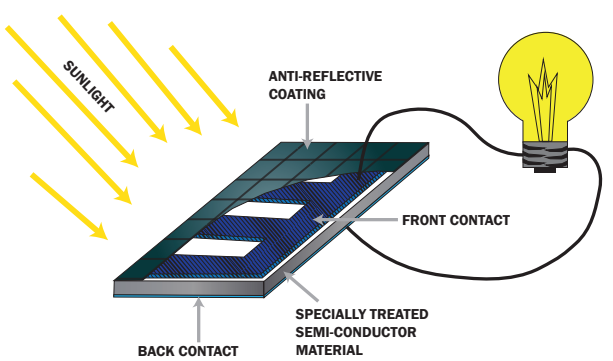

Figure 1. The Photovoltaic Effect.

So the question that Landscape Architects should be concerned with for energy production through photovoltaic solar panels is, how do we maximize sun exposure, and thereby maximize energy production? To formulate an answer, we need to think in terms of the quantification of solar energy. According to Boxwell:

Solar energy is a combination of the hours of sunlight you get at your site and the strength of that sunlight. This varies depending upon the time of year and where you live. This combination of hours and strength of sunlight is called solar insolation, or irradiance, and the results can be expressed as watts per square meter (W/m2), or more usefully, in kilowatt-hours per square meter spread over the period of a day (kWh/m2/day)" (33).

It therefore follows that if we can increase any of the variables in this ratio of kWh/m2/day, then we can effectively increase (with the goal of maximizing) sun exposure and energy production. The variable we cannot affect is the length of the day.

One simple idea is to manipulate the m2, or area, component of the ratio. According to Boxwell, "When you connect multiple panels together, the power of the overall system increases" (19). So

if we add to the area of our solar array, we can increase overall production. Or, if we remove panels, we can decrease production. The point is that the spatial relation of one panel in orientation to another is not relevant to energy production in the way that the area of the overall array is. This is an important consideration in the design of our site, because as the idea of 10-15 acres of solar panel coverage is a pre-determined notion, the spatial layout of that determined area need not be affected by clustering. It may be clustered, or it may be spread apart, but in keeping this given area of a certain capacity solar panel across the site, we do not need to worry about production loss.

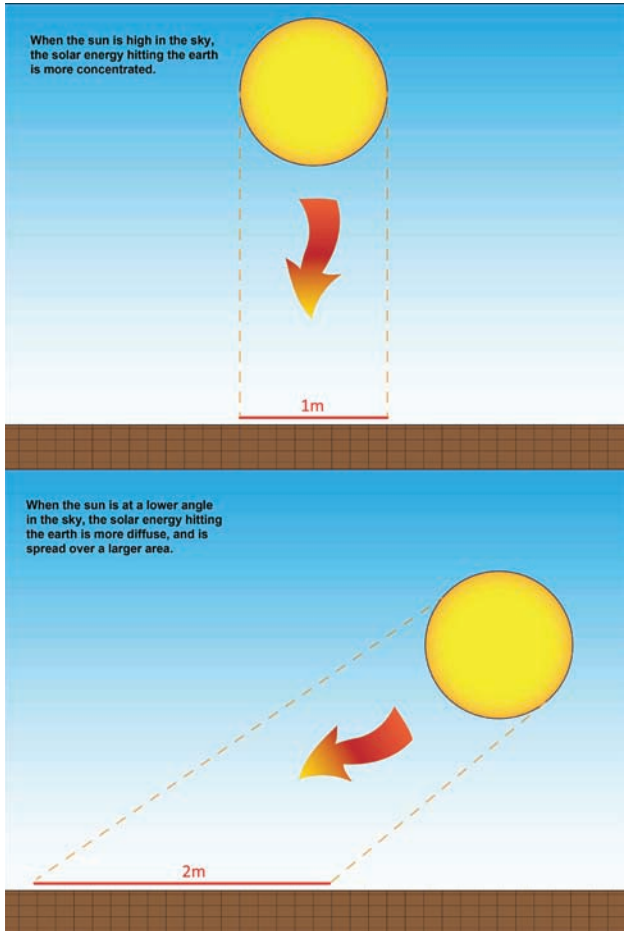

Figure 2. Transmission of energy from the sun to the earth's surface.

Aside from manipulating the area of our solar array, how can we increase the impact of the sun's energy to come in contact with each panel? To explore this idea, we need to think about the angle of inclination. We regularly observe that solar panels in the landscape are tilted in one way or another, but what is the determination behind that tilt? In order to capture more of the sun's energy, we need to think about how that energy reaches the earth. In Figure 2a, when the sun is high in the sky, the energy transmitted to the earth's surface is highly concentrated. However, the sun is never actually directly over head, shining straight down in such a way upon the earth as illustrated in 2a. The sun moves at lower angles across the sky, varying throughout the day, as well as throughout the year. The result of the sun's energy hitting the earth from a lower angle in the sky is that it is spread across a larger area, as seen in Figure 2b. By tilting the solar panel, inclining it towards the sun in the sky, we are able to increase the amount of solar energy absorbed by the panel and thereby increase electrical energy production (Boxwell, 33-37).

Solar Insolation or irradiance, "the hours and strength of sunlight hitting the earth" can be quantified using the unit hours of equivalent midday sun per day (Boxwell, 33). In other words, if we think of the midday sun, when the most energy is transmitted to the earth's surface, it can be analyzed and averaged throughout the year. The Boxwell website uses solar insolation data (collected over many years by NASA) to make recommendations of the optimum angle of inclination for solar panels throughout the year. In Table 1, this data has been compiled for the

New Jersey Solar Insolation Values Related to Angle of Inclination

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
Monthly	3.37	3.91	4.41	4.82	5.28	5.63	5.55	5.13	4.73	4.3	3.39	3.1	**4.47**
Quarterly	3.35	3.91	4.41	4.66	4.81	5.42	5.38	5.1	4.7	4.26	3.24	3.07	**4.36**
40° Year Round	3.18	3.84	4.41	4.66	4.81	4.96	4.97	4.85	4.7	4.26	3.24	2.88	**4.23**
24° Summer	2.82	3.57	4.32	4.81	5.16	5.42	5.38	5.1	4.69	4.01	2.93	2.53	**4.23**
56° Winter	3.35	3.91	4.28	4.28	4.25	4.29	4.33	4.38	4.48	4.28	3.38	3.07	**4.02**
Flat	1.92	2.71	3.69	4.57	5.21	5.61	5.51	4.97	4.15	3.13	2.07	1.66	**3.77**
Upright	3.03	3.25	3.18	2.77	2.49	2.39	2.45	2.69	3.15	3.47	2.99	2.83	**2.89**

Unit: Hours of equivalent midday sun per day

Figure 1. Solar Insolation Values

state of New Jersey. Basing our thoughts on the idea of a flat solar panel, we can see that over the course of a year, the average daily solar insolation is 3.77 hours of equivalent midday sun per year. Boxwell makes the recommendation for a 50° tilt as a stationary angle of inclination for better energy production throughout the year. Applying this 50° tilt, the average daily solar insolation increases to 4.23 hours of equivalent midday sun. However, the Landscape Architect may make further decisions involving the variance of the angle of inclination throughout the year in order to further increase energy return. Bearing in mind that any recommendation for varying the tilt of the solar panels throughout the year will involve certain labor and maintenance costs, this idea must be explored at a deeper level than simply the return in energy production, in order to make a responsible design decision. Regardless, it is evident that by recommending a quarterly adjustment in the angle of inclination, setting the angle at the optimum recommended for Winter, Spring, Summer, and Fall, a greater return on energy production can be achieved; in this case an increase from 4.23 hours of equivalent midday sun per day to 4.36.

The data in Table 1 applies to the state of New Jersey on average, but Boxwell makes more specific recommendations for the geographical area near Voorhees, NJ, which are 40° for Spring, Fall, and year-round, 16° for Summer, and 64° for Winter (Boxwell, website). For an idea of what the angles would look like on a landscape, please refer to Figure 3a-c.

Additionally, in placing a solar array in the landscape, the Landscape Architect must consider the placement of the panels on the horizontal ground plane in order to achieve maximum energy return. In Figure 4, the travel of the sun across the horizontal ground plane is analyzed. It is found that the sun rises and sets in equivalent bearings east and west of the southern axis throughout the year. Because this azimuth of travel throughout

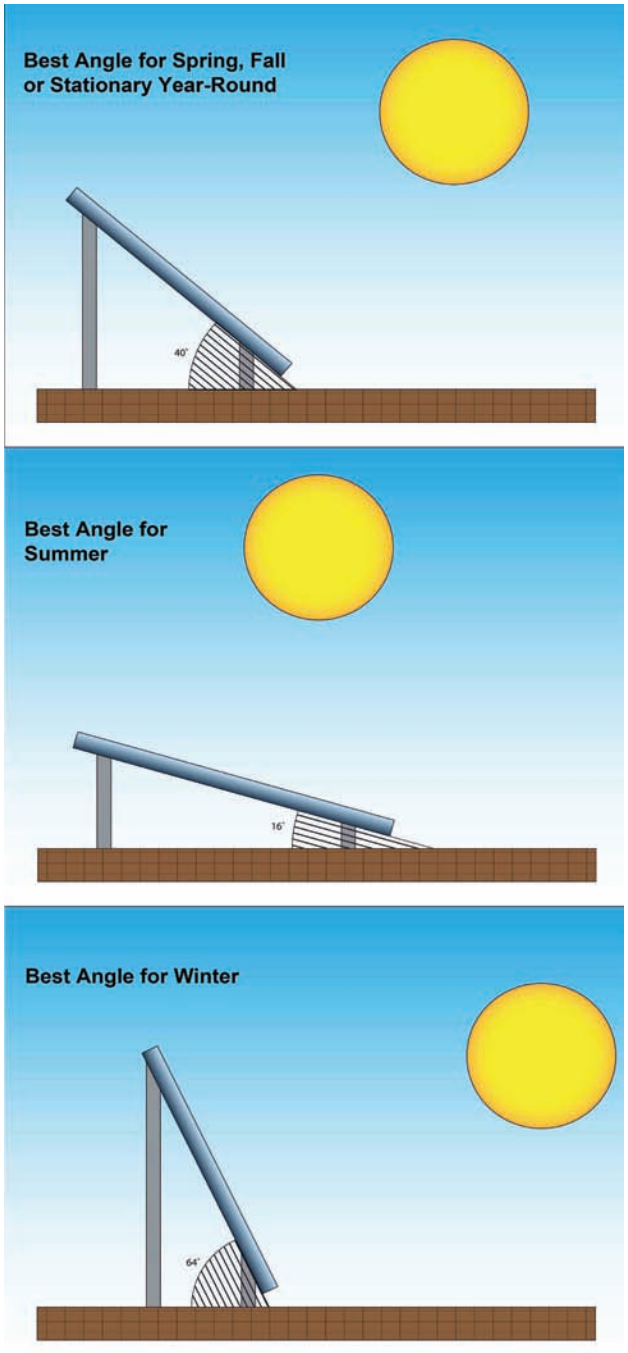

Figure 3. Applied angles of solar panels in field.

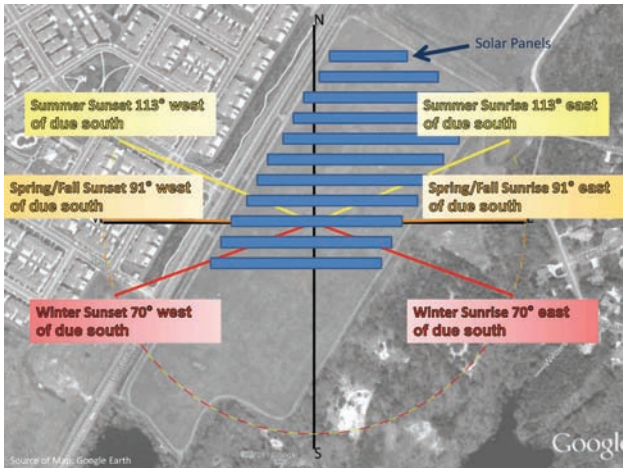

Figure 4. Path of the sun across Voorhees Environmental Park.

the year is not skewed to either the east or the west, but is centered upon the southern axis, it is recommended that the solar panels be oriented due south for maximum sun exposure throughout the year. This means that the slope of inclination should be pointed to the south. This may seem obvious or self-explanatory, but having now analyzed the situation, the solar arrays can be oriented with conviction.

Finally, the Landscape Architect must consider any obstacles within the landscape that would impede the sun's energy from hitting the solar panels either by blocking them directly or casting a shadow upon them. In other words, for maximum energy production, the solar array should be designed so that it is not subject to interference from other landscape elements. Particular attention should be paid to shadows. The Landscape Architect will often study and utilize shadowing within a spatial design, but it is unique to the design of a solar panel array that the miscalculation of shadowing effect can lead directly to the failure of a design. An excellent resource that can be used for the study of shadow effect can be found at www.findmyshadow.com. At the site, a visitor can input his or her geographical coordinates and day of the year and receive the output

Sun Position Chart for Voorhees, NJ on Winter Solstice

Local Time	Azimuth of sun	Altitude of sun	Shadow length	Shadow of 40' tree
(GMT -5.0)	(deg. from N)	(deg.)	(multiplyer)	(feet)
7:20	120.68	RISE	-	
7:30	122.286	1.077	53.171	2127
8:00	127.293	5.804	9.839	394
8:30	132.623	10.215	5.549	222
9:00	138.322	14.252	3.937	157
9:30	144.426	17.845	3.106	124
10:00	150.947	20.923	2.616	105
10:30	157.872	23.41	2.31	92
11:00	165.15	25.236	2.122	85
11:30	172.69	26.343	2.02	81
12:00	180.368	26.691	1.989	80
12:30	188.038	26.269	2.026	81
13:00	195.558	25.091	2.136	85
13:30	202.805	23.199	2.333	93
14:00	209.693	20.652	2.653	106
14:30	216.175	17.522	3.167	127
15:00	222.238	13.883	4.046	162
15:30	227.9	9.808	5.785	231
16:00	233.197	5.364	10.651	426
16:30	238.175	0.61	93.907	3756
16:38	239.456	SET	-	

Table 2.

Sun Position Chart for Voorhees, NJ on Summer Solstice

Local Time	Azimuth of sun	Altitude of sun	Shadow length	Shadow of 40' tree
(GMT -5.0)	(deg. from N)	(deg.)	(multiplyer)	(feet)
4:34	58.24	RISE	-	
5:00	62.338	3.789	15.101	604
5:30	66.872	8.988	6.322	253
6:00	71.257	14.363	3.905	156
6:30	75.56	19.879	2.766	111
7:00	79.858	25.502	2.096	84
7:30	84.238	31.201	1.651	66
8:00	88.812	36.945	1.33	53
8:30	93.728	42.698	1.084	43
9:00	99.2	48.416	0.887	35
9:30	105.546	54.038	0.726	29
10:00	113.276	59.468	0.59	24
10:30	123.216	64.543	0.476	19
11:00	136.64	68.97	0.384	15
11:30	155.012	72.227	0.321	13
12:00	178.113	73.582	0.295	12
12:30	201.66	72.58	0.314	13
13:00	220.866	69.568	0.373	15
13:30	234.971	65.282	0.46	18
14:00	245.355	60.283	0.571	23
14:30	253.363	54.895	0.703	28
15:00	259.885	49.296	0.86	34
15:30	265.467	43.588	1.051	42
16:00	270.453	37.837	1.287	51
16:30	275.07	32.089	1.595	64
17:00	279.472	26.381	2.016	81
17:30	283.776	20.744	2.64	106
18:00	288.073	15.21	3.678	147
18:30	292.441	9.811	5.783	231
19:00	296.947	4.582	12.478	499
19:31	301.817	SET	-	

Table 3.

of a Sun Position Table. Table 2 is a sun position table for Voorhees, NJ on the shortest day of the year, while Table 3 is a sun position table for Voorhees on the longest day of the year. These tables provide us with the position of the sun as it relates to north and the angle of the sun in the sky on 30-minute intervals throughout the day. As an example, if we consider a 40-foot tall tree and the shadow it will cast on our site at 2:30 in the afternoon, we find that on the shortest day of the year, the shadow cast by the tree will be 127 feet long on the bearing 216.175° from north. And on the longest day of the year, the shadow cast by that same tree at the same time of day will be 28 feet long on the bearing 253.363° from north. Figure 5 shows the difference in shadow on these two days of the year. Considerations such as this

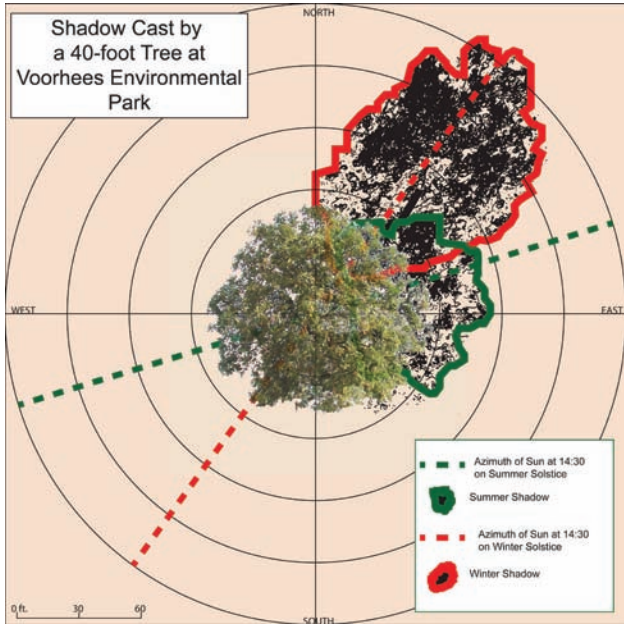

Figure 5.

must be made in order to ensure that the proposed solar array is successful.

Having now explored the implications of size, angle of inclination, angle of orientation, and avoidance of obstacles in the design of a solar array in the landscape, it would help to look at some current examples.

Rutgers Livingston Campus

The Rutgers Livingston Campus solar array consists of 8000 panels across an area of seven acres to generate 1.4 megawatts of electricity. When ground was broken on the facility in 2008, it was the largest solar array on a college campus in the United States. (Miranda and Gregory). In Figure 6, the plan view exposes that this solar array is perfectly oriented to the south. Figure 7 shows the angle of inclination for this array to be

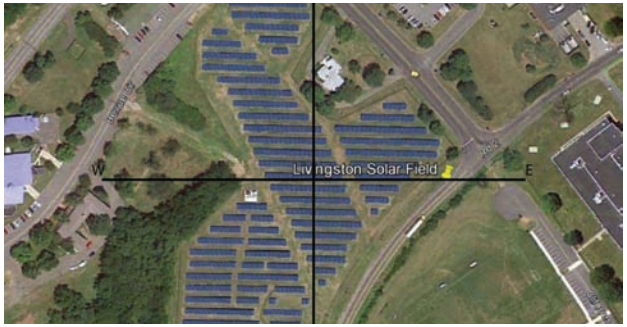

Figure 6.

Figure 7.

16°, and the panels are about ten feet in width. The structure on which the panels are erected appears to be fixed at that 16° angle, meaning these panels do not move at all throughout the year. The site is surrounded by a chain link fence, which inhibits public access. Maintenance appears to be a program of mowing around the arrays, while allowing growth, or at least, infrequently trimming the growth beneath the panels.

Rutgers Cook Campus

There is little information to be found on the Rutgers Cook Campus solar array. While press releases abound for the Livingston array, mum seems to be the word for the Cook Campus array. Whether or not this perception is true remains to be seen, but it is the reason that this analysis cannot proceed beyond first person observation. Figure 8 shows the view of this solar array from outside its barbwire-equipped privacy-slatted chain link fence. It goes without saying that public access to this array is well-inhibited. Figure 9 shows the array inside the fence, with some type of electrical component, possibly an inverter, the inclusion of which will have to be considered

Figure 8.

Figure 9.

Figure 10.

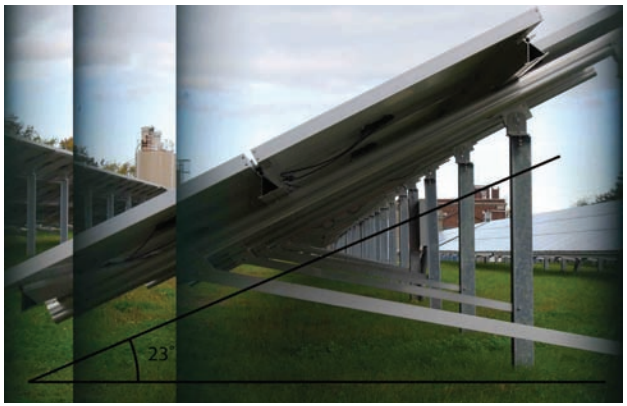

Figure 11.

in the Voorhees design. Figure 10 shows a view along the length of the array (and one wishes for a better view of these attractive panels). Finally, Figure 11 is a composite photo of the structure holding these solar arrays in place.
The array is currently oriented at a 23° angle. The engineering of the stand, especially the hinge-style mount at the top of each brace, leads one to believe that this array variable. However, the programming for angle variation throughout the year is unknown.

Kearny Landfill 1-A

The recent addition of a solar array on the site of a former landfill in Kearny, New Jersey was reported in October, 2011. Thirteen acres of the 94-acre site will be covered with 12,500 solar panels, expected to generate up to three mega-watts of electricity. (Duger and Sibayan). Figure 12 shows a group of government dignitaries in front of this new array. The panels appear to be tilted at a low, summer angle, though it is unde-

Figure 12.

termined whether they are variable in angle of inclination. These panels seem to be moored on heavy concrete footings, and it appears that these footings are set on the ground surface, rather than penetrating into it. This is likely a design response to the landfill conditions which exist beneath these panels. Figure 13 shows an alter-

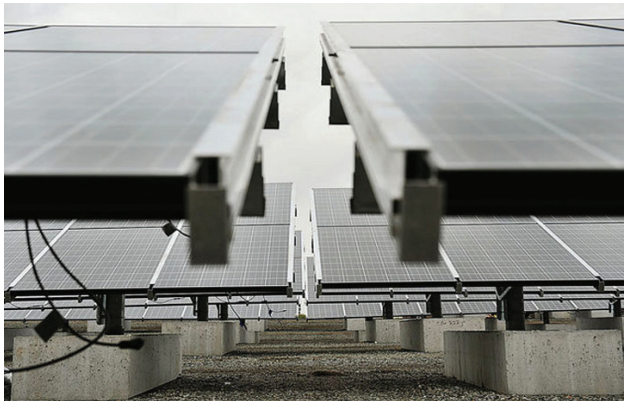

Figure 13.

nate view of the concrete footings. In looking at the ground plane of packed stone, one wonders what, if any, type of wildlife would survive in this landscape and whether any type of heat island effects might occur as a result of this configuration.

Davidson's Mill Pond Park

Located in Milltown, NJ, the solar array at Davidson's Mill Pond Park generates electricity for the Rutgers Cooperative Extension/Middlesex County EARTH Center. Figure 14 shows in plan view this array of twelve solar panels that produce 15 kilowatts of electricity, as they are oriented straight to the south. Mounted on twelve-foot poles, these solar panels are about seven-feet off the ground at their lowest point, and are tilted at a 36° angle, as illustrated in Figure 15. The pole-mounting structure of this array was invasive to the ground plane, as concrete footings 36" x 36" x 60" were

Figure 14.

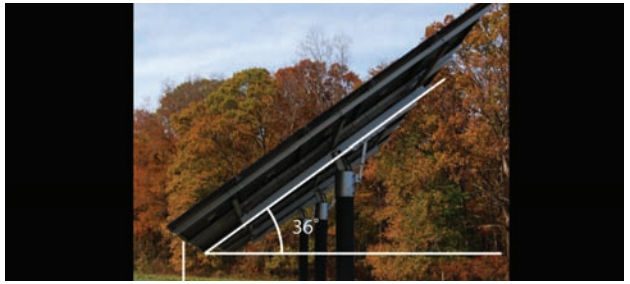

Figure 15.

Figure 16.

Figure 17.

set vertically into place (Middlesex County Sustainable Engineering and Technology). A closer inspection of the mounting structure between the panel and the pole in Figure 16 reveals that these panels are likely tilted at different angles throughout the year.
The interval of change in that tilting program is unknown, but given the small size of this twelve-panel array, a monthly change of angle is not out of the question. Figure 16 shows the edge treatment of these panels, with a low chain link fence and border of euonymus shrubs. Of the four examples studied here, this is the first to explore an aesthetic edge to the array.

In conclusion, it is presumed that Landscape Architects will consider and expand upon the basic tenements of solar panel orientation and configuration discussed in this brief paper. One could venture into deeper detail on each of the concepts presented here, and they represent only a few basic thoughts on the overall efficiency of solar array configuration. As solar arrays continue to grow and pervade our collective landscape, deeper questions will come to the surface. To ask a few, how do solar arrays relate to the problem of suburban fragmentation? How do solar arrays relate to the scarcity of open space in New Jersey? Can people and solar arrays coexist in a diverse and stimulating landscape, and if so, how? By thinking here about the needs of the solar arrays in their mission to produce clean energy, their constraints and opportunities in design, we can form as basis from which to consider the deeper questions of the growing presence of solar arrays in the landscape.

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Fig. 13. Ibid.

Fig. 14. Ibid. 4.

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2.2 Human Interaction in Solar Fields: Sense of Place and Sensation of Space

Denisse Ortiz

As a result of our actions, natural ecosystems and resources have been put aside and deprioritized. We have come to understand that we are the only ones that can turn around the damages that we have caused to the environment into something sustainable. Humanity's response to this unbalance is the utilization of green techniques and approaches that contribute to the healing of the environment that we live in as a way to assure better lifestyles for the years to come.

One of these approaches is the use of renewable or free energy to supply high energy demands to suburbia. New Jersey is known as "The Garden State", this name gives praise to how the state uses and manages their green acres. It is one of the many States that is seeking to implement the use of solar panels as a green approach in bare land just as in urban settings. New Jersey developers are turning "problems" into an opportunity; they have used fallow land to install large solar fields Jack Uldrich referring to Rutgers Livingston Campus Solar Farm. (http://www.jumpthecurve.net The Greener Pastures of Unlearning April 15/2011).

In this paper I want to explore how much further we as Landscape Architecture students can take these approaches and apply our designs. I would like to examine the following questions: How do users interact with new methods of energy production? How will they react in front of such scenarios? How can we design space that enables human interaction with these new approaches?

To answer these complex questions I have revisited the core principles of design and theories explored previously in Theory of Landscape Architecture. These theories will shed light in how the user behaves and reacts to elements and objects in the landscape. I intend to develop my framework by starting with a more general perception of what factors play in the personal definition of sense of place. From there, I tend to look at factors that define sense of space and finally the aesthetics of energy in everyday things known as STATIC! from a design perspective.

Sense of Place

What makes a place significant to someone?

Many factors can define the sense of place and most of them are linked to emotions and affection (Rose, G. Place and Identity: A Sense of Place)

- Places are significant because they are the focus of personal feelings
- Special significance of particular places for people
- Senses of place pervade everyday life and experience
- Places are infused with meaning and feeling
- Places are created by people, individuals/groups

These are characteristics that define how much value a place has for its users. A place cannot be defined by anyone unless it has particular meanings only relevant to them. There is a deeper level on meaning in this concept: "the identity". How do you identify yourself within a place? It comes after it has been experienced; feeling of belonging (this might occur at the social scale) and qualities of that place that based on what have been experienced has been defined.

Sense of Space

Our site is already infused with meaning and value from the people of Voorhees Township. Now it is up to us to develop a design that addresses the meanings behind it so people can identify with the design.

Golfinger in his article "The Sensation of Space" states that a person within a defined space is subject to psychological effects. This is telling us that in order for someone to sense, feel and experiment space, it needs to be defined by objects – walls, vegetation, etc. Depending on the magnitude, materials and other physical qualities of these objects they can produce psychological reactions – enjoyment or mental disorders such as claustrophobia and agoraphobia.

The function of two elements determines the spatial sensation (experience). These are the enclosing agent and the enclosed space. The quality and quantity of both and its relationship with the enclosed person define how the user experiences and behaves in this environment (space).

The physical qualities (aesthetic) of an object (the enclosing agent) influence how that object (the enclosed space) is perceived but does not influence how it is experienced. A space cannot be interpreted or experienced, by simple contemplation, it only can be perceived. Thus its qualities might influence how it is being perceived but not how it can be experienced. The degree of enclosure (object) in relation with the enclosed environment (space) does influence how a person interacts, experiences and behaves in the environment.

Behavior and Environment

The expression of the landscape, foregrounds and distances, sloping and horizontal surfaces, arboreal and other kind of vegetation and the play of the light and shade of the objects determine some facet of perception, comprehension and emotional response to a space. (Appleton).

Behaviors are adaptive and are closely related to function. This concept once in practice is somehow related with the quality (aesthetics) and quantity (degree of enclosure) of the object (enclosing agent) and how we perceive it. Appleton says: *"seems to be" what matters is not the actual potential of the environment to furnish the necessities for survival, but the apparent potential as apprehended immediately rather than calculated rationally* after which comes behavior.

Hinde actually explains it clearer: he is saying that the selection of a prospect usually depends on characters of the environment which are not essential to survival, but which are visible prominent characteristics of the landscape and which thus serve as sign stimuli (Hinde, 1996).

From here we can say that the expression of the landscape (aesthetics), the colors, the spatial arrangements, its visual attributes act like and indicator of favorable environmental conditions.

STATIC!

We as Landscape Architects are designers of experiences and sensations in the outdoor room. Design is one of our tools. Static! Theory explores this principle.

There is an increasing interest in how design might affect people's awareness and choices. This concept uses the power of design to affect and change not only our individual relations to everyday things but social trends, enabling people to relate more to their own choices. It uses design as a persuasive tool that incorporates awareness and purposeful actions in the users over time focusing in energy use.

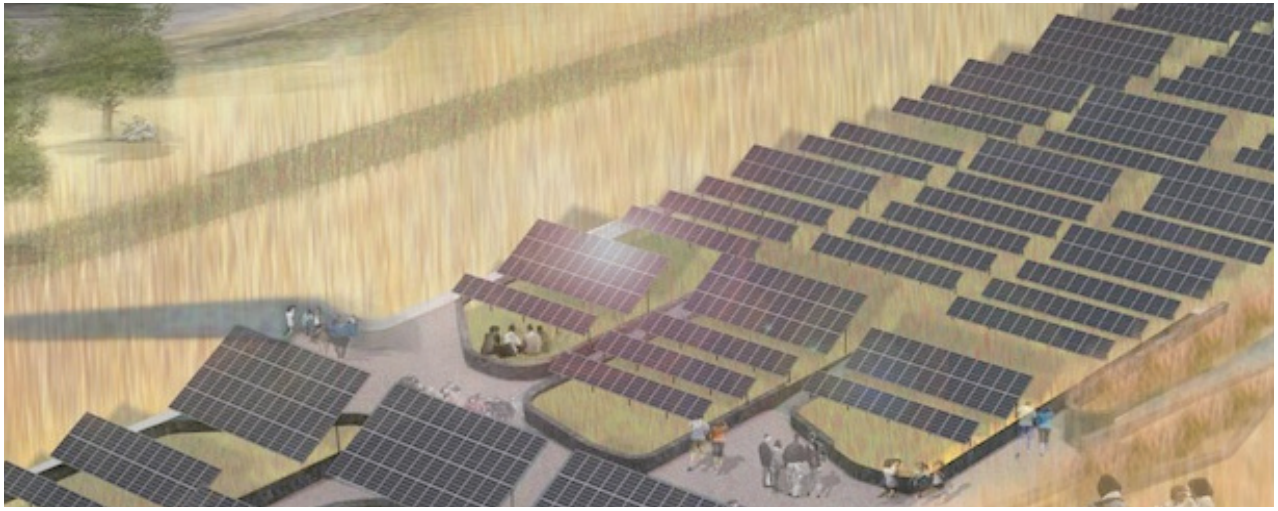

Figure 1. The Solar Strand, SUNY Buffalo, Walter Hood

Design is a tool to:

- Persuasive argument
- Form of socio-aesthetic research
- To develop strategies for how to involve people and invoke engagement

Application of Concepts

The combination and arrangements of the objects utilized for the creation of space has to provide opportunity for the landscape to be apprehended aesthetically (Appleton). In the first concept, we saw that sense of place is determined by values whether the user identifies him/herself with it or not. But to be able to identify something it has to be experienced not only viewed.

The challenge is to bring people to an environment not previously experienced and probably under the assumption of "it seems to be" something that they don't know yet. For the user to explore and experience space their perception of that space has to be changed. In other words, the apparent potential of that space has to be captured immediately rather that calculated rationally.

We now understand that first comes perception (aesthetic) followed by sensation of the space (experience) and then interaction (behavior) with the environment. Any designed space has to provide a set of elements that will enable the user to identify the qualities of any given spaces. These elements include:

- Object has to symbolize prospects and refuge
- Spatial arrangement of the symbols
- Equilibrium between prospect and refuge symbols
- The physical media by which the symbols are being communicated to the observer.

Interaction

The Solar Strand (Fig 1), first solar field that allocates human interaction. The spaces' functionality is also apparent in its ability to accommodate

different events for many Western New Yorkers and visitors. A new type of classroom, formed directly beneath the tilted panels, will include three outdoor social rooms to offer students and visitors the chance to study the panels' circuitry up close. This clever use of space will enhance learning and add vigor to a project that is the largest of its kind in New York State. Besides classes, University officials plan to have students and local residents utilize the space for tours and other educational related activities. "Aesthetically pleasing" Many forms of alternative energy often garner a bad rap as they tend to be thought of as unsightly metal hunks of machine, inept at fitting in with the natural environment around them. Hood's design, however, takes aim at this challenge, and demonstrates the beautiful way that the technological and the natural can unite. When executed, his plan will create an enchanting connection with the surrounding wetlands and invite visitors to come and explore the land with pedestrian pathways that join the solar installation to a nearby creek. What is more, the project will provoke the viewer's visual senses with rows of trees and strips of mowed and unmoved grass forming a stripped pattern congruent with the DNA strand's linear shape (Mulderig. 2011).

There are certain things that we as human perceive as things that are not used for us. There are certain environments that are less likely to be habituated or used by humans. Solar fields are in this range, just for the sake of the lack of examples infused with meaning and identity. That has to do we how we perceive and experienced things (space) mainly under the idea of how something should be done or should look like.

Solar fields have sold this idea of a fenced field very industrial looking and not much human interactions and activities around it, their character is too strong and some other qualities that make someone not feel comfort in this environment.

Many of these things are true, but also there are many unknown things about this environment that needs to be explored and developed. Solar panels are a very unique and versatile artifact that promotes different programs such as shelter, water collection, and play of light reflection; provide us of free energy and so much more. It can create a comfortable environment for people if taken in consideration its physical characteristics and composition. In their first layer component, solar panels usually have a temperate glass sheet that allows X-rays to be absorbed and this energy (heat) is stored not released. I state this because one might be under the impression that its surroundings might be over-heated due to the amount of solar dissipation absorbed. There is a fact that they do create micro climes but not due to this mater but to the lack of vegetation around it. This is true but it can also be manipulated.

There are many considerations and implications at the moment designing with solar panels at a big scale when designing with human interactions such as:

- Physical and Climatic Surrounding
- Proximity to vegetation
- Urban positioning
- Environmental Implications
  Land disturbance / Land use impacts

All utility-scale solar energy facilities require relatively large areas for solar radiation collection when used to generate electricity at utility-scale (defined for the Solar PEIS as facilities with a generation capacity of 20 MW or greater). Solar facilities may interfere with existing land uses, such as grazing, wild horse and burro management, military uses, and minerals production. Solar facilities may impact the use of nearby specially designated areas such as wilderness areas of critical environmental concern, or special recreation management areas. Proper siting decisions can help to avoid land disturbance and land use impacts (http://solareis.anl.gov/guide/environment/index.cfm).

Impacts to soil, water and air resources

Construction of solar facilities on large areas of land requires clearing and grading, and results in soil compaction, potential alteration of drainage channels, and increased runoff and erosion. Engineering methods can be used to mitigate these impacts (http://solareis.anl.gov/guide/environment/index.cfm).

Impacts to vegetation, wildlife, wildlife habitat, and sensitive species; visual, cultural, paleontological, socioeconomic, and environmental justice impacts.

Ecological Impacts

On the one hand it looks like an environmental friendly approach with characteristics such as very low air emission of air pollutants and its potential uses of surface water if dust suppressant, dielectric fluids or herbicides has not been used. But on the other hand if affect the regular environmental cycle of an area. The clearing and use of large areas of land for solar power facilities can adversely affect native vegetation and wildlife in many ways, including loss of habitat; interference with rainfall and drainage; or direct contact causing injury or death. The impacts are exacerbated when the species affected are classified as sensitive, rare, or threatened and endangered.

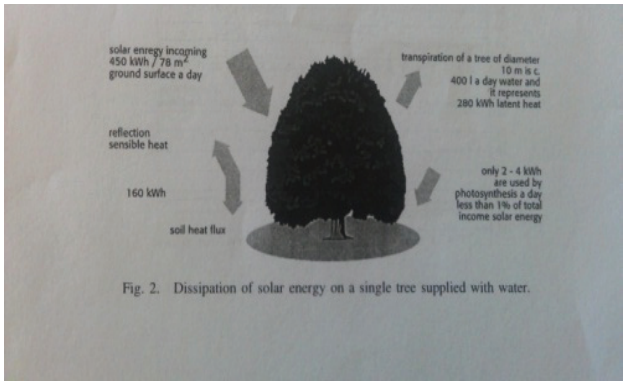

Fig. 2. Dissipation of solar energy on a single tree supplied with water.

Figure 2. Ecological Impacts, Dissipation on Solar Energy

The vegetation on any given scenarios fulfills functions other than shade; it also dissipates solar energy, treats water and also works as an air cooling system creating a better environment for human activities as shown on Fig 2 & 3. In order to get the most out of solar fields' tall vegetation has to be removing so they don't produce shade on top the panels reducing the amount of energy gathered out of it, but creating a more hostile environment for human interactions.

Visual Impacts

Because they are generally large facilities with numerous highly geometric and sometimes highly reflective surfaces, solar energy facilities may create visual impacts; however, being visible is not necessarily the same as being intrusive. Aesthetic issues are by their nature highly subjective. Proper siting dimensions and arrangements decisions can help to avoid aesthetic impacts to the landscape.

Versatility and Uses

Because of its physical characteristics and components, photovoltaic plaques are a versatile material to work with. It comes in different shapes, thickness, textures and applications that allow for many ways of implementations. It ranges from small window curtains to massive solar fields. These plaques can be used in residences as well as for urban furnishing and also can be used an element in the design used engage and aware people to make more environmentalist decisions.

Rain Water Harvesting

Solar panels come with great potential for harvesting water. It provides a clean and impervious surface from where water can be collected (if no chemicals have been applied). Water that does not need to touch the ground perhaps might not even need to be treated depending on the future use such as cooling the superior surface of the panels and irrigation.

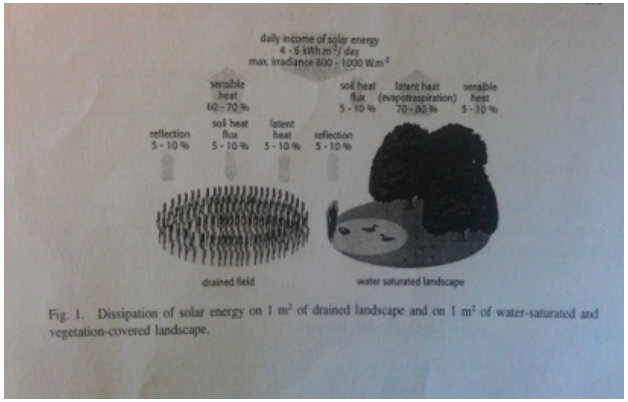

Fig. 1. Dissipation of solar energy on 1 m² of drained landscape and on 1 m² of water-saturated and vegetation-covered landscape.

Figure 3. Ecological Impacts, Dissipation on Solar Energy Diagram

There are some considerations that we have to keep in mind when working in solar fields. The impervious surface of the panels will cause soil erosion. Depending of the use of chemicals to keep the panels clean surface and ground water can be contaminated.

When designing a system to treat storm water runoff we have to consider the slope of the ground plain, the inclination of the solar panels and its elevation from the ground. The appropriate system will depend on the scale, function, change in elevation of the field and the aesthetic aspect of it.

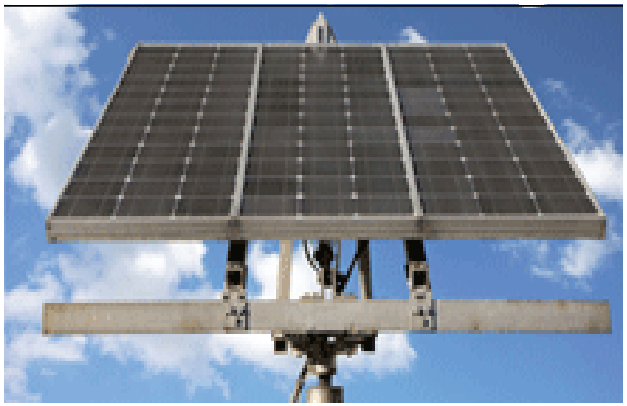

Figure 4. Solar Panels/ Water collection System

Figure 5. Gutter System

Figure 6. Solar Panels with Gutters

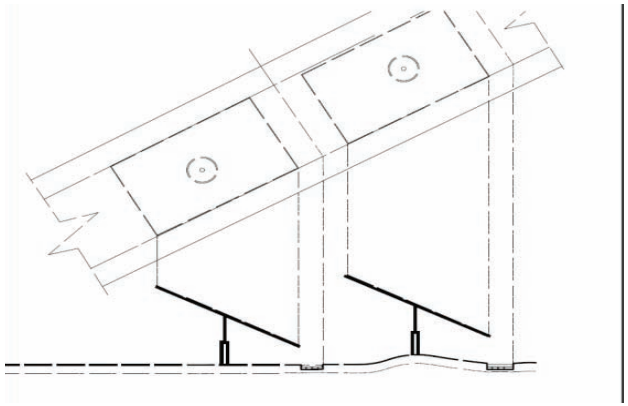

Figure 7. Diagram of Water Collection in Solar Fields

Some solar panel systems have water harvesting system integrated converting the water in potable water (Fig 4). Other systems include gutter systems which collect water before it touches the ground directing water through a series of pipes to the storage unit (Fig 5& 6), and the massive rain gardens that consist on channels (ditches) on the ground right where the water falls (Fig 7). For the last one some grading might be necessary in order to collect all the water in one specific location.

The selection of any of these systems will base on function and form and the objective of the design.

Observation

Solar fields in general provide opportunities for other programs other than the collection of free energy. It has the potential to be developed as a comfortable space for people to enjoy and learn. Thought the body of this text I have explore those qualities need to produce that kind of space. Other than the physical appearance of a place, and space can be developed base on the sensations that we want the user to experience. We have the technics and elements to produce such space.

I end this paper saying that for the particular application of these concepts in human interactions in Solar Fields perceptions plays a big role. The dimension of how a space is seen by the possible user will affect how it will be experience. We can do so creating equilibrium between the scale, dimensions and proportion of the solar panels in relationship to the void that it is creating. The quality of this void (space) will depend on its ability to provide shelter, to see without been seen, to contemplate and the ability to express the landscape.

"When the space is enclosed with the skill of an artist, when the purpose is to move, then "spatial sensation" becomes spatial emotion and enclosed space becomes ARCHITECTURE" (Goldfinger, 1942).

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Fig. 2. & 3. Ecological Impacts, Dissipation on Solar Energy Diagrams (scans) Pokorny, J. "Dissipation of Solar Energy in Landscape Controlled by Management of Water and Vegetation" (2001) 641-645.

Fig. 4. Solar Panels/ Rain Water collection System Wilsons Energy http://gonegreenintexas.com/

Fig. 5. Gutter System Detail, InterSole Gutter http://www.eco-lines.net/node/2203.

Fig. 6. Solar Panels with Gutters: Google Images

Fig. 7. Diagram of Water Colletion in Solar Fieds: Denisse Ortiz.

2.3 Crime and Vandalism Deflection Techniques Through Design

Jim Taranto

There exists an inherent challenge in the design and creation of public parks relating to maintenance and safety. Often public parks are owned by the town and therefore have a minimum budget to spend toward insuring that the park is well maintained and not damaged. Paying for the installation of cameras and alarms, or a security force can quickly become costly. For this reason, it is valuable to look into alternative methods or security techniques to help protect the large capital investment of constructing public parks. While traditional security devices have been employed in public spaces throughout time, an opportunity for subtle design security exists in public spaces.

Management policies play a very important role in the preservation of our public parks but usually come as an added cost through taxes to all who live in the area; including those who do not frequent the park. One popular and proven management technique is to hire personnel to watch over an area. The Crime prevention through environmental design (CPTED) movement refers to this technique as an "organized strategy" and states, "security guards or police provide surveillance and access control but are labor-intensive and expensive (Crowe et al. 1994)." Another option is the use of what the CPTED refers to as "mechanical strategies." It describes this as, "Capital or hardware-intensive security (e.g., alarms, cameras) that provides access control and surveillance. Mechanical strategies may require additional employees to watch monitors, for example (Crowe et al. 1994)." These strategies will certainly in some instances help to increase safety in an area, but according to the CPTED is not ideal. In some instances if organized or mechanical strategies can in fact have a negative impact. Jeremy Nemeth, a PhD in planning and public police from Rutgers University, in his research discovered that, "While studies have shown that people often feel safer in the presence of security personnel, the overabundance of security often generates suspicion that a space is not safe enough to operate without such a significant police presence. Put another way, "the social perception of threat becomes a function of the security mobilization itself, not crime rates (Nemeth et al. 2007)." He goes on to further add that, "Although security is necessary for creating spaces the public will use, making it a top priority is often criticized for restricting social interaction, constraining individual liberties, and unjustly excluding certain populations (Nemeth et

Figure 1. Security guards and cameras at the 911 Memorial

al. 2007)." Although successful we can see here that security personnel, cameras and alarms are not an ideal solution for the policing and protection of public spaces.

Crowe echoes what Nemeth states above and provides a solution through what the CPTED calls, "natural strategies - safety and security are provided through the design and layout of space, the location of windows, etc. Natural strategies have low human and capital resource requirements (Crowe et al. 1994)." This all follows the first objective of the CTPED which is, "a high-quality, aesthetically pleasing built environment— not crime prevention per se, but good physical design (Crowe et al. 1994)." The belief is that a properly designed public space will attract the desired users and make the undesirables, in this case the criminals, less inclined to inhabit the park. The next question then has to be, what constitutes an aesthetically pleasing environment and good physical design?

While there are several subtle techniques such as adding railings on benches and spikes on ledges to discourage certain groups such as the homeless from sleeping; "Experience with CPTED has shown that the most important consideration is to articulate the behavioral objectives for a given space. Careful specification of objectives leads to the most appropriate design and space use decisions (Crowe et al. 1994)." In other words focusing on what the intended actions in a given space within a public park are, and then making smart design decisions to reflect that is essentially the best form of crime prevention. The reasoning, is that designing a space properly for a specific user will not only attract that user, but provide them with a sense of temporary ownership of the space even within a public park. "One CPTED primer argues that territorial behaviour is endemic to [as Crowe states,] 'all human, as well as animal, existence'. Humans have 'a need to establish both temporary and permanent ownership of space… Humans and animals mark their turf'. Design, in this sense, is not manipulative, but rather [as Newman states,] 'catalyze[s] the natural impulses of residents' (qtd. In Blomly 2004). Because humans are territorial the specific users for which the spaces has designed will be in essence a free mobilized police force ensuring the well being of the public park. The better the design of a space, and a variety in design spaces will attract different types of users all with a vested interest in the overall well being of the park.

CPTED lays out some basic design guidelines for

a residential development to aid in creating well designed spaces. These ideas and principles and be adapted to the design of public parks. They first mention that it is important to use "natural access" to control not only who but where and when different users enter a public park. "Access control uses doors, shrubs, fences, gates, and other physical design elements to discourage access to an area by all but its intended users (Crowe et al. 1994)." It is important in the design of public spaces to have a strong control on the circulation of people within the park and this all starts by controlling where they can enter. Providing proper access allows everyone to know where people will be coming from making it more desirable for intended users and risky for unwanted users to make their way unseen into the park.
A second design technique is the use of natural surveillance. "Surveillance is achieved by placing windows in locations that allow intended users to see or be seen while ensuring that intruders will be observed as well. Surveillance is enhanced by providing adequate lighting and landscaping that allow for unobstructed views (Crowe et al. 1994)." For a public park unobstructed views especially from nearby streets, buildings, or residents is essential in preventing crime and vandalism because it does not provide criminals with locations in which they can hide in corners out of sight. The more unprotected a criminal feels, the more at risk he will feel when entering a public park. The third technique focuses in on territorial behavior, similar to what was discussed previously, explaining that residents feel the urge to watch and protect for the public space in front of or around their homes because they have a direct connection to it (Crowe et al. 1994).

Crowe (1994) lists other more specific design strategies listed by the CPTED are as follows.

- Provide a clear border definition of controlled space.
- Provide a clearly marked transition from public to semi-public to private space.
- Locate gathering areas in places with natural surveillance and access control and away from the view of potential offenders.
- Place safe activities in unsafe locations, and unsafe activities in safe locations.
- Provide natural barriers to conflicting activities.
- Improve the scheduling of space to provide for effective and critical intensity of uses.
- Design space to increase the perception of natural surveillance.
- Overcome distance and isolation through improved communications and design
- efficiencies, e.g., emergency telephones, pedestrian paths.

Figure 2. Safe Location Next to Concession Stand

By following some of these ideas and strategies we can then optimize not only the design but also the management of constructed public parks. Too often the design and management of public spaces are thought of independently of each other and the result is a park that is less than ideal, or management strategies that are excessively expensive to implicate. As designers we need to begin to think of them working hand in hand and prescribing how the management strategies will work

Figure 3. Broken Windows Theory

best with the design. One particular management practice that is essential in crime prevention and keeping out the unwanted in public parks is rooted in the broken windows theory, which suggests that "if a window in a building is broken and is left unrepaired, all of the rest of the windows will soon be broken (Wilson et al.)." Based on experiments conducted by Phillip Zimbardo testing the broken windows theory, it was concluded that "untended property becomes fair game for people out for fun and plunder." Furthermore, to remove the sense of ownership and leave an area unmanaged implies, "that no one cares" and quickly attracts the undesirables to an area (Wilson et al.).

Keeping public parks clean and well maintained is of the upmost importance because of these very reasons. One piece of garbage on a pedestrian path can quickly lead to several pieces of garbage, which leads to less of the intended users travelling along that path, which in turn removes the natural surveillance from that area, and ultimately attracts the unwanted users to the park. To reiterate, we cannot think solely about the design or solely about the management of the park. For example dog runs have become very popular because they attract many responsible users to the park who have an interest in maintaining the well being of the park. There can be the most beautifully designed dog run laid out following all

of the CPTED guidelines, but if there is nowhere to dispose of dog waste or the trash receptacles are not emptied regularly because of poor management practices; even these responsible intended users will start to not pick up their dog waste. This will then begin the snowball effect described by the broken windows theory and attract less people to the area removing eyes from the park.

At the core of it all, the correct design of great spaces with clearly defined borders and specific behavioral intentions in mind will lead to an area that people will want to inhabit, travel to, and care for. Coupling great design with low budget, but proper management techniques in accordance with the design is ideal for crime and vandalism prevention techniques. This all gives the community a greater sense of pride in their parks, and as designers by doing this, "We...are advocating territorial definition and the creation of surveillance opportunities to allow the citizen of the open society to achieve control of his environment for the activities he wishes to pursue within it—to make him instrumental in curtailing others from destroying his habitat (Blomley 2004)."

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2.4 Navigating the Picturesque: Olmsted's Entrance and Circulation Systems

Adam Cesanek

Frederick Law Olmsted's system of pathways and entrances at central park gives a cohesive experience to the park goer. Over six miles of meandering walks and roads accommodate driving, biking, jogging, walking, wandering, rollerblading, carriage rides; nearly every mode of land based transportation is feasible. This paper will explore how the design of the circulation in Central park reflects Olmsted's original intent for a unified park and how the idea of the picturesque conveys meaning to the park patrons.

Moving through the landscape is the foundation for experiencing almost every public park. Pathways, roads, trails and other corridors are balanced with entrances to spaces throughout the park in order to achieve a dynamic sense of place. In the mid to late 1800s, and the early portion of the twentieth century, circulation was a fundamental idea that could make or break a design. In fact, the decisive element which won Olmsted the design competition for Central Park was his addition of four transverse sunken roadways, which would serve to connect eastern and western Manhattan without interrupting the scenery of the park. Arcadian ideals of temples surrounded by picturesque fields lent themselves to a contemplative design philosophy. Meandering pathways guided visitors on long walks or rides around water bodies, across rock screes and through model farmland. The picturesque movement in landscape architecture had begun.

During the time period it was not unusual for landscape architects to take long walking tours of the surrounding countryside, tours which would later inform their designs. Olmsted wrote extensively on tours he took throughout England and in the antebellum South: "We are out of town now, and delighting in the open country. Exquisite views of hill, and dale, and wood, and water tempt the sight. [...] Now we are flitting under cedar groves, now under firs, now under mulberry plantations for the silk worm; temples alight every hillside" (Olmsted 77). The beauty found in uninterrupted nature, inspired artists at the time like William Turner to create ethereal masterpieces which expressed a sense of time and manipulated light in truly visionary ways. In another passage from his first book, Olmsted describes the softness of the landscape that inspired him, "The country we walked over for a few miles after leaving the village, was similar to that we saw yesterday - flattish with long, low undulations - the greater part in pasture, and that which was not, less highly cultivated than I had expected to find much land in England, the stock upon it almost altogether cows, and these always looking admirably well [...] The cattle in this pasture-lawn were small and black, brisk and wild looking, but so tame in reality, that as we lay under the tree, they came up and licked our hands like dogs" (Olmsted 108). The experience of the landscape during this time period becomes less about critical analysis of its elements, less

Figure 1. Turner, Landscape with River and Bay, 1835

about ecosystem services, but centers greatly on the visceral, the innate feeling derived from a place: “aesthetic enjoyment arises, not from the intrinsic qualities of objects perceived, but from trains of ideas which they suggest by association, that such trains of ideas must be: un-interrupted by alien ideas, not subjected to analysis by the critical faculty, productive of emotion, connected by some linking principle” (Appleton 34). This quote was from an essay written by landscape theorist Alison in 1812, regarding factors which influence “taste.” Good taste went hand in hand with a romantic view towards nature, in perceiving it holistically. Poets of the time were inclined to sing about the glorious rapture one may experience from “trains” of images within the landscape, here is an example by Knight in his second book of verse dating from 1794:

> For the cunning nymph with giddy care,
> And wanton wiles, conceals her study’d air;
> And each acquired glance of fashion tries,
> To hide in nature’s negligent disguise
> While with unseen design and covered art
> She charms the sense and plays round the heart
> So every pleasing object more will please
> As less the observer its intention sees:
> But thinks it form’d for use, and placed by chance
> Within the limits of his transient glance. (314 – 323)

The apex of the picturesque landscape movement was embodied in Birkenhead Park, the first public park in Britain. Designed in 1847 by Josef Paxton, Birkenhead featured a looping primary pathway system which worked to give continuous movement to the park goer. Smaller, secondary pathways took visitors on perimeter walks around the upper and lower lakes, and led them through areas such as the Rockery, the Sunken Garden, and the Night Pasture. Needless to say, Birkenhead became one of the major influences for Central Park. At the same time Central Park

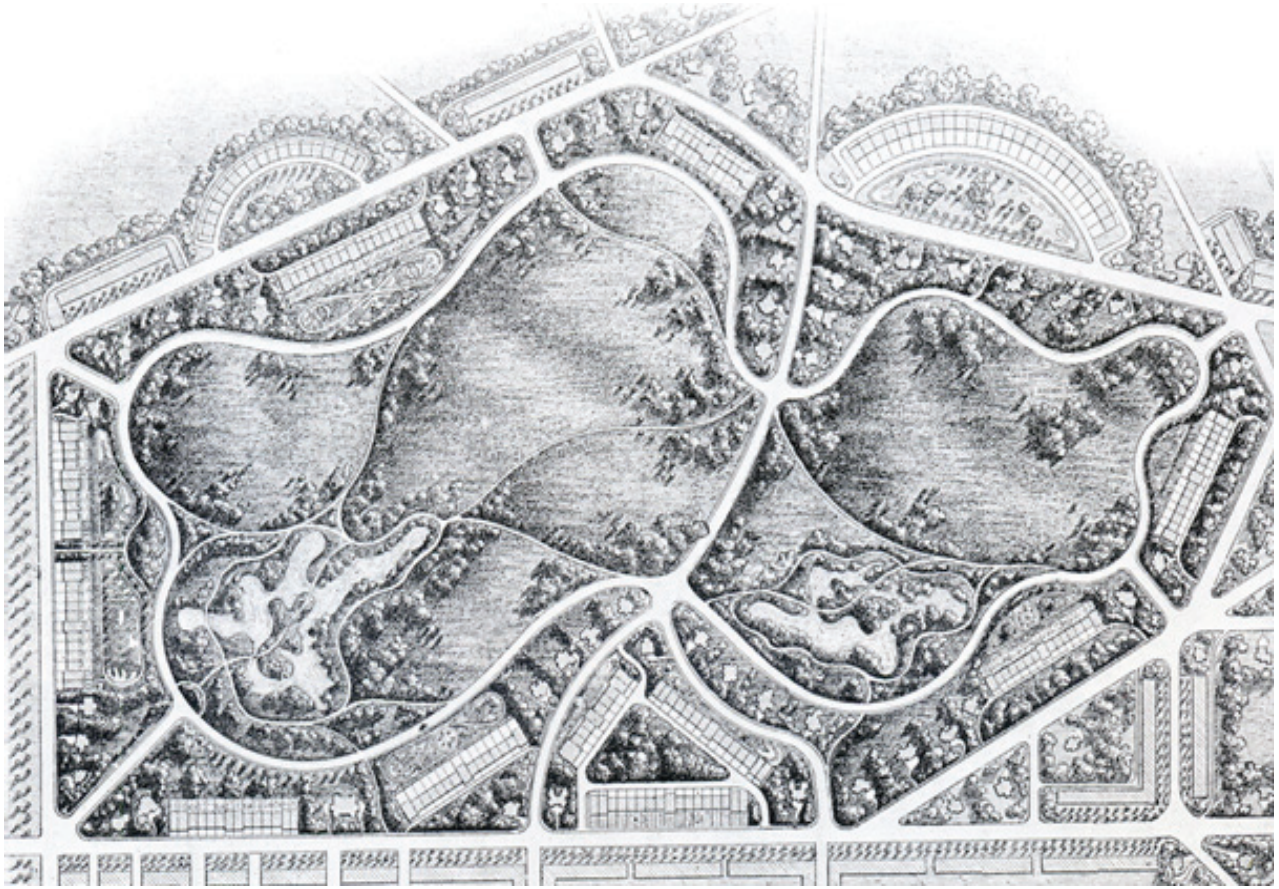

Figure 2. Birkenhead Park, 1843

was being built, Buttes Chaumont Park in Paris was designed by Alphand and Haussman. Buttes Chaumont Park is a testament to the sublime, featuring artificial caves poured from concrete with stalactites and stalagmites, Corinthian temples perched atop large rock outcroppings and a massive pedestrian bridge over a deep ravine. Overall, such parks sought to spark the wanderer’s romantic interest and overwhelm them with nature’s power.

Through the design of Central Park, Frederick Law Olmsted defined the practice of landscape architecture. By generating a new way of thinking about public space, Olmsted founded the American Society of Landscape Architects and was one of the leading authors for the fundamental literature that would help define the profession. “Throughout his career he had struggled to dispel, the perception that landscape architecture was simply an ambitious sort of gardening and to have his field recognized instead as a distinct branch of the fine arts, full sister to painting, sculpture, and brick and mortar architecture” (Larson 50). With over 800 acres of designed landscape in Central Park, Olmsted carved a path for Landscape Architecture in America. The latter portion of this paper will address how the entrances, bridges and specific spaces all play into the circulation system at central park. Overall, the circulation pattern

Figure 3. Riverside Plan, 1869

consists of three overlapping loops, a six mile perimeter loop a smaller three mile loop, and a one mile loop around the reservoir. I will conclude with a general analysis of Olmsted's circulation system of the Riverside estates and a critique of his article on street traffic patterns.

There are four corner entrances to Central Park including: the Frederick Douglass Circle, The Duke Ellington Circle, The Grand Army Plaza and Columbus Circle. Out of these four entrances Columbus Circle (aided by a convenient subway stop) conducts the entrance of over 3.5 million people to the park each year. Columbus Circle, is perhaps the most influential of all the crossroads into central park, it was recently redesigned by Olin partnership and WET, in order to create an even greater entrance to central park, allowing people to come to rest before entering. The circle has a very important role in that it is the center from which all distances are measured from in New York City. The central sculpture erected in 1892 commemorates Christopher Columbus's original journey of the Nina, Pinta, and Santa Maria. The plaza consists of two concentric inner circle is approximately 36,000 square feet and the outer circle is 148,000 square feet. Grand army plaza is located at the southeastern corner of central park at the intersection of 59th and 5th avenue. Before the plaza was designed, 'The area was famous for squatters' shacks and goats and was considered the outer edge of New York City,'' said David Garrard Lowe. Full conversion of the space into a beaux arts plaza was realized by the firm of Carrere and Hastings. From the grand army plaza one can easily access the ice skating rink, or travel up towards the mall.

Within Central Park, areas such as Bethesda Fountain and the formal Conservatory Gardens have their own entrance systems. The Mall is a long entrance-way terminating at Bethesda fountain. Historically, the mall was designed so that visitors could be dropped off at one end and experience the seemingly endless triple rows of Elms planted along either side, only to be picked up again once arriving at Bethesda Fountain. This design style was supposed to attract an upper class crowd to the park, in order to help with gentrification of the environment. However, as time progressed Olmsted had to fight to keep the park free from fairs, stands and other activities which would have greatly detracted from the fluidity of the pathway system he worked to develop. The other formal entrance that marks the bounds of the conservatory garden is defined by the Vanderbilt Gates. The tall, black iron gates are designed in a neoclassical style. The wrought iron on the Vanderbilt gates is thought to be the most detailed in New York City. Overall, these entrances within the park reinforce spatial elements and help to define separate areas of the park.

Spaces such as the Ramble and the Jaqueline Kennedy Onassis Reservoir, have specialized circulation systems which mimic larger ideas distilled from the surrounding landscape. The ramble is a 38 acre, maze of pathways that evokes the natural landscape of northern New York specifically that of the Adirondacks and the Catskills. The circulation pattern within the ramble has been described as "confusing," as pathways merge and intersect at over a dozen locations. By complementing the native landscape with stone archways, Olmsted again evokes the idea

of Arcadia, as if the park-goer were wandering around an ancient ruin. The pathways are thin and narrow, occasionally littered with boulders or dotted with small footbridges over streams. At the opposite end of the spectrum (and the park) lies the Jaqueline Kennedy Onassis Reservoir. A large open expanse, the reservoir lends its occupants a feeling of space and solitude; therefore it is a common destination for joggers within the park, offering a 1.58 mile track around the perimeter. Such contrasting examples of circulation within the park work as foils and help illustrate the idea that Olmsted was trying to manipulate the speed of the park experience in certain areas. However, both areas are similar in that they adhere to the larger idea of a picturesque park experience.

Today, there are 36 bridges located within central park which create a continual landscape experience for the park goer. The bridges create transitions between different areas of the park, leading a wanderer seamlessly into unexplored areas. However, Olmsted's original design for Greensward called for only four bridges in total: "The initial plan called for merely a handful of inexpensive simple brides to fit well within the budget, until a European-influenced Park Board of Commissioners believed Central Park could be nicely suited for well-heeled horseback riders" (Spiegler and Gaykowski 10).

The picturesque movement had taken the New York Park Commission by storm, who subsequently hired a separate architect to design bridges that would complement Olmsted's design. Most bridges and archways (especially within the natural ramble) were built out of the original Manhattan schist, which was excavated from portions of the site. Such natural bridges gently rise out of the landscape and work to create a sense of place, as park patrons stop and lean on a railing to observe their reflection in the water. Or, as viewed from afar, Central Park's bridges give an intimate scale to the landscape, evoking curiosity and thereby contributing to a sense of movement.

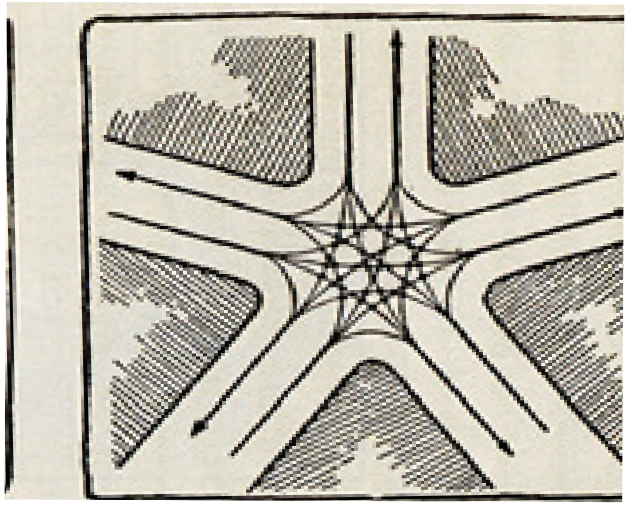

Figure 4. Excerpt from Olmsted's Traffic Studies

Taxonomically, the bridges became part of the overall style of Central Park, "Bridges were first numbered in order of their design sequence and soon co-named with Briticisms such as Dalehead, Gill and Willowdell, likely inspired by Olmsted's earler European travels" (Spiegler and Gaykowski 10). Therefore, the influence of the landscape style associated with parks such as Birkenhead and Buttes Chaumont becomes evident in the very details that adorn Central Park's bridges. It seemed that the emerging movement in landscape architecture was highly influenced by a dynamic interaction with the landscape: "Bridges initially designed to elegantly move the masses along separate routes of visual intrigue so as to increase enjoyment and safety for all suddenly became tools of the rapidly emerging profession of the late 1850s American landscape architect responsible for crafting the lush pastoral scenes seen throughout the park today" (Spiegler and Gaykowski 10). Overall, the bridges serve many functions in the park: a safe passage for pedestrians, a separate vehicular network, they lend visual continuity for wanderers, they tie into the general style of the park and give a sense of place. But, perhaps it is the musicians who capture the nature of these structures the best, as they physically interact with the very space caved out by the long stylized archways.

Olmsted's Riverside Park adopts similar continuous, thought-provoking circulation patterns to those exhibited in Central Park. The design was completed twelve years after the design for Central Park, and shares the same meandering pathways, which work to slow down the pedestrian. It is important to note that Riverside was designed around a railroad station and that intersections are not designed for vehicular traffic. Many five and even one ten point intersection are included in the plan of Riverside, however such intersections are mediated by large planting beds that conduct traffic along the edges, creating places for people to gather in the middle. The general concept underlying Riverside is provided below in an excerpt from Olmsted's office: "In the highways celerity will be of less importance that comfort and convenience of movement, and as the ordinary directness of line in town-streets, with its resultant regularity of plan would suggest eagerness to press forward, without looking to the right of the left, we should recommend the general adoption, in the design of your roads, of gracefully curved lines, generous space, and the absence of sharp corners, the idea being to suggest and imply leisure, contemplativeness, and happy tranquility." Overall, the design for Riverside is again based in the idea of the picturesque landscape. Riverside is so important because it was the first time in American history that the idea of movement, and the experience while moving, was applied to a large scale suburban setting. Jellicoe summarizes the idea, "Riverside Estate is an extension of the theory of park design to include domestic life, one of the earliest attempts to break the rigid gridiron of all American town planning" (Jellicoe 281).

After completing the design of central park, circulation was still at the forefront of Olmsted's thoughts, he went on to write an article for the first issue of the landscape architecture magazine

regarding the resolution of street intersection issues. Such innovative thinking about traffic patterns has still been largely ignored in the field, however the theory Olmsted discusses in the article clearly has its roots in America's most successful urban park. In the article Olmsted works to dispel the myth regarding the roundabout traffic circles, in that they actually create unnecessary confusion and could possibly lead to more vehicular collisions than any normal crossroad: "some of the advocates of this idea [avoiding single points of convergence] have urged the adoption of a gyratory method of handling the movement of vehicles" (Olmsted 1). Olmsted notes that throughout history there have been many attempts to handle crossroad intersections, one such attempt is the offset intersection: "there is an advantage to traffic in terminating one road where it enters another, and branching off again from the latter after an offset, instead of going straight across" (Olmsted 1). However, "in reality an offset street arrangement involves more confusion and inconvenience than a straight street crossing" (Olmsted 2). Olmsted supports these claims with diagrams which outline the traffic flow at intersections, and where the flow lines cross, there is possibility for a collision. In a roundabout roadway, "every vehicle entering the circle from any road is required to turn to the right and to follow the circular roadway out of which it turns to the right again upon reaching the road for which it is bound" (Olmsted 2). And according to the diagrams the collision points are, "increased to twenty with a roundabout, it is usually the case that a very few of the possible lines carry the great bulk of the traffic and that some of the rest carry so little as to be negligible" (Olmsted 5).

Therefore, in later diagrams, Olmsted adopts a new diagrammatic methodology to describe the traffic flow, by detailing the streams that may break off of any traffic flow. However the conclusion is the same, even with the added descriptive factors, that roundabout roadways are just not practical, "when such an opening depends upon the good will of the drivers, especially if each main stream consists of two or three parallel lines of vehicles, a considerable delay and not a little profanity may be caused by every vehicle that has to wait, and find an opening for itself in the opposite moving stream" (Olmsted 6). Furthermore, "it would seem clear that the prompt and orderly regulation of which vehicle is to give way for the other cannot possibly be effected under such conditions, even by a large number of policemen, as well as it can be done singlehanded on the ordinary crossing" (Olmsted 7).

Overall, Olmsted concludes that, "if there were unlimited space for handling the traffic at the more complicated meeting places the best method would be to so guide the streams as to reduce the tangle to a number of separately controllable three way and four way intersections" (Olmsted 8). Widening intersections could be one possible solution to the problem, but Olmsted was still concerned with how the roads touch, and advises landscape architects towards "avoiding any offsets, or even abrupt angles, in those lines which are likely to be followed by the largest streams of traffic" (Olmsted 8).

To this day the circulation in central park is responsible for the passage of over 25 million visitors each year. Visitors can still access the same meandering pathways which wend throughout the park as park- goers did over a century ago. The circulation system functions as a machine, the Columbus circle entrance brings over 3.5 million people into the park each year, and the grand army plaza entrance brings over 3.1 million. The public health aspect that central park brings to New York City is embraced by over 3.7 million joggers, and 1.1 million bikers who make their way through the parks scenic interior each year. Essentially the circulation design is a large loop, which is transected by separate major pathways, with secondary meandering trails breaking off, allowing for more intimate park experiences, and in this way Central park is not very different from its predecessors such as Birkenhead. In conclusion the circulation of central park is based in the idea of moving through a series of landscape pictures, to promote an understanding of nature that is not analyzed, but felt.

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2.5 Entrance and Pathway System in Modern Parks

Mukta Jadhav

Entrance and pathways are important aspects of public parks. Entrances invigorate a sense of arrival among the patrons. Irrespective of different designs of entrances, there exists a certain level of commonality in their functions, which is explored in this paper. Pathways choreograph the movement of people. Thus as designers, we are responsible for creating a comfortable and harmonious circulation for the users in the park. This paper focuses on the design of entrances and pathway systems of public parks and helps better understand their main elements and contributing factors.

For proper functioning of the park, the entrance, pathways, junctions or nodes, and spaces are linked together and are connected. Because of this relationship, these components of a park cannot work independently. So, though this paper majorly explores the entrance and pathways, it will also cover other overlapping topics like junctions and spaces. The analysis is done with the help of two public parks.

The first park is the Brooklyn Bridge Park. [Fig.1] It is an ongoing project of 85- acre land that stretches along the East River from north of the Manhattan Bridge to Atlantic Avenue in Brooklyn, NY. The park includes Piers 1 to 6 and their uplands. This is the most significant park development in Brooklyn since Prospect Park was built 135 years ago. The large scale park is in an urban setting and designing entrances was one of the main challenges. Thus it is a good example as a case study.

The second example is the Heritage Field and Macombs Dam Park. [Fig. 2] Heritage Field was built in place of the old Yankee stadium. This section of the park is located mostly in the former footprint of Yankee Stadium and covers an area of 10-acres. The 17-acre Macombs Dam Park offers a variety of recreational opportunities in a one-of-a-kind setting. One portion of the park is constructed atop the two story Ruppert Plaza parking garage and surrounded by perimeter landscaping. Both these parks are connected by Rupert Plaza. As these parks are at different elevations and are located in a complex urban setting, designing entrances and circulations was challenging. Thus, it also serves a good case study example.

At the end, this paper illustrates the analyzed

Figure 1. Brooklyn Bridge Park

Figure 2. Heritage Field

Figure 3. Brooklyn Coast, Before

Figure 4. Brooklyn Coast, Future

interesting systematic pathway patterns in all the parks that support the function of the spaces they create. It also summarizes the basic elements that together define an entrance.

Brooklyn Bridge Park

Brooklyn Bridge Park is designed to transform the underused and inaccessible stretch into a magnificent public space filled with lawns, recreation, beaches, coves, restored habitats, playgrounds and beautifully landscaped areas. The Park will connect visitors to the waterfront and New York Harbor in extraordinary ways with floating pathways, fishing piers, canals, paddling waters and

restored wetlands. Figure 3 and Figure 4 show the past and future views of the Brooklyn coast.

Access: Direct access to the park is limited to the north and south points of the Brooklyn Queens Expressway terraced roadways, which are necessarily the only points of entry, at-least by land. [Fig.5]. In the future, placement of residential towers near the park entrances, however, will enliven and activate them by creating new pedestrian activity year round. The designer suggests that the visual experience of the park will gain coherence from the conscious framing of views and existing landmarks on-site such as Brooklyn and Manhattan Bridges.

Greenway Initiative: A main pathway runs throughout the park that connects all the piers together [Fig. 6]. The path is pedestrian as well as bicycle accessible and is around 15 feet in width. Use of stone pavers at intervals on this gravel path helps slow down the bikers. The road is divided into two parts, one serves for the bikers and the other for pedestrians. [Figs. 7, 8]

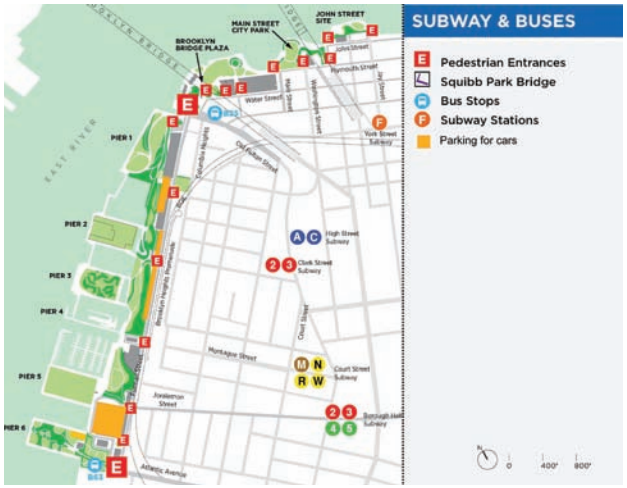

Figure 5. Brooklyn Bridge Entrances, Subway & Bus Stops

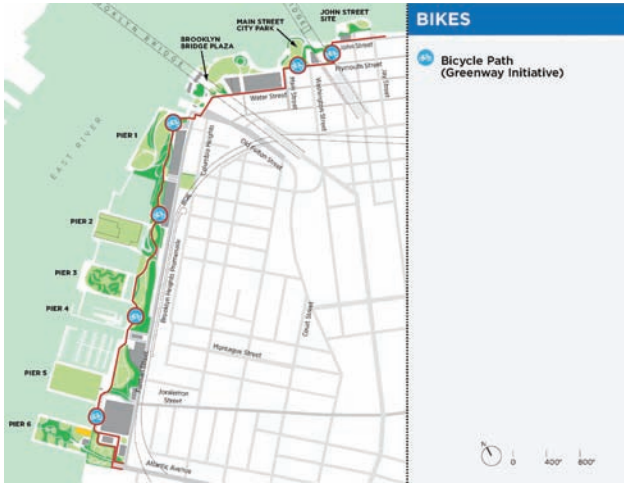

Figure 6. Greenway Initiative

Pier 1:

At 9.5 acres, Pier 1 is the largest of the park piers, complete with two stunning lawns, a playground, waterfront promenade, lush planting, and delicious concessionaires.

Entrance:

The entrance to pier one is from a plaza. This plaza hosts people arriving by waterway, bus, subway, and bicycle or by walking. The plaza [Figure 7] is demarcated from the roadside with the help of big boulders and a change in the surface material [Fig. 11]. Signs including the map of the park, further guide the patrons towards the park [Figs. 9, 10]. A kiosk design and bicycle parking is designed just before the pathway commences from the plaza [Fig 9].

Figure 7. Primary Path Division - Pedestrian and Bike lane

Figure 8. Primary Path Division - Pedestrian and Bike lane

Pathway System:

A primary path borders around the series of spaces, which are formed by the secondary and tertiary paths [Fig. 12]. The primary path is pedestrian and bicycle accessible whereas the secondary and tertiary pathways are only pedestrian

Figure 9. Entrance

Figure 10. Entrance, Pier 1

accessible. The width of the primary path ranges from 15 to 20 feet. The secondary and tertiary pathways range from 4 to 8 feet.

Pier 6:

Pier 6 adds approximately 7 acres of new park, including a 1.6 acre destination playground. Pier 6 also features three regulation-size sand volleyball courts, a rooftop concession stand with views of lower Manhattan, and free weekend ferry service to Governors Island.

Entrance:

Car parking is available near the entrance of pier 6. A kiosk and bicycle parking, and signs mark the entrance [Fig. 14]. The wide pedestrian pathway (about 15 feet wide) is the point of pedestrian entry to pier 6. Four wooden posts and a welcome sign create an impression of a gateway [Fig 13].

Pathway System:

Similar to the pathway system in Pier 1, a primary pathway runs along the edge. Series of spaces within this edge are framed by mounds, secondary and tertiary pathways [Fig. 15]. As there are active play areas in this section, for different age

Figure 12. Pathway System, Pier 1

Figure 15. Pathway System, Pier 6

Figure 11. Entrances, Pier 1

Figure 13. Entrance, Pier 6

Figure 16. Junction

groups, every entrance to secondary pathway from the primary is gated. These pathways are also strictly bicycle prohibited for safety and maintenance of surface materials. The primary pathway ranges from 15 to 20 feet. The secondary pathway ranges from 6 to 8 feet, while the tertiary pathway ranges from 4 to 6 feet

Figure 17. Junction

Junctions: To reduce conflict and for appropriate flow of movement, the wider place is designed where two or more junctions meet. In this park, as the pathways start nearing the junction, they start widening and hence a small node is formed [Fig. 16, 17].

All the entrances to Brooklyn Bridge Park are composed of certain signature elements namely: Stones Boulders or Wooden Posts, Signs, Bike Parking, Kiosk Design and Difference in Surface Material. The pathway systems in general [Fig. 18] have the same concept [Fig. 18]. The spaces are framed by secondary and tertiary pathways while the primary path runs along the edge. Thus, this design effectively prevents conflicts between spaces and bicycle riders.

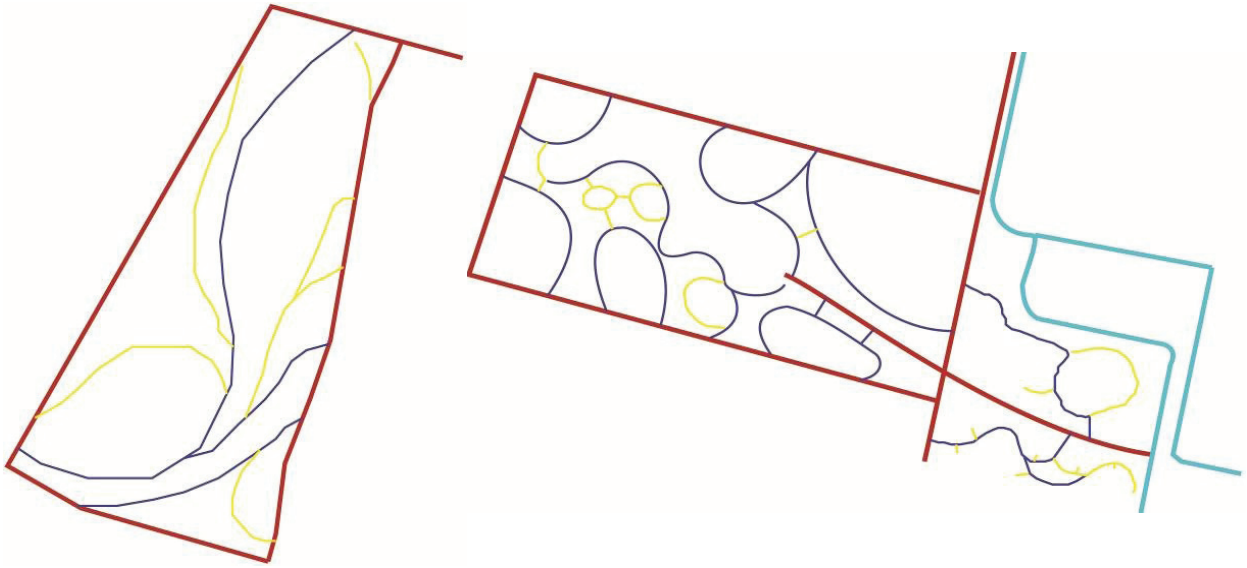

Figure 18. Pathway Systems

Macombs Dam Park, Ruppert Plaza and Heritage field

As part of the new Yankee Stadium project, New York City is providing the South Bronx with state-of-the-art recreational facilities and keeping its promise to replace every inch of parkland displaced by the construction of the new Yankee Stadium, while also providing additional recreational spaces [Fig. 19]. The new high-quality recreational facilities include soccer/football field surrounded by a 400-meter competition-quality track; four basketball courts; eight handball courts; a skate park; a playground; a waterfront esplanade linking a picnic area, play area, tennis center and sixteen tennis courts along the Harlem River; and new fitness equipment. Macombs Dam Park, includes

Figure 19. Macombs Dam Park and Heritage Field

three new grass ball fields, a comfort station, a play area and an exciting new pedestrian plaza.

Entrance:

Macombs Dam Park is at an elevation form the Ruppert plaza, and there is a provision of a staircase and a ramp for access. One end of the Macombs dam park is in alignment with the road

Figure 20. Entrance, Macombs Dam Park

elevation. This has a handicap accessible ramp. All the entrances to Macombs Dam Park have gates [Fig. 20, 21, 23].

Ruppert Plaza is situated between the elevated and at-grade sections of Macombs Dam Park, and connects these two areas with a ramp, a sloping expanse of natural grass, and two grand staircases. This plaza includes ample walking space and feature shade trees, terraces with seating, and landscaping. In addition, it will provide space for a future outdoor vendor. A bridge is built for pedestrian access from a part of the neighborhood that was separated from the site by a highway. This bridge opens up at one end of the plaza [Fig. 22].

Figure 21. Entrance, Heritage Field

Figure 22. Entrance from the Bridge into the Plaza

Figure 23. Entrance, Macombs Dam Park

Entrance to the Heritage field is through various access points from its bordering pathways on three sides and the Ruppert plaza on one side.

Pathway system:

For Macombs Dam Park and the Heritage Field, a primary pathway shapes the main space. Secondary and Tertiary pathways branch outward from the primary pathway giving access to smaller spaces along the edges [Fig. 24]. The Macombs Dam Park is at an elevation from the Ruppert Plaza. Hence, a ramp and staircase access is provided. The secondary and tertiary pathways bring people from the plazas, sidewalk to the main primary pathway. The secondary and tertiary are about 6 feet in width while the primary pathway ranges from 8 to 12 feet.

The entrances to the parks are designed with the help of elements like Signs, Staircases or Ramps, Bridge, Difference in Surface Material and Linear wide Central Plaza. The pathway system is designed in a way that it connects the neighborhood to the main space of the park. The secondary and tertiary pathways branch out from the main pathway and extend towards the community [Fig. 25]. The primary pathway along with a stronger function also helps in giving a strong edge to the mains central space.

Figure 24. Pathway System

An entrance is an entrance is an entrance! Different situation, different designs but a certain level of commonality lies in the design of entrance, which relates to the comfort level of users. Appropriate access, signs for guidance, a demarcation at the starting point are some of the factors. The pathway systems are of utmost importance. Chaos and confusion among the users will be a sign of poor pathway systems. Pathways should be coherent and in harmony with the whole design.

An interesting thing between both cases is that the primary pathway is in a loop. It borders a series of spaces in one case while a big space in the other. Correspondingly, the secondary and tertiary

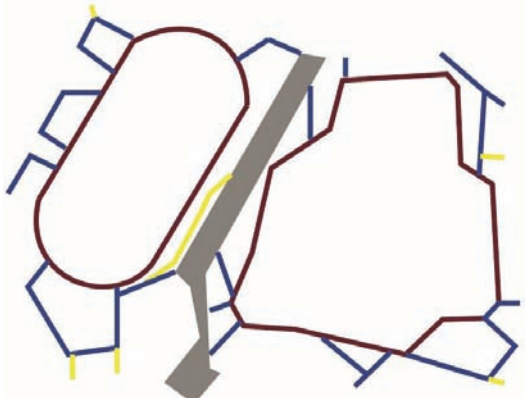

Figure 25. Pathway Systems

pathways in the first case support the interior spaces, while in the second case, they extended outwards, maintaining an undistributed space in the center.

For proper flow and functioning of a park, the entrance and pathway system needs to work in harmony with the context, location, and rest of the elements in the park. This will thus reflect in an un-conflicting experience for the user.

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2.6 Promenades in the Park

Kris Kemper

The word promenade is one of those select few words in the English language that is both a noun and a verb. Simply put, a promenade is both a place for strolling and the act of strolling itself. While it seems like promenading is an activity associated with the gentry of the 18th and 19th century, it is not an act which is limited to one social class. Promenading is an activity for the masses and is still a form of passive recreation currently popular in cities and parks worldwide. In his article Promenades and Promenading, Kenneth Helphand states that promenading originated during the 18th century. People living within the confines of old defensive walls would stroll atop these structures surrounding their cities once they were no longer of use. People saw the recreational amenity offered by these areas and once these defensive walls were demolished boulevards were constructed in their place. People could continue to leisurely amble in a designated area which was specifically created for this purpose (Helphand 2008, 11). This paper will look at four specific examples of Promenades, two historical: The Literary Walk/Mall in Central Park and the Broadwalk of Regent's Park, as well as two more contemporary examples: Allee du Zenith in Parc Villette and the Royal Palm Promenade in Al-Azhar Park. Through the analysis of these examples it will be shown that Promenades, while at first glance may appear to be a means of getting from one destination to another, actually are a destination themselves.

As previously mentioned, promenades rose to fame as being locations were community members historically came together to socialize. They served the purpose of allowing people to see, be seen and interact with their neighbors. These

Figure 1. Santa Monica's 3rd Street Promenade

users, often on Sunday afternoons or Weekday evenings, would dress to impress and set out for their local promenade to, as Daniel Bluestone puts it, "heterogeneously mix" with their peers (1987, 529). Designers such as Olmsted saw the opportunity for parks to include these formal spaces in addition the more naturalistic setting he was trying to create. Prior to constructing the Mall in Central Park many residents would take to 5th Avenue, Broadway or the Battery Waterfront to do their promenading. Including promenades in the park would allow people to engage in the more social act of promenading as well as giving the user access to the more serene and intimate activities of the picturesque and pastoral elements of the park. In addition, these promenades could serve as the setting for various civic and religious functions (Bluestone 1987, 529- 531).

Before looking at specific examples of promenades in parks, it is of value to look at a few examples of promenades which stand alone as a single attraction. They typically occur along streets, such as Denver's 16th Street Mall or Santa Monica's 3rd Street Promenade or as Esplanades along waterfronts. Denver's 16th Street Mall stretches a distance of approximately half of a mile along a portion of 16th Street. The street has been closed to vehicular traffic with the exception of a shuttle which runs from end to end. During this half mile stretch visitors have the option of visiting various shops, restaurants and entertainment venues which border each side. For users not wishing to engage in these retail activities, the Mall offers a place where people can walk, jog or bicycle. The center of the street is line with a double row of Honey Locusts in certain areas. These areas also contain seating which allows pedestrians a place to come to

Figure 2. Portland's Eastbank Esplanade

a rest, engage in a conversation or simply take in the events unfolding around them. The 3rd Street Promenade in Santa Monica is very similar to the 16th Mall with the exception that it is completely void of vehicular traffic. This promenade also stretches approximately half of a mile and offers the same abundance of retail, dining and entertainment options. In this example the trees are not in the center of the promenade but instead border the edges and consist of taller palms and smaller ornamental trees. In certain locations the street widens allowing for central islands which contain decorative plantings, fountains and seating (Google Earth, 2011).

Esplanades, which is simply a term for a promenade occurring near water, can serve almost as narrow parks themselves or be an element of a larger park. Esplanades tend to be longer than their landlocked counterparts as is evident in the two examples of Portland's Eastbank Esplanade and San Francisco's Crissy Field Promenade. The Eastbank Esplanade spans one and a half miles along Portland's Willamette River, serving as a recreational corridor under Interstate 5. Portions of the esplanade are built upon an existing sea wall and at certain points walkways actually jut out over the river. These structures serve as an opportunity for users to experience the Willamette in a variety of ways. San Francisco's Crissy Field is part of the larger Golden Gate Recreation Area and was constructed over an old airfield. The Promenade here stretches over a mile and is a central feature of the larger park. Users of the promenade are bordered by the San Francisco Bay on one side and by a restored tidal wetland, open lawn and parking on the other (Helphand 2008, 11-12). As opposed to the previous examples, these esplanades do not offer the same retail experiences but instead give users a chance to get up close and personal with natural features while they jog, walk the family dog or have a conversation while strolling with a friend; they offer the same opportunity for people watching as well as watching the beauty offered by the surrounding supportive environment.

While in the previous examples the promenades were attractive destinations, the attention was focused more outward toward businesses or pleasing waterfront views and not so much internally on the promenade itself. In the following examples of promenades in a park setting, we will see that the promenade itself can be the star of the spotlight. The first example to be examined is one of the most iconic promenades on the East Coast: Central Park's Literary Walk/Mall. Olmsted was a huge advocate for the public park improving the health and well-being of city residents through the stark contrast of its green setting compared to the urban environment. While Olmsted strove to create scenes of the pastoral and picturesque within the city, he knew that it was necessary to provide people with a formal park element, the mall, for structured social activity. Olmsted was inspired by his travels to European parks where he observed long, tree lined walks for strolling which at times opened up to pleasant views or grassy fields. In Central Park, Olmsted created a promenade one-

Figure 3. Literary Walk, Central Park

quarter of a mile long lined by two rows of American Elms planted in grass islands on each side of the pathway (Bluestone 1987, 539). At the south end, the mall terminates at a planting island where four bronze statues of famous authors are located, hence the alternate name literary walk. To the north is Bethesda terrace which offers a spectacular view of the Bethesda fountain and lower lake. The Promenade offered a place where residents of the city could become part of an urban parade as well as observe one. While today people still come to the Mall to walk and people watch there are also additional activities taking place. At any given time there could be multiple street performers entertaining a crowd, vendors selling snacks or merchants pawning off their goods to tourists. While the Mall serves as a pathway to reach the Bethesda terrace its primary function is as a destination in the park. It's not just a walkway it's a specific place people want to visit and experience which is evident by the crowds of people gathered there on any given day.

The next promenade is the Broadwalk located in London's Regent's Park. The Broadwalk is one of the dominating features of the park and stretches over three-quarters of a mile on the eastern side of the Park. The London Zoo lies off the west side of the Broadwalk on the north end and the south end of the promenade passes through and terminates in the formal Avenue Gardens. The northern half of the promenade is bordered by rows of various species of trees on each side. John Nash, the designer of the garden, intentionally broke the row trees in certain areas to frame views of park scenery. To the south, where the promenade passes through the Avenue Gardens, the planting pattern becomes more rigid and formal with a row of small trees and hedges on each side of the path. Originally, Regent's park was not thought of as a Public Park. The Broadwalk served as a link to the Regency terraces residential area to the south and as a place where the wealthy residents could gather and show off their social status. However, the Park was opened to the Public in 1835 and the Broadwalk became a place where people of varying class

Figure 4. Broadwalk, Regent's Park

could come together. To this day the Broadwalk is a heavily used feature of the park where people come to stroll and take in the scenes of the park, the only activity not welcomed on the walk is cycling (Tate 2001, 84-91).The Allee du Zenith is the first contemporary example of a promenade in a park examined in this paper. It is located in Paris's Parc de la Villette designed by Bernard Tschumi and stretches approximately one-quarter of a mile. Offset to the south is La Cite de la Musique, a center for the study of dance and music, and to the north is the Zenith, a type of concert venue. The path is completely paved, with a difference in paving patterns distinguishing foot traffic (a sort of cobblestone paver) from cyclists

Figure 5. Allee du Zenith, Parc Villette

(asphalt). Each side of the path is bordered by regularly planted London plane trees and occasional seating. Off the sides of the Allee are some of the park's folies and specialty gardens (Sound and Bamboo Gardens). While the Allee serves as a pathway to reach these various park elements, it also offers a comfortable place for people to view activities taking place in other areas without actually being in them (Tate 2001, 56-60). The fact that the other park features are offset from and not directly on the axis of the Allee, help to define the Allee as a separate element, and not a mere pathway.

The final, and most recent example, is the Royal Palm Promenade located in Cairo's Al-Azhar Park. The park itself is constructed on a former landfill and the quarter mile long promenade is a central, spine-like feature of the park. The promenade is completely paved and bordered by a double row of royal palms on each side. Seating and lighting are regularly spaced along the axis and a central water channel runs along most of its length. This water channel feeds various water features located on the promenade which add interest to its length. The promenade ends to the south in a sunken garden which is offset from the promenades axis and to the north in a formal, almost knot-like Islamic garden. The Park's main entrance is located off the eastern side of the

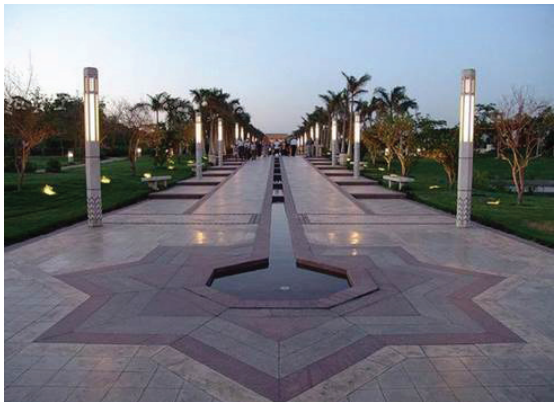

Figure 6. Royal Palm Promenade, Al-Azhar Park

Promenade near the northern end. After passing through the entrance gate, park visitors are immediately placed onto the promenade, emphasizing its importance as a central feature of the park (Nassar 2011). Cairo is a densely populated city without much green space, the lush border plantings, towering royal palms and water features of the promenade offer visitors a pleasant change from the surrounding area, making it a place they will want to linger in.

As seen in these four examples, Promenades are more than just a pathway. While as a secondary function they may serve as an axis to other park elements, their primary function is as a destination within the park. When thinking about the design of a promenade, these four examples offer valuable information. In general, a quarter of a mile seems to be an appropriate length. Regularly planted trees and seating allow people with comfortable places to come to a rest and observe what is happening around them. Also the rows of trees help to reinforce the linear nature of the promenade and can be used to frame views. A second row of trees can be added to strengthen this effect especially on wider promenades, as in Central Park or Al-Azhar. Finally although the repetitive nature of promenades is what helps to define them and give them strength it is important to consider what additional programming is occurring along its length to keep people interested. This could vary from something simple such as statues in the case of Central Park or something more creative as the interactive water features in Al-Azhar.

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2.7 Bosquets: Past and Present

Erik Maietta

Bosquets have existed in landscape design for hundreds of years, and has been defined by metropolitangardens.com as “a grove of trees. Some mimic the forest, while others are more formal. Trees are spaced regularly, or more randomly. Bosquets are evergreen, deciduous, or both. Larger bosquets often have more kinds of trees. Trees planted in a grid may be underplanted randomly with shrubs and perennials”. While Bosquets can take many forms with different planting and ground plane materials, the major feature I will be highlighting is the actual experience of moving through a bosque and how it affects the user.

According to Wikipedia, In the French formal garden, a bosquet (French, from Italian bosco, “grove, wood”) is a formal plantation of trees, at least five of identical species planted as a quincunx, or set in strict regularity as to rank and file, so that the trunks line up as one passes along either face. When a landscape architect begins working on a park, he or she must refer to André Le Nôtre in seventeenth-century France. During this period after the main architectural framework of Versailles was established, more attention was given to the development of the Bosquets – Le Notre created several of these green theaters within the grounds of Petit Parc of Versailles that transport the visitor to different, inner worlds (Weltman-Aron 2).

In the West, the garden has been viewed as an ordered and partly man-made space that contrasts with, and offers a shelter from, the wilderness without. During the Renaissance and the seventeenth century, garden designs emphasized geometrical forms and symmetry, and this tendency has been interpreted as a sign of man’s control

Figure 1. Saint Antoine Promenade

over the landscape, even though at the time it also meant to reflect Nature’s

harmony. This can be seen in the gardens of Versailles, which illustrate the French formal style (Weltman-Aron 2). Since the Renaissance, space has been viewed through one point-linear perspective, a theory which was applied to paintings and garden layouts. The French formal garden was based on a single axial view from the house, with a long perspective, and the position of the spectator was predetermined in relation to the “picture” he or she was to behold. This does not mean, however, that parts of Versailles, such as the labyrinth or the bosquets, did not disrupt the rule of the single axial view, or limit the prospects afforded by perspective (Weltman-Aron 3).

In the Bosquet del’Encelada mythological giant is crushed by the rocks he had piled up with the purpose of reaching the Olympian gods. This imagery was both metaphysical and political, providing the viewer with the lesson that the Sun-King’s rule was absolute. As explained by Caterine Szanto, when we leave an allee to enter a bosquet, one of the wooded squares of the garden, where we are completely surrounded by tall vegetation without any view beyond. But we find this also at the scale of each of the inner green rooms inside the bosquets: after leaving a main allee, we follow a narrow path in a different direction. At the end of the path, we reach the inner garden; we are still completely surrounded by tall vegetation – showing us that we are still within the same bosquet – but

the dimensions, proportions and characteristics of the space we are about to enter are different. In the bosquet of Enceladus, The space is organized with several concentric layers, each offering a distinct sensory experience. First the outer space is a pergola, with several openings towards the center. Then, inside the pergola is a terrace, and on the other by steps marked at the angles by fountains, creating a distinctive sound environment. To enter the innermost area surrounding the basin of Enceladus, we need to go down these steps, and again the user is transported to the most intimate environment (Szanto 945).

The experience of moving through the succession of spaces in the Bosquet of Enceladus can be represented along a time-line (figures 5b) and an experiential score, (figure 5c). So the experience of walking in the garden is made up of entering and exiting spaces, setting reachable goals for yourself - distant objects and panoramic views, spaces to be entered -and eventually reaching them. Each spatial "thing" (object, spatial unit or panoramic view) offers a right point of view, from which it can be perceived and understood for what it is better than from any other location. Szanto explains:

The right point of view is a function of both the physical characteristics of that thing and the possibilities of movement its environment affords us. We feel we have reached the thing when we have reached the right point of view: we experience a sense of having reached our goal, of having fulfilled our desire - a sense of "Here". If we feel attracted by a panoramic view beyond a terrace delimited by a balustrade... we will cross the terrace until we reach its limit: we then feel we have "reached" the panoramic view, although the location where we stand is a function not as much of the view as of the balustrade which doesn't allow us to go further. The panoramic view was a "There" for us as long as there was a space for us to cross to come closer to it; it became an overwhelming "Here" when we reached the limit of that space" (Szanto 946).

Closely-related to the bosquet is the orderly orchard, a feature that has been linked with pleasure gardening as early as the Persian gardens of the Achaemenids. Like the bosque, "the structure of the orchard has an effect on you – orderly rows of trees or columns or piers to mark off modules in a field of space, and establish a rhythmic order that pulls us in. As you move through the regular intervals of trees, arcades form between them – ahead of you and diagonally to the right and left – superimposed and even confusing orderings from the same grid" (Lyndon 33).

The regularly-paced aisles of Gothic churches come closest to the orchard motif, with their ribs branching into vaults overhead. "In the Bourges cathedral, the tall double side aisles on either side of the nave cause the space to spread generously and mysteriously as under the branches of a majestic, tall orchard". The experience of being in one of these s fields of columns will change as you penetrate into the darkness from the edge, which is usually more open to allow air circulation (Lyndon 39).

Over the years, the bosque motif has appeared in many forms with different names. Although different trees and styles have been explored, the main, unifying feature is the experience of moving through the space. As a bosque matures, it creates a dense, dark canopy that contrasts well with open areas seen the distance. The bosque remains a unique park program that allows park patrons to enjoy a private and meditative journey in a public space.

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2.8 Nodes in the Park and their Design as Social Spaces

Wan Huang

To support and further develop the individual design of the Voorhees Environmental Park, in this article, nodes as physical elements in a park and how they can work for people as social spaces will be analyzed. First, I'll look at Kevin Lynch's *The Image of the City* to see how nodes are defined and designed. Afterwards, William H. White's analyses of pedestrian behavior at urban plazas, and other related researches about public social behavior will be studied for insight on how to make places friendlier and easier for people to use in a park.

Nodes as junctions or concentration

As one of the five elements of the image of the city, nodes are strategic focal point into which one can enter and travel. Typically they are junctions of paths, or concentration of some characteristic. For nodes that are junctions, they mark the switch of a journey. People make decisions at junctions, about where to go or what to do next. As a result, they are more aware of such places and perceive the elements with more than usual clarity. These junctions mark the transition between major structural units, like a transition from a highway to a city street, or break-points of transportation (Lynch 1960, 47). They are places people remember well in a journey.

Instead of shaping by physical linkage, another kind of node is thematic concentration. It is the focus and symbol of an important region of functional importance. It's more shaped by the activity of people there. There are nodes which can be both junctions and concentrations, for example, Jersey City's journal square, which is an important bus and automobile transfer and is also a concentration of shopping areas (Lynch 1960, 74).

Figure 1. Piazza San marco, Venice, Italy.

Design of nodes

Paths and nodes are closely interrelated. Junction nodes occur automatically at major intersections, and reinforce those critical moments in a journey. It's logical to make the node coincide with a decision point on a path. The joint between path and node must be visible and expressive, for traveler to see how he enters the node, where the break occurs and how he goes forward (Lynch 1960, 102).

If the node has a local orientation within itself, then it can be related to the larger orientation system, for example, up or down, outward or inward, left or right. Situated at a more oriented system, the observer knows in what direction to move outward, and the particularity of the place itself is enhanced by the contrast within the total image (Lynch 1960, 103).

Nodes can be configured as conceptual anchor points. They need to be distinct, unforgettable places. The achievement of identity can be attained by the singular and continuous quality of the walls, floor, lighting, vegetation, topography, or skyline of the node. Coherent spatial form, provision of one or two objects which are foci of attention, and sharp boundary can help the node to be more defined.

The Piazza San Marco, Venice, Italy is an excellent example of node in a city. It has clear and sharp boundary and it's highly differentiated and structured. It stands in sharp contrast to the general character of the city which has lots of narrow, twisting spaces, whereas it ties firmly to the major feature of the city, the canal and other landmarks, and has an oriented shape that clarifies the direction from which one enters (Lynch 1960, 78). The node is not only strengthened by the landmarks, but also provides a setting which almost guarantees attention for those marks (Lynch 1960, 84).

Given the elements of nodes, if the goal is to shape such places for people who will use them, we not only need to know how to design its form, but also how to make it serves its function. Some studies show there are characteristics of people's behaviors based on cultural and psychological traits. Thus it's beneficial to study the patterns of human movement and activity in public spaces, in order to design the nodes work as social spaces for park visitors. Followings are some findings in related studies.

What attracts people in the park?

Human activity is one of the biggest attractors in parks. "What attracts people most, it would appear, is other people." (Whyte 1980) People want to be where other people are. And there is a strong carry-over effect, and instinct that the place is safe where there are people around. People usually don't say they like to sit in the crowd, but what they do reveals a different priority than what they say (Lyle 1970, 31).

People seem to be directed to what consider being the heart or core of the park. They avoid dark and isolated places. Places away from the main circula-

Figure 2. Fountain at Discovery Green, Houston.

tion routes and those in isolated locations are less used. What's more, spots close to attractions can attract people as well. Other features where other attractors are nearby, like areas near a playground, or a café, could become favored places too. Propinquity of attractors reinforced their attractions (Lyle 1970, 31). And people are generally attracted to water features, both natural and man-made ones.

There are other general tendencies. There is tendency for people to cluster about the edge of spatial unit, like a grove of trees, a clearing, border of a pool, steps, etc. People like well-defined spaces. They incline to station themselves near objects, either sitting or standing. Rarely chosen is the middle of a large space (Whyte 1980, 22).

The disposition of various age groups has patterns too. Children take the central position in most situations, while groups of younger, parent-aged adults are around the children, and elderly are about the periphery of the situation, often watching from a considerable distance. (Lyle 1970, 31) People tend to sit facing open space, or in the direction of human activity or some feature, for example, a piece of sculpture, body of water or flower bed. Conversational groups need to face each other. If several people occupy a single bench, usually they are almost invariably homogeneous in age or sex or both (Lyle 1970, 51).

Nodes as sociable spaces

Junctions and transfer points are where lots of activities happen. They are favored places for standing, chatting, sitting, and picnicking. There is an inclination that people stay in the main stream, and follow the pedestrian flow, because it offers maximum choices for people to break off, linger, move on and other options. The design of such spaces, the nodes in the park, need to provide linkage between people, as well as joints to other parts of the park.

If nodes are spots where people mingle and meet, first they need to be places that can make it happen. The provision of sitting would be indispensible.

First of all is the provision of sittable space. What people sit on, the size and shape of sitting need to be determined. "People tend to sit most where there are places to sit."(Whyte 1980, 28) Benches, chairs and other edges are options for consideration, to control the amount of sitting space. Corners are functional. They are good for face to face sitting. People in groups appreciate them. There was study showed that people conversing prefer to sit across from one another, although at some slight angle, rather than side by side. People will sit across from one another until the distance between them exceeds the limit for comfortable conversation. (Sommer 1969, 66) People will sit almost anywhere between a height between one to three feet (Whyte 1980, 31).

When benches are two backsides deep, choice is greatly enlarged and more people can sit without feeling crowded. Dimension of such benches matters. Don't make people tempt to sit on both sides but too shallow to let them do so comfortably. The preferable depth of two backsides bench mentioned in Whyte's book is 36 inches (Whyte 1980, 31).

To make sitting space socially comfortable firstly is to give sitting choices, sitting up front, in back, to the side, in the sun, in the shade, in groups, off alone (Whyte 1980, 28). What the surroundings look like and what's going on at eye level when people sitting needs to be considered in the design of sitting. People's movement, people watching people and being watched is one of the great spectacles of a gathering space.

Designers have to see from users' perspective, and think in accordance with the purpose of the space, to provide such opportunities. The study of people's social and behavioral patterns in public spaces is important, for it not only helps designer to make spaces more user friendly for people, but also shapes the space to support the function as a node in the park, in controlling people's way of using such areas.

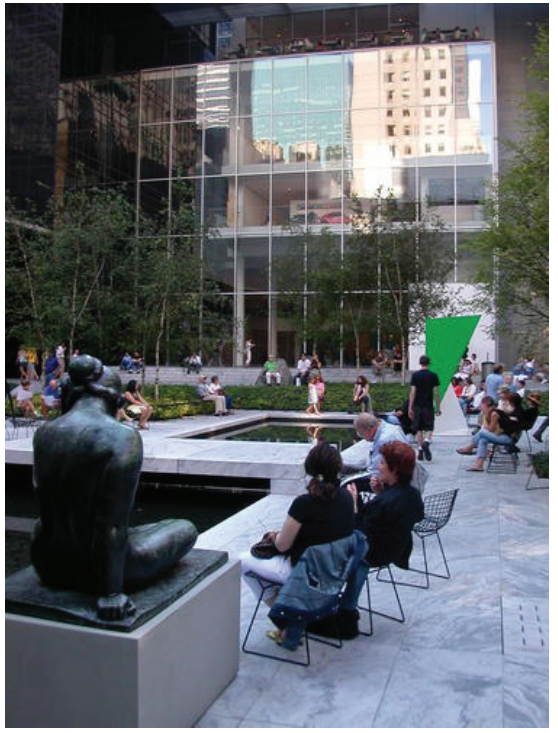

Figure 3. MOMA Sculpture Garden, NY.

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2.9 Spots in the Landscape

Kim Nuccio

I set out to figure out exactly what a “Spot” in the landscape is. And what I found is that a spot is largely defined by scale, function and materiality. All of the examples I found also had a few things in common. First of all, they invite people in; by virtue of their location, elevation, sun exposure or some other intriguing designing element they offer a small haven for an approaching person. They all have seating, they all are designed to take advantage of some sort of view, and they all fall into what I call a “spot size range” that goes from small to large: small being large enough for only a single bench, medium being big enough for 3-4 benches or chairs and large big enough for a few tables.

By FUNCTION, I mean the intended purpose of the space, which is a spot. The function of most of the following examples is to simply take in a view, come to rest, talk, read, etc.

I analyzed the following examples in terms of scale, function and materiality.

Dumbarton Oaks, Beatrix Farrand

This site is full special places to just sit and take in the view. Each of the many the benches and seats which dot the hillside of Dumbarton Oaks are perfectly-placed, little havens in the garden.

Farrand designed the gardens at Dumbarton Oaks “working in happy and close collaboration for almost thirty years, with her client planning every garden detail, each terrace, bench, urn, and border.” (The Bee, online.) The benches themselves are works of art. They are beautifully designed for each space and perfectly offset their setting within their structure.

Figure 1. Dumbarton Oaks, Beatrix Farrand

This special spot at Dumbarton Oaks is small, as it has room for a single bench, is intended to simply enjoy the view of the gardens and is characterized by carefully crafted wooden bench.

The Stone Stairway, Thomas Church

In his book, *Gardens Are For People*, Thomas Church uses this spot to illustrate how the character of a landscape stairway is largely determined by the materials used to build it. Although this spot is large enough for only a single chaise, clearly it is a destination in the garden. Again, the function of this space is for passive activities or simply relaxing.

Figure 2. Thomas Church, garden stair

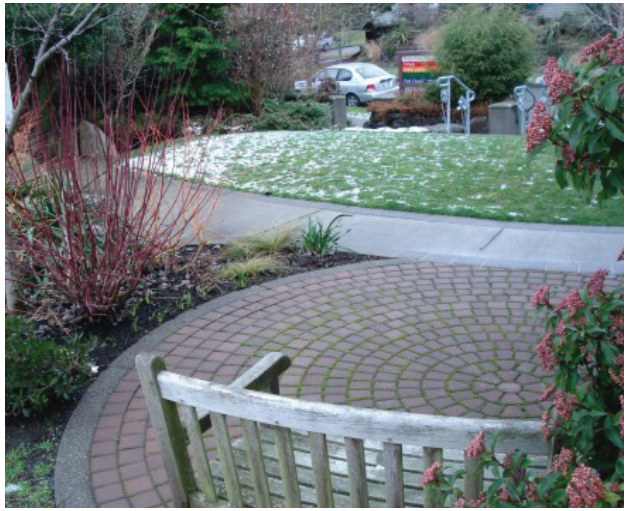

Figure 3. Seattle Pocket Park

Figure 4. Thomas Church, residential terrace

Seattle Pocket Park

This Seattle pocket park, also in the small category is differentiated from the path with a change in materials (concrete to brick). Plantings further define the space, utilizing a healthy mix of evergreens, deciduous trees and perennial shrubs for year round interest.

Residential Terrace Thomas Church

The next three examples all fall into the medium category but differ in material and function. Thomas Church writes “This semi-circular terrace denies any timid compromise with the slope.” It’s function is to extend the outdoor space into the woods, which is characteristic of Church’s work.

Figure 5. Golf course overlook

Figure 6. Treetop Deck, Thomas Church

Figure 7. Woodland Deck

Figure 8. A “Spot” at the water’s edge

Woodland Deck & Golf Course overlook

This woodland deck and golf course overlook function in a similar way, providing a place in the landscape for a few people to come to rest and enjoy a view

Treetop Deck, Thomas Church

The next two examples both fall into the large category. The treetop deck by Thomas Church sits 20 feet above the ground 40 ft into the foliage. The views are unparalleled in this space for small gatherings, quiet contemplation bird watching or reading.

A Spot at the Water’s edge

I’ll finish with a spot that is most relevant to our park project. This spot at the water’s edge is large enough to accommodate a small group of people, is both linked to the path, but separated from it and offers park users a quiet and beautiful haven to enjoy nature.

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Fig. 2. Garden stair, *Gardens are for People,* by Thomas Church, Grace M. Hall, and Michael Laurie.

Fig. 3. Seattle Pocket Park. Accessed online November 4, 2011

Fig. 4. Residential terrace, *Gardens are for People,* by Thomas Church, Grace M. Hall, and Michael Laurie.

Fig. 5. Golf course overlook. Accessed online November 4, 2011

Fig. 6. Treetop deck.*Gardens are for People,* by Thomas Church, Grace M. Hall, and Michael Laurie.

Fig. 7. Woodland deck. Accessed online November 4, 2011

Fig. 8. A spot at the water's edge. Accessed online November 5, 2011

2.10 Privacy in the Public Realm

David Hanrahan

There are numerous reasons people visit public open space and parks in the public realm. Ranging from the purely social inspiration for face-to-face interaction with others to the desire to seek private space, individuals in the public realm move through spaces that may be programmed for specific interactions with others, spaces that are claimed by individuals in an attempt to exclude others, and sometimes, spaces that may be programmed in such ways that explicitly exclude individuals. This paper focuses on the theoretical definitions and methods individuals and groups employ to establish a sense of control over their surroundings in the public realm. Through a literature review that focuses on the user initiated private space in the public open space realm, I examine theories of personal space, personalized space and territories. Because personal privatized space in the public realm is often temporary in nature and influenced by design and other park users, I explore concepts of the relation to the continuum between sociability and relationships among park users. Lastly, in light of the continuum between private and public space within a single public space, I discuss design challenges and opportunities for a suburban park, Voorhees Environmental Park, in Voorhees, New Jersey.

First and foremost, when one imagines public space, one may think of a continuous onslaught of face-to-face interaction with others in direct communication and harmony with others. The nature of public space is such that one often maneuvers temporary relationships with unknown individuals using the same space. The relationships vary in intensity and duration, but, in general, public realm relationships and interactions contrast with those one encounters within in the

Figure 1. The Public Domain

confines of an individual's private domain. Interactions are generally less intimate, varied and fleeting and may be unpredictable. Lyn H. Lofland (1998) characterizes five principles that have historically guided human interactions and the public persona in the face of strangers in the public realm: (1) cooperative motility, (2) civil inattention, (3) audience role prominence, (4) restrained helpfulness, and (5) civility toward diversity.

Lofland describes the principles as rules that regulate interactions with strangers in the public realm. To build into a discussion on privacy, it is prudent to first explore the meanings of each of the principles above in relation to interactions with strangers in the public realm. First, cooperative motility refers to the actual patterning of everyday interactions and movement among strangers and around objects. "Most of the time our movement through the public realm is simply uneventful, and it is so because humans are cooperating with one another to make it so" (Lofland 1998, 29). Civil inattention absolves the individual to exist within the same public realm without direct verbal contact. "Civil inattention makes possible copresence without comingling, awareness without engrossment, courtesy without conversation....Civil inattention suggest that when humans in the public realm appear to ignore one another, they do so not our of psychological distress but out of ritual regard, and their response is not the asocial one of "shut down" but the fully social one of politeness" (Lofland 1998, 30). Audience role prominence focuses on the voyeuristic nature of humans where they "enthusiastically assume the audience role in the face of what the face of what are very seriously problems..."(Lofland 1998, 31). Restrained helpfulness encompass responses to "requests for mundane assistance" (Lofland 1998, 32). And, finally, civility toward diversity

Figure 2. Claiming Space in the Public Realm.

situations where an individual is offended or "confronted with what may be personally offensive visible variations... the urbanite will act in a civil manner, that is, will act "decently" vis-à-vis diversity" (Lofland 1998, 32).

In its purest sense, there is rarely privacy in the public realm. Privacy can be defined as one's ability to control interactions with others (Lang 1987). And, according to Lang, humans establish privacy through securing personal space, personalizing space and establishing territories. Furthermore, with regard to the rules that regulate interactions with strangers in the public realm, Lofland (1998) states that they may be used to accomplish several things. Primary to this paper, though, I would now like to focus on the two of the outcomes of the rules above: (1) ensuring privacy, disattention, and avoidance, and (2) defending territory. John Lang (1987) describes privacy as the establishment of personal space, personalized space or territories. While personal space refers to "the distance that animals of the same noncontact species maintain among themselves except for the most intimate interactions" (Lang 1987, 147), personalized space refers to "the marking of places or the accretion of objects within them, and thereby the staking of claim to them" (Lang 1987, 147). Lofland states further of the rules in the public realm toward privacy communicate, "I want my privacy and am not available to be spoken to or encountered in any way... I know you are present and you know I am present but we are, of course, each invisible to the other.... I am not intruding and will not intrude into your personal space; in fact I am going out of my way to avoid doing so" (Lofland 1998, 34-5).

Personal and personalized spaces often interact in similar ways with territories. Yet territories often develop as an intentional or unintentional marking of space. Leon Pastalan notes that territories are "a delimited space that a person or a group uses and defends as an exclusive preserve. It involves psychological identification with a place, symbolized by attitudes of possessiveness and arrangements of objects in the area." (qtd in Lang 1987, 148). Definitions of territories "suggest some basic characteristics of territories: (1) the ownership of or rights to a place, (2) the personalization or marking of an area, (3) the right to defend against intrusion, and (4) the serving of several functions ranging from the meeting of basic physiological needs to the satisfaction of cognitive and aesthetic needs" (Lang 1987, 148). The behavior often materializes from a need or desire to establish a sense of control over the activity and behaviors of others in a space and it often reflects the aesthetic tastes of the individual or group seeking the territory (Lang 1987).

Robert Sommer (1969) performed key research on Personal Space as it manifests among the actions of people defending space or retreating into space. Based on research of the use of the tables and seating areas, he studied the spatial relations of individuals that were actively defending space compared with those that were retreating in a space. Sommer found that those people in retreat generally located toward the edges of tables closest to walls and away from aisles. They preferred to face away from the entrance of the room. Those in defense mode preferred the center of the tables and those near aisles. They also chose to face toward the entrance. While the rear of the room was generally preferred whether individuals were in defense or retreat modes of behavior, at higher crowd densities, the tables of the anterior of the room and tables and chairs closest to the wall were heavily preferred. "A large sociopetal room that orients everyone to the center makes it difficult for people to retreat...Conversely a large homogeneous area lacking lines of demarcation, barriers, or obstructions make it difficult to mark out and defend individual territories" (Sommer 1969, 51) and they may need to employ objects external to the space's design in order to do so. The research on the personal space of individuals in defense and retreat can assist designers in understanding the differing needs of individuals

Figure 3. Privacy in the Public Realm.

and assist them in maintaining privacy and individuality in the public realm by offering a diversity of situations for users that may look to retreat into a space or defend their established space.

In the literature I surveyed for this paper, I found little information on the temporal nature of establishing territories in the public realm. One area of research, though, dealt with an individual's rights to claim as a space as their own after they had established "residency" and when faces with intrusion from another individual staking a claim to their territory (Sommer 1969, 52). In general, users that had established their territory for shorter periods of time, approximately 10-mintues, expressed no claim to their territory and submitted their seat to the intruder making the claim. After longer periods of time in residency (30-minutes), though, users rejected the intruder's claim and defended their right to the seat (Sommer 1969).

Another area of research, deals with the territorialization of space by an individual through personalization—more specifically, the marking of the territory with objects that staked claim to the territory while the individual that personalized the territory was absent. First of all, Sommer (1969) found that at low densities of use in the space, "almost any marker is effective in reserving space." With greater densities, however, the success of the object tends to deal more with the appearance of the object. Tidy-appearing objects or sets of objects arranged in a purposeful manner were more effective at dissuading the intruder from staking claim to the territory than were objects that appeared messy. Types of objects that lent themselves toward clear ownership, such as sports jackets, were more powerful in staking a claim than were more disposable items, such as newspapers and refuse. Neighbors of the seemingly vacant territorialized space were often solicited for assistance in determining the availability of the space. Neighbors responded with the "...inclination to defend the space. However it is still interesting that under the conditions studied

Figure 4. Territories in the Public Realm.

to find that (a) a relatively impersonal marker was able to keep the space vacant, (b) the legitimacy of the marker was supported by two-thirds of all neighbors, and (c) the strength of the neighbor's defense was related to the length of time the former occupant had been away" (Sommer 1969, 55).

Another interesting manner of reviewing territories is in relation to personal space claims made by individuals in crowded situations. Herbert Jacobs studied such examples based on aerial photography of protests and rallies at Berkeley (Sommer 1969, 27-8). He found a reliable formula that estimates crowd size that also points to the amount of square feet individuals "claim" in crowded situations. Based on his analysis, he found that individuals claimed six-to-eight square feet in very dense situations, and an average of ten square feet in looser crowds. With this information, he was able to establish a formula for estimating crowd size to be equal to the length times the width of the crowd divided by the appropriate correction factor for dense or loose crowds. Of particular interest to this paper, are the spatial estimates that individuals make claim to when securing personal space in crowded situations.

While the research on crowd size estimates is interesting, it does not speak in detail about spatial usage under more natural and sustained densities when large events are not in progress. Alexander's classic, A Pattern Language (1977) details this type of information. Alexander provides details of the spatial situation required for individuals to function in relation with one another. He found that plazas with diameters of 70-feet or less enabled two individuals at opposite ends to feel connected with one another. "Two people with normal vision can communicate comfortably up to 75 feet. They can talk with raised voice, and they can see general outlines of the expression on one another's faces" (Alexander 1977, 313). In addition to this, he estimates that an individual with approximately 150-to-300 square feet of space between other individual's using the space lends itself well to a feeling of a "lively" space. "If there are more than 500 square feel per person, the area begins to be dead" (Alexander 1977, 597). He also suggests that the "life of a public square forms naturally around its edge. If the edge fails, then the space never becomes lively" (Alexander1977, 600). These statistics have interesting implications on the nature of territorialization. While more related to one's feelings of connection to others within a public space, the recommenda-

Figure 5. Users Claim Personal Space in Large Crowds.

Figure 6. Claiming Territories.

tions have implications for those seeking retreat and establishing territories, and for designers providing options for a variety of purposes within a public space.

Looking at personalization of space in suburbia through the lens of architecture and design, Sean Griffiths of FAT (Fashion Architecture and Taste) works in reinventing suburban spaces in Europe. In a lecture given at the Walker Art Center in Minneapolis, Minnesota, Griffiths claims "suburbia is an architecture of time" (2008). He is particularly interest in the additive nature of personalization in suburbs. He notes that suburban residents are particularly adept at personalization of space and continually adding elements to the public realm. He offers the example of the suburban home and its efficiency in accommodating change through additions, extensions, backyard gardens, facades, and decorative elements. In particular, he has noted how individuals appropriate spaces that were designed with a specific intention and alter their meaning. One example he offers is how children will alter the street, making it into a temporary soccer field for play. The space that is a territory manifests itself and takes on a new meaning. From a design perspective, the additive process is one that changes over time with new uses. The additive elements are often allusions or symbolic references of something else, possibly reflected in the nostalgia for a better time, and express the individuality of the owner. Overall, he states that the flexibility of suburbia allows the individual to territorialize. It allows the occupant to create rules that are legible. Designers identify the idea that territory exists as a spatial conception. Designers like Sean Griffiths allow for this allow for establishing territories in space but do not dictate how it happens. Finally, he states that the drawback of much of contemporary architecture is that it relies on very expensive details. The beauty of the suburban home, in his opinion, is that it has offered occupants with a cheap envelope that people may alter effectively and efficiently. Opportunities exist for the design of Voorhees Environmental Park to play with the notion of the additive and the ability for users to personalize it as a territory.

Another topic that repeatedly appears with literature regarding suburban space is the blurring of clear distinctions between public and private realms. "For both the architecture and landscape of the suburb—where "picture windows" eliminate the distinction between inside and outside, and where separate but contiguous lawn replace urban and rural privacy with the illusion of shared, neighborly space—highlight the visibility of its residents" (Beuka 2008, 96). Andrezejewski (2009) researched the concept behind the picture window and community design in the suburban community in Wisconsin. She established the role of panoramic surveillance as a method for community building in suburbia that design elements such as picture windows, open front yards and cul de sac facilitated as unintended consequences of the design. The keys to panoramic surveillance are that multiple people engage in these activities with movement throughout the landscape from different positions. Both the surveyed and the surveyor are aware of the activity of the other and actively engage in panoramic gazing. And, lastly, there is unimpeded "exchange of visual knowledge related to others" (41). The opportunities for panoramic surveillance through intentional design exist in Voorhees Environmental Park. Especially when considering Lofland's (1998) discussion of the employment of rules in the public realm. These are places and spaces that enable the individual to navigate the public realm with the visual knowledge that others exist within established territories and also enable the ability to understand that intruders to one's territory may be approaching.

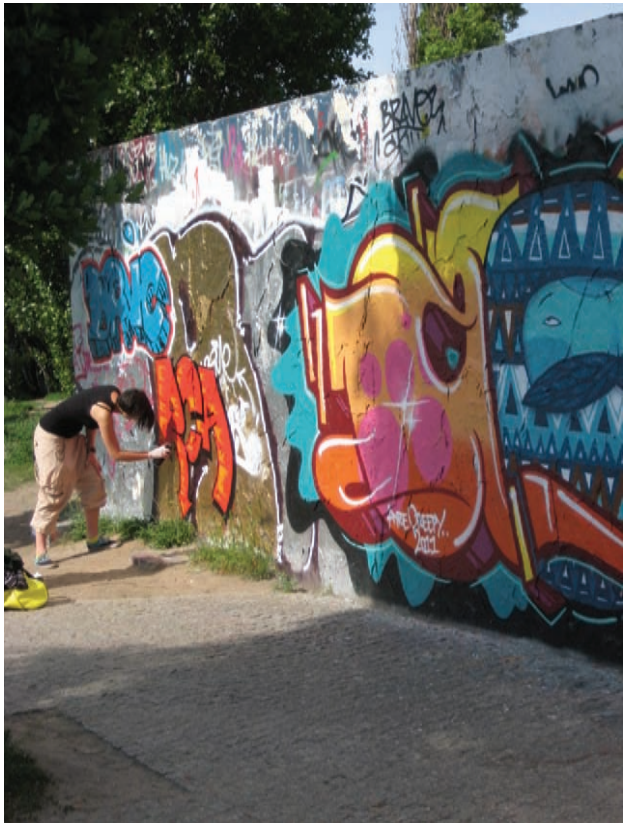

Figure 7. Adding to the Public Realm?

Many suggest that the pastoral ideal is pervasive in suburbia and repeated imagery of the pastoral abounds in the design of the landscape (Duncan 2004, Hayden 2003, Rowe 1991) James Duncan and Nancy Duncan have researched the implications of the "Anglo-Pastoral Narrative" (Duncan 2003, 94) in relation to the landscape, cultural norms and their influence on those that have been traditionally considered outsiders, particularly immigrants. With this, they have written of the implications of the pastoral landscape as coming to embody the nature of a purely American space. Nobel states that "these ideals became institutionalized within the national culture of the United States through the writings of transcendentalists, the visual art of the Hudson River School, evocations by historians of the frontier as a unique source of regeneration, and ultimately, in the ideal of the private, properly-ordered suburban home" (qtd. in Duncan 2003, 15). Based on their research into the class and race struggle between two neighboring communities, the upper-class Bedford town and a more working-class, immigrant population of Mount Kisco, New York, they have presented a situation where the values in how the public realm is used by different racial groups creates tension based on the views of the role of the public realm and preferences and history of landscape type. For example, the residents of Bedford tend to indicate that the landscape be used for walking, but not congregating, and have instituted rules restricting the immigrants and day laborers from using public space even though the space has been designed for seating and gathering. "...American ideologies of individualism and privacy are cross-cut by a powerful desire for conformity. Expressions of individualism are encouraged only as long as the broader cultural frameworks such as the public-private space dichotomy remain undisturbed" (Duncan 2003, 95). Questions that require additional research in relation to Voorhees Environmental Park and this topic remain. Namely, could the proliferation of the pastoral ideal in a pastoral-based park design in a contemporary park be subconsciously interpreted as a class or race-based establishment of territory, alienating certain groups through the design language?

Returning to Lofland's concepts on the public realm, Lofland (1998) extends her research on the rules guiding interactions between strangers and their role in guiding movement through public space into more social life and a discussion of the fluid relationships that develop within the public realm. She also details that people also have a relationship to a specific place. Those relationships are connected in many ways with the establishment of connections to a place. But, she identifies three types of places in the public realm that offer connections to that place: (1) Memorialized Locales, (2) Familiarized Locales, and (3) Hangouts and Home Territories. For the purposes of this paper, I would like to focus on Hangouts and Home Territories. These are territories in which the frequency of use is especially high for many plausible reasons—proximity to users, feelings about the place, etc.. She offers a warning of situations where individuals that are connected in intimate relationships over longer periods of time jointly establish a connection to a space: "If home territory relationships to a space are established by people who also have intimate-secondary relationships with one another (which is frequently the case), and if the density of those relationships gets very high, the space—however legally defined—is no longer in the public realm" (Lofland 1998, 70). This could have implications for Voorhees Environmental Park. As one of the primary supporters for the park, VECEF has an investment in establishing the park and could unknowingly territorialize park, and situations where non-VECEF members feel excluded from the park could start to emerge. Attention to the design of the space that meets the needs of multiple user groups, but still satisfies one of the primary envisioned user groups, is particularly relevant in our design challenge.

Through a review of literature related to personal space, personalized space and territories in the

Figure 8. Pastoral Landscape in Neuer Garten.

Figure 9. A public space takes on a new meaning as a Food Truck Plaza.

public realm, I have illustrated several challenges and opportunities relevant to Voorhees Environmental Park. While other theories and observations exist in contemporary discourse, this paper is meant to function as an initial survey of issues related to individual use of space in the public realm. In conclusion, the opportunities for creating a public park in Voorhees, New Jersey has the ability to offer individuals the chance to establish their own connections to a public open space. The designer must also balance the challenge of creating a public realm that is capitalized by a limited group of users and thereby excluding others from the public realm.

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Fig. 1. The Public Domain, Portland Oregon. Personal Photograph by Author. January 17, 2011.

Fig. 2. Riverside Park South, New York. Personal Photograph by Author. April 11, 2010.

Fig. 3. Park(ing) Day, San Francisco. Personal Photograph by Author. September 16, 2007.

Fig. 4. Park(ing) Day, San Francisco. Personal Photograph by Author. September 16, 2007.

Fig. 5. St. Mark's Square, Venice. Personal Photograph by Author. May 21, 2011.

Fig. 6. Düsseldorf. Personal Photograph by Author. June 2, 2011.

Fig. 7. Berlin. Personal Photograph by Author. May 23, 2011.

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Fig. 9. Food Trucks in empty parking lot in downtown Portland, Oregon. Personal Photograph by Author. January 17, 2011.

2.11 The meaning of elements around the pond in the Asian Garden: Interrelationship between the elements and receptor

Baewon Suh

Alexander mentions “We came from the water; our bodies largely water; and water plays a fundamental role in our psychology. We need access to water, all around us; and we can not have it without reverence for water in all its forms.” Likewise, water is the most important fact to human to live. This water is essential ingredient of not only human but also ecological system. At the same time, we can easily find many types of water space such as river, sea, wetland, etc. However, it is necessary to research a pond, which is the one of the water spaces as a Landscape Architecture. The reason for this is that the water space plays a pivotal role in natural ecology, regardless of its size. “A recent study has shown that small bodies of water, such as ponds and ditches, are just as important as rivers and lakes in supporting a range of aquatic biodiversity in the agricultural landscape.” I will try to investigate on how the ponds consist of and the meaning of elements that they have around many Japanese gardens and Korean gardens. After that, I will categorize those elements by its characteristic and accessibility and inquire into the relationship between the elements and receptor.

Examples of elements in Asian gardens

1. Japanese Garden

Ueda Atsushi describes the characteristic of Japanese garden with saying “The Japanese garden is a “work of art” which is to be appreciated while sitting in the drawing room. Thus, the garden is something to be seen, and not a place to exercise or relax in. Most older Japanese, those who were raised before the war, are likely to have memories of being scolded by their mothers on the score: “Get out of there. The garden is not a place for playing!”” So, the Japanese garden is for meditation with the sequential or stationary scenes rather than playing inside of the garden. For this reason, water space is essential element of Japanese garden. If so, what is the meaning of water to Japanese garden?

Dr. Koichi Kawana states: “Japan is a group of islands surrounded by oceans and seas. From ancient times, the Japanese people had an affinity for the sea. Water as a design element in the garden is crucial. One of the most popular styles of garden is called chisen, in which a pond or lake occupies the most significant portion of the garden. Water’s importance is not as a substance but as a symbol and expression of the sea. Even the quantity of water present is unimportant. If space is a problem, one is supposed to be able to enjoy the tranquility of the sea in contemplation of a bucketful of water contained in a stone water basin.”

Then, table 1 shows that other symbolic meanings of elements in Japanese garden.

Item	Symbolic Meaning
Japanese Flowering Cherry	Celebrate change of seasons
Japanese maple	Autumn welcomed as a friend
Pinus densiflora	Eternity
Mounds	Mountain ranges
Pond in shape of tortoise	Longevity
Crane	Longevity
1 Rock	1 of 3 Mythical Islands, a guarantee of prosperity
A line of rocks	A line of boats sailing toward the Isles of the Immortals
Shumisen – 1 Central rock	Central pillar that supports the heavens
3 Rocks	The Buddist trinity
Island in pond	Paradise – land of paradise
Guzei – Red bridge	Route blessed to take to salvation
Split bridge	Bridge split to prevent evil spirits from crossing (evil spirits are believed to only move in straight lines)
Mountain	Assertive, hard, uncompromising (Yang)
Water	Intellectual force, softness of water associated with feeling (Yin)
Wooden terrace jutting over picturesque garden	Constant need to be with nature

Table 1. Elements of Japanese garden

1-1. Islands and Bridges

Figure 1. Examples of island and bridge

Islands are another long-standing component of Japanese gardens, and range in size from single stone outcroppings to large islands big enough to support buildings. They often represent real islands or have religious symbolism, such as those built to resemble turtles and cranes, symbols of longevity and health, or Horai, a sacred mystical mountain in Taoism. Bridges are another common feature that is used to connect islands and cross-streams or ponds. They are built of stone or wood, and range in complexity from a simple slab of uncut rock lay across a stream to elaborate, covered wooden structures that span more than ten meters.

Figure 2. Examples of vegetation

1-2. Vegetation

Trees, shrubs, lawns and flowers of all kinds are used in Japanese gardens. Plants, such as maple and cherry trees, are often chosen for their seasonal appeal and are expertly placed to emphasize these characteristics. Conversely, pine trees, bamboo and plum trees are held in particular esteem for their beauty during the winter months when other plants go dormant. Mosses are also used extensively, with over a hundred species appearing at Kokedera alone. Plants are carefully arranged around the gardens to imitate nature, and great efforts are taken to maintain their beauty. Trees, shrubs and lawns are meticulously manicured, and delicate mosses are swept clean of debris.

Figure 3. Examples of path

1-3. Path

Paths became an integral part of Japanese gardens with the introduction of strolling and tea gardens. Strolling gardens feature circular paths constructed of stepping-stones, crushed gravel, sand or packed earth, which are carefully prescribed to lead visitors to the best - albeit controlled - views of the garden. Winding paths also serve to segregate different areas, such as an isolated grove or hidden pond, from each other so that they may be contemplated individually.

Figure 4. Examples of buildings

1-4. Buildings

Many types of gardens were built to be viewed from inside a building, such as palace, villa or temple. In contrast, gardens meant to be entered and enjoyed from within, use buildings as a part of the garden's composition, including pavilions, tea houses and guest houses.

2. Korean Garden

Chung Jaehoon explains the character of Korean garden, as "The Korean garden is more than just a scenic location For Koreans of old, it was a microcosm of the universe, an architectural embodiment of the universe, an architectural embodiment of the Korean world view. Man's influencing touch is kept to a minimum — rocks, streams, pounds, and trees are left as close to their natural state as possible; artificial additions, meanwhile serve to highlight or complement nature, not dominate it. By tying together the natural and man-made, the garden expresses man`s harmony with his natural environment, an ever-present theme in Korean traditional culture." Furthermore, supporting the Korean traditional garden is a Korean world view, original to the country and reinforced by imported ideologies such as Buddhism, Taoism, and Confucianism, that reveres nature and seeks harmony of man in his natural

environment. “Korean Gardens: Where Man and Nature Become One,” Since the characteristic of Korean garden is harmony of those elements, I will investigate how the elements are embodied around ponds in three palace gardens.

Figure 5. Views of Anapji

2-1. Anapji (Anap pond)

Anapji was part of the palace complex of ancient Silla(57 BCE – 935 CE) and it was constructed by order of King Munmu in 674 CE. This pond is situated at the northeast edge of the Banwolseong palace site, in central Gyeongju. It is an oval shape; 200m from east to west and 180m from north to south with containing three small islands alluding to Taoist sanctuaries. Anapji has curved embankments on the northern and eastern sides, somewhat resembling the shoreline of a river. Furthermore, the southern end is perfectly straight while the western side is angular and all of the four sides are lined with dressed stones.

2-2. Gyeongbokgung Hyangwonji(Hyangwon pond)

Hyangwonji constructed in 1456 and it belongs to the rear garden of Gyeongbokgung palace. According records, the pond was built along with the Chuirojeong pavilion, and lotus flowers were planted. The existing pond was reconstructed in 1873, and the hexagonal pavilion of Hyangwonjeong and Chuihyanggyo bridge were built in 4605 square

Figure 6. Views of Gyengbokgung Hyangwonji

meter of the area then. There is watershed, along with carp swimming in the pond; a variety of trees, including zelkova, Chinese juniper, maple, pine, oak and pear also surround it. The pond is at its most spectacular when Mt.Bugaksan, the pavilion and the wooden bridge are reflected on the pond’s surface.

Figure 7. Views of Changdeokgung Buyeongji

2-3. Changdeokgung Buyeongji (Buyeong Pond)

In Buyeongji, distinctively shaped rocks are arranged around the pavilions, walls, and flowerbeds, together with landscaping along the sloping banks. Moreover, attractive stone bridges cross a little stream. The garden incorporates a lotus pond, pavilions, and landscaped lawns, trees, and flowers. The surroundings and the palace itself are well matched. There are over 26,000 specimens of a hundred different species of trees in the garden and some of the trees behind the palace are now over 300 years old.

3. Difference and Similarity

3-1. Difference

Most of the major gardens in these countries look similar. However, if you examine these gardens more carefully, you can find the big difference. Yongduk Kim mentions “It “takes some time to get the feeling” of each nation’s garden, but there are more general philosophical differences. Japanese gardens are more manicured, while Chinese gardens tend to be overwhelming in all aspects. Korean gardens, however, stress naturalization—there is a less human approach. Korean gardens will typically feature a pond, trees, and rocks, left in their natural state or placed in a manner approximating nature. Overlooking the scene, usually on a hill or by the side of the pond, a simple pavilion will be built to provide a panoramic view of the scenery. In larger gardens, such as the famed Huwon Garden of Changdeokgung Palace, several pavilions will be built, each offering its own unique view of the landscape.”

3-2. Similarity

From above examples, we can see each national’s elements around ponds has similar symbolic meanings such as paradise and heaven for the island, their islands have the meaning of paradise and heaven and longevity of turtles. Also we can find the strong connection among each element around pond. Furthermore, those elements provide views along with the sequential movement. Finally, we can realize that most of the ponds are not accessible.

Relationship between receptor and objects by controlling objects and accessibility (Objects: Pavilion, Tree, Space, Bridge...)

After I investigate those elements in Asian garden, one question has arisen which is "how can we control those key words, such as symbolic meanings, connection, accessibility and views, to the real site?" To answer for this question, I need to categorize the cases and then study the relationship between elements and people. Specifically, I will look more carefully about how the objects effect on the behavior by controlling circumstances.

1. Two Connected objects

In this case, there is chance to have two focal point at once while the receptor is moving and keeping the distance with those two objects.

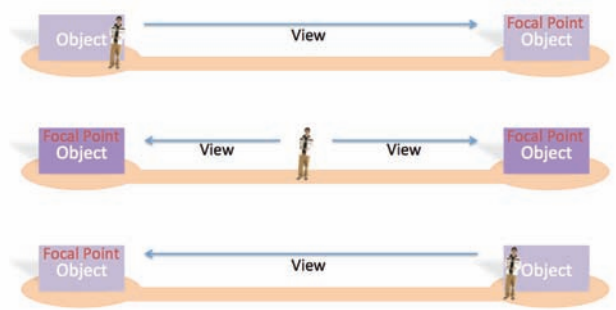

Diagram 1

Furthermore, the intensity of two focal points is keep changing by moving along with the path. For example, once the people arrives one object, the object is not focal point any more. However, he/she can play and enjoy it by touching and experiencing the object.

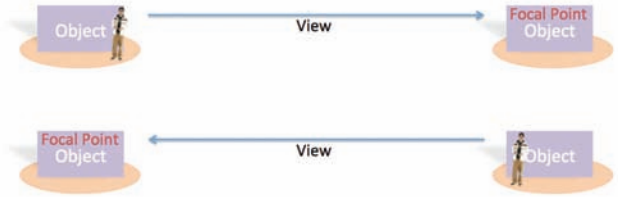

Diagram 2

2. Two disconnected objects

In this case, there is no chance to have two focal points at once and the intensity of focal point will be steady.

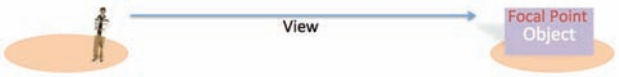

Diagram 3

3. One distant object without connection

If there is no attractive object, receptor has less reason to stay at the space; accordingly, the time to have the view will be reduced. Therefore, the object possibly provides the view to the focal point momentarily.

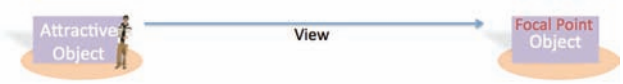

Diagram 4

4. Two disconnected objects

In this case, the attractive object can bring the receptor and it can increase the chance and time to give the view to the focal point, even thought, there is no chance to work as a focal point itself.

From the research of elements in Asian garden, we could find the key elements to consist of the ponds. Most of ponds were not accessible but users can stroll the path so that they can meditate. To do so, the relationship between objects and viewer is major aspect to be studied. Also by doing the study of diagram, there was opportunity to see the relationship between elements and viewer more carefully. Moreover, I could see those Asian gardens can achieve their purpose by arranging the elements. When they are at the most appropriate place to communicate with themselves and users, the garden will be considered as a successful space.

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2.12 Floating Treatment Wetlands

James Bykowski

The Voorhees Environmental Park is planned to be constructed on closed, capped landfill in Voorhees, New Jersey. This park will offer the public access to a once closed piece of land. An important issue that comes up when dealing with the public and brownfield redevelopment is, will the public feel safe and want to use the newly created park? This can be done in a number of ways but I feel education and viewing the cleanup process is the best way to gain the public's trust and getting them to use their newly created public space. One of the clean up issues with the Voorhees site is the small body of water at the southern end of the site. This water body is not a natural feature to the site but is a result from the one of the previous owners who operated a sand and gravel excavation pit. They removed material from this area until they hit groundwater and created a pond. The problem with this, was with the next owner of the site turned this quarry into a land fill. This allowed all storm water to move through the land fill and impact the water in the pond. The storm water is still an issue today because of the permeable capped used to close the land fill. What storm water that percolates through the cap comes in contact with the land fill and then slowly makes its way to the pond as groundwater, which keeps the pond full year round. An important part of our park design includes bringing people close to the waters edge. Too do this safely and create an enjoyable experience for park visitors the water in the pond needs to cleansed. This can be done through the use of Floating Treatment Wetlands. These man made wetland systems will clean pollutants from the water while also creating an educational and aesthetic experience for park visitors through the use of new technology in the landscape.

Figure 1.

Floating Treatment Wetlands (FTW) are a new technology that is being used in the landscape to treat storm water run off in urban and agricultural landscapes. FTWs do this through a natural process that is similar to the functions that take place in a natural wetland. In a natural or re-constructed "Wetlands rely upon natural processes to mechanically and biologically filter water as it passes slowly through shallow areas of dense aquatic vegetation, and through permeable bottom soils. Research has shown that constructed wetlands significantly reduce aquatic pollutants, especially nutrients, without requiring extensive maintenance and upkeep." (Cunningham, et. al. 2008. 26) The most important difference is that FTWs are floating on the waters surface and not rooted to the sediment under the water. "A floating treatment wetland basically involves the growth of emergent wetland plants on a structure that floats over a pond. Water receives treatment as it passes through the root mass that develops beneath the floating wetland. Fine particles may potentially become entrapped within this hanging root mat and associated biofilms." (Headley, Tanner. 2006. 7) Being that the roots of the plants are not embedded in the bottom of the pond they are free to take up pollutants in the water and do not have to wait for them to pass through the sediment. "Plant roots provide a living surface area for development of biofilms containing communities of attached-growth microorganisms responsible for a number of important treatment processes. The thick network of roots and associated biofilms are effective at physically trapping particulates within the water column, which subsequently slough off the roots as heavy particles that are more amenable to settling." (Headley, Tanner. 2006. 3) With the plants root systems directly in contact to the water they will be more efficient in removing pollutants which "make relatively small floating platforms function with an

efficiency equal to much larger traditional wetlands." (Cunningham, et. al. 2008. 26)

Not being rooted to the bottom of the pond also offers the advantage of being able to handle the fluctuating water levels which occur in storm water basins.

The pond area at the Voorhees site is the most interesting part of the site as it stands today. It has the most area of habitat and land form change. The rest of the site is relatively flat and covered with grass that looks to mowed weekly. People are naturally going to be attracted and drawn to the waters edge. It offers an interesting experience as it fells like a natural wetland. Being that there is nothing natural about it, FTWs can offer a lot in developing a more constructed and planned feel to the pond area. The FTWs will also offer visitors a chance to explore a technological habitat. "In addition to serving as effective tools for removal of excess nutrients, floating islands are useful for providing wildlife habitat, reducing bio-gas emissions, and improving the visual appearance of treatment areas" (Cunningham, et. al. 2008. 33).

By using FTWs at the Voorhees site visitors will receive an educational experience in storm water management. These islands have a technological purpose but also create an aesthetic and spacial experience for park visitors. "This growing popularity has been largely due to the fact that pond and wetland based systems offer the advantages of providing a relatively passive, natural, low-maintenance and operationally simple treatment solution whilst enhancing habitat and aesthetic values at the same time."(Headley,Tanner6)

Creating a habitat or an artificial habitat on a landfill is important to future public awareness of brownfield redevelopment. People will feel safe using these spaces if theses spaces feel well designed. FTW can help in the future of brownfield redevelopment by help with the cleansing process of these sites. The Voorhees Environmental Park could help lead the way for the future of this new technology.

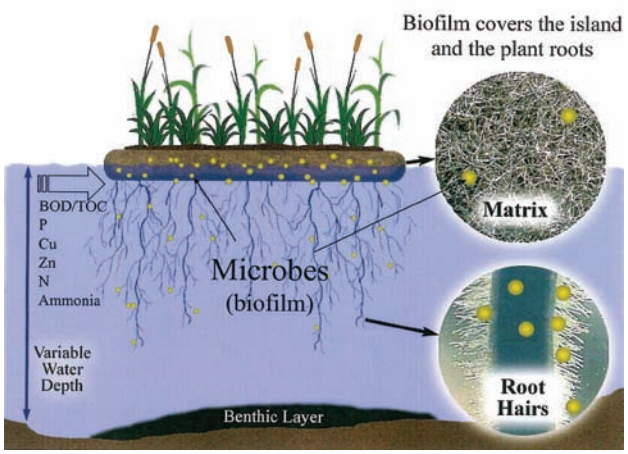

Figure 3.

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2.13 Vegetative Succession and Aesthetics on Landfill Parks

Alisa Stanislaw

As designers, when considering our planting design, we must consider vegetative succession. Succession is used to describe how vegetation changes over time on a disturbed site. (Collins and Anderson 12) This concept is extremely important because it gives the designer an idea of how long it will take for plantings to reach maturity and fulfill its goal in exhibiting spatial qualities. In many cases, ecological succession can appear messy to the untrained eye, therefore aesthetics and cues to care for the area through human intervention must be visible. In this paper, vegetative succession of woodlands and meadows will be discussed in relation to Voorhees Environmental Park which is on a former landfill, as well as considerations of how to create an aesthetically pleasing human intervention in order to avoid the planting design to appear unmaintained and abandoned.

Woodland Succession

In a scientific study at the Edgeboro, NJ landfill Professor Steven Handel and colleagues observed what first successional woodland species thrived on the disturbed site. They planted shrubs and trees, and evaluated what survived on the site, while attempting to determine what methods were successful in stimulating succession and recruitment of species from remnant woodlands. From their plant list, White Pine (*Pinus strobus*), Red Maple (*Acer rubrum*), American Sycamore (*Platanus occidentalis*) and Pin Oak (*Quercus palustris*) deemed most successful. (Robinson, Handel and Mattei 2)(Figure 1) After careful observation, they attested that after two years there were many incoming recruitments from the neighboring

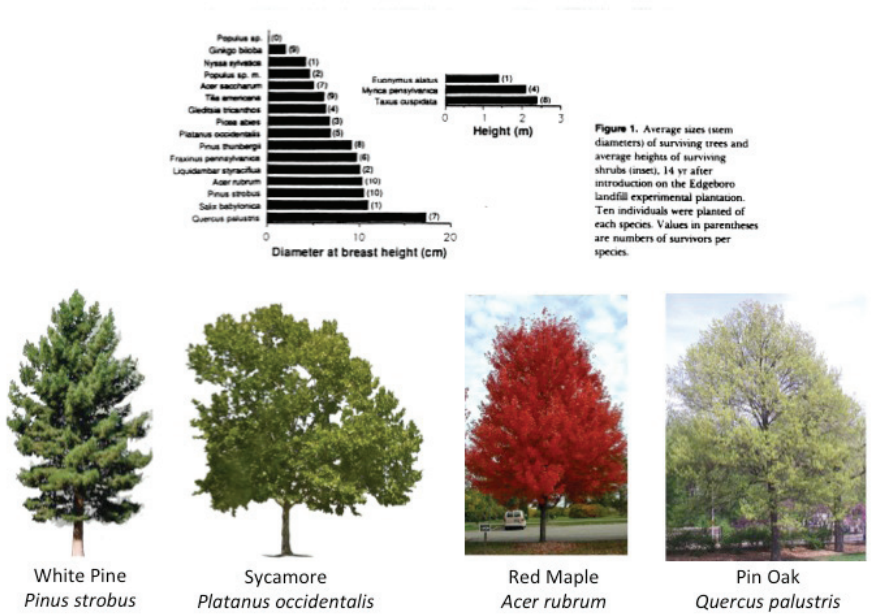


Figure 1. Study on the Edgeboro, NJ landfill

woodland, and based on the theory that "successful colonization of a new species can result from a series of isolated invasions by small populations that eventually coalesce." (Robinson, Handel and Mattei 3) Recruitments are incredibly important when attempting a woodland on a disturbed site, but management of dense herbaceous cover is equally important, since it tends to limit growth and opportunity for density of plantings.

In another study at Fresh Kills landfill on Staten Island, NY, Handel and colleagues observed the survival, reproduction, and recruitment of woody plants after 14 years on a reforested landfill. Of the plants used, Chokeberry (*Aronia arbutifolia*), Hackberrry (*Celtis occidentalis*), Bayberry (*Myrica pensylvanica*) and Wild Black Cherry (*Prunus serotina*) thrived the most. They chose the plant list from a list of attributes of early successional plants. (Robinson, Handel Schmalhofer 267) (Figures 2, 3) Other breakthroughs were how the

Table 1. Attributes of early successional woody plants and their usefulness in habitat reclamation and restoration

Characteristic	Usefulness
Habitat generalists	Successful in a variety of open habitats
Rapid maturity	Immediate sources of propagules
Large relative reproductive effort	Large colonization potential
Cast shade	Resist invasions by weedy herbs
Provide perching structures	Attract avian seed dispersers
Provide physiognomic complexity	Increase habitat heterogeneity
Generalist pollination	Attract multiple pollinating species
Produce and trap litter and debris	Accumulate soil organic matter

Figure 2. Table from the Edgeboro, NJ landfill study

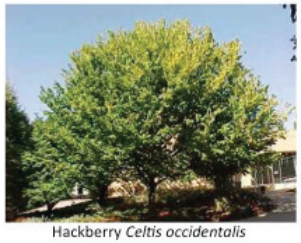
plantings were configured, using the concept of habitat islands. They proposed that in planting design to speed up succession, habitat islands with ample perches and fleshy fruits for birds were helpful by aiding in dispersal. (Robinson, Handel Schmalhofer 269)Once these habitat islands are established, hopefully the woodland will fill in naturally between recruitments and dispersal.

Table 2. Summary of germination and survival for species tested in field germination trials. Per cent survival is the percentage of individuals that germinated which survived for the first post-germination year of the study. Mean germination and survival rates over all species pooled are statistically indistinguishable between treatments

Species	Per cent laboratory germination	Number of seeds planted	Per cent field germination		Per cent survival	
			fenced	unfenced	fenced	unfenced
Aronia arbutifolia	60.0	1500 (3)*	24.9	26.9	71.7	55.4
Betula populifolia	1.0	1000 (1)	0.2	0	0	0
Celtis occidentalis	30.0	1800 (5)	52.6	52.0	83.1	73.3
Cornus amomum	16.0	800 (3)	43.5	38.8	77.6	79.4
Cornus stolonifera	3.0	200 (2)	2.1	3.6	66.7	40.0
Fraxinus americana	4.0	400 (2)	0	1.5	0	66.7
Juniperus virginiana	3.0	500 (1)	1.6	3.6	75.0	33.3
Myrica pensylvanica	61.0	400 (2)	13.0	11.0	53.8	54.5
Prunus maritima	54.0	200 (1)	51.0	37.0	87.8	91.9
Prunus serotina	66.7	700 (3)	51.4	37.1	78.9	80.0
Rhus aromatica	43.0	500 (1)	18.8	16.4	80.9	85.4
Rhus copallina	5.0	1000 (2)	0.6	1.2	0	0
Rhus glabra	4.0	1000 (2)	1.6	1.0	25.0	20.0
Rhus typhina	10.0	500 (1)	0.4	4.8	0	0
Robinia pseudoacacia	55.0	500 (1)	0.8	2.0	50.0	20.0
Rubus allegheniensis	4.0	500 (1)	0.4	2.8	0	14.3
Rubus occidentalis	2.0	500 (1)	1.6	0.8	0	50.0
Sambucus canadensis	39.5	2000 (4)	11.8	15.1	2.5	4.0
Viburnum dentatum	0	200 (1)	3.0	0	33.3	0
Mean (+/- 1 SD)	24.3 (25.0)	32.5 (63.3)	14.7 (19.9)	13.5 (16.5)	41.4 (16.5)	40.4 (32.9)

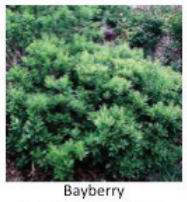
*Number of accessions (collection locations) in parentheses.

Red Chokeberry *Aronia arbutifolia*



Hackberry *Celtis occidentalis*

Sand Cherry *Prunus maritima*



Bayberry
Myrica pensylvanica

Wild Black Cherry
Prunus serotina

Figure 3. Study on the Fresh Kills landfill

In relation to Voorhees Environmental Park, many of the woodland species were found on the edge of the site, and the planting palette should depend on the above studies while also referencing the species on the edges. (See Inventory Map) In addition, species chosen that were not found on the site should have fleshy fruit for birds to disperse in the open areas between the habitat islands, such as Chokeberry. Root length should not be an issue, since there are scientific studies proving that they will not penetrate the cap, due to the severe lack of nutrients in the landfill.

Meadow Succession

When establishing a meadow on a former landfill site, there are a few issues to consider. Although tree roots will not endanger the cap, there are speculations that small taproots found in grasses could be a threat. Therefore, it is advisable to choose a grass and wildflower palette with shallower root systems. Also, the plants should be drought tolerant and native to the region, in order to readily adapt to the given climate. (Marton 1) Considering poor conditions, warm season grasses that grow and bloom later in the summer are preferred, since they are more adaptable. If planting wildflowers with grasses, there must be awareness that this will require heavy maintainence for the first few years to avoid grasses outcompeting the slower growing wildflowers. Managing a meadow in general will require heavy maintenance for the first few years and on, since a meadow in the northeast is a successional stage that will want to turn into woodland. Therefore, people must go into the meadow and pull out woody plants and invasive species, so that they do not outcompete the meadow species. Mowing and burning on a schedule once or twice a year at the end of winter is also highly recommended.

Switchgrass *Panicum virgatum*

Annual Rye Grass
Lolium multiflorum

Little Bluestem *Schizachyrium scoparium*

Partridge Pea *Chamaecrista fasciculata*

Figure 4. Examples of warm season meadow plants

When creating the plant palette for a meadow (or even a woodland) look to choose species within the Fabaceae family. Plants within this family fix nitrogen within the soil on disturbed sites, meaning they aid in the building up of organic nitrogen in the soil, lessening the need for chemical fertilizers. (Marton 1) This includes an early successional plant Partridge Pea (*Chamaecrista fasciculata*), and fast growing warm season grasses include Switchgrass (*Panicum virgatum*), Little Bluestem (*Schizachyrium scoparium*) and Annual Rye grass (*Lolium multiflorum*). (Figure 4) Annual Rye grass is a rapid grower, and will fill in the meadow before dying back, and then other meadow plants will follow.

Aesthetics

Along with a planting design, it is a designer's job to create an aesthetically pleasing environment during the stages of succession. Joan Nassauer's article "Messy Ecosystems, Orderly Frames" discusses that our idea of nature is that of the picturesque, and we seek to have this ideal in our

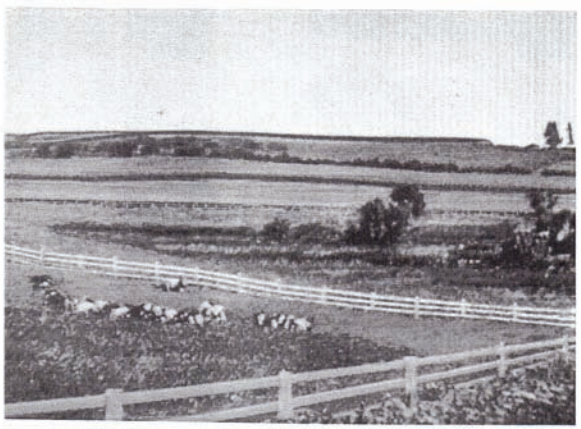


Figure 5: Model conservation landscape designed to communicate the appearance of good stewardship.

Figure 5. Nassauer's Structural Cues to Care

natural surroundings when in succession, this is not the case. (Nassauer 161) So, in order to avoid the design to appear abandoned or "messy," she has set up standards as a "cue to care" through human interventions of spaces. There are five cues to care that apply to a park that is going through stages of succession, and they are mowing strips as paths or edges to give the idea of lawn; by planting trees and plants that flower for aesthetic (and ecological) appeal, including wildlife feeders and houses to attract beautiful songbirds in a brushy area; implementing plantings in a linear fashion or rows to establish order; and finally, adding structural cues to care through fences and ornaments that are maintained. (Nassauer 168) (Figure 6)Providing a framework that communicates human intervention is very important during successional stages, for them to appear kept to the untrained eye into maturity.

In addition, there are ways to show the process of succession through education and sculpture, as opposed to creating scenery. Earthworks or art can aid in the process of succession and show change in an area throughout time. (Kirkwood 131) Also, planting seedlings or grasses and wildflower in a meadow with volunteers from the community can bring appreciation in the hard work they put in to establish plant communities. Observing them as they evolve throughout time will also bring incentive to care and protect their community's park. (Kirkwood 134)

In conclusion, as designers there are many issues to consider when creating plant communities on a former landfill. Careful decisions in species, planting plans and management will help the park reach maturity, while considering involving the community through education.

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Figure Source List

Fig. 1. Robinson, Handel, Schmalhofer, 1992. Accessed November 5, 2001.

Fig. 2. Robinson,Handel,Schmalhofer 1992. Accessed November 5, 2001.

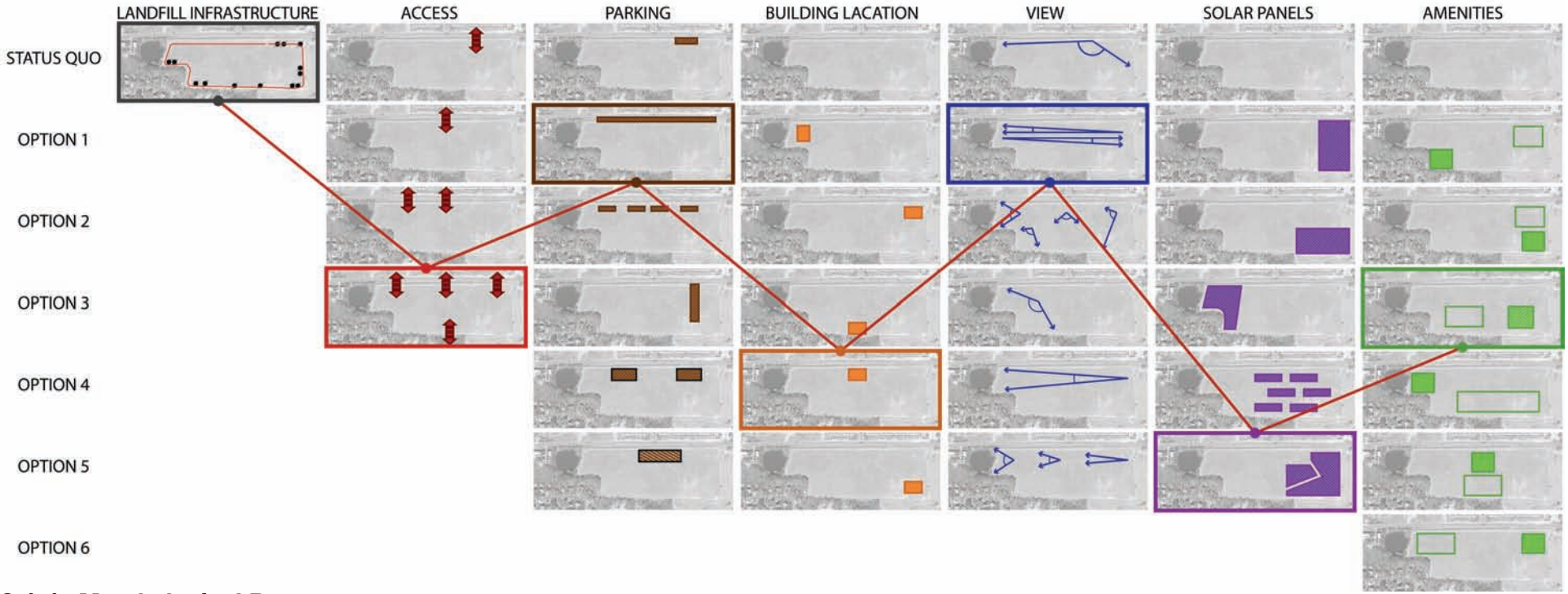
Fig. 3. Mattei,Handel, Robinson 2003. Accessed November 5, 2001.

Fig. 5. Nassauer 1995. Accessed November 5, 2001.


Coming Soon!
Future Site of the
Voorhees Environmental Park
vecef
VOORHEES
REI
RUTGERS

3.1 IN SOLIS PACEM

Kristopher Kemper
Kevin Perry
Baewon Suh



3.1.1 Morphological Box

Diagram1. Morphological Box

Landfill Infrastructure

The former site of the Buzby Brothers Landfill, which is the proposed site of the Voorhees Environmental Park, comes equipped with landfill remediation infrastructure installed throughout. The prominent signs of this infrastructure include a series of sparging wells located along the park borders and a lightly graveled road circumnavigating the property to create management access to the wells. All of this infrastructure will remain in place in a new design for the park.

Access

The boundary shared between Voorhees Environmental Park and Centennial Boulevard stretches of one-quarter of a mile. Because of this length, the best strategy is to employ multiple access points along Centennial Boulevard, with primary access in the center and secondary access points at the toward the ends. A fourth access point is proposed on the southeast border of the site, which will allow access to the park from a proposed housing development that has yet to be built in that area.

Parking

Voorhees Environmental Park does not currently have a parking lot. We will supply on-street parking on Centennial Boulevard, which will decrease the weight load demands placed on the landfill cap as well as the amount of impermeable paving that would be added to the watershed, were a parking lot to be placed on the landfill cap itself.

3.1.2 Evaluation & Test Design

Building

A programming requirement of the Voorhees Environmental Park is to include an enclosed building that will serve as an education and multi-purpose meeting center. We choose to site this building within close proximity to the proposed main entrance point on Centennial Boulevard. As a result, the education center will serve as a welcoming gateway to the park with easy access to parking.

Viewshed

We have experienced a notably elongated viewshed within the unimproved Voorhees Environmental Park. Our design reinforces and emphasizes this innate quality of the site.

Solar Panels

A solar panel array is a programmatic requirement of Voorhees Environmental Park, as it will provide a revenue stream to cover park development and maintenance. The solar panels will be sited on the northeaster end of the property, which receives the highest amount of sun exposure to produce maximum benefit from the solar panels. Furthermore, the solar panel array is to be considered an amenity of the site, not an encumbrance. To reinforce this notion we will create a meditative space for people within the field of solar panels.

Passive Amenities

Most of the public parks in Voorhees Township include active amenities, such as sports fields. Voorhees Environmental Park should include a large space for passive amenities. This space will be sheltered from the noise of Centennial Boulevard and fit in with circulation throughout the park.

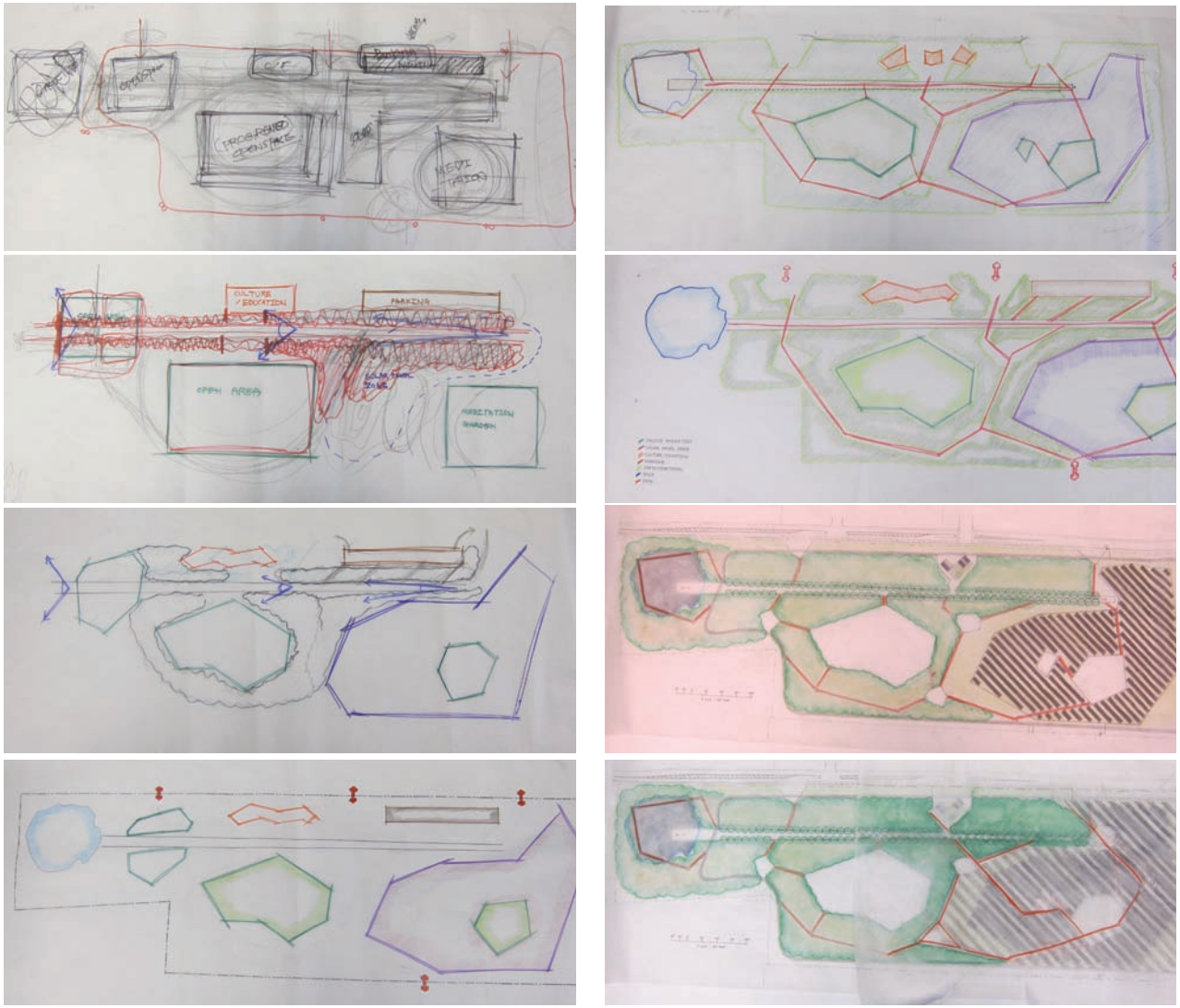
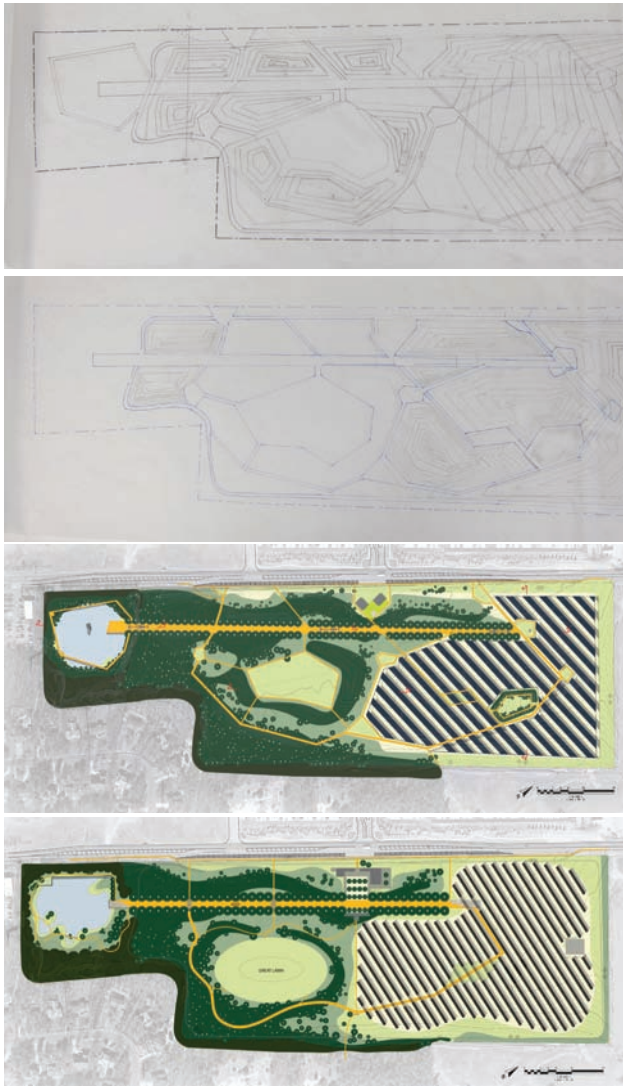


Figure 1. This image shows several versions of site plans, beginning with the relatively crude initial stages to the refined final product



A conceptual design began to be developed by design teams using information gained during the morphological box process. The different design solutions were drawn out on a plan to begin the process of determining the layout of the site. That plan was then evaluated to determine what was working and what was not. A new design was then derived from the successes and solutions to failures of the previous design. This process of evaluation and test design was repeated several times which allows for a final conceptual master plan that has been refined through multiple evaluations. This entire process is illustrated in the Figure to the left. The initial stages of design were very crude as designers developed the basic layout of the site. As the layout and programming were evaluated, the design begins to become clearer and more detail emerges on the plan. At first glance the final product may appear similar to the midterm conceptual design. This is because through the evaluation and test design process it was determined that the overall layout was working and that attention could now be focused on individual areas within the design.

3.1.3 Master Concept & Group Design

Technology is part of modern life. Whether we feel stifled by technology, or enhanced, is a matter of feeling as personal as our taste buds. But whether or not one would be an adopter of the latest personal technological gadget, we are all nonetheless subject to a certain level of societal technological approval, from an acknowledgment that our automobiles run with internal computers, to the idea that our power grid can become both smart and clean in years to come.

Nature is also part of modern life. While in over 400 years of development we have subjugated most of what could be considered wild nature in New Jersey, we still look to a certain idea of nature as a place of solace and renewal. Indeed, in contrast to the many technological demands of our productive lives, the idea of nature exists as a place of emotional refuge.

Voorhees Environmental Park is a unique combination of technology and nature. Its history as a quarry and municipal landfill reminds us that not a square inch of this property has gone untouched by the hand of man. And yet, it will become a place where plants are invited to grow by the process of natural succession, and a place in which a person can find a daily dose of the meditative solace of nature.

Our plan for the park begins with a discussion about technology and nature. (Figure 1) A field of solar panels to produce economic revenue for the development and maintenance of the park is to be installed on the northern end of the site. Asking visitors to consider technology and energy, a Solar Garden exists among the panels. In contrast, an Asian-inspired Pond Garden is designed for the southern end of the site, using the existing pond as the focal point. It is a place of reflection and emotional repose. As we balance nature and technology in our lives, these two contrasting

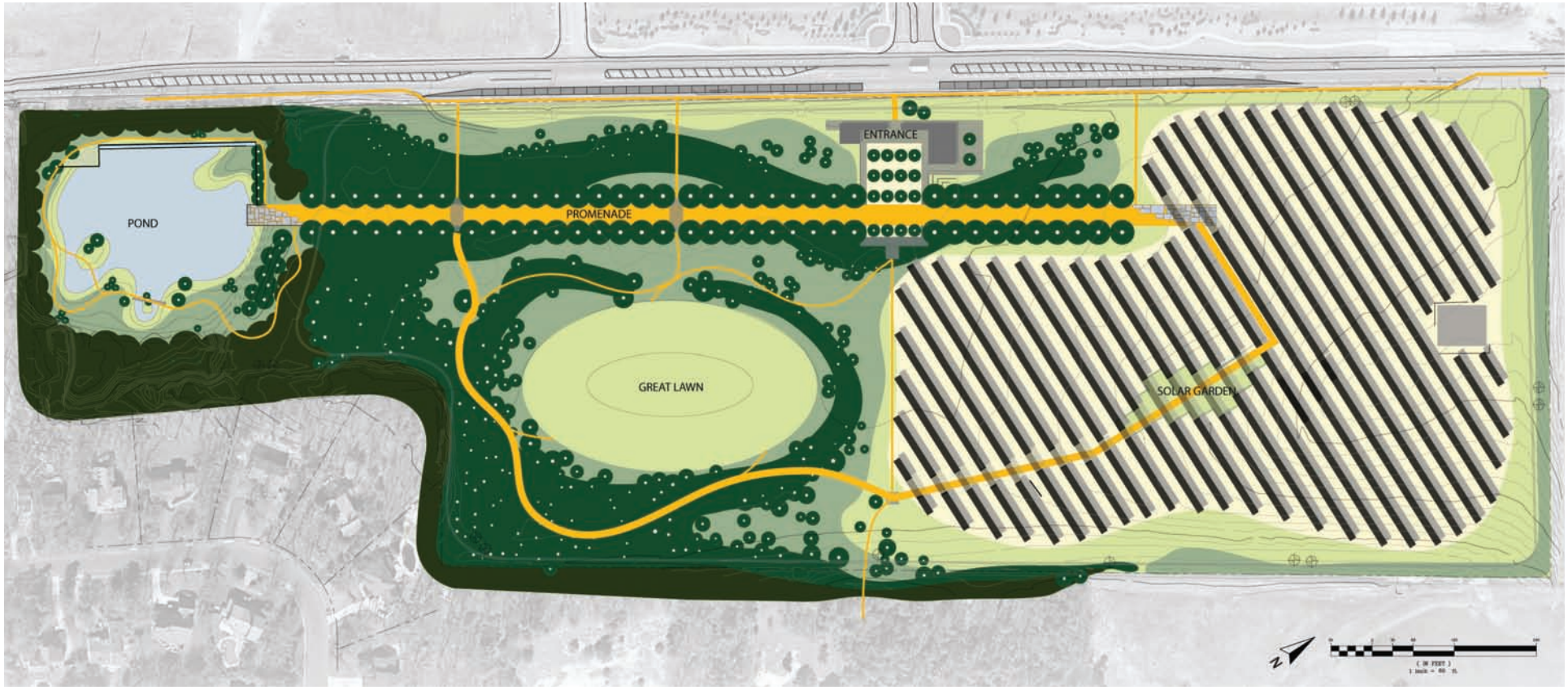


Figure 1. Master Plan

spaces are balanced on the strength of a quarter-mile Promenade to serve as both a unifying agent and main corridor. (Figure 2) The main entrance to the park, as defined by the installation of a building to serve as an education and meeting center, is located at the midpoint of the promenade, acting as the balancing point between the two experiences on either end.

Smaller secondary pathways branch off of the Promenade and promote circulation around the remainder of the site. (Figure 3) The majority of structured planting occurs along the promenade and within the Asian-inspired garden. Just south of the solar field is the Great Lawn, its oval form to be defined by raising the landform around its edges to form a berm. Upon and around this berm, the process of natural succession will bring plant life prominent height, further defining the edge condition of the Great Lawn. (Figure 4)

Whether visiting the Asian-inspired Pond Garden, the Promenade, the Solar Garden, or the Great Lawn, the feeling of Voorhees Environmental Park is one of meditative repose, both in movement, and at rest.

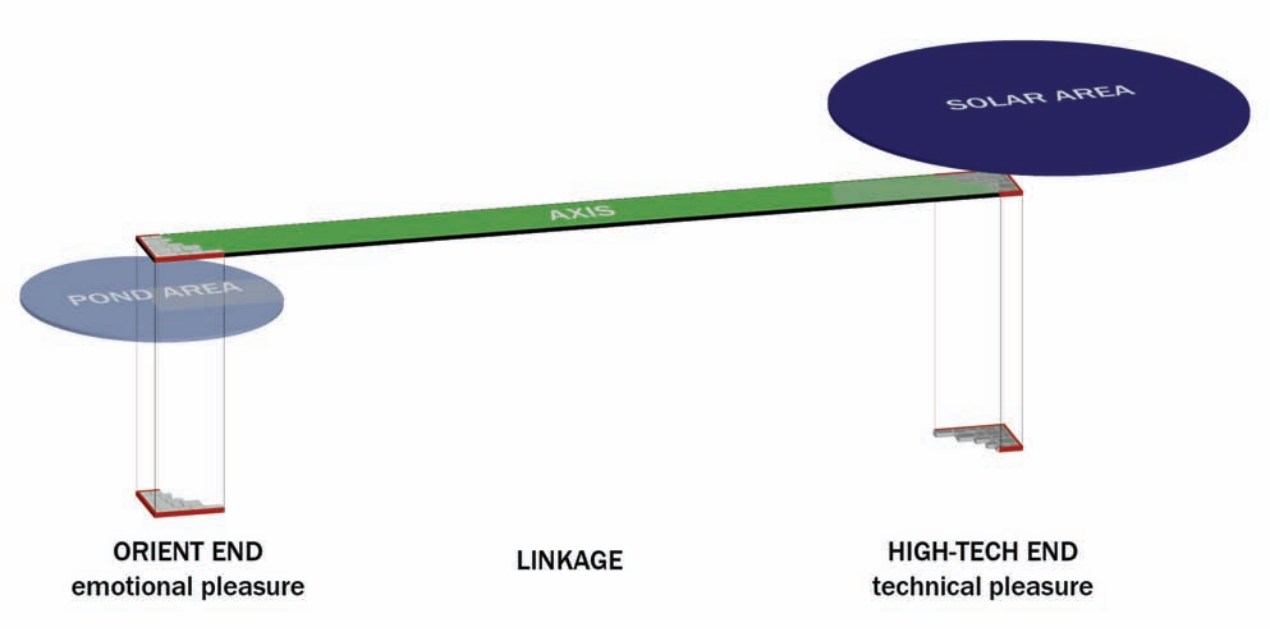


Figure 2. Concept Diagram

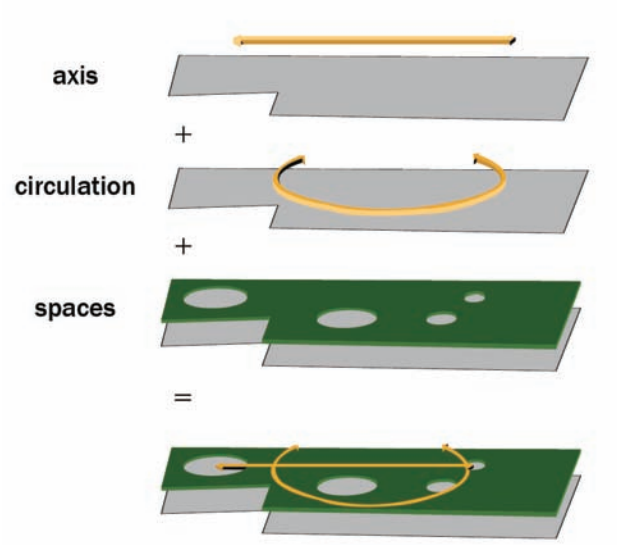


Figure 3. Circulation Diagram

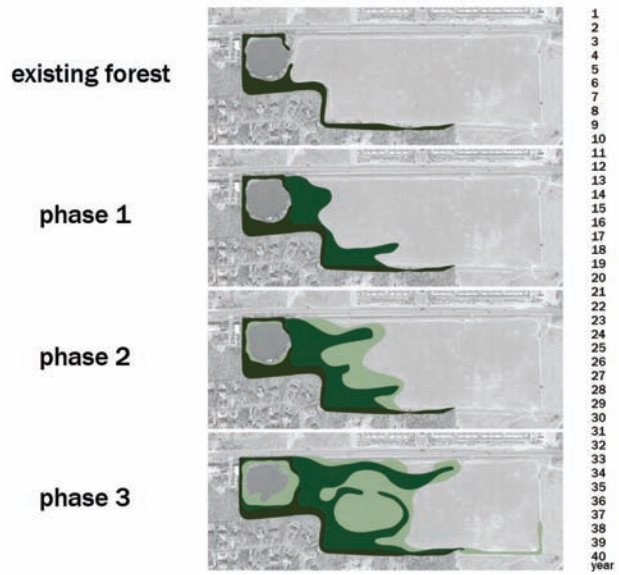


Figure 4. Successional Diagram

3.1.4 Individual Site Designs

Pond Design

Baewon Suh

Figure 1. Master Plan

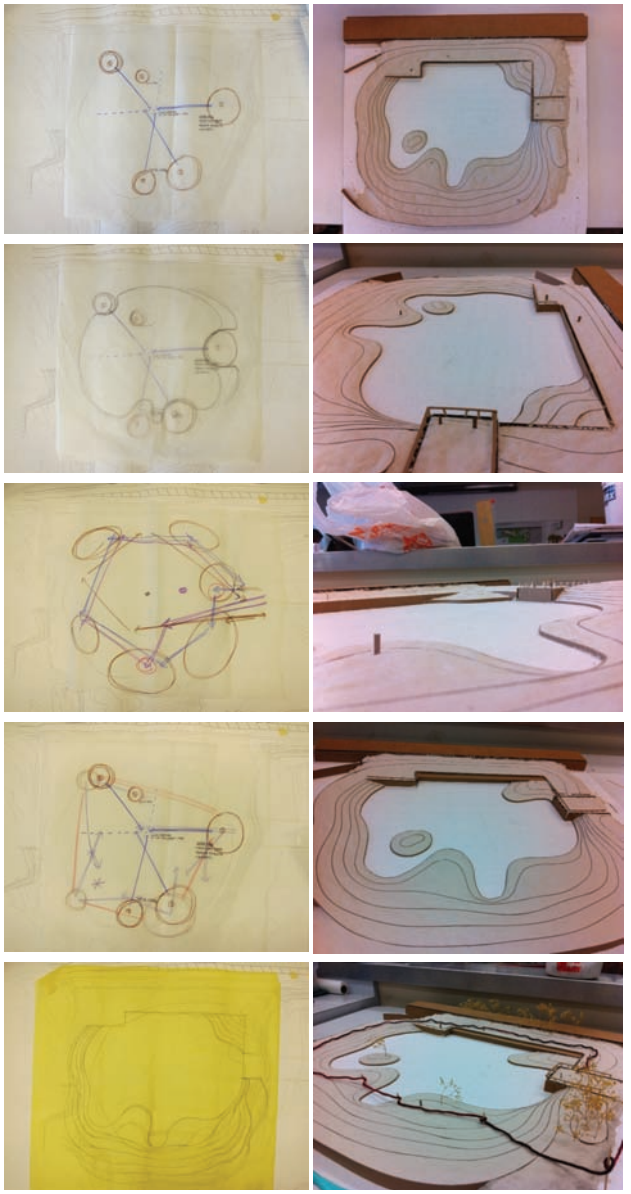


Figure 2.Design Development & study models

Visitors meet a different world when they arrive at southern end of the promenade. Spreading before them at an elevation six feet below where they stand at the edge of the promenade, the Oriental style of the pond while provide a moment of deep emotion. Unlike the complex external environment, this space, emphasizing stillness and peace, will instill in visitors the feelings they have when appreciating an Oriental painting. (Figure 3) By applying de-constructivism to the shape, the visitors complete a biomorphic form of the pond along the natural shape of shore subconsciously despite the linear shape of a cascading waterfall. It is possible to arouse safety questions about the contaminated water that is penetrating the debris layer, even though the biggest portion of water is coming from the surface. Therefore, the access to the water is restricted by plants and stones along the shore. Furthermore, it is designed that the water surface can meet up to 114 feet contour line, when precipitation is very high.

At the end of the axis overlooking the pond, which is paved with big bluestone, a sense of space is offered with the paving material and asymmetric access to the pond. Two benches are located on one edge, providing both a sense of proportion and a functional purpose. Users move through the path that is closed to the edge of the axis after overlooking the pond from the end of axis. The reason for this is that a path emerges from the edge formed by the benches, which visitors will recognize as a physical connection to the pond below.

Having entered the path, visitors will experience a cascading waterfall and a small rough-grassed landform with natural stones through the row of trees on their left side. Traversing the length of the cascading waterfall, visitors will simultaneously descend a gentle two feet and arrive at a resting space paved with the same bluestone material that marked their experience back on the promenade. This space shares an appreciation of both the promenade and the pond, with cascading waterfall on the left.(Figure4) Benches and the shade of trees help to define this space as a comfortable place to come to rest and appreciate the surroundings.

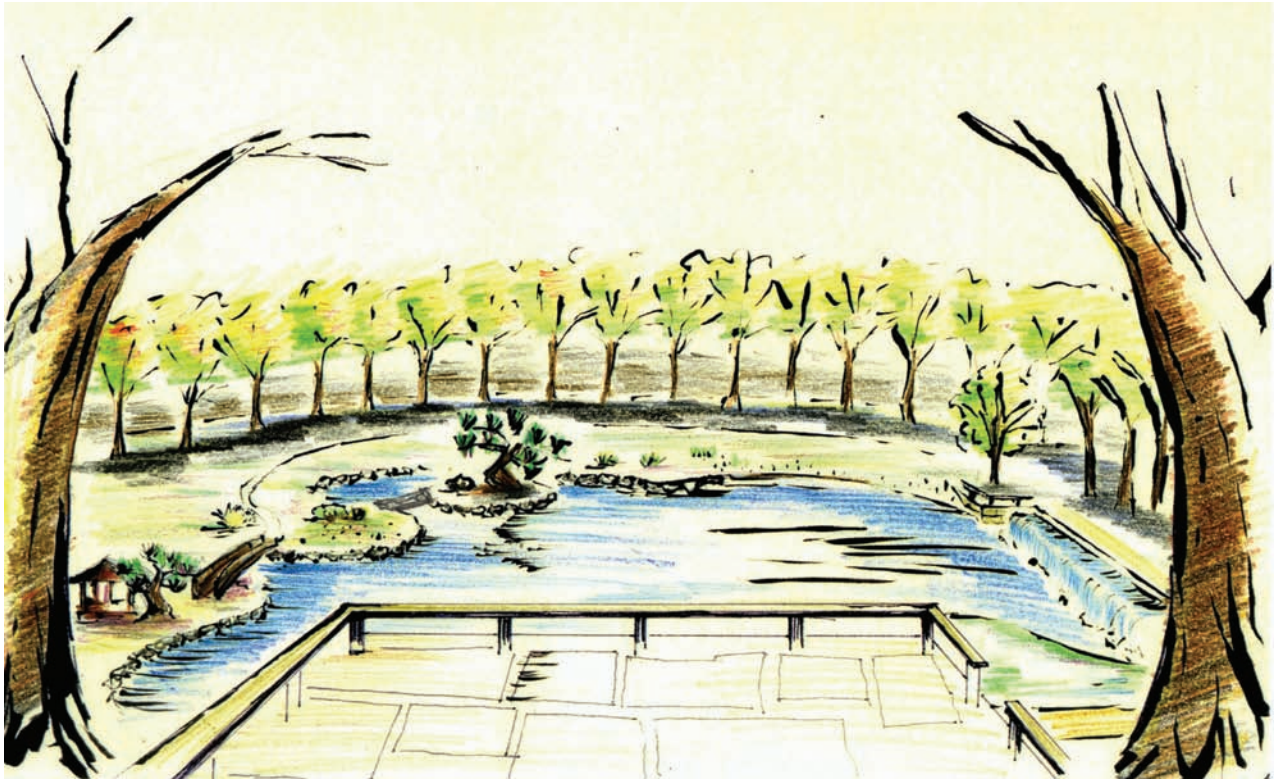


Figure 3. View1

The travel into the oriental painting continues after all these experiences. The gentle slope leads visitors into island which is the lowest topographical point of this spatial sequence. A flat stone bridge provides access to the island where there are two Japanese pine trees planted. Visitors can take a rest on a bench placed under these trees, where an oriental pavilion and pine trees come into view.

At the same time, they will recognize the view of the promenade space they once occupied, and realize that the gentle descent to this point has taken them a full ten feet lower. A wooden bridge

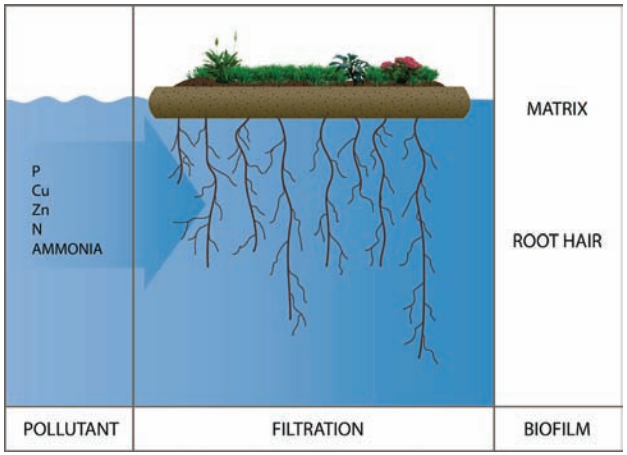


Diagram1. Floating Treatment Wetland

is connected to the path. (Figure5) The artificial island beneath the bridge is placed there as an ornamental purpose element, and is therefore inaccessible. However, it provides the important function to purifying the water because the plants are not rooted in the sediment, they are forced to acquire their nutrition and pollutants directly from the water column, which enhances potential rates of pollutants uptake into biomass. (diagram1) Moving further along the path, a series of stepping-stones leads the visitors to the pavilion and they can take a rest. At this moment, visitors can look back the footsteps they have taken to this point, where they are now directly facing the cascading waterfall.

This waterfall works with electricity generated by the solar panels located upland in the park. A relationship is created between the waterfall and the solar panels, wherein the amount of energy being generated at a given moment is expressed in the rate of flow of the cascading water. (Diagram2) Moreover, the movement of the water will decrease the mosquito population. The path continues to the existing forest area and it will lead the user to the first space where they started the journey subconsciously, because the trees block the view.

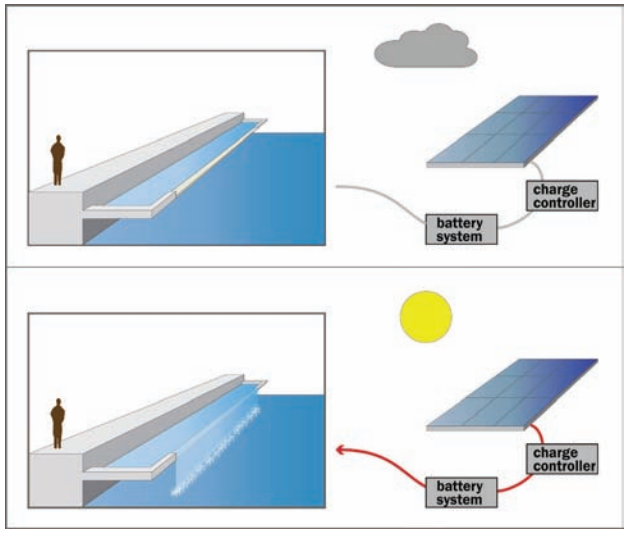


Diagram2 Cascading waterfall system

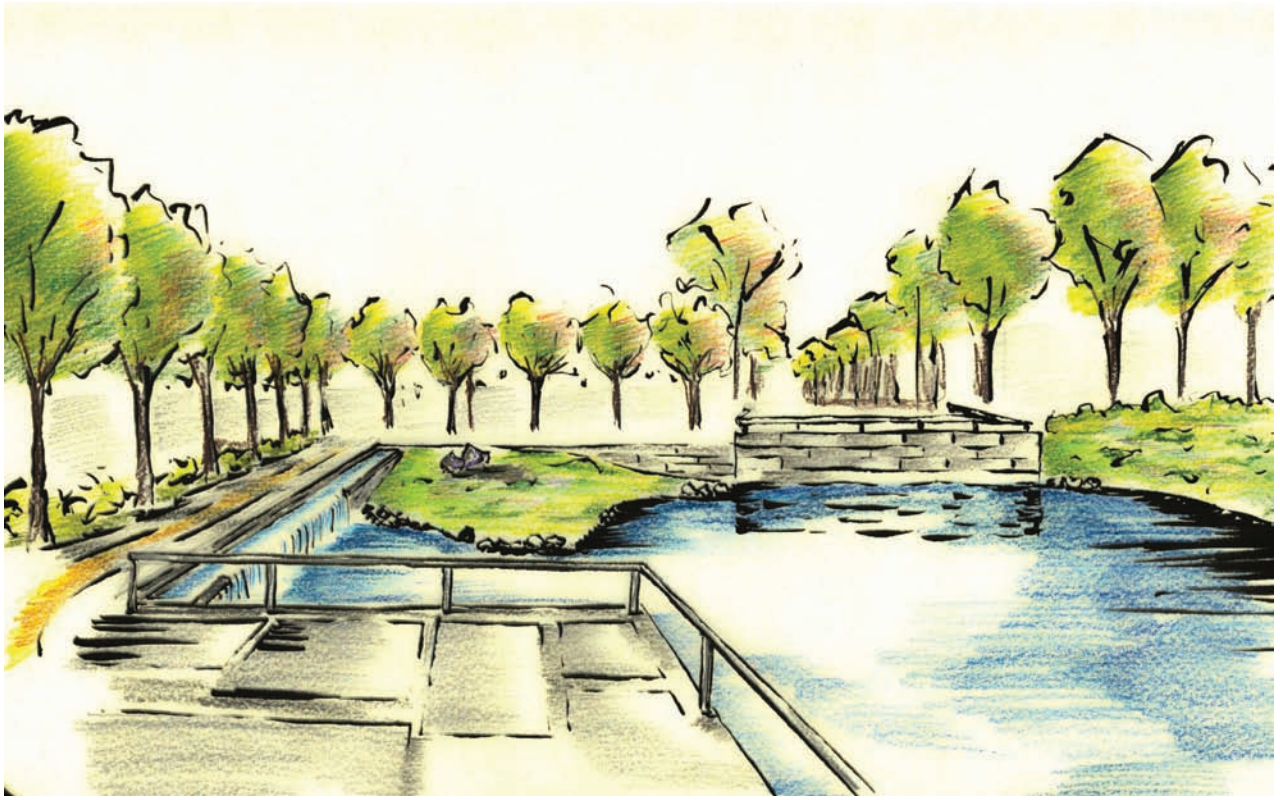


Figure 4. View2

This pleasant journey will keep you refreshed and ease your mind while you get tired of daily routine. Moreover, this emotional pond area can support the balance to the high tech end solar panels area.

Figure 5. View3

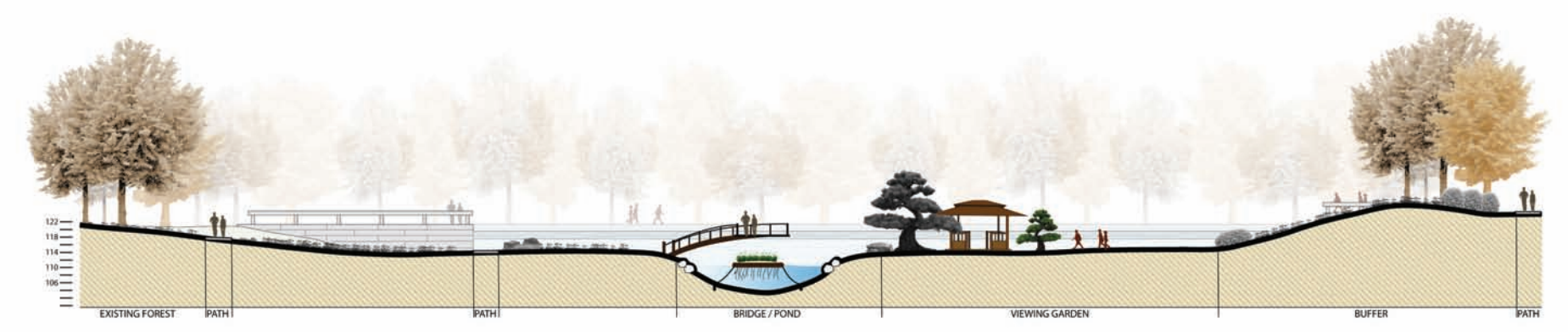


Figure 6 Section A-A'

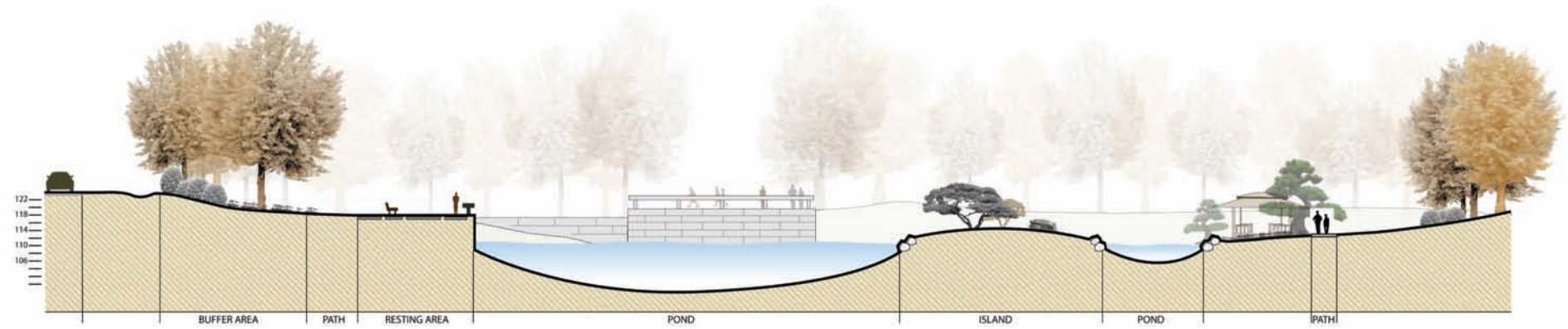


Figure 7 Section B-B'

Site Entrance and Promenade

Kris Kemper

The main entrance to the park is located across from the main entrance to the Centennial Mills Residential Development with parking located along Centennial Blvd.. The existing bike lane will be diverted onto the existing ring road at the south end of the site and back onto Centennial Blvd. at the north end of the site, with bike parking located next to the visitor center building. As people enter the site they will arrive at the visitor center and have the option of entering the building or proceeding through to the courtyard and promenade. The overall design was influenced by Ayers, Saint, Gross's visitor center at the Nemour's Mansion in Wilmington, DE which consists of a single long corridor with flanked by two rooms (figure 2). The center here is composed of two separate buildings, linked by a long corridor. A pergola structure between the two buildings helps connect and unify the structures as one and also helps create a gateway for those choosing not to enter the buildings. The long corridor will be a place for displaying art in the southern building and a place to display and highlight technology in the other. In addition the buildings will house classrooms and other facilities. The long, linear nature of the visitor center is meant to mimic the promenade. Earth, along with the structures is used to create a courtyard visitors will enter after exiting the building. The courtyard features a bosque of flowering dogwoods and a serial design of benches and hedges. The planting pattern and seating are laid out on a pattern based off the architecture of the building (figure 3).

Figure 1. Plan of Site Entrance showing the visitors center, courtyard garden and a portion of the promenade

Figure 2. Nemour Mansion Visitor Center

After exiting the courtyard, visitors will be placed onto the park's promenade. The promenade is a vital portion of the overall park design and serves as a link between the solar field portion of the site and the Asian style garden. In addition, the promenade creates a long linear view across the entire length of the park. It is a quarter-mile in length and is flanked by a double row of oak trees

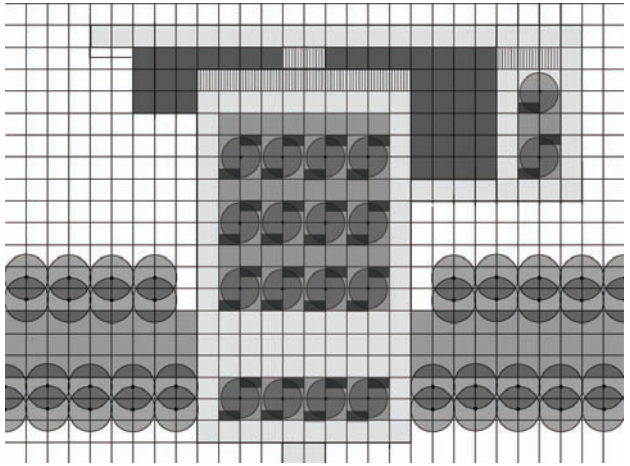


Figure 3. Diagram showing the grid used to layout the visitor center design

planted in constructed berms. Inspiration for the promenade was taken from Central Park's mall, which is also approximately a quarter and bordered by a double allee of Elms. This Oak allee will use four different species of oak which were found growing on or around the site and include: White, Pin, Chestnut and Red Oaks. The width of the promenade is 30 feet which is divided by bluestone pavers into three separate lanes, two pedestrian lanes and a central bike. Benches, which are built into the planting berms and over bluestone pavers, are located approximately every 80 feet along the axis. The bluestone pavers used act as a unifying element between the different gardens which lie at each end of the axis.

Figure Source List

Figure 2 http://www.asg-architects.com/portfolio/nmg-visitor-center/, accessed 11/05/11

Figure 4. Sketch showing the courtyard space created by the Visitor Center structure and earth

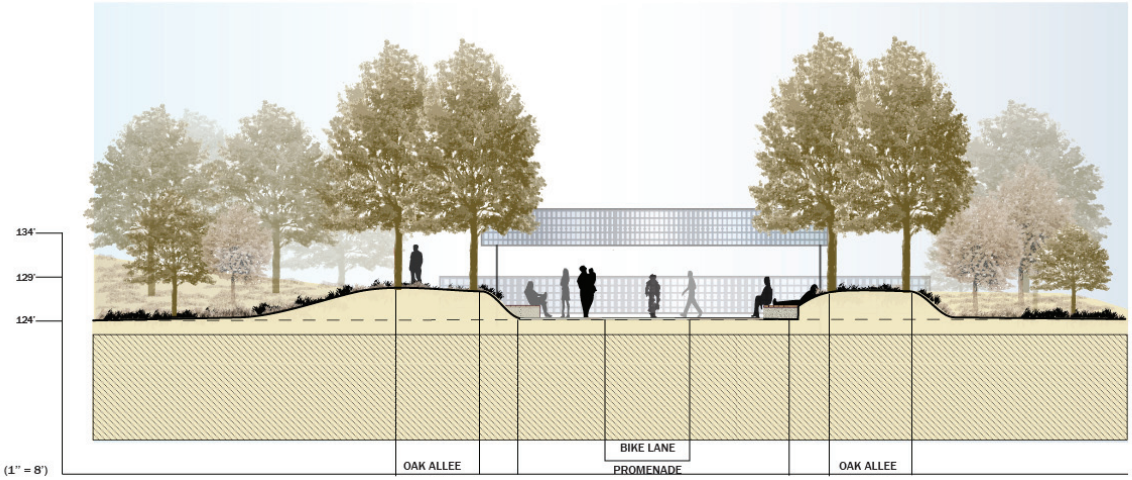


Figure 5. Section cut through the promenade looking north

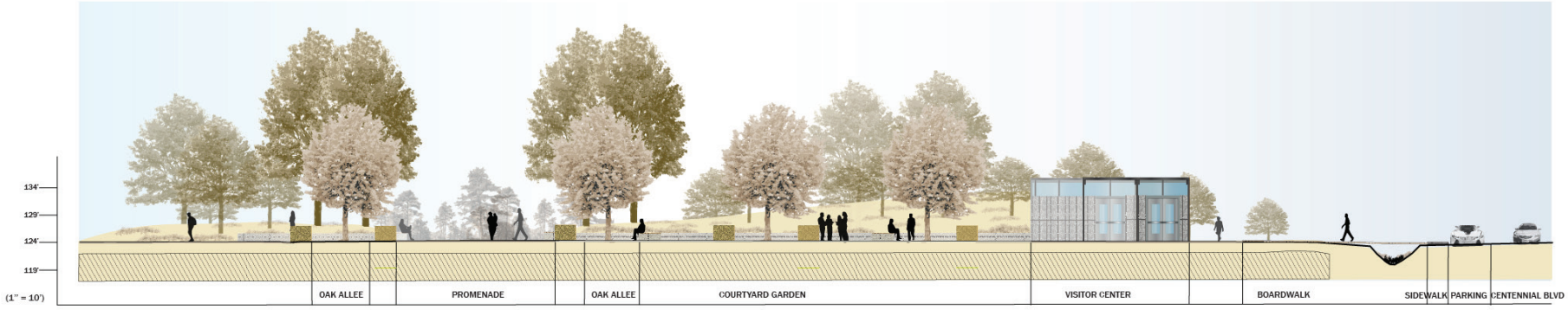


Figure 6. Section cut through the main entrance looking south

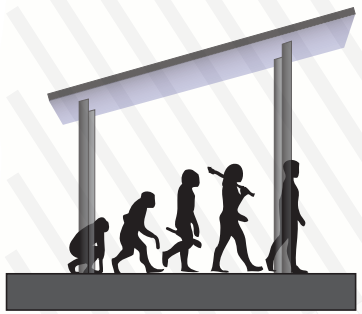
Solar Garden

Kevin Perry

It has been argued in recent literature, specifically Michael Pollan's book *The Omnivore's Dilemma*[1], that possibly the strongest link between humankind and the landscape is the way in which our species produces and consumes food. That argument is taken to into a new context with the realization that in the thermodynamic sense of the word, food is power. Food is fuel, food is Joules per second, food is Watts, food is Calories. food is part of the equation that supplies energy to the human body. It follows then, that it is not food that ties us most strongly to the landscape, but *energy*.

Intervoltaic Flow → **Energy Make** → **Energy Take**

A quantitative look at solar energy and its place in human life



What does it take to produce solar energy?

12: in feet, the width of each row of solar panels
12,615: in feet, the total length of all rows of solar panels
151,380: in feet^2, total area of solar panel array
16: in feet^2, the area of an individual solar panel
9460: in panels, the total number of solar panels in the array at Voorhees Environmental Park

215: in watts, the peak power generation rating of each solar panel
2,033: in kilowatts, total peak power generation rating of the solar panel array
16,624: in kilowatt-hours, average photovoltaic energy produced per day

How do we consume energy?

100: in watts, the average internal power demand in a given moment to support human life
2.4: in kilowatt-hours, the average internal energy used to support human life for one day
76,432: in kilowatt-hours, the average internal energy to support the human lives of the Voorhees population for one day

926: in watts, the average power demand in a given moment for a home in New Jersey
22.2: in kilowatt-hours, the average energy used to support a home in New Jersey for one day
261,405: in kilowatt-hours, the average energy used to support the homes of Voorhees for one day

Figure 1. Intervoltaic flow: a relationship between people and solar energy [2]

It is rare, however, that we are able to experience the landscape with energy on our minds. The facilities in the landscape that produce and channel energy are too often dangerous, or ugly, or loud, or fenced off and inaccessible to people. In contrast, this design showcases the installation of a solar array at Voorhees Environmental Park which will offer a unique opportunity to create a landscape that is inclusive of both people and energy.

The dialogue between the visitor and the solar field begins at the north end of the Voorhees Environmental Park Promenade. (Figure 2) Here the panels raise up from the ground into the air, creating a space beneath for people to enter. An interactive LED lightwall is installed here, powered by energy created in the solar field. The wall can sense visitors and reflect back to them their silhouette in LED lights. (Figure 3) The lightwall will also offer a multimedia interactive learning opportunity about solar power in general as well as the particular aspects of this field installation, including real time energy output. From this learning space, a path leads visitors away from the Promenade and down the length between two rows of solar panels, where it joins the Solar Garden. (Figure 4,5)

Within the Solar Garden, the solar array provides spaces where people can interact with solar energy by walking among, sitting next to, and existing under the cover provided by solar panels. This spatial idea is reinforced by simple gestures of raising the earth and extending the structural components of the solar array (Figure 6), creating a unique experience of space, which celebrates, not decorates the expansive lengths of solar panels which define this end of the park.

Furthermore, in energy, there is the implication of movement. Kinetic energy is the expression of a body in motion. Potential energy is the expression of a body's motivation to move from a state of rest. The common unit of electrical power, the Watt, is not a volumetric unit of measure, but a rate which expresses the quantity of Joules of energy collected or spent per second. Energy relates to power and time in the same way that distance relates to speed and time.

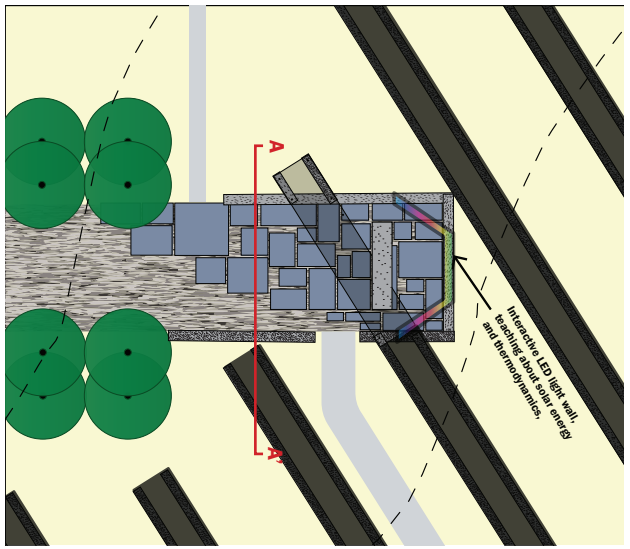


Figure 2. Plan view of north end of the Promenade with interactive LED lightwall

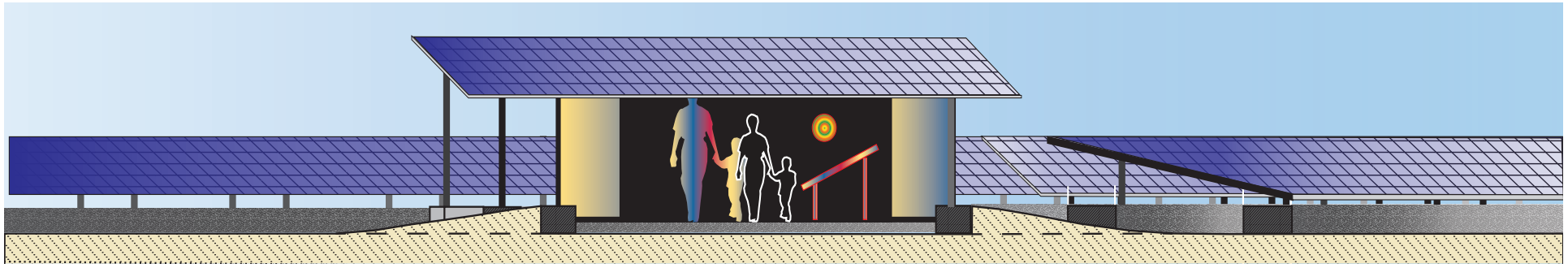


Figure 3. View of Section A-A' within Figure 1

Figure 4. Plan view of the Solar Garden with path that connects to the Promenade.

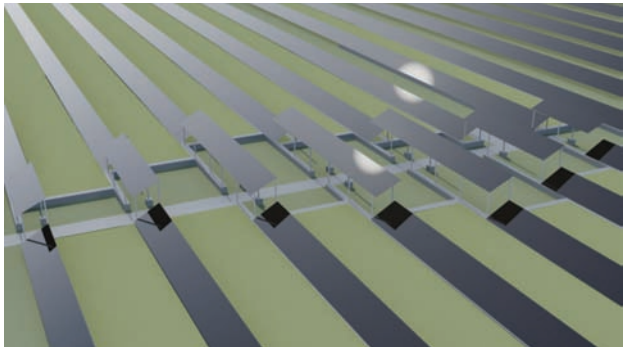


Figure 5. Bird's eye view of the Solar Garden.

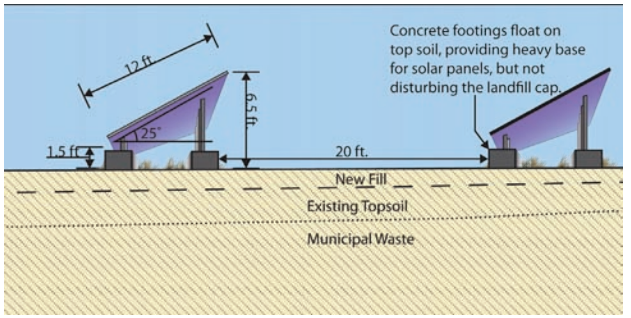


Figure 6a. Standard dimensions of solar panel arrays as laid out in the field.

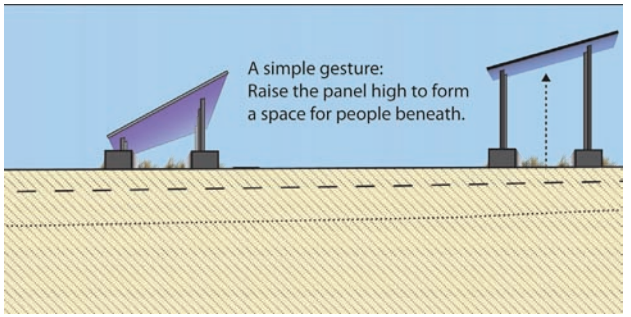


Figure 6b. Creating space for people.

To place a garden within a field of solar panels is to act in celebration of energy. In such a celebration, the concept of movement must be emphasized. (Figure 7) As a visitor moves through this processional garden, he or she becomes a unit of energy, powering a kinetic experience through time and space. (Figure 8)

In solar energy, there also is a continual conflict between productivity and rest. Like many people, the solar panel is productive in the light of the day and restful in the dark of night. Whereas hydrological or mechanical energy may be constant (which is not to say perpetual), solar energy is cyclical, responding to cycles on the scale of hours and season.

In an act of balance to the idea of energy expressed in the processional movement through space, the idea of rest is expressed in a series of spaces laid out along the procession. (Figures 9-10). The spaces modulate along the length of the procession, responding to the modular nature of solar panel arrays.

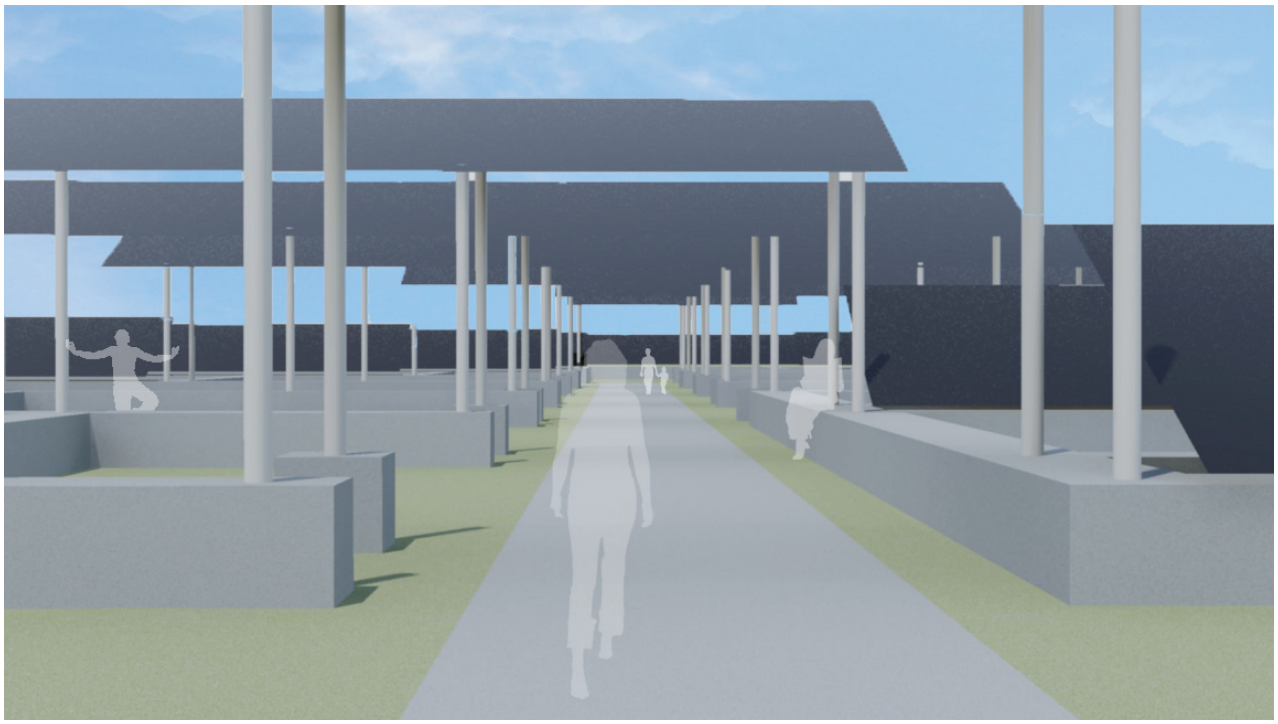


Figure 7. Perspective of the processional walk within the Solar Garden.

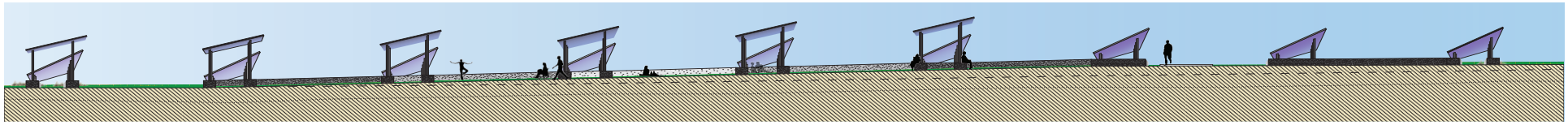


Figure 8. View of Section B-B' within Figure 3 showing the sequence of movement through the Solar Garden.

Finally, this Solar Garden responds to and provides balance in the context of Voorhees Environmental Park to the spirit of rejuvenative nature found in the Asian-inspired Pond Garden. However, it also enters the discussion of land use and the current state of solar array design on a regional scale[3]. While the trend has been to isolate solar panel arrays from the public, this Solar Garden instead serves to unite people with this renewable source of clean energy. In so doing, it makes a statement of confidence in the safety and effectiveness of solar power as a part of our landscape, proving us not only with electrical energy for our homes and businesses, but also unique outdoor spaces for passive outdoor recreation.

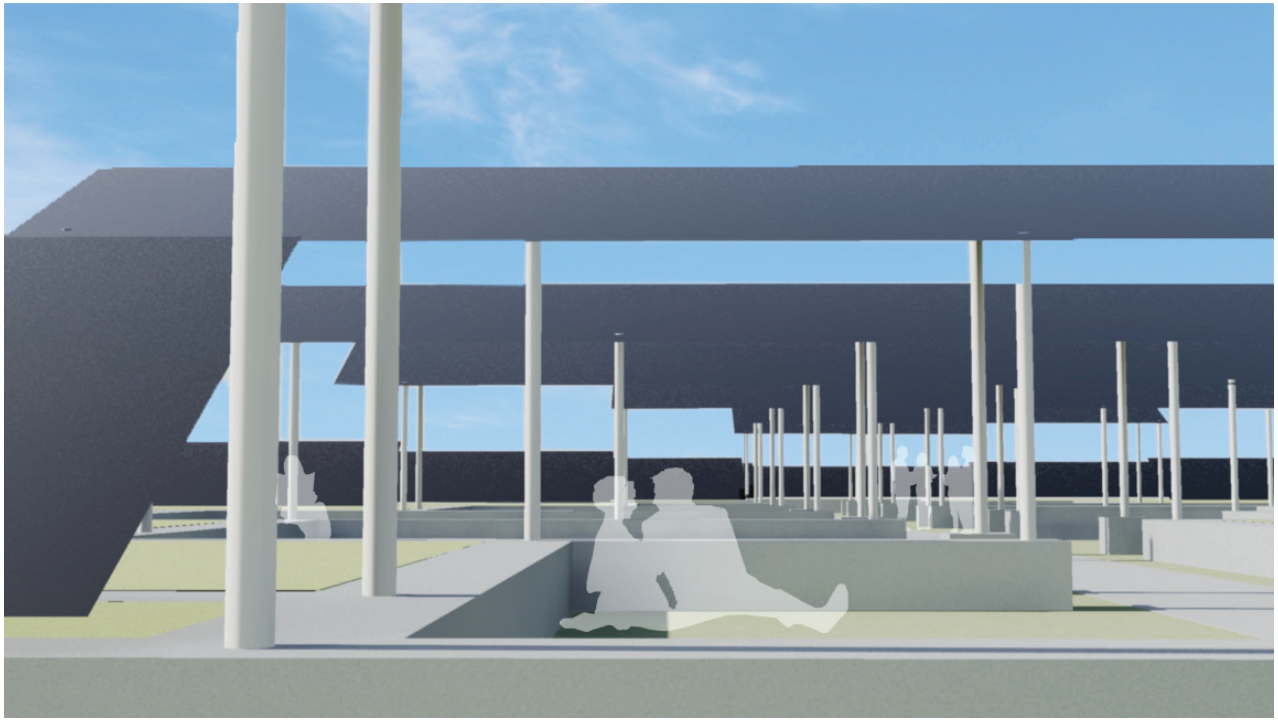


Figure 9. A resting space within the Solar Garden

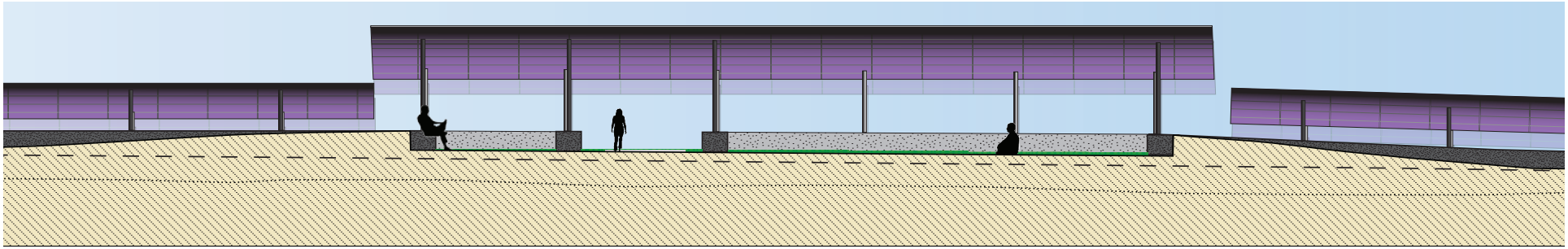


Figure 10. View of Section C-C' showing a resting space within the Solar Garden.

1. Pollan, Michael. "The Omnivore's Dilemma: A Natural History in Four Meals". Penguin Press. 2006.
2. Standard consumption data derived from Yildiz, Orhan. "Electric Power Annual 2010 - State Data Tables". U.S. Energy Information Administration. http://www.eia.gov/cneaf/electricity/epa/epa_sprdshts.html. Accessed 11 December 2011.
3. Reference examples of solar array in the landscape chapter 2.1 of this publication.

3.2 Nucleus

3.2.1 Morphological Box

Adam Cesanek
Mukta Jadhav
Wan Huang
Erik Maietta

"Best possible connections – best possible use – best possible benefit"

Our goal is to strengthen the connectivity between the people of Voorhees and the park in the physical, functional and social aspect. Providing an engaging environmental experience appealing to a wide audience will be integral to the success of the park. Also we aim to bring out an educational and economic benefit from the programs we introduce. Through connectivity, natural landscape and educational components the Voorhees landfill will create a sense of place and town pride within the region.

Considering the current access conditions, there are restricted points for pedestrians and vehicles to enter the park. We aim to provide favorable, safe and easy connections from the larger town of Voorhees to the Environmental Complex. Introducing an area that integrates the bike routes with a vehicular access points will draw visitors passing by on Centennial Boulevard and surrounding neighborhoods. Connecting the open, adjacent landscape features will allow our site to function beyond its boundaries.

Secondly we want the site to be open and welcoming to people from all ages and backgrounds. We will provide a set of programs that will cater to a wide array of people whether it is families, students or adults. Recreational experiences will ameliorate the inter-relationships between townspeople in Voorhees, resulting in better social connectivity. The program will be centered upon

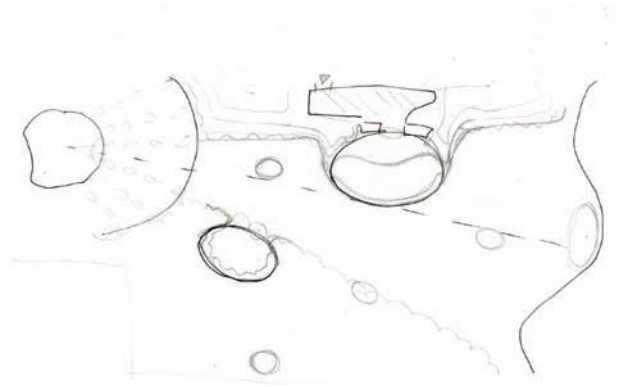


Figure 1. Radial Bosque informs the site design

the themes of passive recreation and education, which are not currently satisfied by the township's multiple active recreation complexes.

Given the proximity of the Voorhees High School, the environmental complex will support large group discussions and facilitate outdoor learning. Specifically through the introduction of Solar Panels in the park, visitors will be exposed first hand to cutting edge green technology. Such programming will lend the site a unique character and identity that distinguishes itself from other spaces.

The landfill site provides a unique environmental experience that allows the opportunity to showcase the educational benefits of the remediation process. There will be no effort to "hide" what is buried beneath the cap, in fact we will elaborate on the current remediation processes, in that this provides a valuable education opportunity. The sparging facility and monitoring wells spaced throughout the park speak to the site's history as does the fill from an adjacent borrow pit, which now creates a sandy terrain in the nearby vacant lot. Overall we aim to change people's opinions about the site, from negative ideas associated with a landfill to current sustainable thinking.

The site is entirely open to traffic and noise pollution created along Centennial Boulevard. Additionally, there are no visual breaks between the park and the adjacent active adult community. Therefore we will provide a buffer by changing the topography and adding physical enhancements such as reintroducing vegetation.

Thirdly, we aim to benefit the town of Voorhees economically and educationally. The management plan for the park will introduce park goers to sustainable methods of landscaping. Passive irrigation, low and no-mow areas and permeable surfaces will not only help to create an environmentally viable landscape, but also fall into accordance with regulations regarding disturbance of the cap on the landfill. While there will be a return from the implementation of solar panels at the site, we plan to keep this park environmentally viable through a number of educational, artistic and cultural opportunities organized by the park and available to patrons.

Overall, the Voorhees Environmental Complex will attract visitors from adjacent towns and create a sense of community pride. The new park will increase property value in neighboring developments and inspire a healthier, more environmentally aware lifestyle. By introducing better connections to the town, sensitivity to environmental conditions, appropriate programming and economic benefit; we will bring this Spartan landscape back to life.

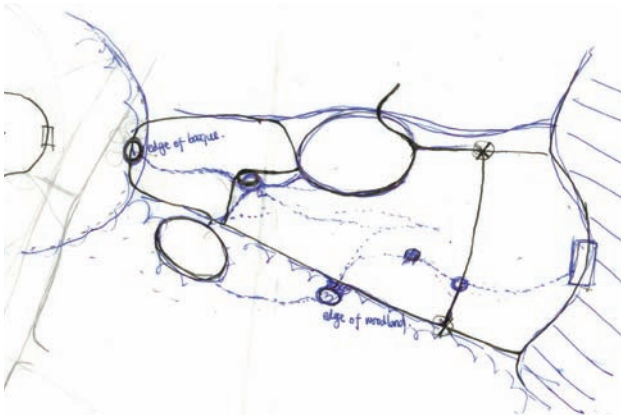


Figure 2. Conceptual Space Diagram with Circulation

The morphological box aided in creating a cohesive design for our site. Central to the idea of the morphological box is that there are many different options for the various services that the site provides. We focused on seven different services including: site amenities, education, circulation, parking, vegetation, solar panels, and parking. Many options were explored for each topic and one of each variable was combined into a cohesive product. For each variable we addressed a specific problem statement and chose the best design based on strict criteria. Overall, analysis will cover the seven different services Voorhees Environmental Park will provide, their associated problem statements and a list of criteria ion which to base these ideas.

Beginning with amenities, it was requested from VECEF and the townspeople that there be a passive recreational facility on site. The recreational facility must be unique in that it must offer a different experience than that which is provided by other recreational facilities throughout Voorhees. The morphological box drawing reflects the criteria that the amenities facility must create quiet, meditative areas which are enclosed from the surrounding township and create gathering spaces that encourage a sense of community.

Secondly, we addressed the problem of storm water management on site according to the issue that currently the site is graded to promote runoff towards the pond and sparging facilities. The grading is causing trace amount of chemicals to leach into the surrounding water bodies. Therefore we decided that the best designs for controlling storm water runoff would decrease the rate of flow of water on the site and to create buffers for the runoff from reaching the surrounding water bodies.

There is currently no vegetation on the site, which gives the site a character of openness and vastness. In the same vein we found that this causes the site to be totally exposed to traffic along Centennial Boulevard, potentially creating a noise disturbance for park users. Due to the current lack of vegetation, the many features the site could provide are masked in a directionless quality. Therefore we decided that vegetative designs would be graded on the criteria in which they would best create focal points and highlight well designed areas. Functionally, the vegetation must not shade the solar areas provide on the site and also provide a sense of enclosure form the adjacent roadway and GE site.

Circulation on site currently has been adapted to those checking the monitoring wells, a circuit road lines the perimeter of the site. There is only one access point to the site along Centennial Boulevard, which has a high speed limit, discouraging the idea of a public space. We decided that appropriate circulation designs must separate park-

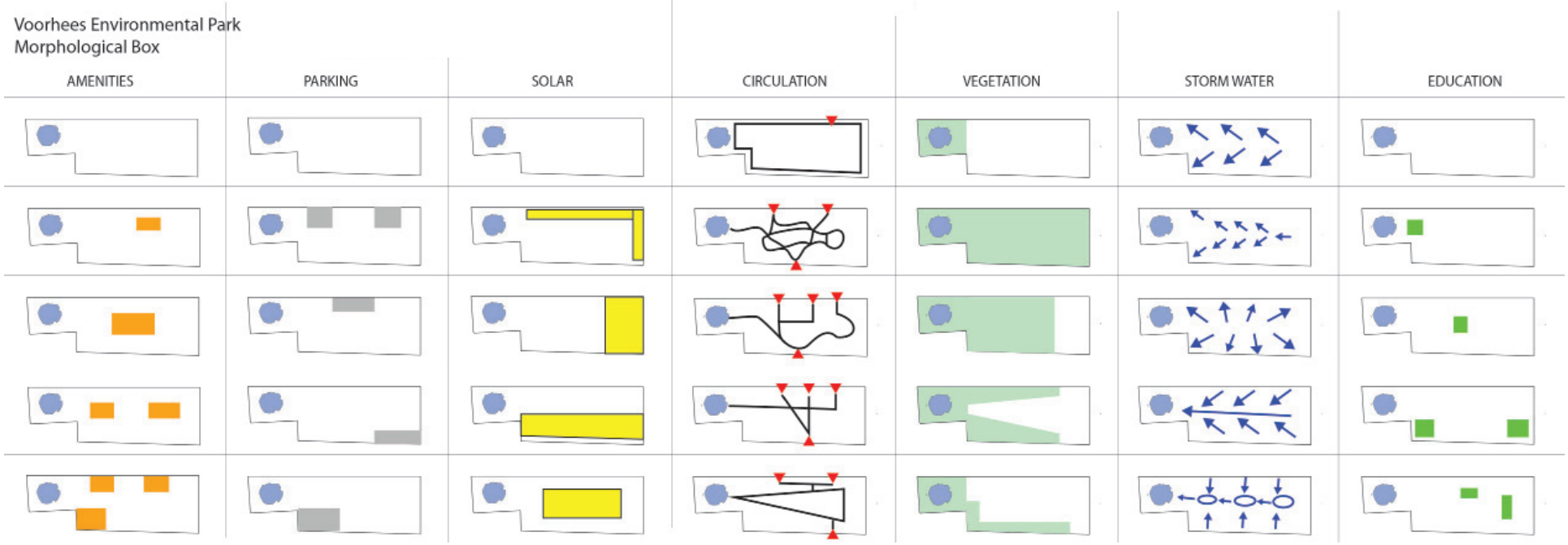


Figure 3. Morphological Box

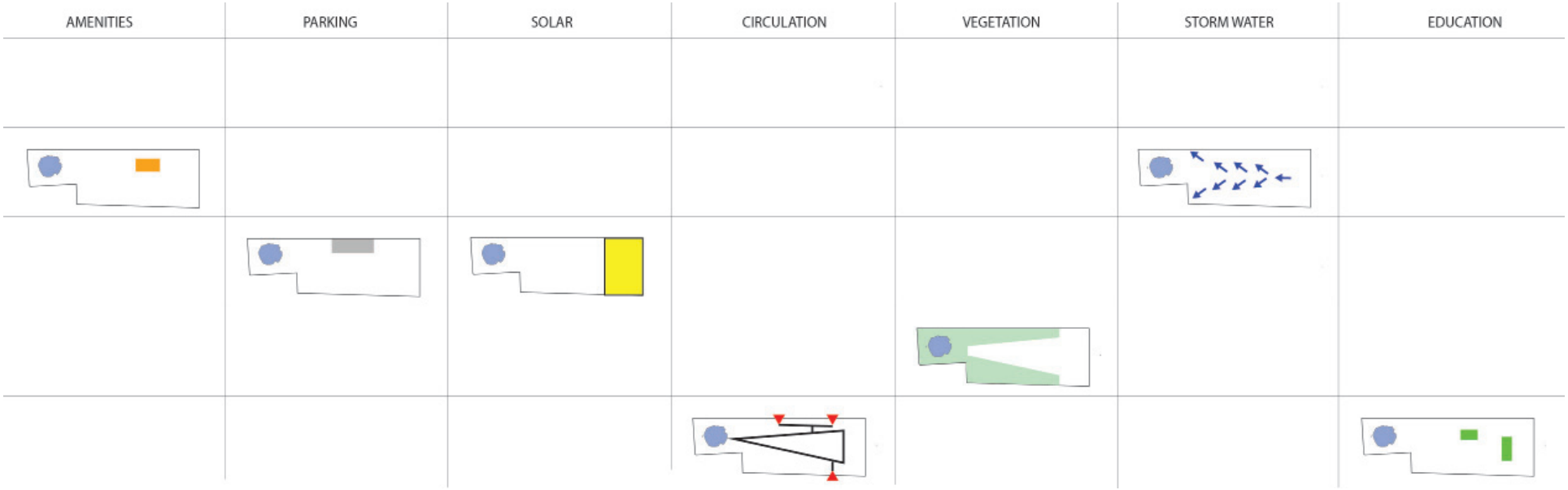


Figure 4. Morphological Box, Chosen Designs Based on Criteria

ing and site circulation, provide safe connections to the surrounding residential areas and provide separate vehicular and pedestrian routes.

The township of Voorhees seeks to offset the cost of building an environmental park by installing a large solar field installation. The installation must be at least 11 acres to be looked at by a potential bidder. At the same time, the residents of Centennial Mills and VECEF would like to preserve a portion of the site to be turned into an environmental park. We decided that the best designs would be evaluated based on the criteria that they are designed in a way that is aesthetically pleasing and provides maximum solar efficiency. Also, the design must facilitate interaction between the public and solar panels without compromising the safety of the panels.

There is currently no vehicular parking on the site. We decided that a parking lot should provide adequate space for park visitors on the local and town scales. The parking design would be evaluated on the criteria that it allows for separate parking for cars and bikes and is large enough to host the neighboring townships and communities.

Lastly, our morphological box addresses the idea that education could happen at Voorhees Environmental Park. Education would be an important part of the programming for the space in that the site offers distinct opportunities in solar panel, landfill restoration and native habitat areas. The educational aspect must also work to reverse negative connotations associated with the landfill and promote a positive experience. The design for the education at the site will be evaluated based on the criteria that it elaborates on the process of environmental remediation and at the same time showcases sustainability.

Figure 5. Sketch of Solar Panel Overlook

3.2.2 Evaluation & Test Design

Initial Design Concept

The Initial design concept, Transformative Connections, consists of a series of open and woodland spaces interconnected with primary and secondary path systems. The concept also includes educational programming to help the park visitor understand the ongoing remediation process on the site. The meandering pathways provide a gradual transition from larger recreational spaces to smaller meditative areas. The design is aligned along a strong central axis that allows for visual connections throughout the park. While being located in the geographical center of Voorhees Township, our site provides an escape form the everyday suburban environment.

Earthwork and vegetation provide an enclosure from Centennial Boulevard and communicate a sense of arrival to park visitors. Aesthetic and educational integration of solar panels becomes part of the experience of the park, while low impact design works with existing series of meandering pathways providing a gradual transition from larger recreational spaces to smaller meditative areas. The design is aligned along a strong central axis that allows for visual connections throughout the park. Our site provides an escape form the everyday suburban environment. Earthwork and vegetation provide an enclosure from Centennial Boulevard and communicate a sense of arrival to park visitors. Strong connections are made to surrounding neighborhoods through a network of open spaces and circulation. Overall our design draws on the existing open character of the site while creating a passive spatial experience in order to bring the Voorhees Landfill back to life conditions. Overall our design draws on the existing open character of the site while creating a passive spatial experience in order to bring the Voorhees Landfill back to life.

Figure 1. Test Design Plan

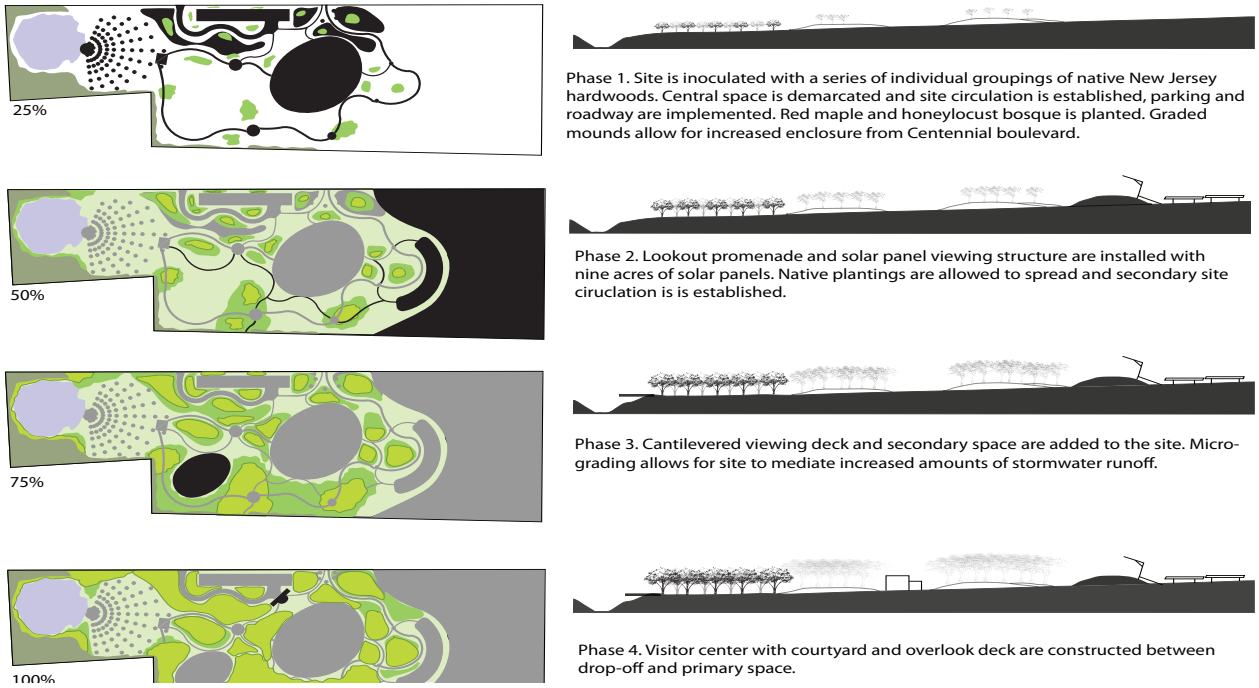


Figure 2. Phase Diagram

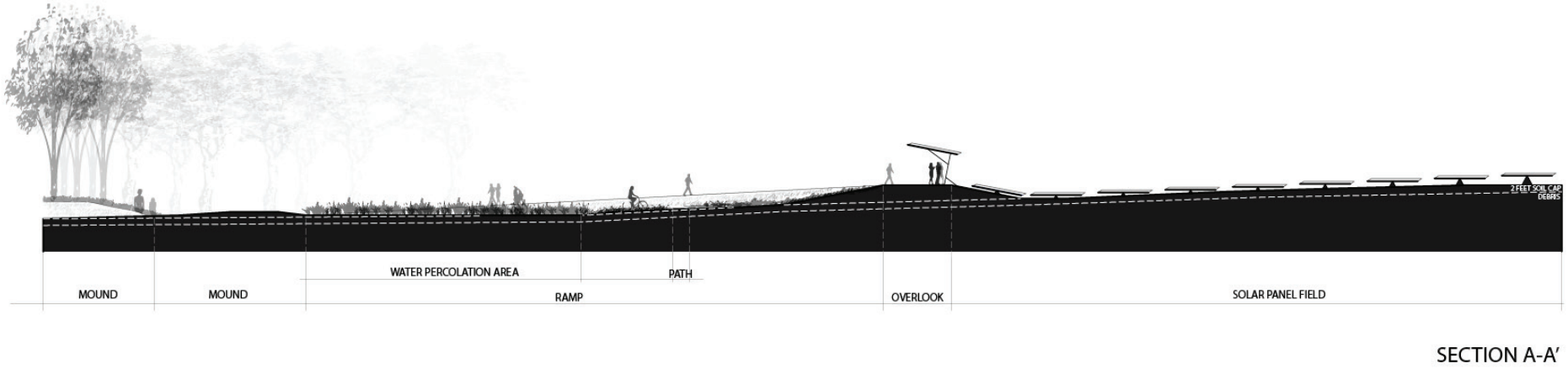


Figure 3. Solar Overlook Section

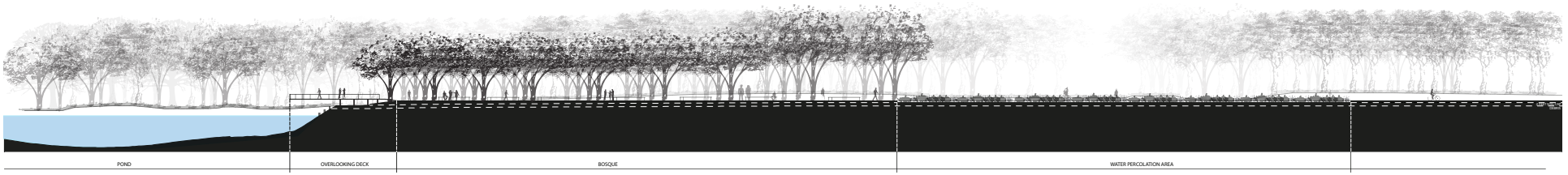


Figure 4. Bosque Long Section

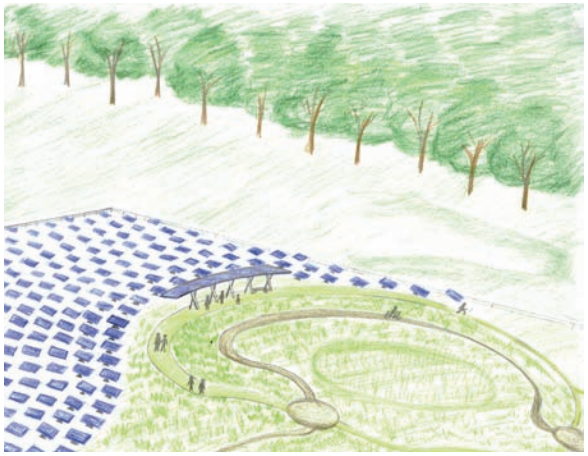


Figure 5. Solar Overlook Perspective Sketch

Figure 6. Bosque Overlook Perspective Sketch

Figure Source List

Figure 1. Site Plan background satellite image courtesy of Google Earth 2011 (Accessed October 1, 2011)

Evolution of Our Master Plan

The Master plan was a result of the changes we made in response to the issues and critics received at the mid term presentation. Key factors considered were circulation, storm water drainage and scale of spaces needed refinement.

Also, we were advised to make the plan less object-oriented, which would strengthen the relation between the elements of the plan.

To make the circulation coherent, we decided to make a clear distinction between primary and the secondary pathways. Primary pathway would serve for bikers and pedestrians. [Fig. 1]

It would be one main loop connecting and giving access to all the spaces. [Fig. 3]. The secondary pathways would branch off from the primary pathway and would serve only pedestrians. [Chapter. 2.5]

To make the plan more cohesive, we extended the geometry of the radial bosque throughout the site. The spaces and pathways were aligned to the same geometry, giving the design a certain orientation.[Fig. 2 and Fig. 3]

We re-graded the entire site so that there would be no catch basins. The water would either flow away from the site or run into the pond.

The spaces were scaled down according to the appropriate functions they were offering.

After making these changes, we revisited our concept name. We moved one step further and renamed our concept from “Transformative Connections” to “Nucleus”.

Figure 1. Perspective View of Meadow

Nucleus

Nature is our nucleus. As we move away from the center, we divert away from nature and move closer to technology. In our design, the pond is a representation of nature, while the solar field on the extreme side is a representation of the man-made technology.

We provide a connection between these two opposite concepts and offer a place of self reflection for the users through our design. On another layer, we also hope for this environmental park to become the Nucleus or the center of the Voorhees Township.

Our initial concept of “Transforming Connections” got more definition after the test design. The circulation changed from a meandering pathway system to a radial geomtric one.

The origin or the center focus was the pond which represented nature. It was the center around which the whole design aligned itself, and so we decided to name our design the “Nucleus”.

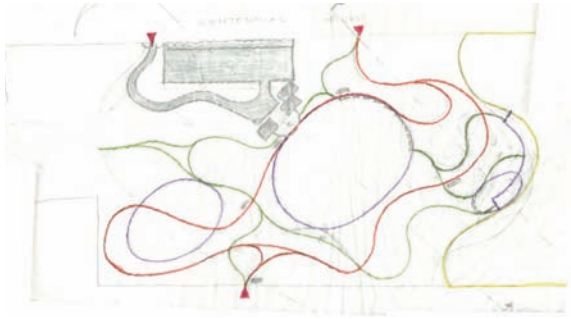


Figure 2. Circulation Diagram II

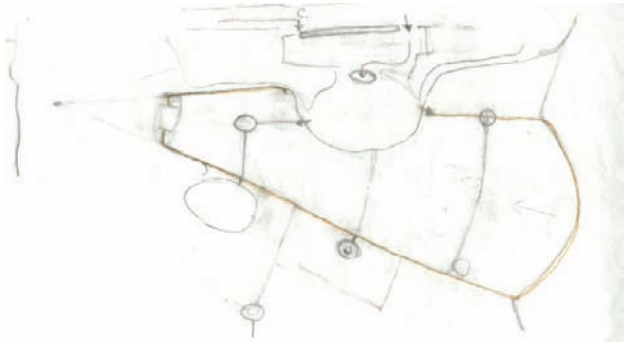


Figure 3. Circulation Diagram II

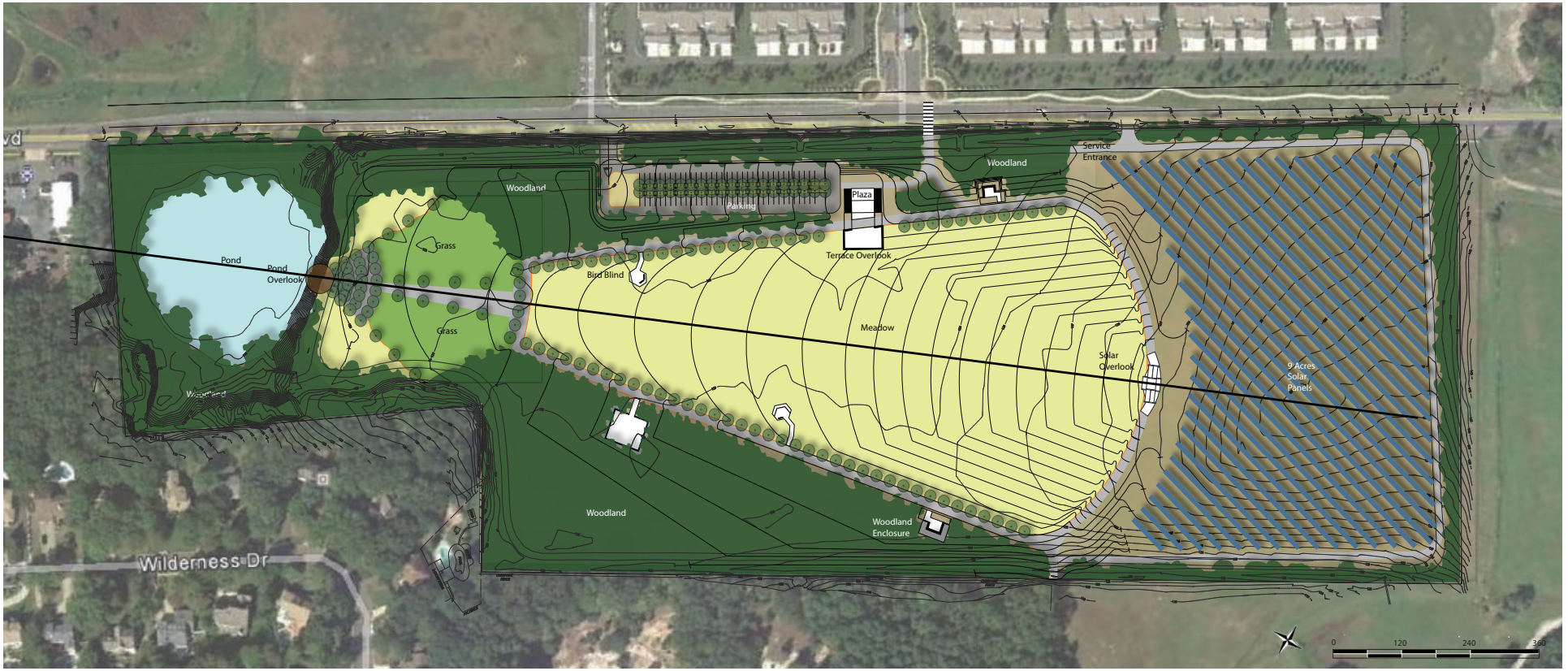


Figure 4. Master Plan

3.2.3 Master Concept & Group Design

Our design offers views and vistas, places to observe and not be in.

There are three entrances to the site. One out of the two located on Centennial Boulevard is a vehicular entrance while the other is for pedestrians and bikers. The third one, located at the end of the proposed residential block at the northeast side of the site, also serves pedestrians and bikers. All of these entrances gradually connect the patrons to the primary pathway.

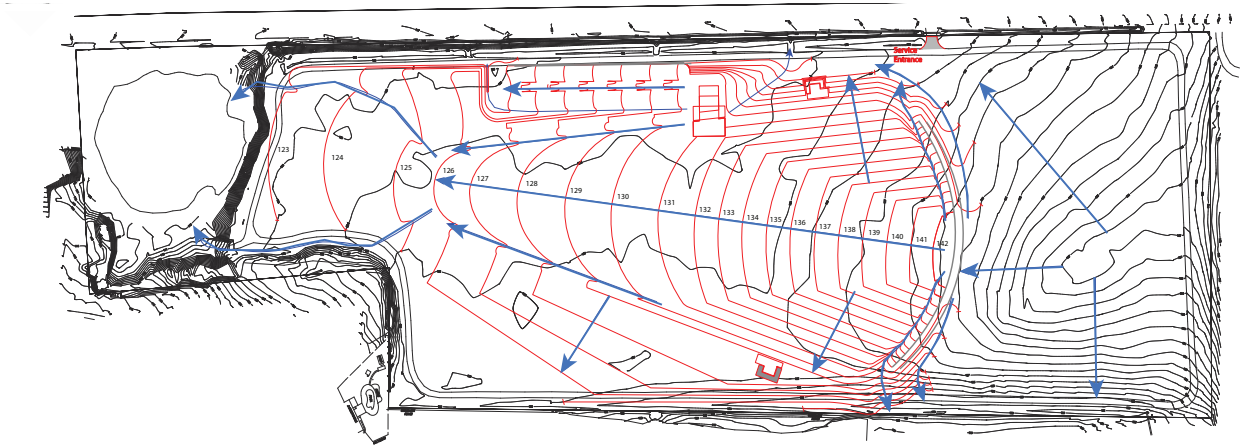


Figure 5. Grading Plan and Water Flow Diagram

The entrances from the Centennial Boulevard bring people to the information center through a plaza. An overlooking deck at the edge of the plaza brings people to the most open area of the site. This prospect allows people the view of the solar structure on one end and the bosque trees on the other while incorporating a sense of being in the meadow.

The entrance deck, the solar panel overlook and the pond overlook are connected by this primary pathway, while providing rest spaces intermittently. These rest spaces provide views to the meadow and the woodlands. [Fig. 6 and Fig. 7]

The main spaces are located on the outer edges of the primary path. The inner space formed by this path loop is designed as a uniformly-graded meadow area. People can walk from the solar panel overlook to the bosque through this meadowland.

The woodlands define the primary path and the meadow area as well as provide enclosure for the park. The bosque serves as a transitional meditational experience. The designed spacing of the trees enhances the user experience, preparing the visitor for the surprising view of the pond.

Figure 6. Birdseye View of Radial Bosque

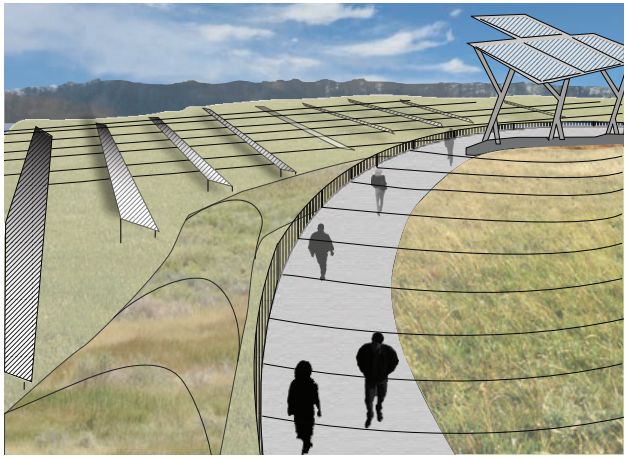


Figure 7. Birdseye View of Solar Overlook

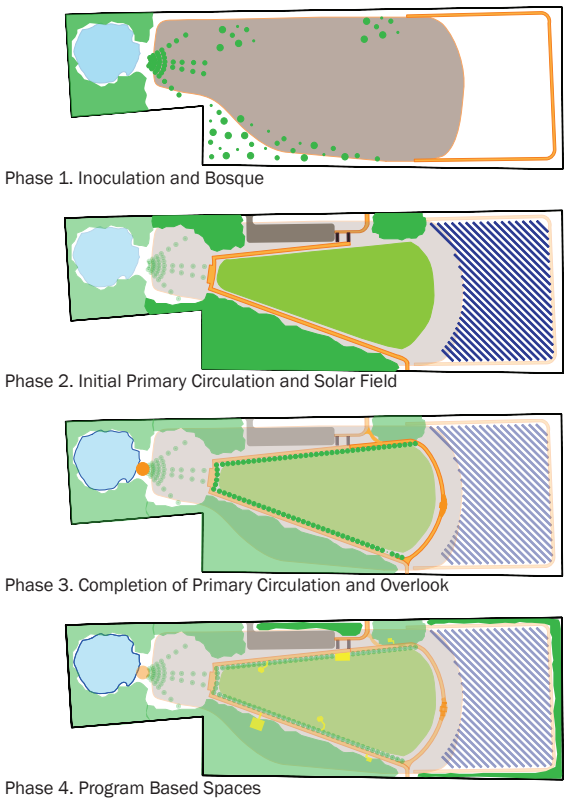


Figure 8. Design Implementation Process

3.2.4 Individual Site Designs

Entrance and Visitor Center

Adam Cesanek

The design for the entrance and parking system effectively separates the vehicular and pedestrian access routes while creating a sense of enclosure form Centennial Boulevard. The pedestrian entrance is connected to Centennial Mills via a crosswalk on Centennial Boulevard. Pedestrians are met with a gentle bridge over the swale running along Centennial Boulevard, signifying the new entrance to the park. Pedestrians walk up a gentle 5% slope towards the plaza created by Rice University's design for Zerow House. A secondary path branches off the main pedestrian entrance which will be used as a more direct route for cyclists to enter the park. Above the plaza floats a grid of solar panels which are anchored on a scalloped wall, further separating the park-goer experience from Centennial Boulevard. The view of the main plaza can be seen in Figure 2. In the main plaza pedestrians are welcomed to come to rest on the benches extending off of the light interior of the Zerow House.

The design for the parking lot accommodates seventy vehicles while choreographing the experience of the park goer. After exiting their vehicle the park goer walks down an allee of October Glory Red Maples (a design element which reoccurs in the Bosque and radial allees) from there, the pedestrian only has to cross one road within the parking lot to enter the solar plaza. This design for the parking channels the storm water into dual swales which flank the allee, the park-goer can navigate these swales by use of a small foot bridge. The view of the parking design can be seen in Figure 3.

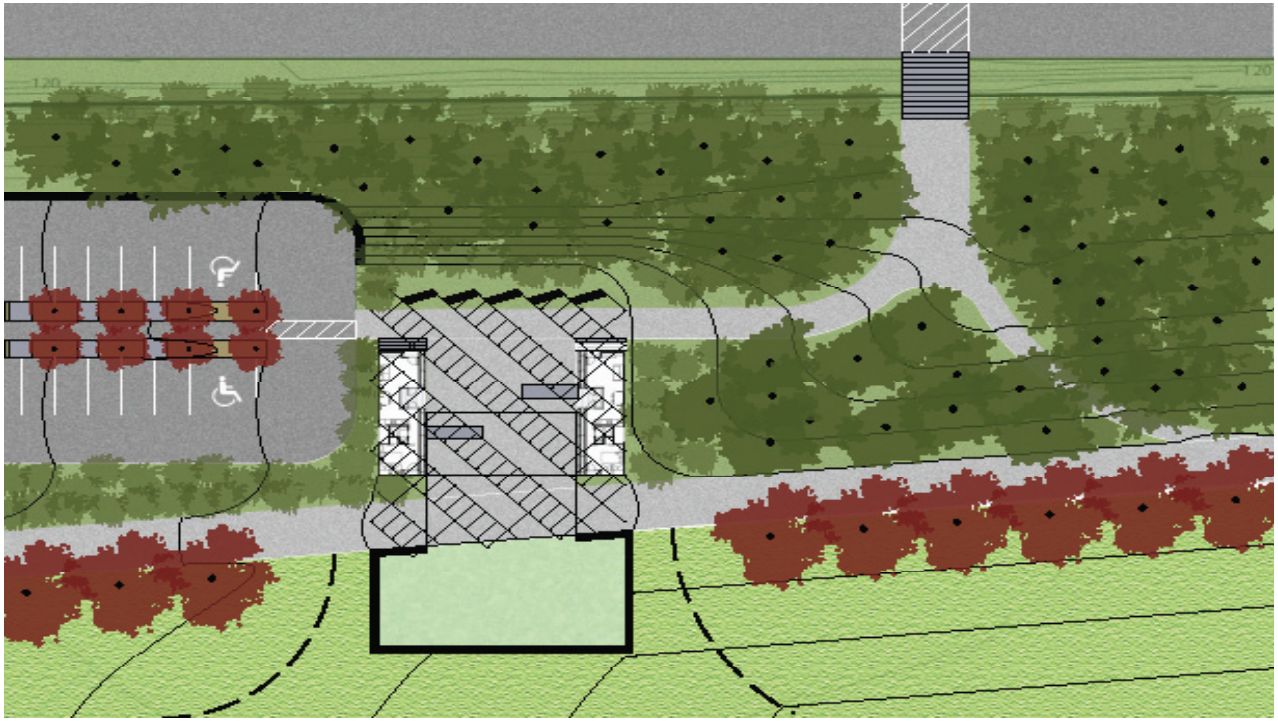


Figure 1. Entrance and Visitor Center Plan

Rice University's Design for Zerow House would be adapted for use as the main visitor center. These houses are built to be run entirely off of the energy provided by the Solar panels, and would benefit the construction process by avoiding having to dig underground wires. The program for the visitor centers would include areas open to the public, in which groups could learn about the mechanics of solar panels, how they work and what promotes the most efficient absorption of solar power. Other portions of the visitor centers would be designated to provide office space for VECEF. Rice University's Zerow House has been designed to be built from prefabricated materials and offers green walls which would face the interior of the plaza. Combining the solar panels within the design for the visitor center would eventually more than repay the cost for construction of this structure.

After exiting the plaza, pedestrians are greeted with a graded over-look terrace, a green space which floats above the central meadow. The terrace is bound by a concrete retaining wall on which people are invited to come to rest and experience the idea of the vastness of the site. From the terrace overlook park goers can make their own way through the central meadow or follow the allee of October Glory Red Maples to the Bosque or solar panel overlook areas.

References

Rice University School of Architecture. "Zerow House." Last modified November 3, 2009. Accessed December 11, 2011. http://ricesolardecathlon.org/

Figure Source List

Figures 4 and 5. Solar Decathlon Zerow House. Rice University School of Architecture. http://ricesolardecathlon.org/

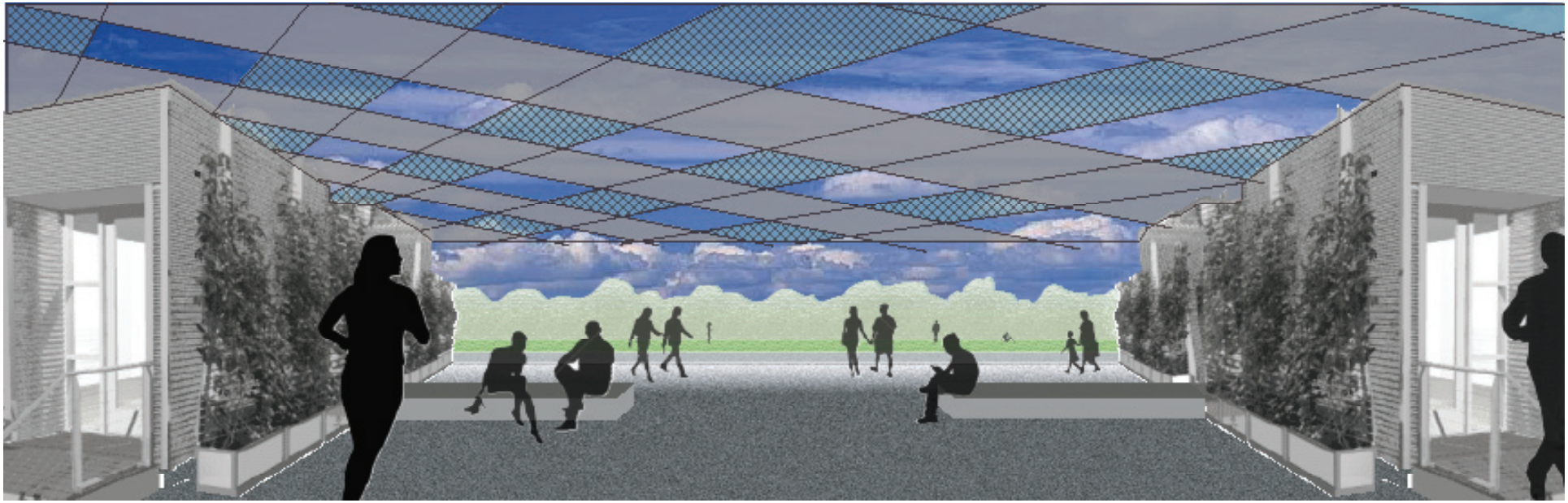


Figure 2. Perspective view of plaza

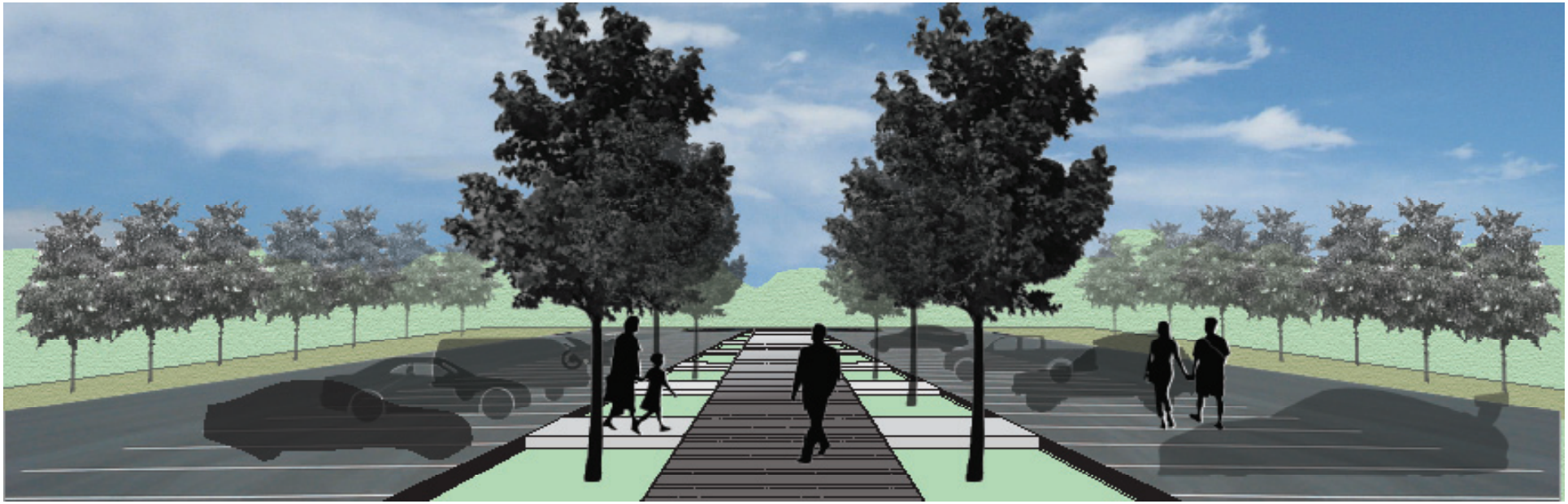


Figure 3. Perspective view of parking

Figure 4. Rice University Solar Decathlon House

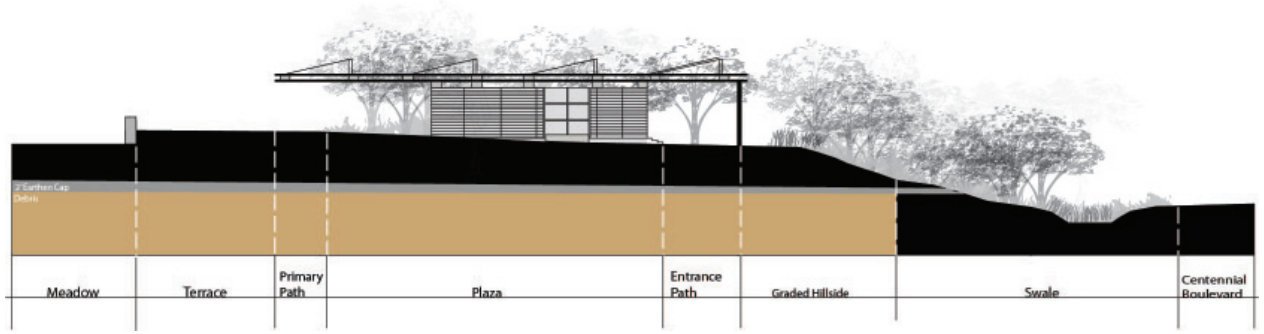


Figure 5. Section looking South-West cut through Central Plaza and Terrace

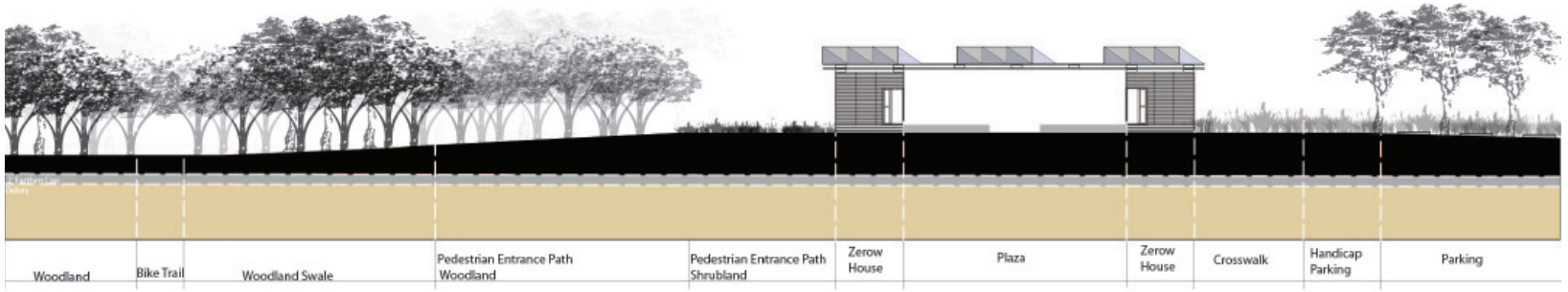


Figure 6. Section Looking South-East cut through Parking, Central Plaza and Entrance Trail

Solar Overlook

Mukta Jadhav

Located at the highest point on the site, the Solar Overlook was the critical part of the park to design. It was the point of division between the Solar Panel field and the rest of the park. From initially being just a solar walk, this space evolved later through individual design process.

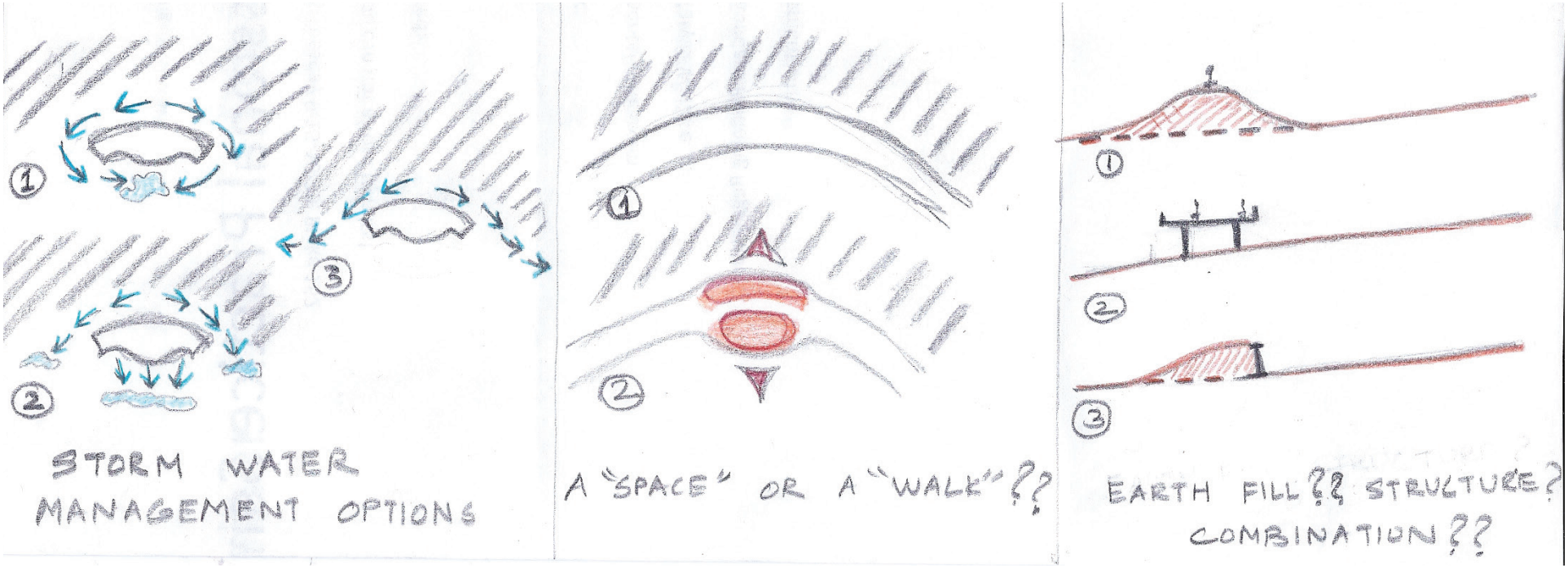


Figure 1. Design Options

The Process

The fact that this area was elevated between the meadow area and the solar panel field raised certain design questions. How to elevate the overlook? Is a "walk" better or a space? In which way can the storm water management be better designed? In which way can the Solar Panel fence be incorporated in the design? [Fig. 1] Appropriate evaluation of possible options resulted in certain ground rules which played a key role in the design process.

- A combination of structure and earth was used to achieve the same elevation yet reduce the amount of earth fill.
- People tend to spend time at a prospect. Having a "Space" instead of a walk certainly seemed practical.
- Given the site was a landfill, draining off the water from the site seemed the best suitable and economical option.
- The functioning of a regular fence could be achieved though innovative structure design which would be aesthetically pleasing and could become a part of the experience.
- The space needed to have a shaded structure for the people.

Design through Experience

The experience of the overlook space starts from the beginning of the ramps on the primary path. The patrons get views of the solar panels from different angles as they walk towards the overlook. Once they reach the top, they are exposed to two views, standing in contrast to each other by nature. One reflects man-made technology and the other reflects nature. The space tends to offer self-reflection and observation for the users. This prospect counter-balances the overlooking deck to the pond, located on the other extreme end of the site.

The Meadow area is uniformly graded. People can walk down the naturally formed trails towards the other end of the side from this overlook. Opposite to that, an elevation drop of 10 feet prevents access to the solar panels and helps to achieve the desired viewing effect.

Design through Elements

The desired elevation was achieved using precast concrete retaining walls and earth fill. The design of this wall nullified the need for a fence.[Fig.3]

A structural element of railing for the overlook was designed so that it ran all along the length of the ramps. As the elevation comes down to zero, the railing eventually transforms into a fence like structure. [Fig.2]

The shaded roof is designed using steel frame supporting structures and Solar Panels. The structure speaks the same language as the solar panel field, so as to invigorate a sense of continuity between them. [Fig.4]

The concrete foundation for these structures also acts as a seating space. The earth fill allows for the necessary deep foundation.[Fig.4]

Figure 2. View

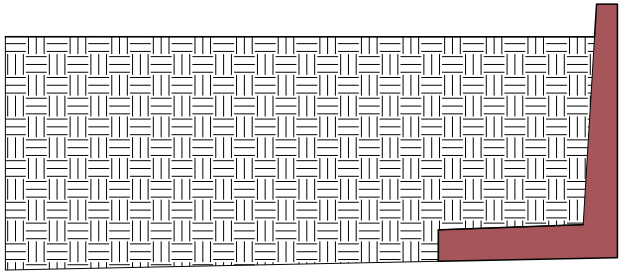


Figure 3. Earth Fill and Pre - Cast Concrete Retaining Wall

Conclusion

During this process of individual site design, the master plan was revisited numerous times. In order to maintain the relationship and the overall group concept, necessary changes were made to both the individual site design as well as the master plan. Continuous discussion with other group members while studying their site designs helped in achieving a design parallel in nature to theirs.

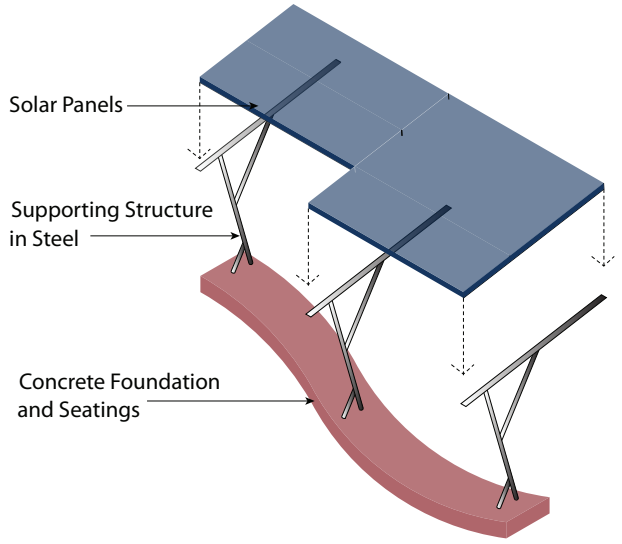


Figure 4. Structure

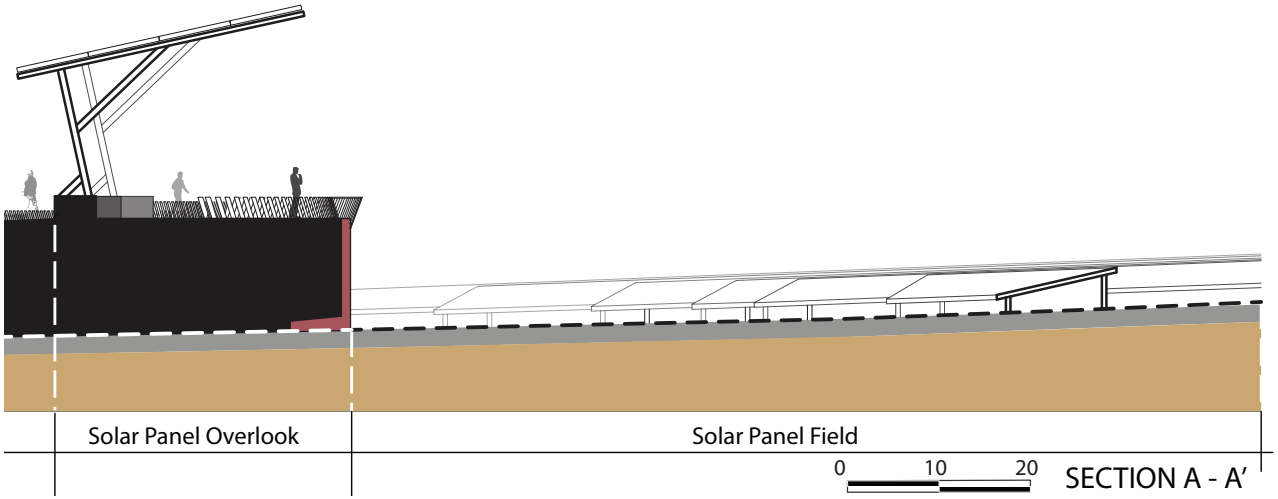


Figure 5. Section A-A'

Figure 6. Study Model, Solar Field and Ramp

Figure 7. Study Model, Structure and Railing

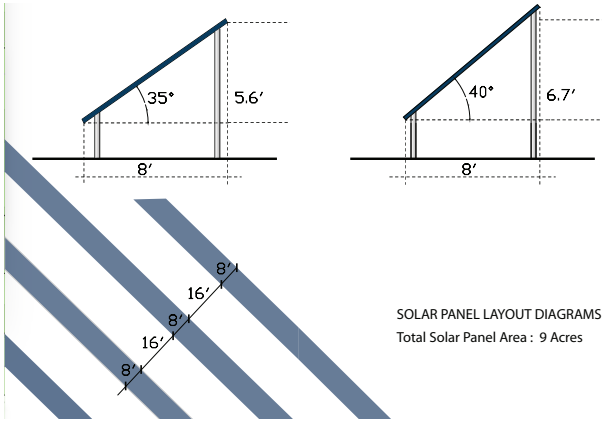


Figure 8. Solar Panel Layout

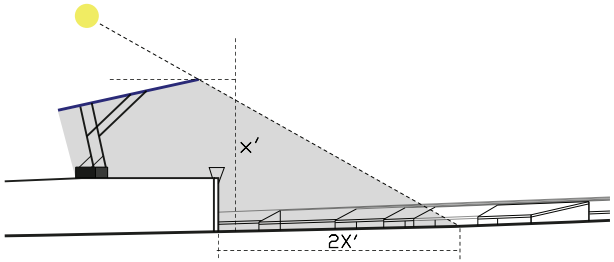


Figure 9. Shadow Calculation

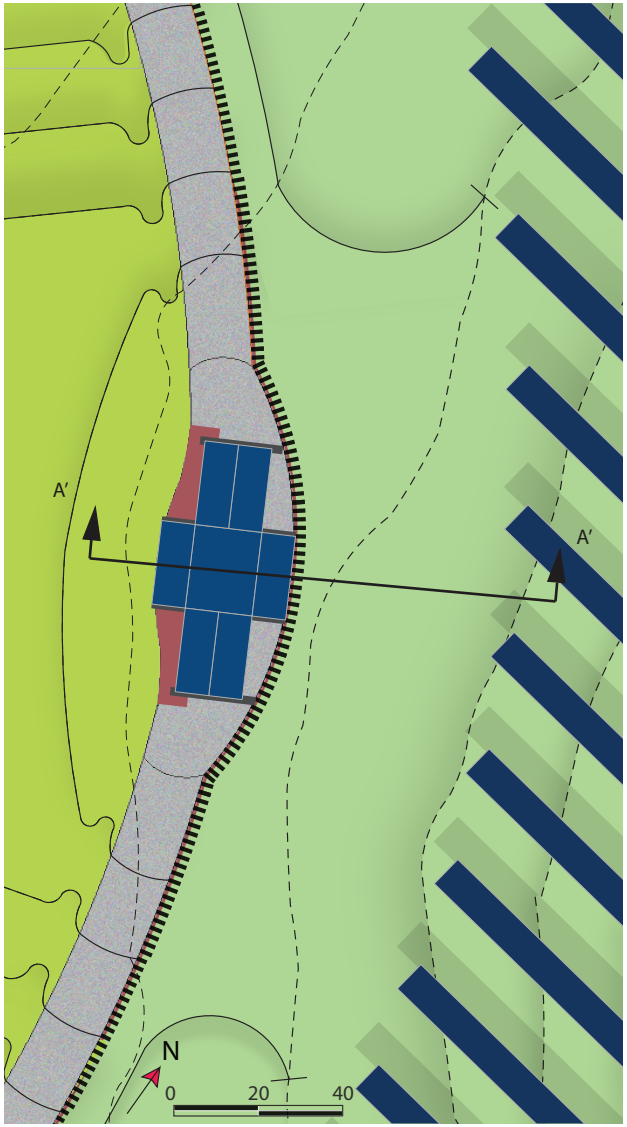


Figure 10. Plan

Small spaces for resting, viewing, and bird watching

Wan Huang

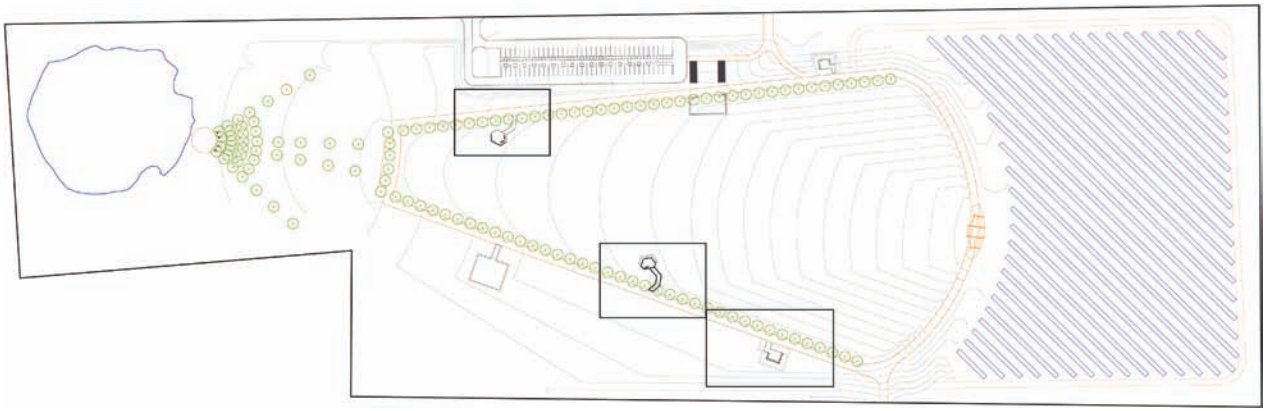


Figure 1. Reference Plan

These small spaces are located along the main circulation path, within fifty feet walking distance. They are points in the park for people to stop and have a more private space to linger. Two of them are in the woodland area. They are rectangular space defined by seating edge and shrubs, with trees canopy overhead. The ones in the meadow are for viewing the natural habitat in the center of the park. They are two feet high wooden deck with geomorphic path connected to the main path, one with a bird blind and the other with seating around the edge of the deck. These spaces are designed for small group gathering, activity like yoga practice and individual reflection. Because the main path of the park also acts like a division of the woodland and meadow area, the distribution of these small spaces create a contrast between open and enclosed, inner void and outer surrounding, which not only bring visitors to different experience but also strengthen the overall concept of the park.

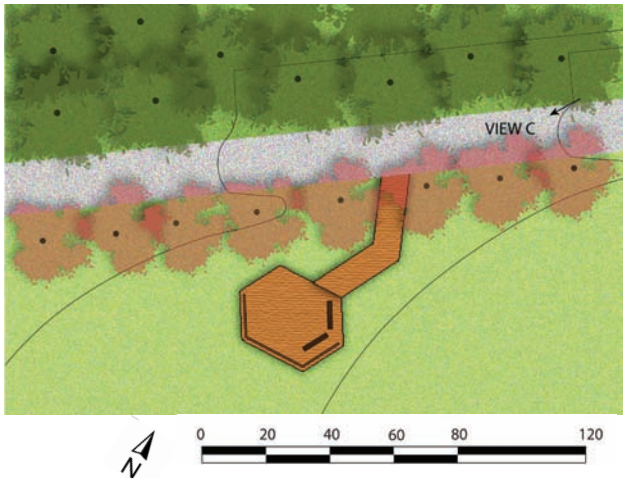


Figure 2. Plan C.

Figure 3. View C.

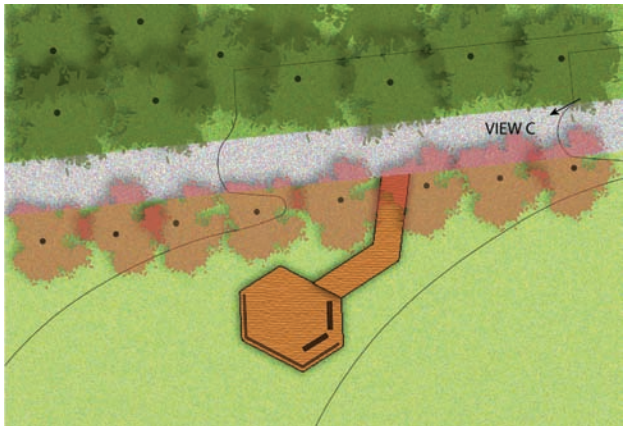


Figure 4. Plan A.

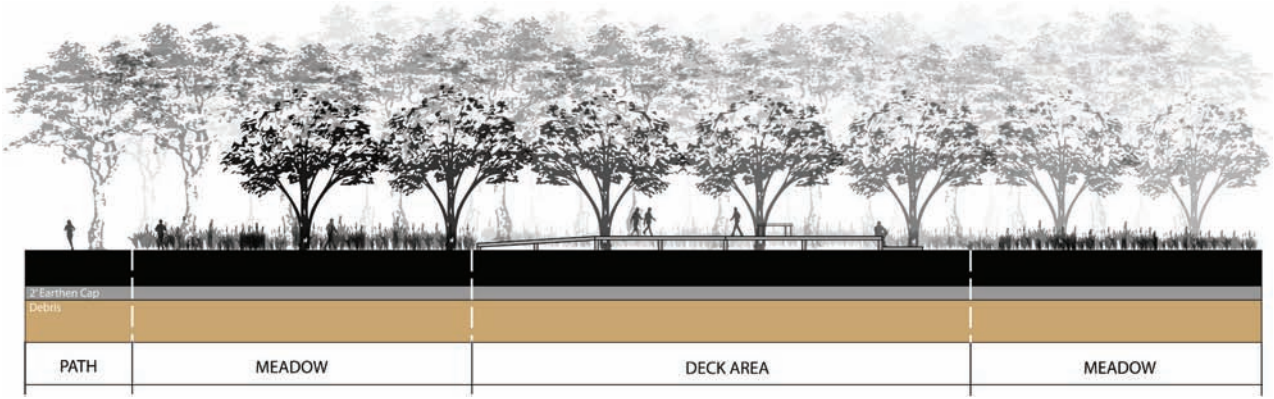


Figure 5. Section AA'.

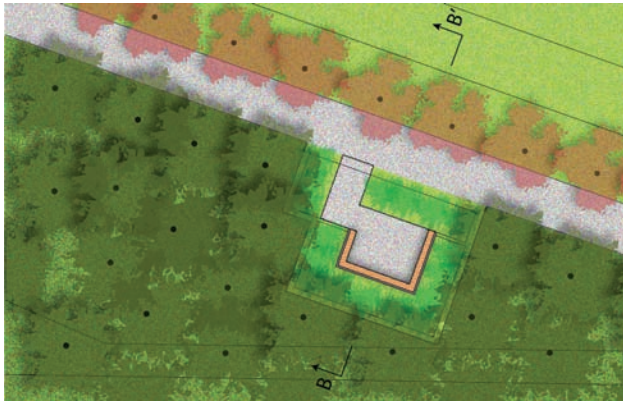


Figure 6. Plan B.

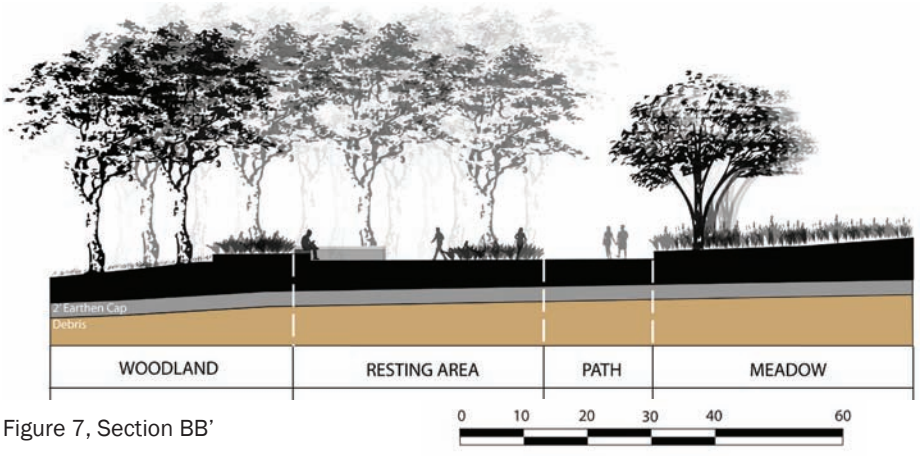


Figure 7, Section BB'

Radial Bosque

Erik Maietta

As the focal point and counterbalance to the solar overlook structure, the radial bosque serves as the terminus of the master plan's central axis in addition to providing a portal to view nature devoid of man's presence. This gateway represents the final stretch in a journey away from technology towards the natural order of reclamation and remediation through beneficial biological processes. This moment is only fully realized at the focal point of the bosque—the circular overlook. This space is designed for meditation and reflection while providing freedom to move unhindered along an unbroken ground plane.

The specimen tree species selected is acer rubrum 'October Glory' Red Maple. One of the best and most popular cultivars, the October Glory maples are excellent for intense fall color and have a medium to fast growth rate of 1-3 feet per year in ideal conditions. The Leaves are long with red stems and stay green longer than usual into autumn, extending the seasonal display, giving dependable late-season crimson-red fall color. In the spring, red flowers in dense clusters form before the leaves, and the red fruits are an attractant for birds and squirrels. This species is also preferred for its non-allergic pollen and for tolerance to salt and wet-site conditions. It also prefers the native acidic and sandy soil conditions found at Voorhees Environmental Park site.

The 'October Glory' Red Maple has a good oval-rounded form. It tends to hold its lustrous dark green leaves late into fall. The intensity of the brilliant orange to red fall color is worth the wait. Surface roots are also common under the tree canopy; however this will help eliminate grass and potentially damaging mowing around the base of the trunks as well as help add surface protection to the earthen cap below.

The design of the bosque is based on a radial grid emanating from the center of the circular overlook and aligning with concentric rings spaced out with increasing distance from one to the next. 4 single lines of trees extend outward from the central bosque cluster emulating the rays of the setting sun that also represents the end of life's journey. Additionally, the bosque overlook will provide excellent views of the winter sunset.

The geometric arrangement of the bosque will create a rhythm as the visitor passes down the central bosque allee. The arrangement and placement of the allee benches is based on the concept of Biophilia—the concept that man is naturally drawn to nature and when the visitor reaches the end of the main path where the bosque allee begins, the trees are the farthest apart and seem distant to each other. In front of each allee tree is placed a single bench with no backing made of recycled composite rubber. The benches are all placed directly off the main path regardless of how far away the trees are in relation. However, as the procession continues, the benches decrease in scale in reaction to the effect of the trees moving closer together and closer to the benches. The park visitor is able to freely move along or off the path and step into spaces of grass and meadow framed by the allee and the bosque in the background. The benches are also open to sit facing in any direction to compare views from one end to the other. As the procession continues, the park visitor is now leaving the technological world behind and beginning to experience a more natural environment. Only after experiencing the trees at the densest and darkest do you finally emerge through the portal to view man's ability to heal nature and respect its fragility. Although this seemingly natural scene of a pond and Phragmites is completely man-made, it represents how nature can recover and actually help improve conditions.

The structural components consist of the bosque maple trees, recycled composite rubber benches, and gray crushed stonedust along the path and central bosque area. Although this portion of the site will be graded with a slight crown and swales on each side to divert water flow around the bosque to the pond, an auxiliary trench drain system is recommended to capture and redirect any rainwater that could path through the grass/lawn area and disrupt the stonedust. The trench drains will follow the arcs of the trees and border the circular overlook and the edge of the interior bosque. The drains will also be lined with recycled rubber edging. . The drain pipes could be incorporated to pass through the circular overlook and empty directly into the pond avoiding potential bank erosion. All edging and drain intakes will be dark/black colored to not distract from the tree design.

Figure 1.. Bosque Aerial Perspective View

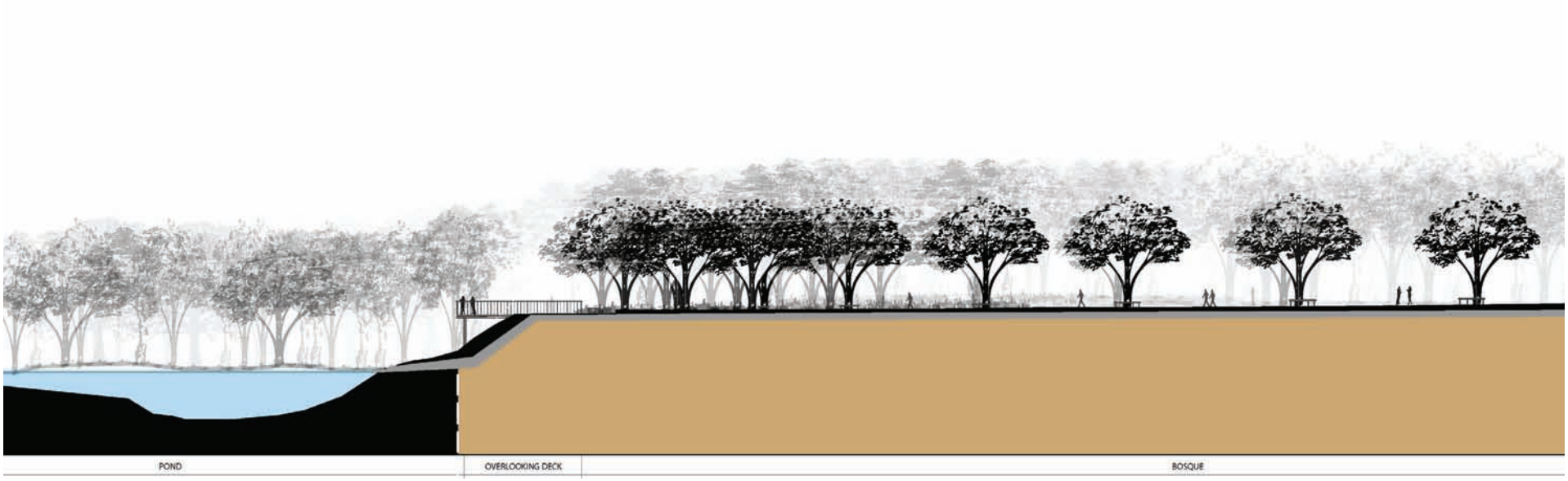


Figure 2. Bosque Overlook Section

Figure 3. Bosque Overlook Perspective View

Figure 4. Bosque Allee Perspective View

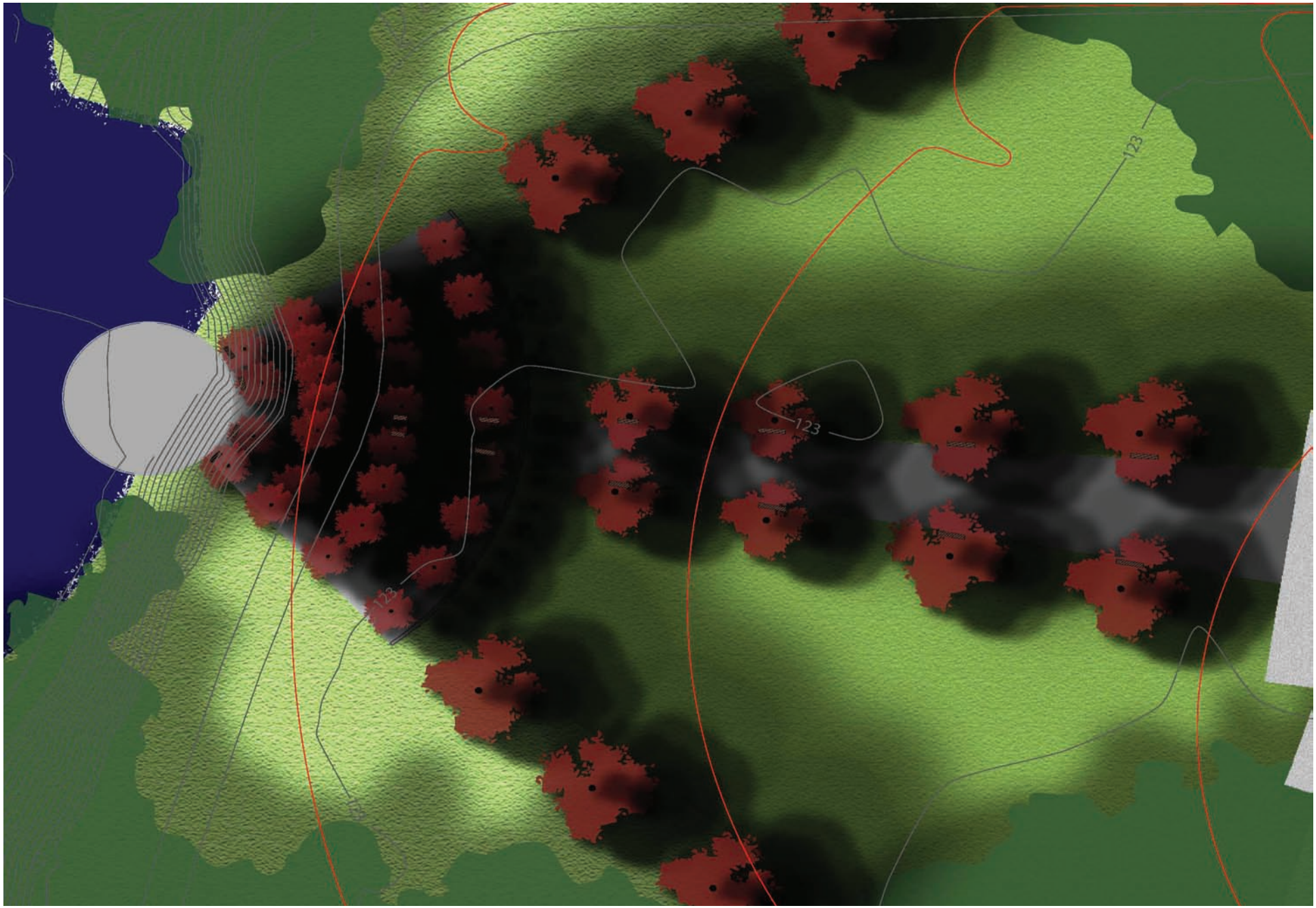


Figure 5. Radial Bosque - Plan View

Figure 6. Bosque Test Configuration

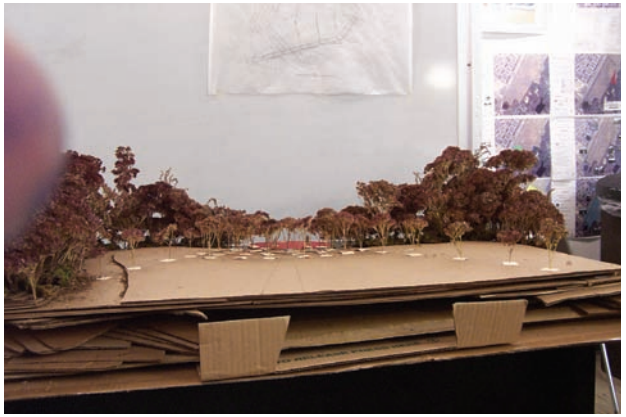


Figure 7. Bosque Test Configuration

Figure 8. Bosque Test Configuration

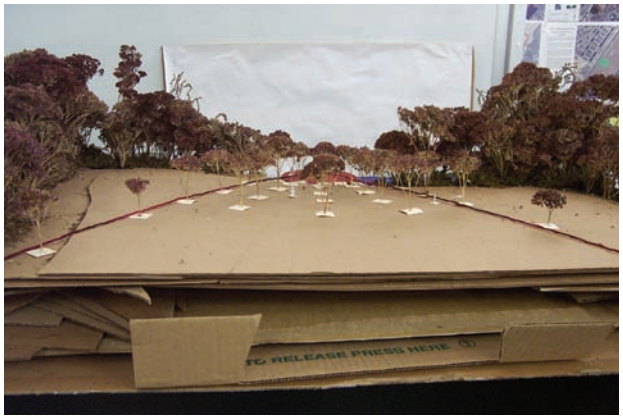


Figure 9. Bosque Test Configuration

Figure 10. Bosque Test Configuration

Figure 11. Bosque Test Configuration

Design Development

Following the midterm review, a study was conducted to compare various bosque configurations including a reduction in scale. A main criticism of the original bosque is that sprawled right to the edges of the forest vegetation making it difficult for the park visitor to appreciate its form. Figure 6 shows the condensed bosque concentrated only around the overlook opening. This version did not provide any connection between the end of the primary path and the start of the bosque. In the next version, 2 rows of trees are projected from each end of the bosque in an attempt to frame the view (Figure 7). The next experiment in figure 8 shows the ends of the extending tree lines connected across the front of the entrance. However, this arrangement effectively blocks views to the actual bosque and disrupts of the entry/arrival sequence. Figure 9 shows the connect row of trees removed and the introduction of a primary single row extending along the axis from the primary path to the overlook. Figures 9 and 10 show different angular configurations of the bosque that have a direct relationship to the density of the bosque trees. The arrangement in figure 9 is set to a 90 degree angle causing too much spacing between trees. The final angle is adjusted to 75 degrees to fit best within the context of the site while providing the most spatially-pleasing rhythm of trees.

Figure Source List

Figures 1 -11. Courtesy of Erik Maietta 2011

3.3 Succession by Design

Kim Nuccio
Denisse Ortiz
Alisa Stanislaw

PROBLEM STATEMENT

How do we turn a property that has long been associated with industrial use and a toxic history into a welcoming public space? A space that invites community members in, and encourages them to explore and enjoy the ecology and environment of a neighborhood park and at the same time overcome the stigma of landfill?

PROJECT GOALS

Our first goal for this project is to create safe and usable open space for passive recreation in Voorhees that will not affect the health and safety of the park's users. It is the Landscape Architect's responsibility to fully understand the use restrictions at the site and ensure that our installation and ensuing park operations will be in complete accordance with those restrictions.

Our second goal is to ensure environmental sustainability in terms of storm water, structures, plants and preservation. Creating a sustainable landscape is an extremely important aspect that will be acknowledged in our design at Voorhees. Understandably, public safely is a major consideration when dealing with the environmental conditions at the site. This includes the identification and mitigation of site-specific hazards to ensure the safety of park users and maintenance workers.

Figure 1. Continued access to a ring of monitoring wells will be an important design consideration

Figure 2. Existing conditions at the site are considered a "Blank Slate"

The contaminates will continue to be monitored and controlled, the solar panels installed in an effective manner, and natural ecosystems restored. In addition, providing safe access for people to enjoy the benefits of park and pond spaces is also very important, as is offering habitat and access for wildlife. When deciding on plantings the root systems will be evaluated proportionally to the amount of fill so the cap will not be punctured. Structures will be limited to those requiring only shallow footings. Additionally, our design will include a water management plan that continues to divert all runoff to the pond.

Solar panels will offset the costs associated with the construction and maintenance for the park. Incorporating a solar field into 11 acres of the park, as well as other "green" design strategies into the overall design will certainly be one of our goals.

Another project goal is to create a design with cultural relevance, and in that to recognize and be cognizant of various local ethnic populations. In the past master plan, there was a large emphasis on Asian gardens split into individual spaces. One of our goals is to incorporate and hopefully merge cultural identities within this public realm whether it be through gardens, or perhaps passive recreation relevant to the various backgrounds within the community.

Finally, community education, which is very important to the townspeople in Voorhees will also be very important to the design. Rain gardens, kiosks, brochures and onsite activities with the community will go to this end.

In short, these stated project goals are driven by the following priorities:

- Public Safety
- Environmental Sustainability
- Economic Sustainability
- Cultural relevance
- Education for the Community.

Figure 3. Residents of nearby Centennial Mills will be among the park's primary users.

3.3.1 Morphological Box

The morphological box is a systematic and organized design methodology. A carefully devised set of criteria and options form a matrix from which a test design emerges. All options are evaluated in terms of effectiveness, aesthetics and viability; our categories include: structures, parking, revenue, storm water, circulation and vegetation.

Structures in the design include a visitor center, solar overhangs, solar walls in the plaza, retaining walls, and a descending stair. Also structural, this design includes a floating dock, a treetop overlook and a long view park lookout.

Regarding vegetation, our process involved creating a tree line that included a successional woodland which would border the site while providing shade and shelter for people enjoying the park.

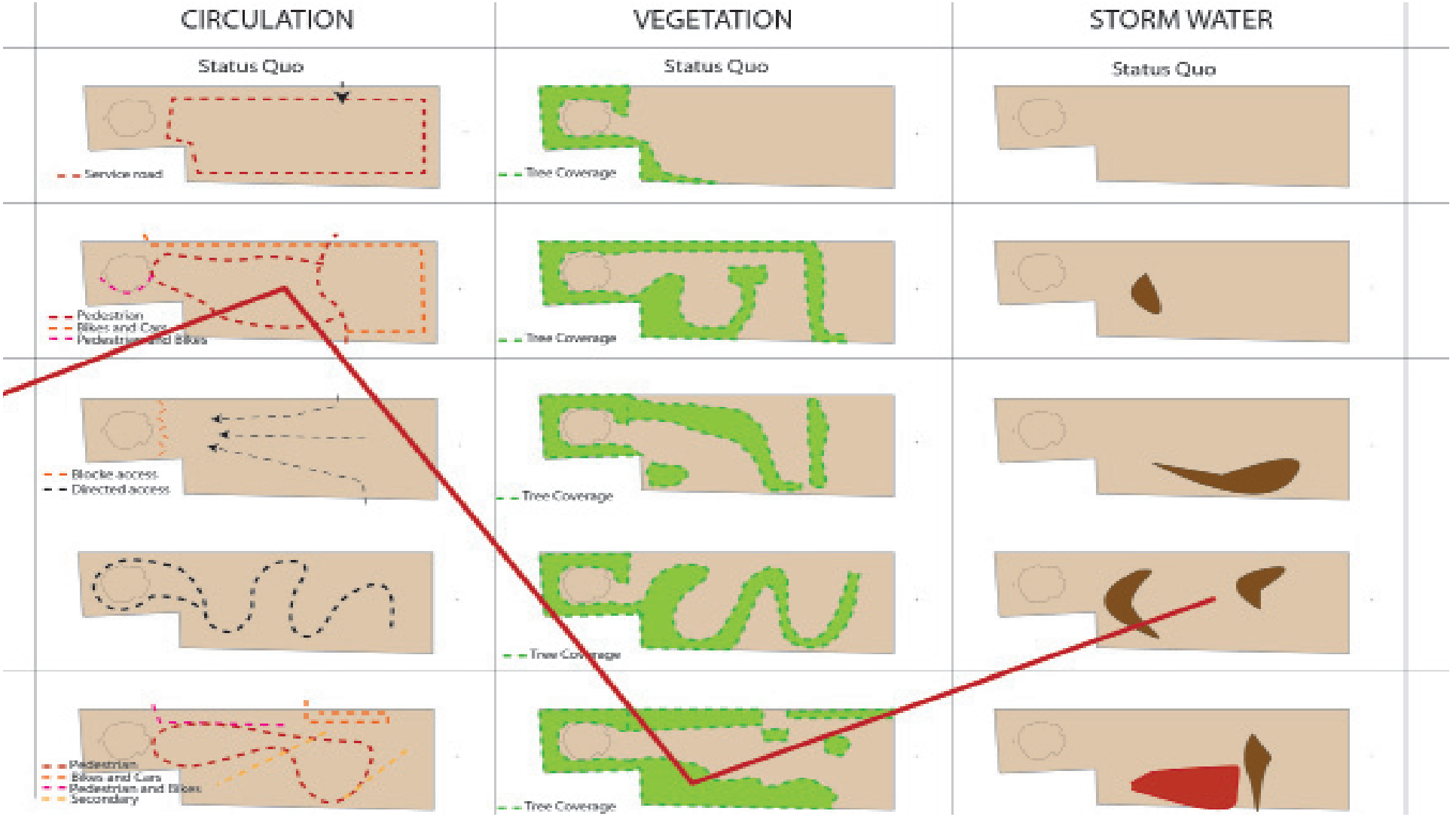
In addition, our goal was to frame the spaces with vegetation, whether it be trees, meadows or shrubs.

Considering revenue, during this process we aimed to create a design that enables the park to be financially self-sustaining, and/or generate some income to offset the cost of installation of maintenance through solar energy while utilizing the deed restricted area. In the end, 11 acres

were put aside for a solar field, along with solar panels on the visitor center.

The process of developing our circulation was extremely important. In the beginning we sought to have it mirror a proposed sculptural element, but it then evolved to a primary loop with secondary and tertiary pathways, which cater to pedestrians and bicyclists. Also, we seek to connect neighboring communities to the park, by creating accessibility from areas that are deemed inaccessible.

Parking for at least 50 cars was considered in various locations: incorporated into the solar field, broken into rectilinear groups across the front, and in an angled form in the middle of the park. The final solution, that grew out of many iterations, ended up being a continuous string of double sided parking spaces across the front of the park, along a curvilinear landform. Rainfall, which currently falls directly on the soil cap and both infiltrates and sheet flows across the site to the pond, continues to erode the very steep slope at the south end of the site. Design considerations to mitigate this issue included increased runoff, due to the pending solar array installation and preservation of the pond area. Our final solution captures and directs storm water in the solar field into a channel, and rain gardens. Landforms prevent continued flow down the existing slope.



3.3.2 Evaluation and Test Design

From the Morphological box, the best options in each category come together with trace overlay to form the first test design.

Many iterations of the test design were evaluated and considered before finalizing our group concept. At midterm our group design was reviewed by both faculty and members of the Voorhees community to gage our progress and to identify strengths and weaknesses in the design.

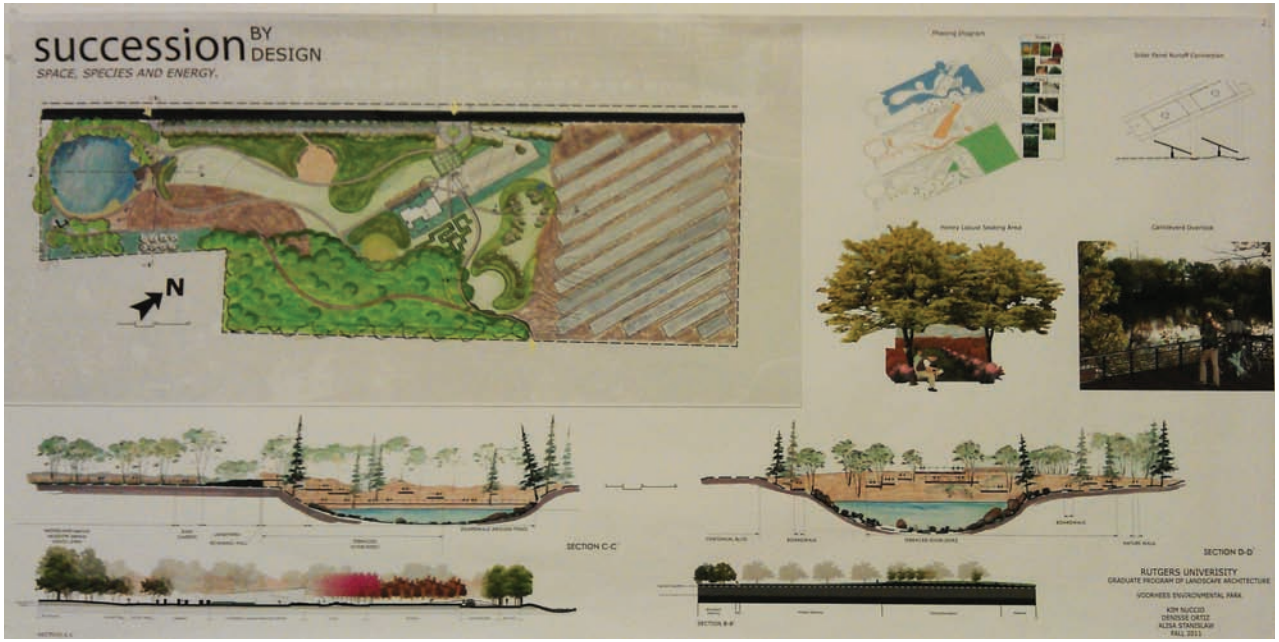
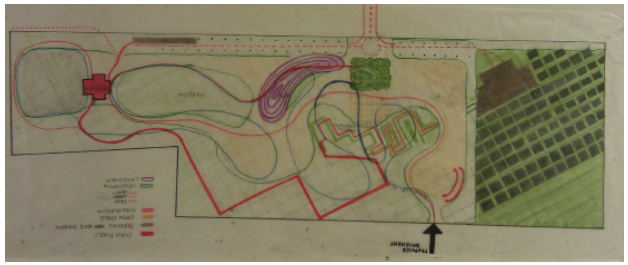
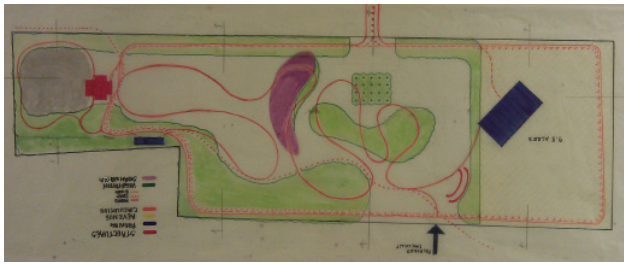


Figure 2. Midterm Group Concept Plan





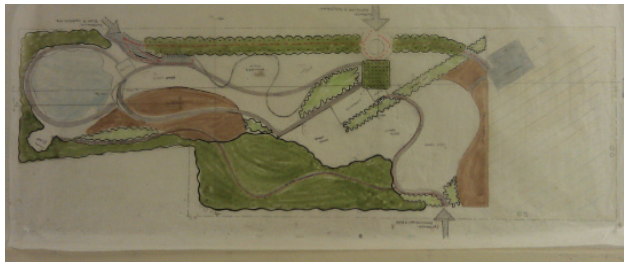


Figure 1. Group Test Designs

This was an eye-opening discussion regarding our design, which was crucial in developing the final group and individual designs. Constructive criticisms included chaotic circulation, too many ideas without a coherent overall space, and the lack of a concrete grading plan. These suggestions were seriously considered, and in preparing for the final design we addressed these issues by simplifying the circulation and freeing up spaces that appeared cluttered with objects, which assisted us in creating a more focused, cohesive plan.

3.3.3 Master Concept & Group Design

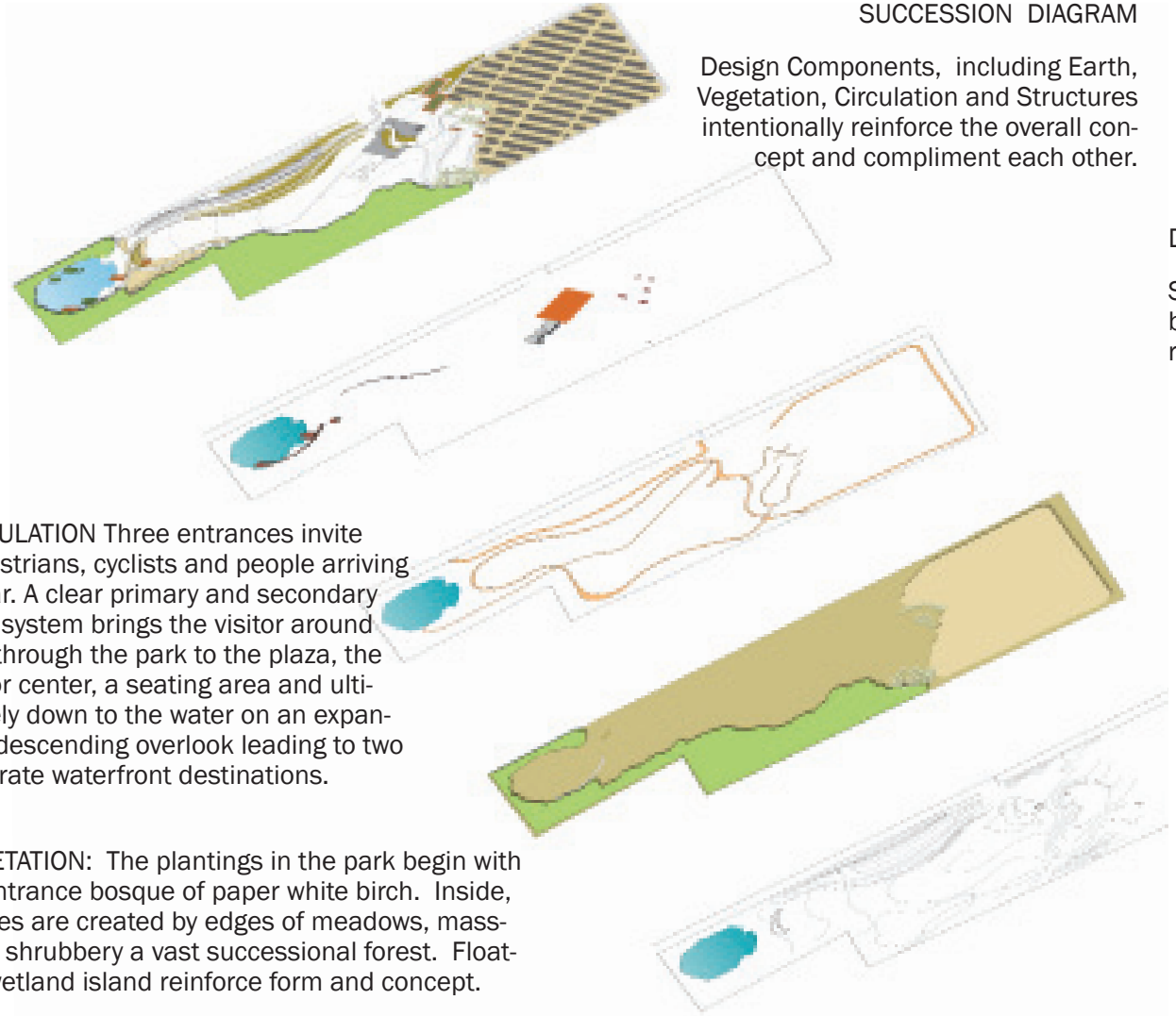
Ecological succession, defined as the observed process of change of an ecological community over time forms the basis for our final master plan design. The concept is succession; succession of space, species and energy.

The succession of space being the conversion of a closed landfill to a community destination. Succession of species, represented by natural forces at work in the woodland and meadow, and finally, the succession of energy usage, evolution form carbon-based fuels to solar energy. The park celebrates this evolution through a connection between the natural and engineered spaces within the park to the solar array. A connection has been established between the alignment of park structures and spaces to the alignment of the solar panels to the sun.

Figure 1. Succession by Design Master Plan

SUCCESSION DIAGRAM

Design Components, including Earth, Vegetation, Circulation and Structures intentionally reinforce the overall concept and compliment each other.



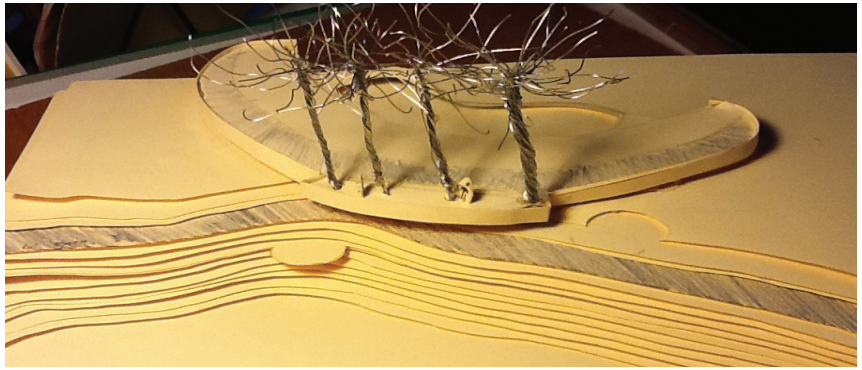
CIRCULATION Three entrances invite pedestrians, cyclists and people arriving by car. A clear primary and secondary path system brings the visitor around and through the park to the plaza, the visitor center, a seating area and ultimately down to the water on an expansive descending overlook leading to two separate waterfront destinations.

VEGETATION: The plantings in the park begin with an entrance bosque of paper white birch. Inside, spaces are created by edges of meadows, masses of shrubbery a vast successional forest. Floating wetland island reinforce form and concept.

EARTH: Our grading plan directs storm water into rain gardens and ultimately into the pond via ground water, bypassing the existing problematic eroding slope. Water travels from the solar field through channels and the plaza to be slowed by 2 path-side landforms and into accompanying rain gardens where it slowly makes it's way to the pond.

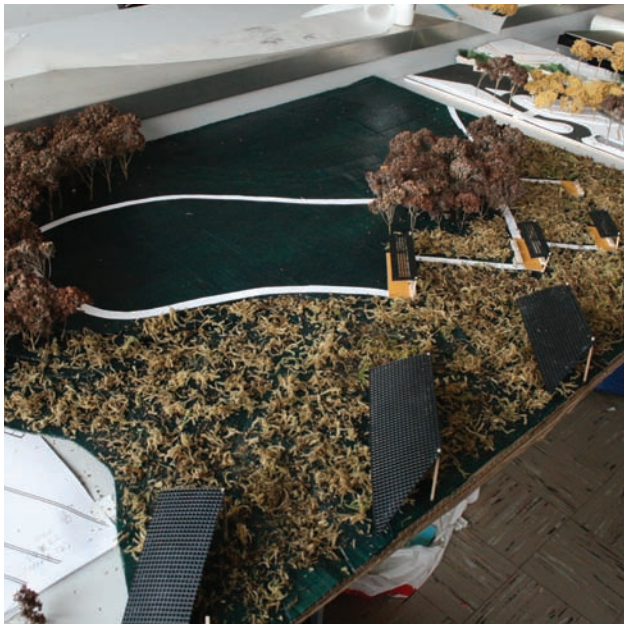
DESIGN PROCESS

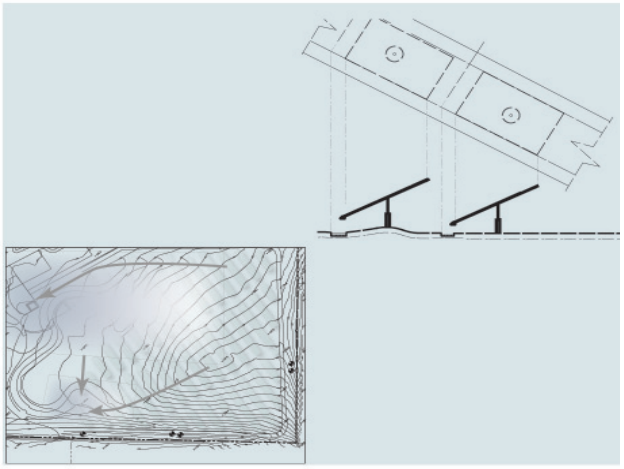
Study models, sketches and diagrams were used by the design team to understand spatial configurations and relationships.



WATER MANAGEMENT DIAGRAM

Storm water runoff from the solar panels is collected in channels and diverted through the plaza, to rain gardens and ultimately to the pond, but avoiding the existing, yet eroding slope.





3.3.4 Individual Site Designs

Entrance and Arrival

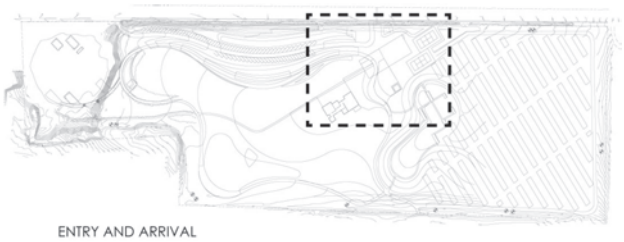
Denisse Ortiz

Recognition of the importance of urban places which provide settings for socialization and social learning and the importance of preserving and enhancing natural systems, processes, diversity and habitat has been key factors in the development of the design. The benefits of human interaction with nature it is important for the design, that this site be recognized as a specific place having a distinct character, rather than being seen as an undefined or undifferentiated space which leaves no impression and get no response from those who pass through it.

This concept proposes a “Channel which runs through part of the site, marking it as a special and unique place and. The symbolism of a river is directly related to the main concept of the site master plan “Succession” which refers to the different layers used for the design process. In addition, water is the most elemental and potent life giving force; an appropriate metaphor for regeneration of a brownfield.

A fluid swath of vegetation; double roads of trees, shrubs, native plants and grasses will break to the access point. This ribbon of vegetation will define and elaborate both the entrance to the site and to the main views of Centennial Mill. Its geometry is derived of the street representing how the site is reaching out off the property line of the site as a way of welcoming people to the park.

Located opposite to the Centennial Mills entrance is “The Origin”. It is the gateway to the park where the spatial experience begins. The Origin is a compound of four spatial elements which al-



Reference Plan

locates different areas. Some of these areas are: Entry and Arrival, Drop off and Parking, Sitting and Gathering areas as well as exercising.

The use of architectural forms such as entrance overhead structures, gaps in the landscapes and walls are used to give the entrance a unique identity. The use of paving patterns and porous pavers are used to define these areas. The goal was also to create a gathering space and visitor center that offer users space to interact with others - a plaza that unifies the whole site but also allows for direct visual and physical connections with most of the spaces designed on the park.

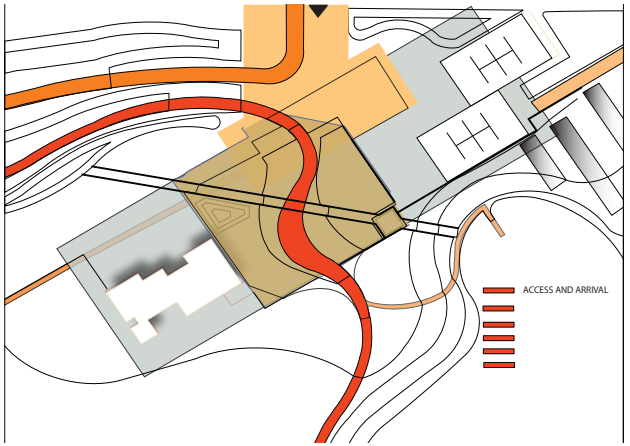
Through the design of “The Origin” we took in consideration the amount of impervious surface to use as well as the possible increase of storm water runoff. The design aims to not increase the existing preset volume of runoff treating and collecting it on site.

The master plan design mainly offers passive recreation activities; “The Origin” on one hand offers a range of passive to active passive activities. “The Origin” is subdivided in zones interrelated through their functions as mentioned above.

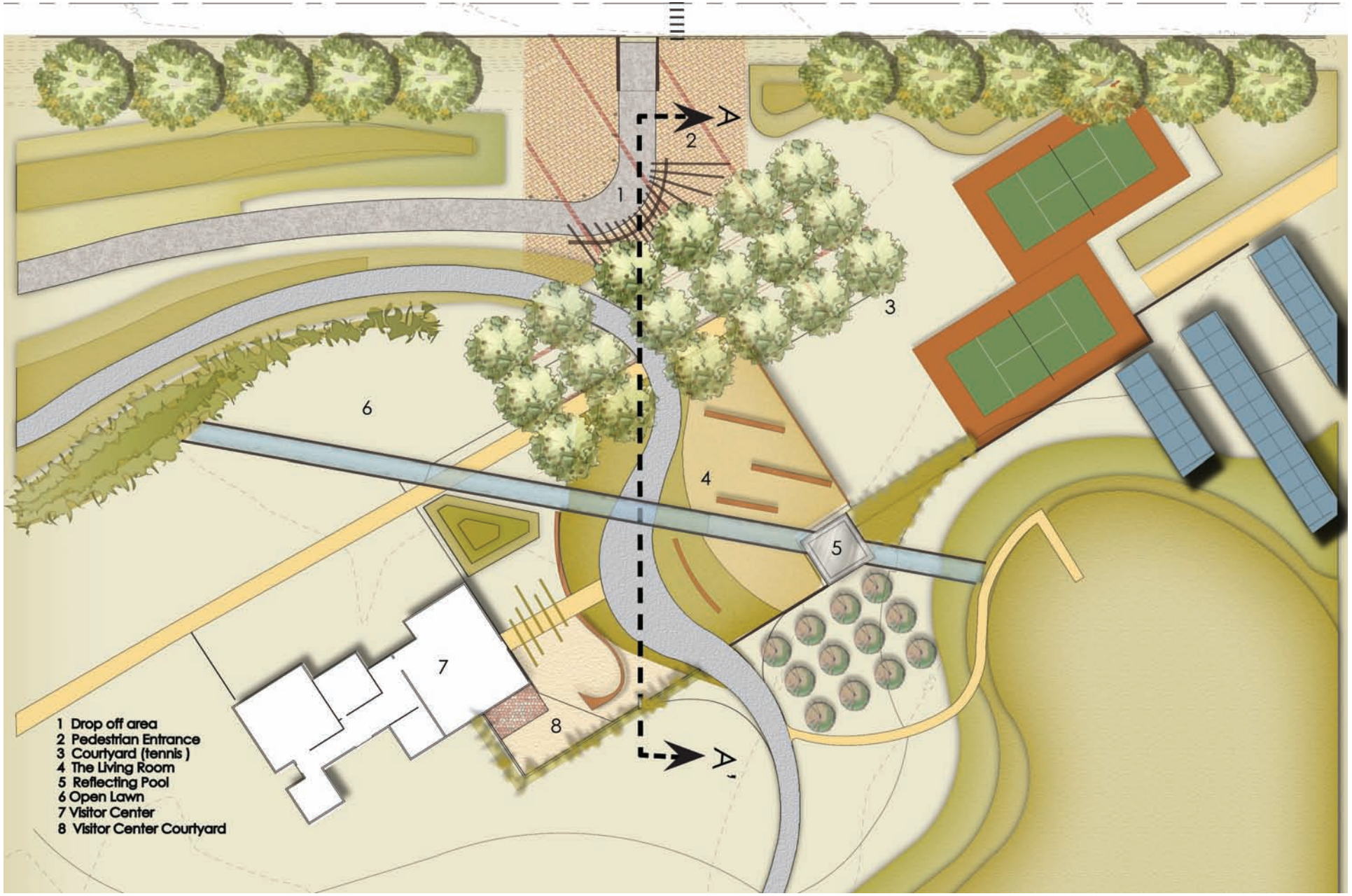
Site ordering

Kevin Lynch talks about the “sensed quality of a place as an interaction between its form and its perceiver” (Lynch 1990, 153). That form means the ordering of the elements within a space, the size, location, orientation, and disposition of elements along the entrance; buildings, parking lots, pathways, plazas, and plantings provide the structure of the design. In the process the use of a zoning diagram in the early design stage helped to determine the location of these elements based on its functions. The plaza is the main node where the connection of the main circulation path acts like an integer part of the composition. It is designed as a junction that serves as the gateway that disperses the user to different points and spaces within the park. One of its main layers is to have a visual and physical connection with the different nodes and spaces of the park.

At this point the design has evolved in order to fill a better void in the design. At the conceptual stage of the design, the intention was to have all the semi active activities conglomerate in on a single point that will not interfere with other passive activities in the park. The location of these spaces were still the same as they are now with



Zoning Diagram


A
2
1
3
6
4
5
7
8
A
1 Drop off area
2 Pedestrian Entrance
3 Courtyard (tennis)
4 The Living Room
5 Reflecting Pool
6 Open Lawn
7 Visitor Center
8 Visitor Center Courtyard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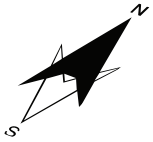
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S

Study Model

View

the difference being the zoning concept shifted in positions in order to have a more cohesive relational matrix that will support human activities in a more practical way. The use of grading as a medium to support this objective was one of the key elements in the design, allocating a channel system that will direct and recycle water as well as adding another layer of elements to the design.

The channel extends from the lower west corner of the solar field to the south east corner of the plaza where water is collected in a reflecting pool then directed thru the plaza to a bio retention basin.

Entering...

In describing a linear organization, Francis Ching talks about a series of spaces which “can either be directly related to one another or linked through a separate and distinct linear space”, He points out that a linear organization “can consist of a linear space that organizes along its

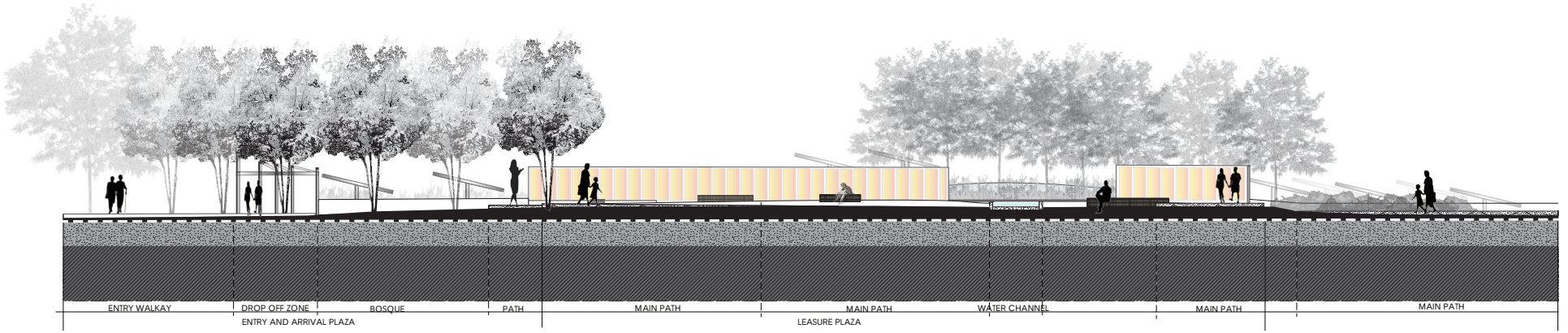


Figure 2. Section AA’ , Looking west

length a series of spaces that differ in size, form, or function, and that spaces that are formally or symbolically important to the organization can occur anywhere along the linear sequence and have their importance articulated by their size and form (Ching 1979, 214).

In this case the plazas would the linkage between the different spaces in the site design have the same conformal elements but differs in size and function. The plaza also provides a series of orientation points from which users can spread through the site.

Adjacent to the esplanade is the parking lot that extends along Centennial Boulevard. Located at one of the most feasible areas on the site to reduce surface pavement and enhance user accessibility. The parking lot and the access esplanade are linked by a drop off area the acts like the gate to the site frame by a stainless steel structure that bleeds into “the Bosque”. “The Bosque” is the connecting feature between the arriving zone and the park itself and also supports the theory of prospect and refuge. It also adds another layer of color and experiential sequence through the space creating a virtual separation between the outside and the park.

The Bosque extends into the plaza linking this zones and the direction people flow into this area.

The concept for the plaza is to have different spots within it to allow for different activities within the range of semi active activities. A section of the main pathway loop passes thru it. The path was treated in a way that people feel free to move throughout but also feel welcomed to stay in this area. This design is accomplished by enhancing the path as it goes thru the plaza and widening those spots where we want people to enter to the other areas in the plaza.

The path also divides the plaza in two subzones, the one on the right bordered by a solar wall that will illuminate the plaza at night time and also adding colors and pattern to the plaza. This area is the most active one and it can be used for group meetings and small community activities. The one on the left provides a context for the visitor center and small café with the outdoor patio. In this same side, the design allocate amphitheater like sitting benches that supports the idea of visually connecting the site.

The material palette used in the design infused the design with green materials that also enhances the beauty of nature.

The design is to be the portal place for all other outdoor rooms in the master plan.

References

Ching, F.D.K. (1979) Architecture: Form, Space and Order (New York, Van Nostrand Reinhold).
Lynch, Kevin (1990) The Image of the City.

Figure Source List

All figures displayed in this chapter are property of Denisse Ortiz.

Gathering Space

Alisa Stanislaw

A gathering space is an essential part of a park setting. It gives us the opportunity to rest, interact and play. On the site of Voorhees Environmental Park, the goal was to create a gathering area that caters to the surrounding community, while also integrating itself with the design language of the rest of the site.

The intention of the design at the beginning was to incorporate the solar field with the space, while also creating smaller seating areas that range from intimate to exposed. These intentions became decisions, and were an integral part of the design process. Seating areas are at the same angle and appear as an extension of the solar field, with solar overhangs along them for enclosure in the most open spaces that overlook a field for play and passive recreation. The solar overhangs provide a shading pattern, the benches are made of stone, and the ground material within the spaces consists of compressed shale. Landform defines these spaces and offers views into the open space and park, while creating enclosure for the more private areas.

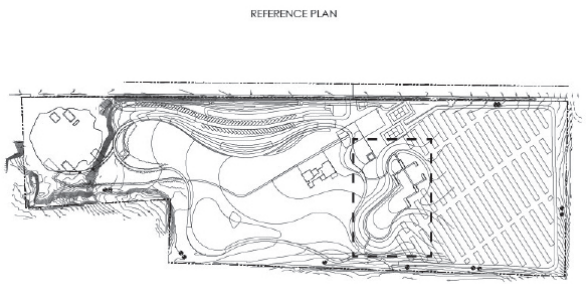


Figure 1. Reference Plan of Site Design

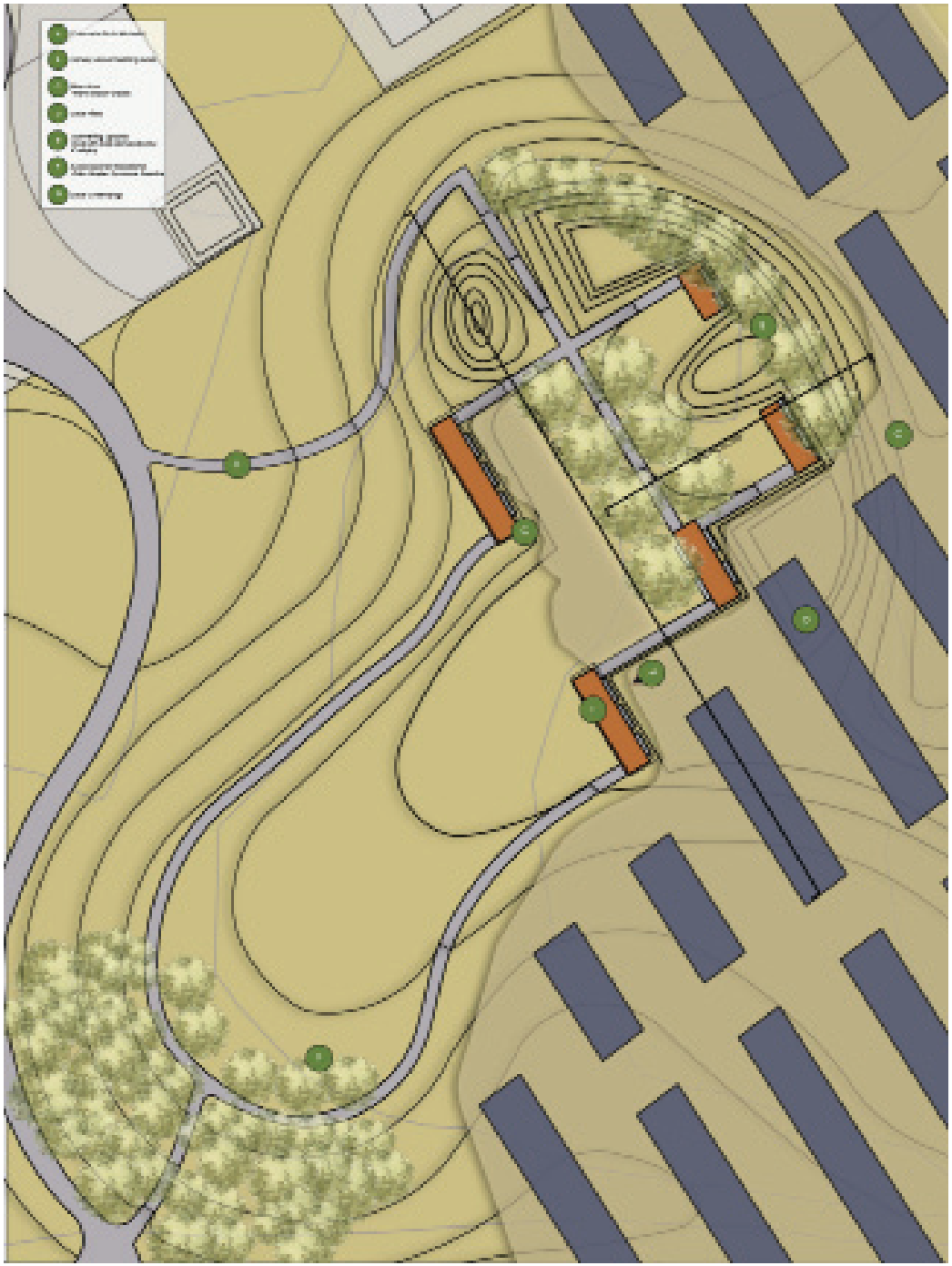


Figure 2. Gathering Space Site Design Plan

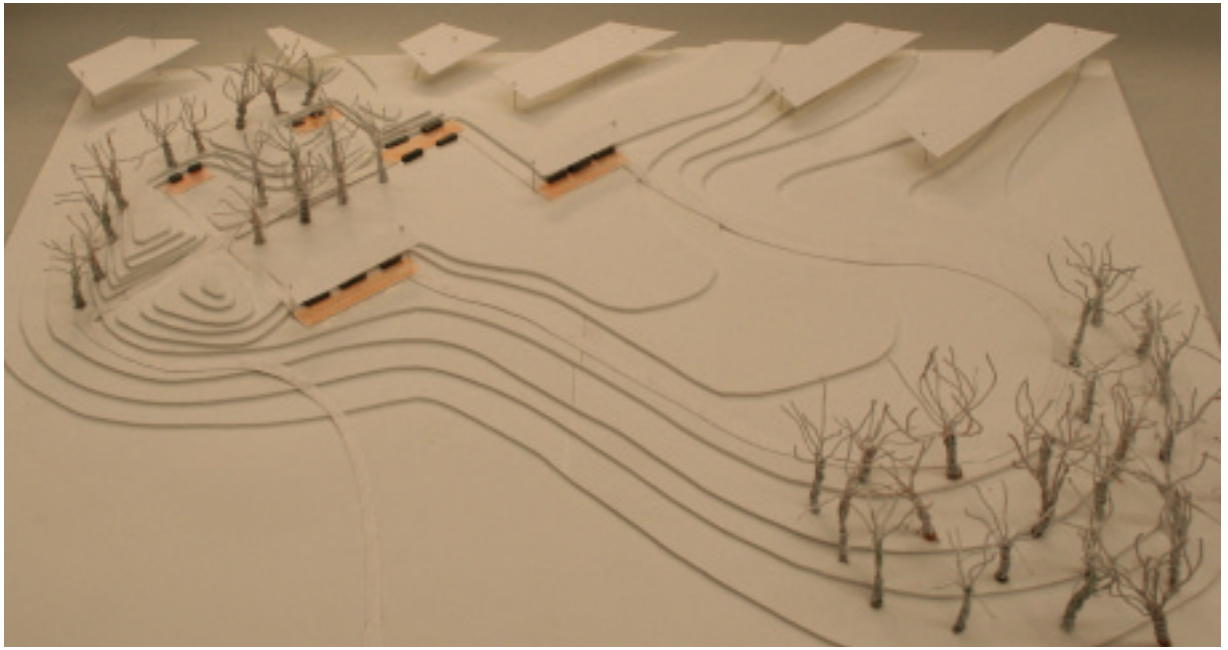
Figure 3. Process Sketch of Gathering Space

Regarding vegetation, a meadow of warm season grasses partially spills into the gathering area, while Thornless Honeylocusts (*Gleditisia tricanthos var. inermis*) provide shade and enclosure for the spaces that do not offer solar overhangs. In addition, honey locusts are in the Fabaceae family, meaning that they fix nitrogen, improving the soil quality of the area. In order to provide a quick yield of meadow grasses, Annual Rye Grass (*Lolium multiflorum*) will be added to the seed mix as a cover crop, and giving an opportunity for other grasses to grow in the upcoming seasons. Warm season grasses include Big Bluestem, (*Andropogon gerardii*) Indian grass, (Sorghastrum nutans) Little Bluestem (*Schizachyrium scoparium*) and Switchgrass (*Panicum virgatum*) and a variety of native forbs including milkweeds (*Asclepias tuberosa*).

Across the open field is a portion of the successional woodland, which will include oaks, maples, pines and sycamores that enclose a path that leads into the open space and loops around the gathering areas.

Figure 4. Final Site Design model

Figure 3. Perspective through Solar Overhang into Open Space



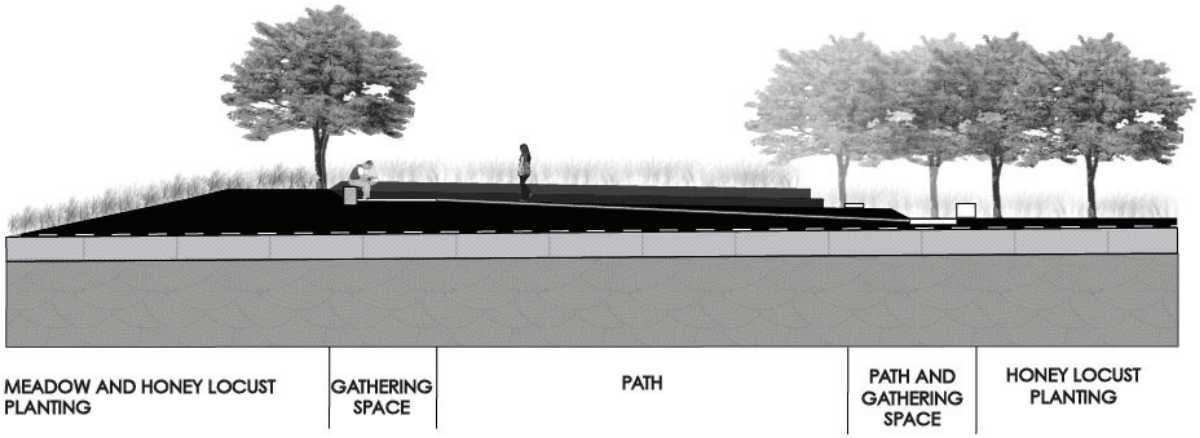


Figure 5&6. Sections cutting through the gathering spaces

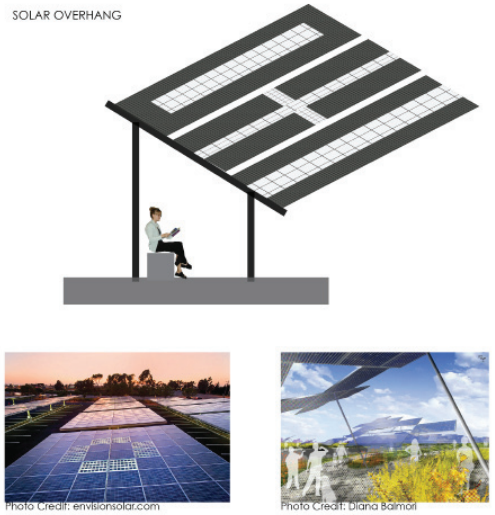
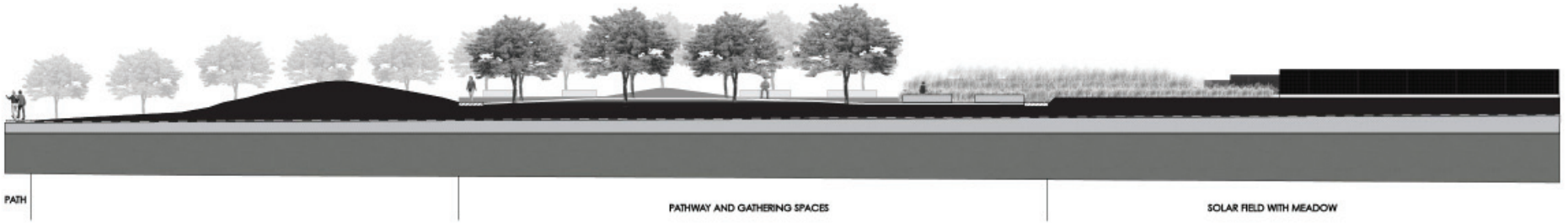


Figure 7. Diagram of Solar Overhang



The Pond

Kim Nuccio

The challenges posed by the eroding slope, an environmentally impacted pond, and connecting an existing bike path are addressed first with a single sweeping arc that begins at the edge of an entrance garden and gracefully descends the slope with a stair that is “of the land” rather than on it. Earthwork and grading make this possible with the help of an equally graceful retaining wall. Along this path, a visitor finds an appropriately shaded treetop overlook with unparalleled views of the pond area. The path terminates on the water with a floating dock, furnished with modern and stylish benches to rest, read or relax in a naturalized setting among the trees.

Although not the main point of entry, a secondary entrance is introduced to link the existing bike path and welcome visitors on both bike and foot via a small bridge to span a natural ravine. Arrival in the entrance garden offers glimpses of the park but doesn’t reveal all at once. A clear path system of primary and secondary routes brings you around and through the park, to various look out points and a few “spots.” (See special topics section on “SPOTS in the landscape.”)

The impacted pond is addressed with technology driven “Biomats” that act as floating wetlands to uptake contaminates in the water, naturally remediating it, while offering a sleek and aesthetically pleasing solution to the only remaining environmentally problematic area on the site. (See Bykowski, p. 95, in Special Research Topics).

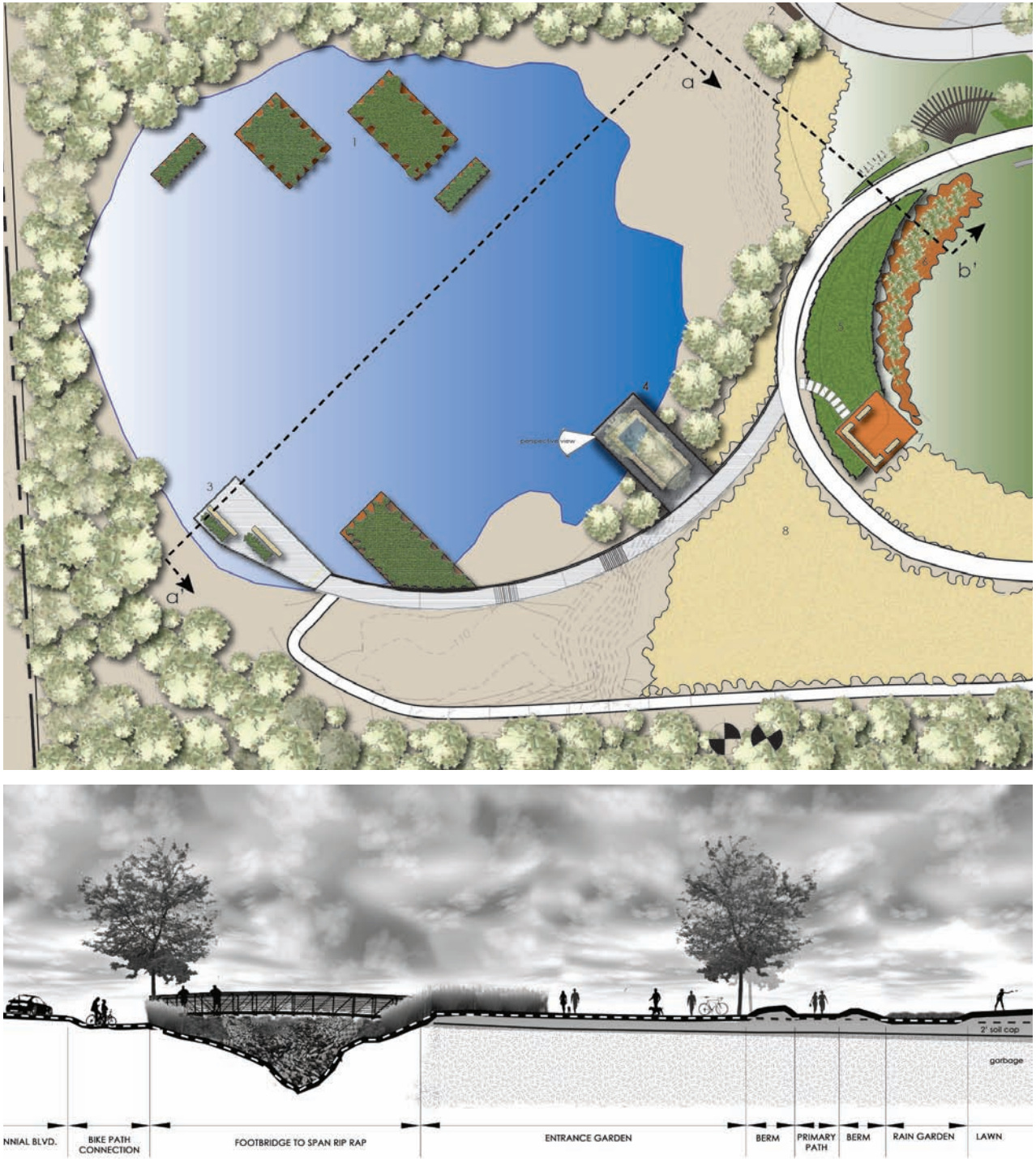
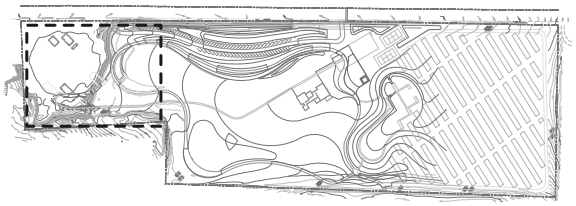
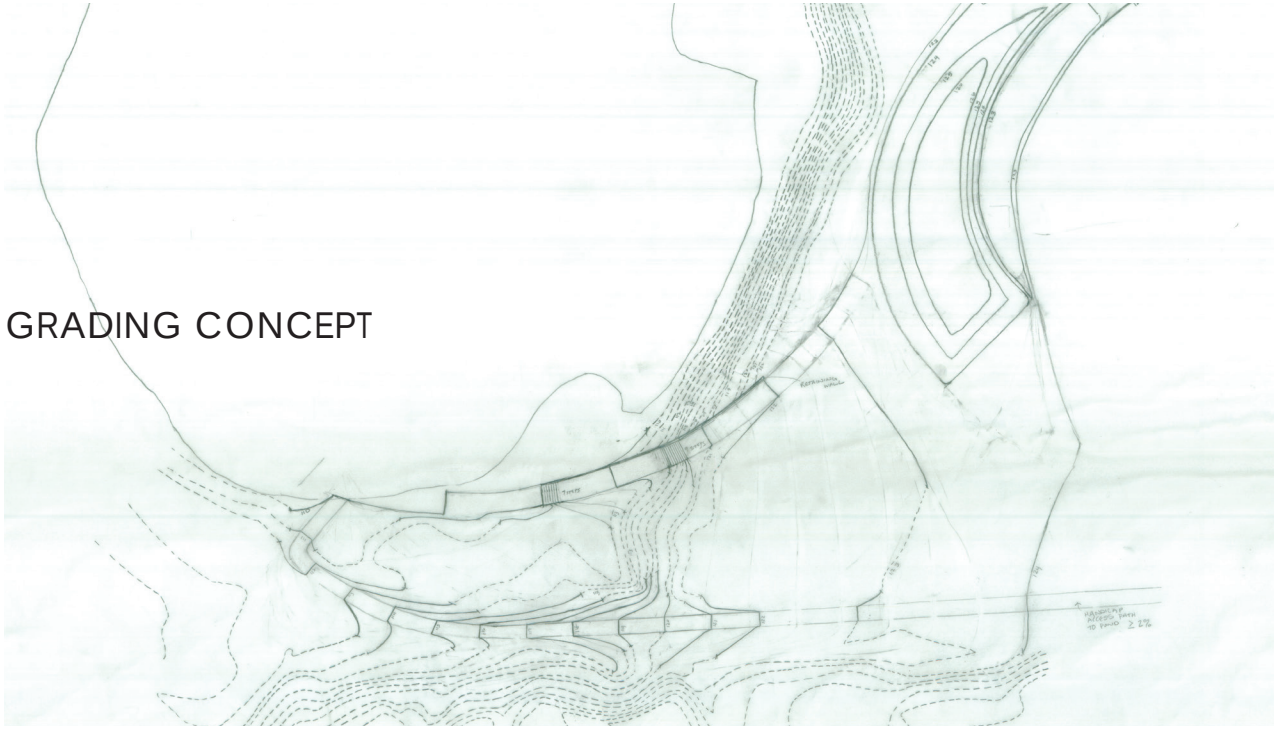


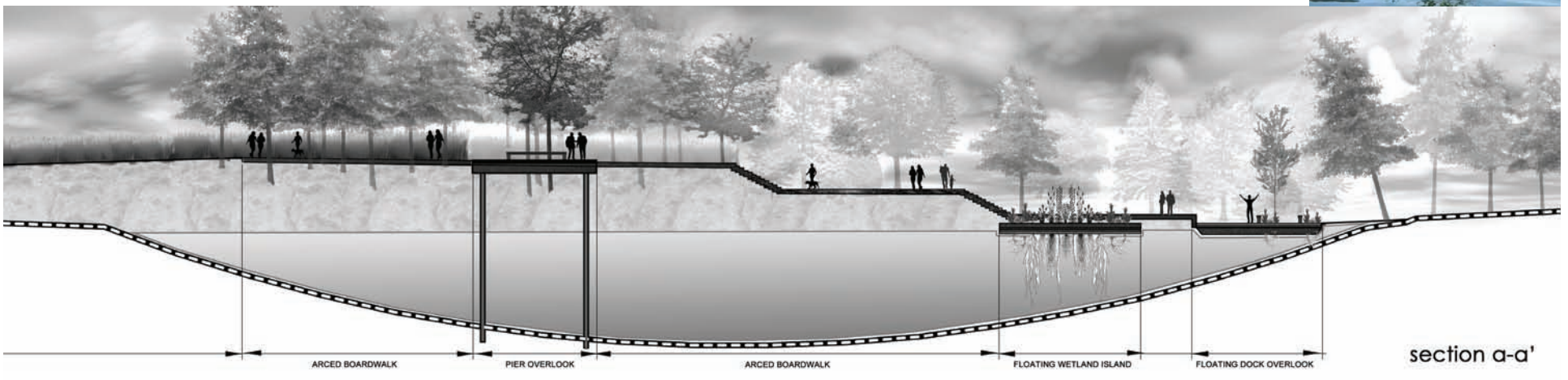
Figure 1. Pond Master Plan

Figure 2. Reference Plan



GRADING CONCEPT





3.4 INTERLOCK

James Bykowski
David Hanrahan
Jim Taranto

3.4.1 Morphological Box

With "build out" conditions expected in Voorhees, New Jersey by 2015 (A Master Plan for the Future), the "Voorhees Environmental Park" (VEP) will serve as a critical element in maintaining neighborhood vitality, fostering a deeper sense of community pride, and emphasizing the importance of open space in Southern New Jersey. The transformation of a former industrial site, the defunct Buzby Brothers Landfill, into a publicly accessible park symbolizes the vivification and restoration of a landscape that was once inaccessible to and precarious for local neighbors, as well as contaminating of local natural resources. In conjunction with diverse passive recreational choices for people of all ages—biking, trail running, exercise and walking, community interaction and education—the ecologically sensitive restoration and cultural and educational programming designed within the park will emphasize environmental and economic sustainability and a Southern New Jersey (suburban) model for public involvement and ethical responsibility for land stewardship and reducing historically harmful impacts on surrounding communities and the earth.

With the aforementioned mission statement, the following goals and objectives evolved:

- Incorporate VEP into the existing network of open space.
- Establish public entrances to VEP on at least two sides of the park and cultivate connections among surrounding residential areas currently separated by the fenced-in defunct landfill site and nearby roads.
- Cultivate revenue opportunities in coordination with the Township's commitment fiscal responsibility and in order to generate revenue to support design, development, implementation and maintenance costs.
- Integrate any economic or commercial aspects of the site into the entire park design. Minimize conflicts between the economic and commercial goals and the publicly accessible park space.
- Control storm water runoff on-site without additional impact to municipal infrastructure and harm to the landfill infrastructure. Protect sensitive sites and valuable natural areas within and near the site by minimizing imperviousness and handling runoff on site.
- Provide diverse cultural, educational and passive recreational programming for visitors of various ages and cultural and socioeconomic backgrounds during different times of the day and multiple seasons.
- Create a prime destination for visitors from surrounding municipalities.
- Ensure protection of the existing landfill closure infrastructure.
- Highlight the historical uses of the former industrial site.
- Expand on access from various locations within the Township by influencing desire for multiple modes of transportation, especially alternative modes, such as pedestrian, bicycle and public transportation.
- Accentuate the site's historical contamination and remediation activities within the park design in order to promote the mission of rebirth and renewal of a post-industrial site within S. New Jersey.

Figure 1. Perspective showing visitors interacting with art walls in the plaza (Midterm design)

Incorporating both the inventory and analysis of the site and our design group's mission statement and objectives, we honed in on seven design issues: buildings/structures, parking, circulation, economic/solar, programmed areas, vegetation and storm water. For each design issue, we developed a problem statement and criteria for which several diagrammatic solutions were repeatedly developed. Ultimately, one diagrammatic solution which met the criteria for each issue, was selected from each issue and used to compile an overall preferred design solution for the park.

Buildings/Structures

Voorhees Environmental and Cultural Education Foundation (VECEF) prefers a building constructed on-site which would ultimately be used as a gathering location and a source of rental revenue. Landfill requirements are such that no invasive footing is allowed. Smaller structures offering shade or defining spatial boundaries have the potential for greater enjoyment in the park.

Criteria:

- Non-invasive to landfill, providing enough fill to serve as the platform for the structures.
- Provide opportunities for shade.

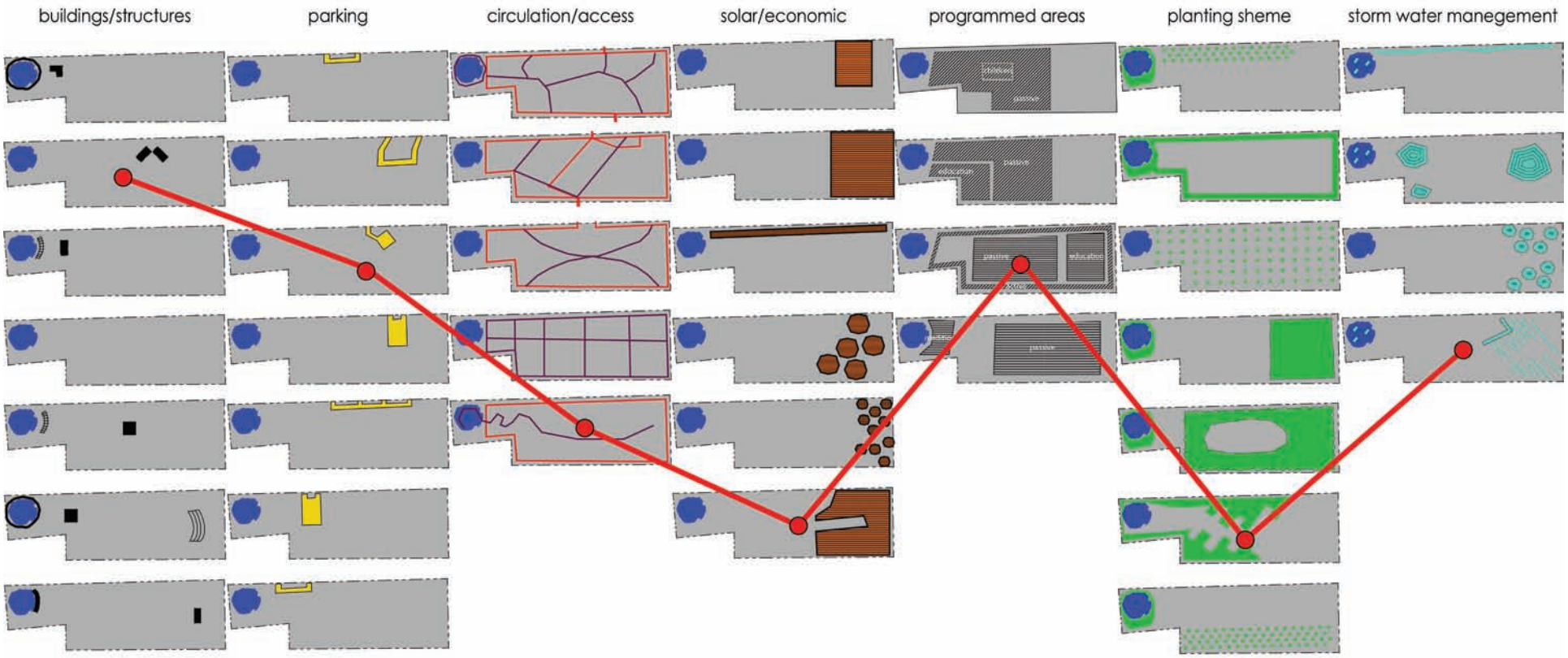


Figure 2. Morphological Box. Diagrammatic design solutions for seven design issues (INTERLOCK).

- Does not shade the solar panels.
- Easily accessible from the parking lot.
- Showcase green technologies.
- Provides separation between programs

Parking

Interested parties do not know how much parking is appropriate for the future park site. Our group does assume that the majority of park visitors will arrive by car. One of the main challenges is that parking lots tend to consume large amounts of space. Our group is challenged with designing the parking in such a way that it is clear that the car-bound visitor enters the park as soon as their car drives along the roadway to the parking lot—the parking lot should be fully integrated into the park.

Criteria:

- Provide a sufficient number of parking spots relative to the size of programmed areas.
- Provide ADA accessible parking.
- Orchestrate continuity between the parking lot design and the park's design.
- Provide safe entry and exit to and from Centennial Boulevard.
- Design the parking and entrance road to infer pedestrian superiority.
- Provide positive drainage into a system that treats and cleanses oil-based runoff.

Circulation

Access to the site is currently restricted due to concerns for safety of the landfill infrastructure. There is currently one access point from the congested Centennial Mills Boulevard. Other than a single access road circling the entire site, there is no other defined circulation through the site. Access to the landfill/groundwater monitoring equipment near the access road must be maintained.

Criteria:

- Provide a gateway into the park that signals the arrival to a place of importance.
- Minimize the views of residential fencing or chain link fencing.
- Maintain access to existing monitoring

equipment and infrastructure.
- Provide connections to programmed areas.
- Connect to township bicycle routes.
- Separate bicycle and pedestrian circulation.
- Provide a safe pedestrian entrance from Centennial Mills.
- Provide access from the proposed Haddonbrook development that does not interfere with GE property.

Economic/Solar

Voorhees Township desires to offset the future costs of the park by developing a revenue driver for a portion of the park. The Township has issued an RFP to solar providers and hopes to lease approximately 11-acres of the site to a solar provider. SREC's for solar energy credits have, in recent months, declined significantly, minimizing the revenue producing potential for a small solar field. VECEF has questioned this direction.

Criteria:
- Maximize the accessible park space while minimizing the economic footprint.
- Provide multiple/diverse revenue engines.
- Provide economic opportunities that do not interfere with the passive recreation mission.

Programmed Areas

There is currently no programming on the site other than the landfill monitoring. VECEF hopes that the park's focus honors passive recreation and meditative activities over active recreation. VECEF feels, and inventory and analysis has shown, that there is a surplus of child-focused and active recreation programming in Voorhees (along with a deficit of programmed spaces for adults).

Criteria:
- Majority of programming—passive recreation.
- Adult and elderly recreational areas with no interference from bikes or aggressive sports.
- Meditative and reflective spots that are quiet and secluded with contemplative view sheds
- Mix of larger and smaller gathering areas.
- Mix of didactic and indirect educational "information" programmed into the design.

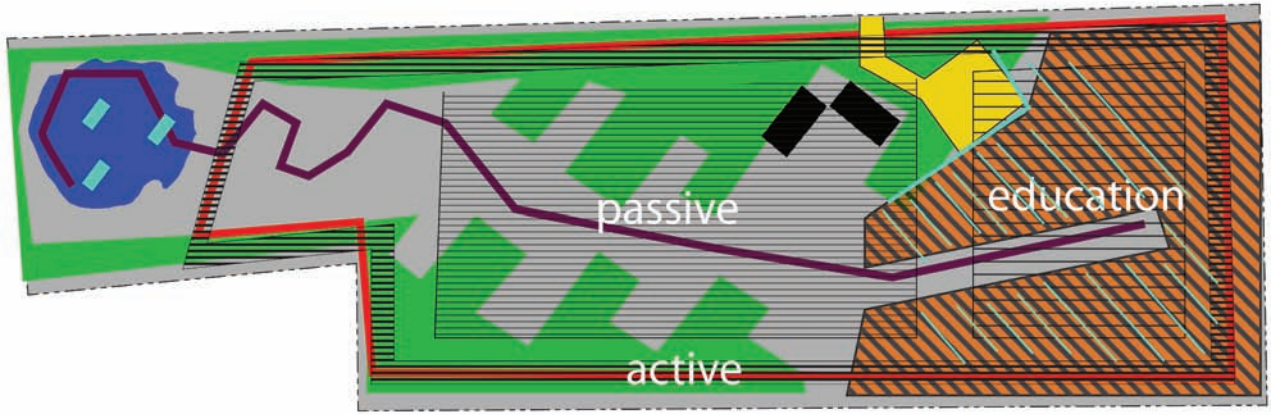


Figure 3. Morphological Box. Preferred design solution.

Vegetation

The majority of vegetation on site is mowed grass. There is a mixture of healthy and questionable trees surrounding the site. Opportunities to introduce a mixture of vegetation to define spaces within the park exist.

Criteria:
- Vegetation should not shade the solar array.
- Vegetation should not damage the cap (the cap is permeable)
- Should offer shade to programmed areas.
- Non-invasive species.
- Mixture of species.
- Save existing vegetation of good quality.

Storm water

Our group was challenged with collecting and reusing all storm water on site, without additional impact to municipal infrastructure. Since the landfill cap is permeable, pooling and penetration of storm water through the cap into the groundwater should be minimized. Because solar introduces greater impervious surface cover, runoff from panels may be problematic, as it sheets from the panel surface and incises the permeable cap.

Criteria:
- Maximize storm water usage by vegetation.
- Collect and direct water sheeting from panels.
- Treat and cleanse storm water.
- Reuse collected water for irrigation.
- Integrate the existing storm water swales.

References

"A Master Plan for the Future." History of Voorhees. Voorhees Township. http://voorheesnj.com/content/history/, Accessed September 11, 2011.

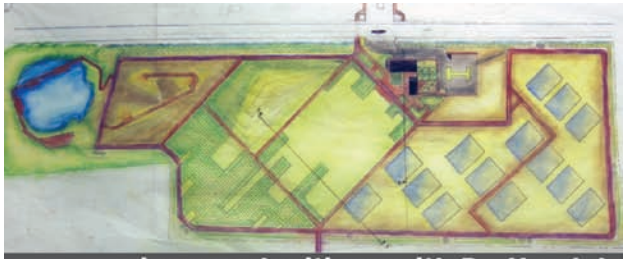
3.4.2 Evaluation & Test Design

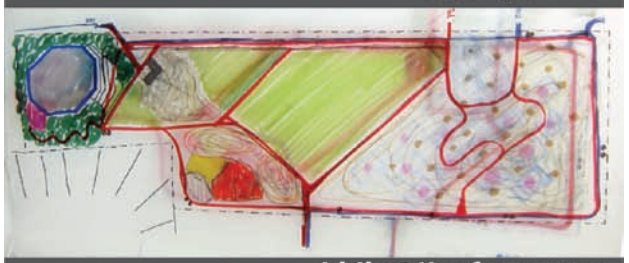
From the preferred solution in the morphological box, our group proceeded through several stages of evaluation and testing. Our initial challenge focused on combining our preferred diagrammatic designs into a unified conceptual master plan. With a focus on the history of the site as an industrial construct, a technical invention that efficiently and effectively handled municipal waste. Subsequently our design reinterpreted the site as technical construct—one that could ultimately generate renewable energy. Therefore, the programmed areas were oriented in the same direction as the solar array, on the north south access, to mirror the ideal southern facing direction of the solar panels. After several attempts, we carved out a main central space. The design language, though, appeared formal and athletic-field shaped. Finally, INTERLOCK evolved from attempts to interlock forest planting that shaped spaces with solar panels and art installations.

Earthwork had consistently emerged as a design focus. From nearly constructed mountains to smaller landform volumes providing the surface grade a proposed meadow boardwalk, forest planting and a plinth. Major steps toward our midterm master plan were simplifying circulation and changing the orientation of the buildings to align with the 'solar panel orientation.' A quincunx to which we aligned planting, solar placement and pathways throughout the site.

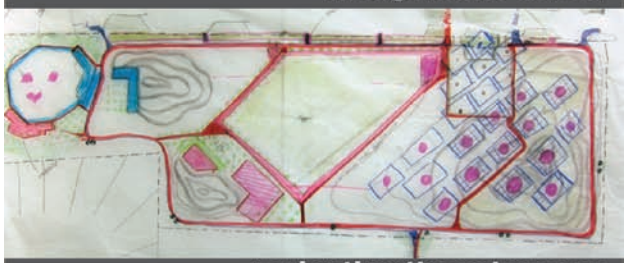
Feedback from the midterm master plan exposed the need to study the entry and arrival, lessen the corridor-like spatial feeling between many earthwork/tree volumes and arrange circulation more consistently throughout. With the midterm feedback, we moved into the individual design process, focusing individually on sections of the master concept. At each stage of the individual design process, we returned to our master concept and integrated our individual design elements into the master plan.


master plan #1

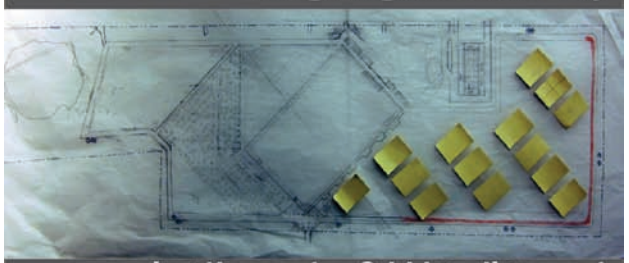

pin up and critique with Dr. Handel

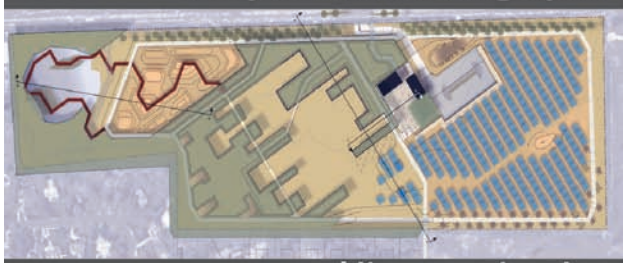

hiding the far corner

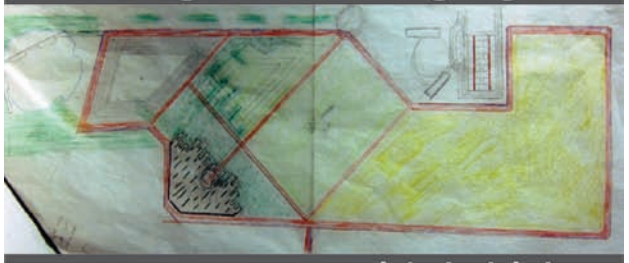

simplifying circulation and quincunx

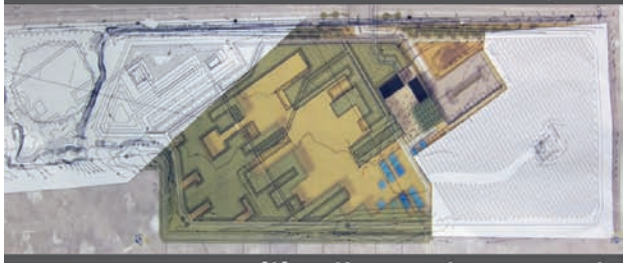

navigating the solar array


a major shift in building layout


carving the center & bldg. alignment


midterm master plan


interlock is born


reuniting the master concept

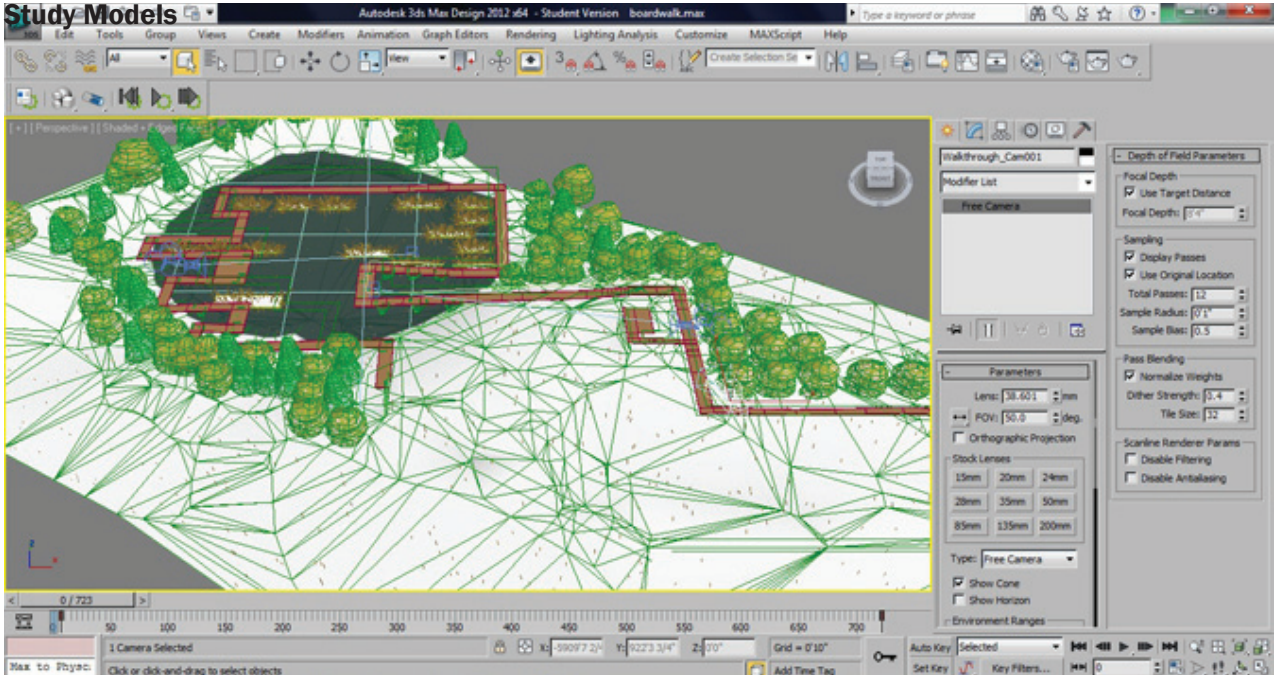
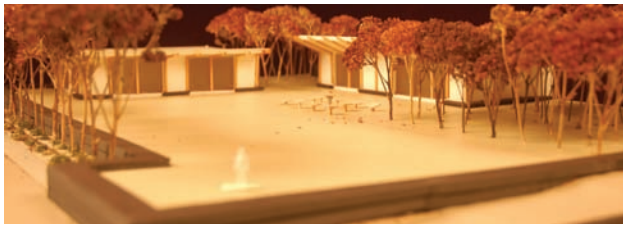


Figure 4. Autodesk 3ds Max Design model of boardwalk extending from meadow to pond area.



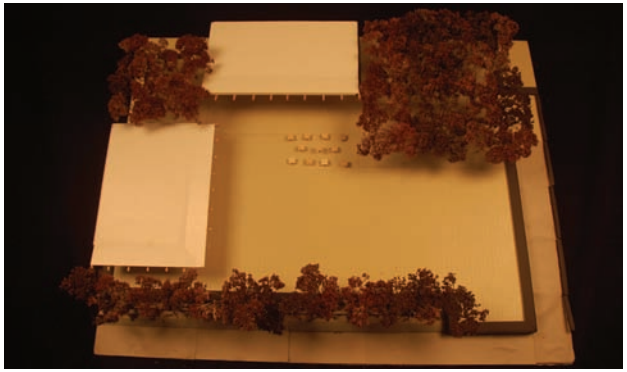


Figure 5. Study models of plaza and plinth area.

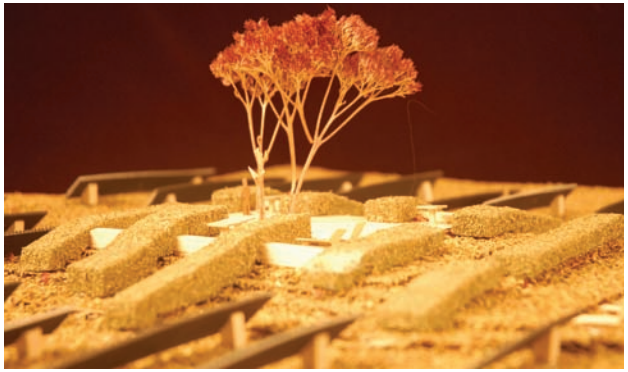


Figure 6. Study models of solar garden area.

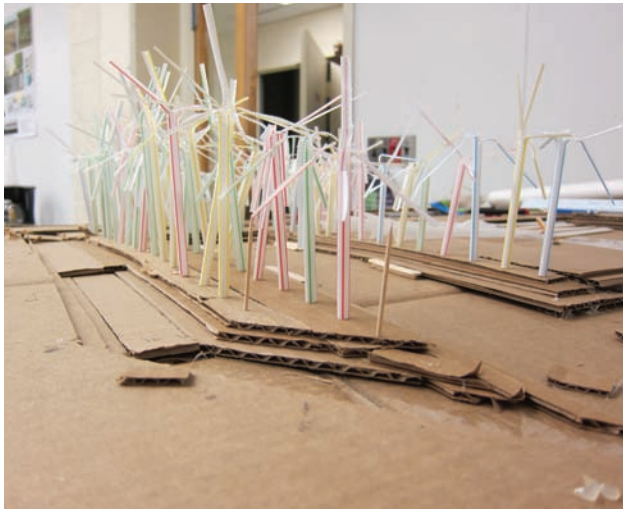


Figure 7. Cardboard study model of landform volumes and tree planting..

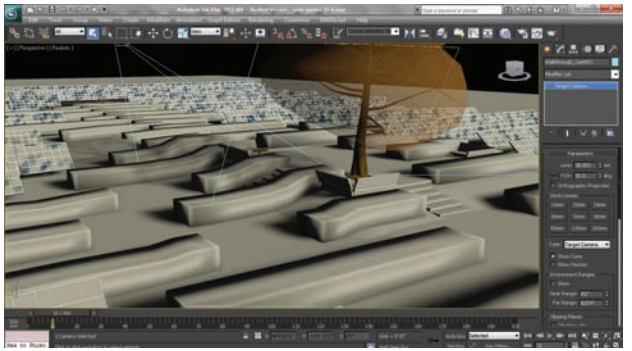


Figure 8. Autodesk 3ds Max Design model of solar garden.

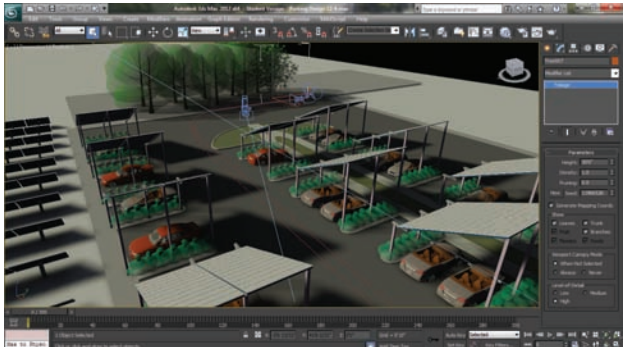


Figure 9. Autodesk 3ds Max Design model of parking lot solar structures.

3.4.3 Master Concept & Group Design

For over 60 years, the future site of the Voorhees Environmental Park has been altered to operate as a technological component in the Voorhees municipal infrastructure. From the late 1950's it served as the site for a gravel and sand quarry. And, shortly after, began to accept municipal and industrial waste through landfill operations. From the landfill closure until today, it functions as a site of remediation, in an attempt to correct the contamination issues introduced during the landfill period.

The master plan design, INTERLOCK, connects the former technological and industrial uses of the site with new forms of technology as well as the potential of reestablishing natural processes once endemic on the site. First, INTERLOCK integrates the sustainable technology of solar energy production at the upper end of the site. Secondly, INTERLOCK introduces reforestation through segments of the central and lower portions of the site. Lastly, the design establishes and maintains the first stage of succession with an open meadow at the lower portion of the site near the pond area.

Programmed spaces for passive recreation vary; yet, follow a similar design typology, throughout the site. The main programmed areas of the site include an entrance plaza surrounded by a bosquet, a café and cultural center, a sun deck looking out from the middle of the solar panel array, grass lawn gathering areas surrounded by elevated soil volumes planted with various bosquets of different species and successional growth of vegetation, and a half mile boardwalk meandering through the meadow and pond areas.

Figure 10. INTERLOCK. Master Concept and Group Design, James Bykowski, David Hanrahan and Jim Taranto.

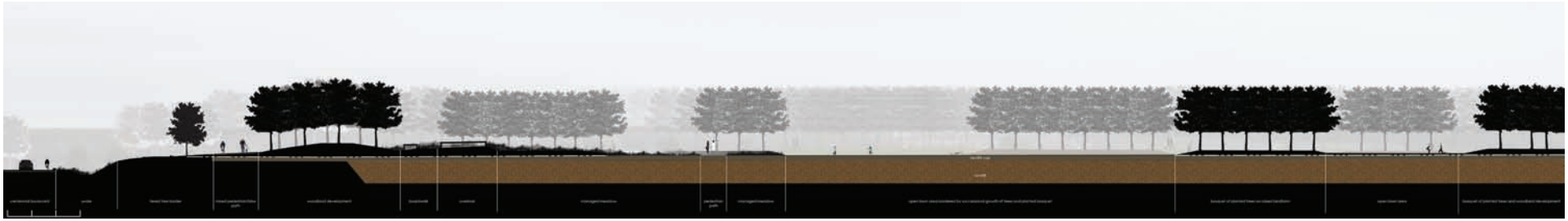


Figure 11. section a-a', cutting through Centennial Boulevard, the boardwalk and meadow, and landform volumes; looking north.

INTERLOCK endeavors to provide a functional gathering area and community park to all residents in Voorhees. Particular attention was paid to increasing pedestrian connections between nearby neighborhoods such as Centennial Mills, Alluvium, Alluvium Woods, Traditions, Wilderness Lakes and Lost Tree, as well as the future Haddonbrook development, increasing walkability between neighborhoods. Elements to ease pedestrian access across the busy Centennial Boulevard from Centennial Mills were implemented by establishing a center tree island that functions both as a traffic 'choking'/slowing device and a place where pedestrians may come to rest after crossing one lane of traffic. In total, approximately two-miles of pedestrian pathways have been designed throughout the site.

The outline of the existing gravel road was maintained and altered slightly to maintain access to existing monitoring wells designed to monitor for potential groundwater contamination. The road now functions as a mixed pedestrian and bicycle path that circles the site. In total a bicycle path just over one-mile in length has been added and incorporated into the Voorhees master bicycle plan.

Figure 12. Entrance bosquet punctuated with art walls.

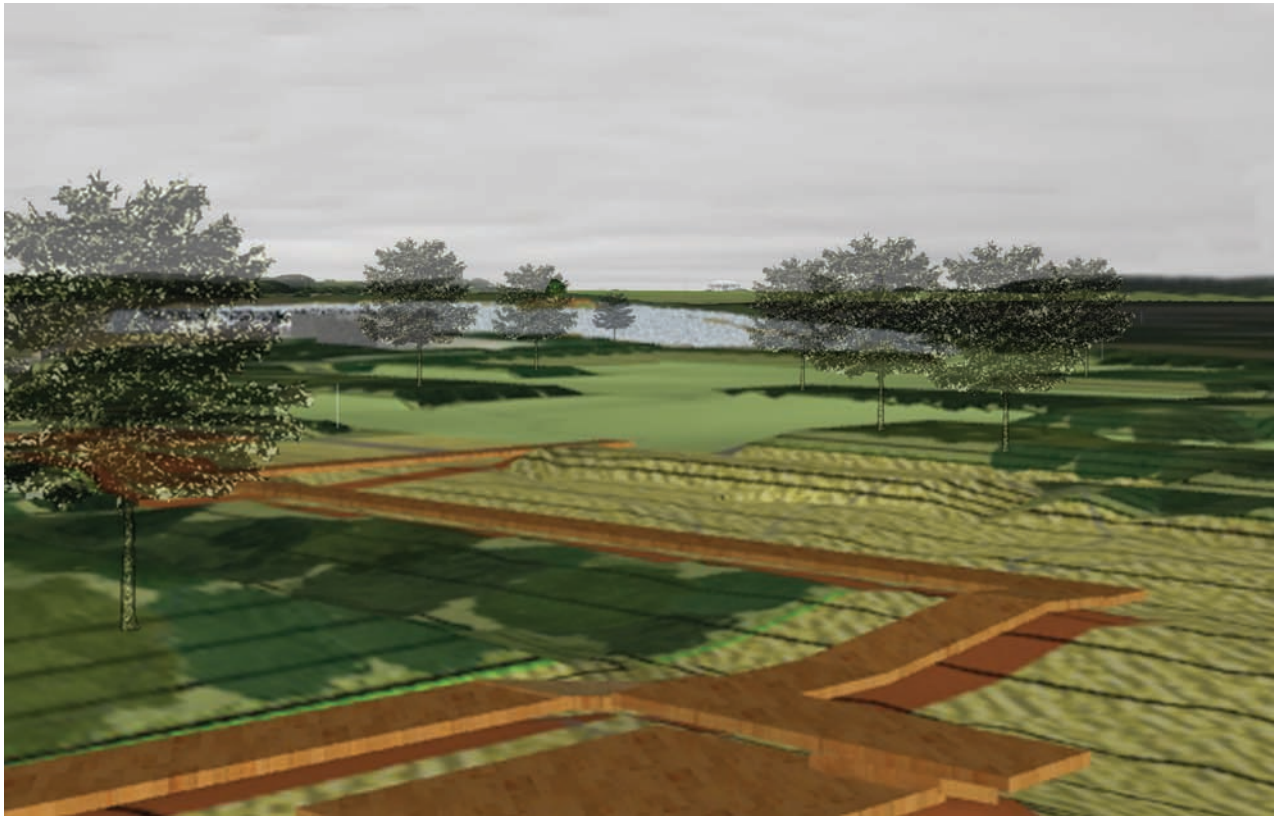


Figure 13. Perspective looking from boardwalk across landform volumes toward the solar array.

The main spatial experience that park visitors will enjoy as they meander through the site differs greatly by section. In general, though, visitors will travel between forest, meadow, solar array and formal planted grids of trees. They will have the experience of being engulfed in a solar array. They will have the experience of standing above the solar array on a deck with a not only a view back to the forested and meadow landscapes of INTERLOCK, but also the emptiness of the vast General Electric-owned landfill nearby. Visitors will experience alternating knolls of rectilinear land-form volumes, upon which formal tree planting and successional vegetation grow. Visitors me-ander through an elevated boardwalk, engulfed on all sides by tall meadow grasses, with views back across the lawn to the solar and views down to the pond. As visitors follow the boardwalk to the pond, visitors become progressively secluded from the remainder of the park due to the grade change as the boardwalk descends to and mean-ders around the pond, through floating treatment islands, and ultimately back to the meadow.

Land Use Summary

	Current		Proposed	
	Acres	%	Acres	%
Vegetation	**34.0**	**90.9%**	**21.9**	**58.5%**
Trees (on property)	3.1	8.3%	12.9	34.4%
Trees (off prop/buffer)	1.7	4.6%	1.7	4.6%
Meadow	0.0		2.8	7.5%
Hedges	0.0		0.2	0.5%
Mowed Grass	29.2	78.0%	4.2	11.2%
Floating Treatment Islands	0.0		0.1	0.3%
Circulation	**1.7**	**4.5%**	**4.3**	**11.5%**
Boardwalk	0.0		0.6	1.6%
Mixed Bicycle/Pedestrian/Monitoring	1.7	4.5%	2.0	5.2%
Pedestrian-only	0.0		0.5	1.4%
Parking and Paved Entrance	0.0		1.2	3.3%
Structures	**0.0**	**0.0%**	**8.4**	**22.5%**
Solar Deck	0.0		0.04	0.1%
Solar Array	0.0		8.0	21.4%
Buildings	0.0		0.1	0.4%
Plaza	0.0		0.2	0.6%
Art Walls	0.0		0.01	0.02%
Stormwater	**1.7**	**4.6%**	**2.8**	**7.5%**
Bio-Swales	0.2	0.5%	1.7	4.6%
Pond	1.5	4.1%	1.0	2.8%
Water Storage	0.0		0.04	0.1%
Total	**37.4**	**100%**	**37.4**	**100%**

Figure 14. Land usage details of INTERLOCK by acreage and share of use before and after design implementation.

Grading Plan

Several grading plans were tested in order evaluate solutions to promote positive drainage. Because the site sits on a former landfill and the landfill cap must be maintained, only grading by fill is possible; cutting into the existing landform is possible.

Ultimately, the landform volumes in each section of the design were sculpted by placing fill on top of the existing grade. Doing so maintained the existing 0.5% slope of the central space. Mounds of imported fill surrounding the central space create interlocking landform volumes. The volumes slope up three-feet at 20% shaping several niche spaces and providing beds for tree planting, as well as providing the base on which to construct the parking and the plinth for the plaza structures.

The main reason the existing grade was maintained in the central open space was because of the amount of fill required. Even with the selected option shown in Figure 15, 42,894 cubic yards (or 11,582 tons) of fill would be required.

Attempting to grade the central space at a 1-2% slope to enhance more positive drainage from within the small niche spaces toward the meadow, would increase the amount of fill required exponentially.

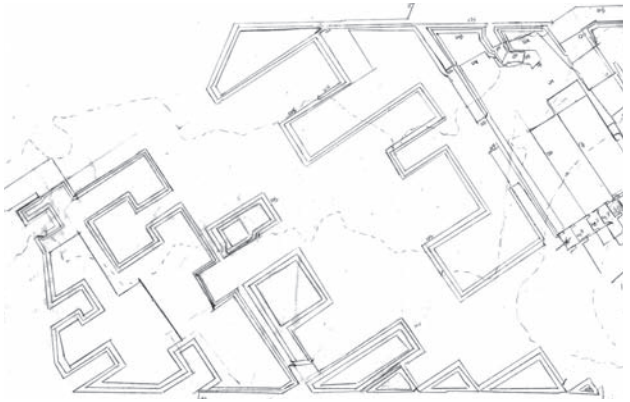


Figure 15. Selected grading plan for landform volumes in the central space and plaza area (42,894 cubic yards of fill).

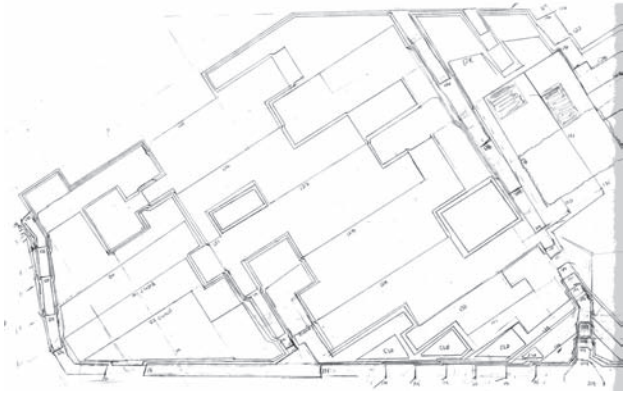


Figure 16. A test grading plan of the central space with a 1% slop through the central space draining toward the meadow.

Figure 17. A test grading plan of the central space with a 2% slope through the central space draining toward the meadow.

3.4.4 Individual Site Designs

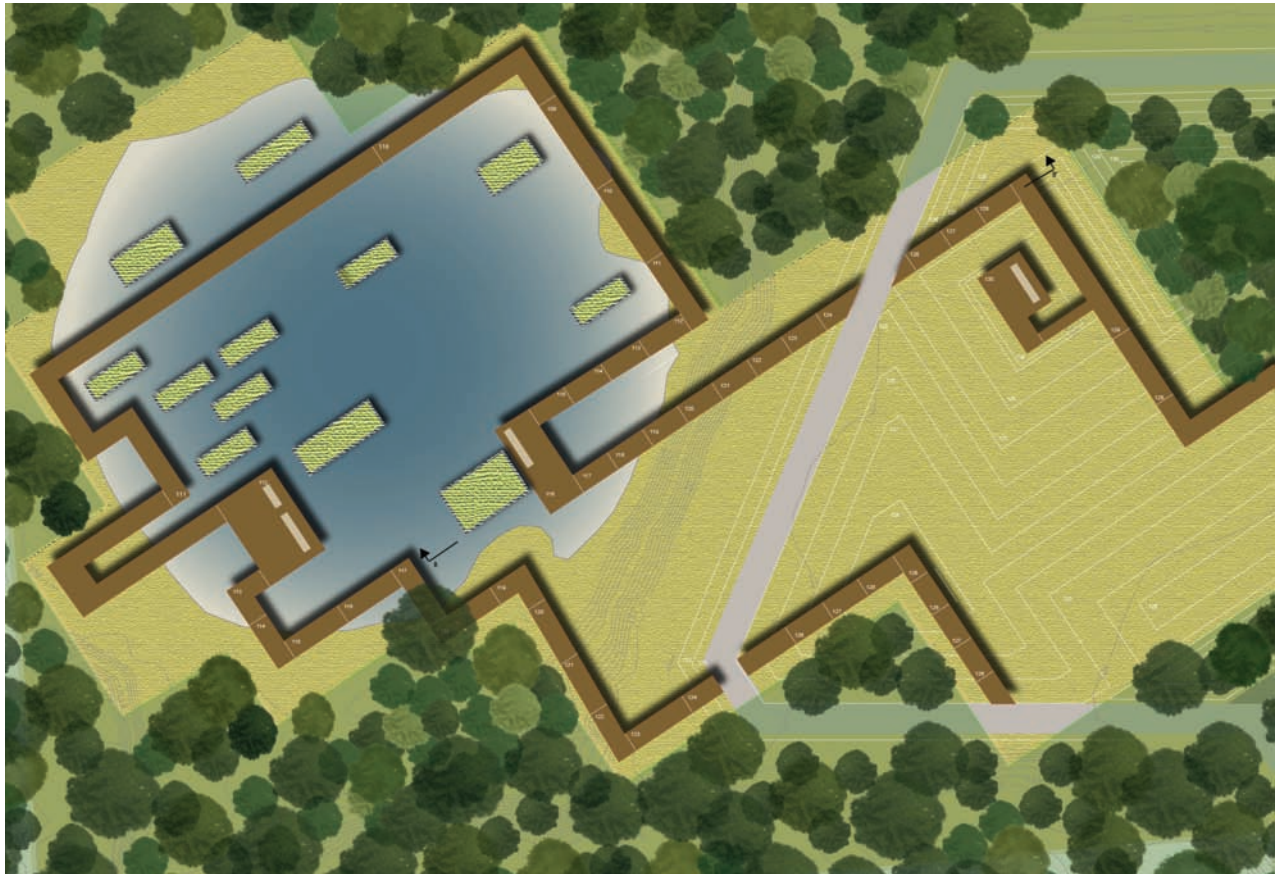


Figure 18. Meadow and boardwalk. Individual Site Design, James Bykowski.

Meadow and Boardwalk

James Bykowski

The southwestern portion of the site has the most existing grade change and vegetation making it the most interesting area of the site. This creates a great experiential opportunity for park users. The main idea of this portion of the design is to create a walk through a remedied landscape that offers park users a chance to experience a less maintained landscape in beginning stages of succession.

It was important to link this section with the main gathering spaces in the center of the site to create a main corridor through the site but, offering visitors a much different experience. This was achieved in the site design with the continuation of the design geometries and interlocking the proposed meadow and existing pond area.

As one leaves the main gathering areas into the meadow, their movement will be controlled with a boardwalk raised above undulating land form. The land form will be graded to create new high points offering park users new views of the pond and a new view back towards the main lawn area. The boardwalk, made of black locust, will move through the landscape up and down land form towards the pond where user will get to experience the floating treatment islands. The floating islands naturally cleanse the water in the pond, creating a safer place for users.

Figure 19. section b-b'. Section looking west through boardwalk (entrance near pond section of walk).

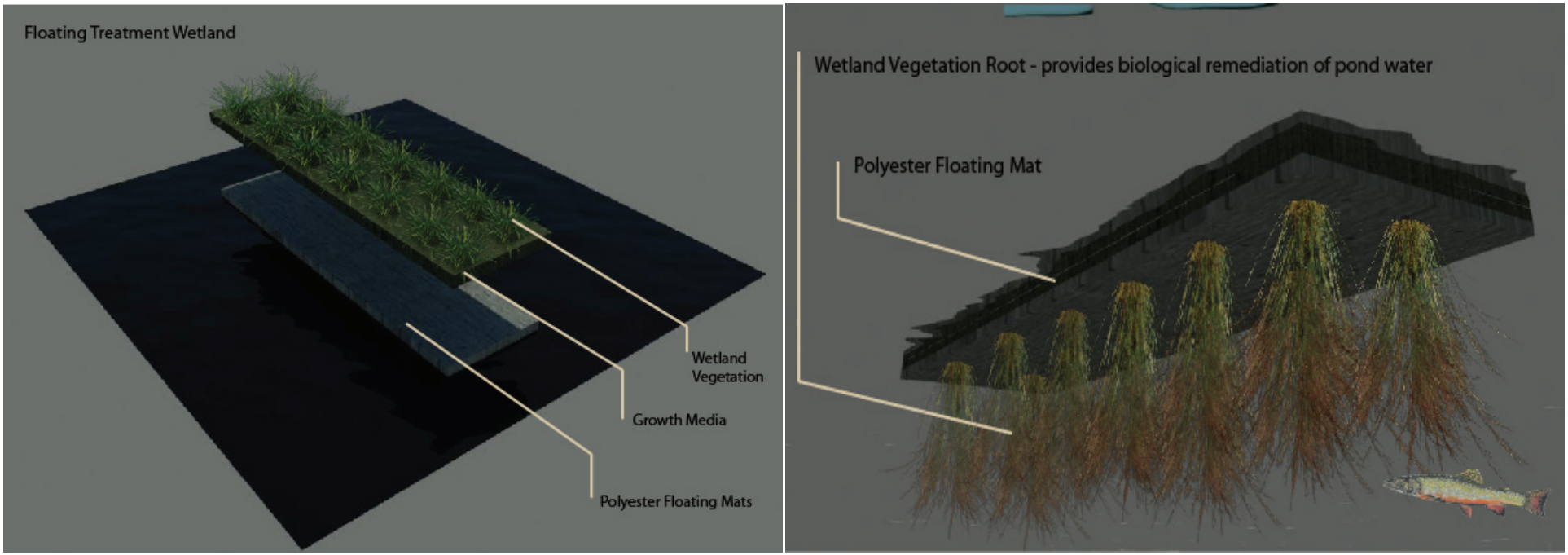


Figure 20. Diagram of floating treatment islands.

Figure 21. Perspective looking from boardwalk to meadow.

The fill being used to create the land from in the meadow will also provide a great base for the trees planted on the perimeter of the space. These trees will need a good base for root development in order to reach their maximum height. The amount of fill need to create the meadow land form is 12,783 cubic yards or 3451 tons of clean fill. This will require 172 truck loads of fill. This fill will benefit the project by creating a much more enjoyable experience for park visitors while also helping in creating a much richer habitat.

Figure 22. Perspective from pond section of boardwalk looking toward meadow.

Figure 23. Plaza and Open Lawn. Individual Site Design, David Hanrahan.

Plaza and Open Lawn

David Hanrahan

The plaza and open lawn, which sit between the meadow boardwalk and the solar array, are designed as the central portion of the site. Most visitors will enter the site through the plaza via either a pedestrian entrance between the educational and the café buildings or directly from the parking lot.

Movable tables and chairs sit within the plaza space near the café building. The buildings are designed with an overhang that assists in defining the ground-level circulation around the plaza. Grid slabs of concrete also define the major circulation around the buildings.

A herringbone-paving pattern exists within the central core of the plaza. The pattern was designed to mimic and refer to the shape of the interlocking landform volume that spreads throughout the central space.

A drive-up coffee counter is also located on the parking lot side of the café building, near the drop-off area. Pillars along the building mirror the grid of the tree planting within the plaza creating a rhythm. Small benches, seeming to emerge directly from the building walls, surround each of the plaza- and entrance-facing sides of the buildings.

A seat wall surrounds the western corner and the southern and eastern edges of the plaza. The seat wall is constructed of a perforated concrete base placed at larger intervals on the same grid used by building pillar and tree planting throughout the plaza. The bench top is a wooden slat bench constructed of black locust. At times, when the bench intercepts the base 10’x10’ tree grid, it is punctured by trees growing directly through it.

Two entrance bosquets define the edges of the plaza. The largest bosquet connects the planted landform volume of the lower open space with the planting in the plaza, extending all the way to the parking lot, and ultimately, transitions to overhead solar parking structures. The entrance bosquets are planted on a 10’ x 10’ grid. Care taken to

Figure 24. section c-c'. Section looking east through plaza and lawn area.

construct the subsurface soil, structural soil and drainage for the tightly planted tree bosquet, including providing sufficient structural soil between each tree and constructing channels for roots to spread beneath curbs and other hard surface barriers. The main entrance bosquet is also punctuated (interlocked) with art walls, which sometimes replace the tree trunks on the grid.

Art walls, murals, digital displays, chalkboards, graffiti boards, artistic displays begin in the plaza. The art walls offer multiple functions. First, they offer the ability to interpret and refer to the history of the site through the presentation of historical time lines and aerial images in permanent displays. They also offer the ability for local artist to interpret our relationship to technology, including landfill and remediation technology, rebirth, and natural processes through exhibitions. Lastly, chalkboards, mural, and graffiti art walls offer the ability for individuals to personalize the area by contributing to the public realm. Personalized displays are meant to be temporary in nature and may be altered by new visitors at any time.

Figure 25. section d-d'. Section looking north through plaza.

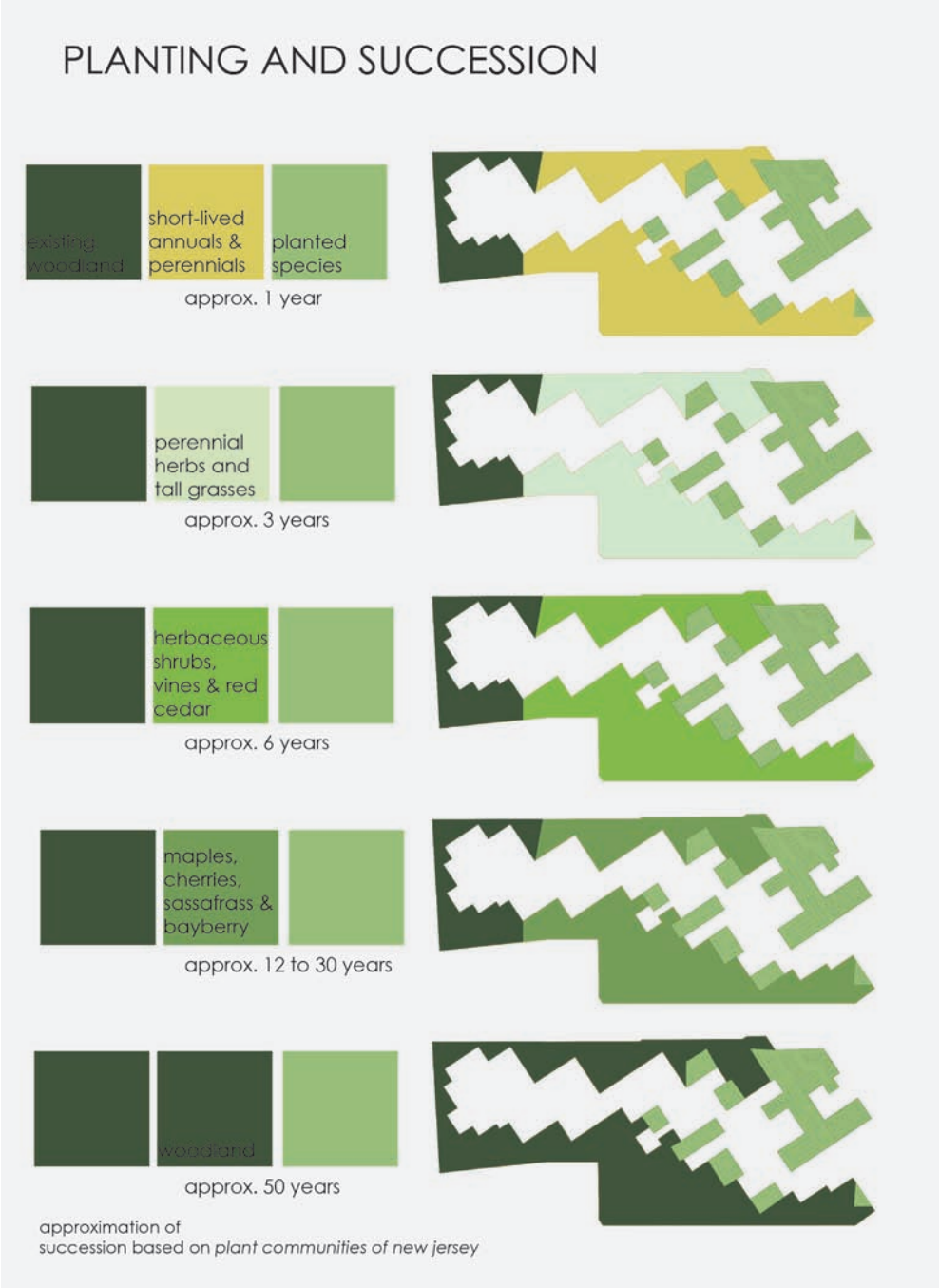


Figure 26. Planting and Succession diagram.

The visitor leaves the plaza and enters the main central space through an accessible ramp sloping just over 3% (also punctuated with art walls) down to the central space where solar panels and art walls converge and commingle on one side and a landform volume emerges on the other side of the corridor.

The main central space contains several interlocking landform volumes that, in plan view, appear to have been pulled apart from one another to create a central open lawn space. In section, the landform volumes create smaller gathering spaces along the main central axis. 2,894 cubic yards (or 11,582 tons) of fill would be required to create the landform volumes. The inner edge of each gathering space is bordered by seat wall that functions as a retaining wall for the inner side of each landform volume. 4 The seat wall houses the drainage infrastructure that channels water through the landform volumes.

The planting of the interlocking landform volumes not only provide opportunities to refer to the historical design typology of planted tree bosquets, but also enable areas for the establishment of successional processes. In total, ten landform volumes will be explicitly planted with a formal grid of trees. Each individual bosquet will contain the same species, totaling to ten different species across all bosquets. The design decision for planting identical species within each bosquet versus mixing species in a single bosquet was both aesthetic and maintenance driven. First of all, concerns regarding monoculture planting and death from diseases impacting a single species are serious. In situations where a disease may target a single species, though, it will be best if all were located within one bosquet. From the aesthetic perspective, the loss of a single species would mean the loss of a single bosquet, instead of the loss of individual trees spread throughout ten different bosquets, diffusing the aesthetic grid effect of bosquets. From a maintenance perspective, it would be much easier and less disruptive

Figure 27. Planting plan for bosquets. Communities based on Collins, *Plant Communities of New Jersey: A Study in Landscape Diversity*.

to soil and other trees to replace the trees within a single bosquet versus replacing single trees spread across multiple bosquets.

References

Collins, Beryl Robichaud Collins and Karl H. Anderson. *Plant Communities of New Jersey: A Study in Landscape Diversity*. New Brunswick, NJ: Rutgers University Press, 1994.

Figure 28. Perspective looking into niche space.

Figure 29. Perspective looking toward the center of the plaza.

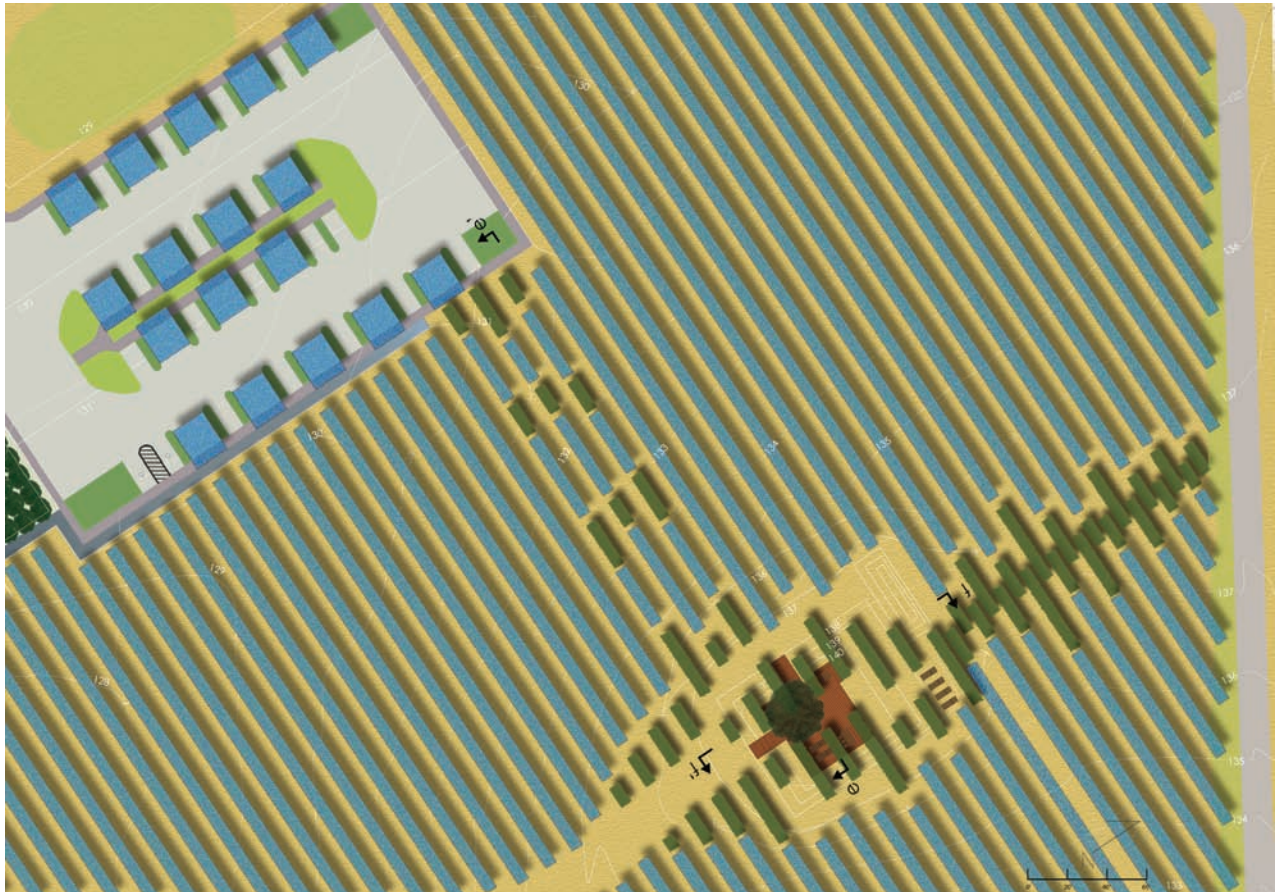


Figure 30. Solar Array and Parking. Individual Site Design, Jim Taranto

Solar Array

Jim Taranto

The solar array is located on the northern side of the site and features an integrated parking lot and a solar garden. Visitors entering the park by car will shortly approach the parking lot upon entering the site. The parking lot is designed with a series of overhead solar panels spaced at intervals to maximize solar energy and provide sufficient parking spaces underneath. Each solar panel provides a roof for two 9 x 19 foot parking spaces with one parking space between solar panels. These panels are fixed at a 24 degree angle facing due south and are 8-feet off the ground at the lowest point and around 15-feet at their highest edge. A 6-inch high by 4-foot wide planted area bordered by a curb protects the structure of the solar panels from cars driving directly into them. In addition, the small planted areas catch the storm water runoff from the solar panels and make the parking experience more pleasing. The lot has a total of 51 parking spaces and 2 handicapped parking spaces.

The whole parking lot is pitched at 2 percent towards Centennial Boulevard to allow for storm water runoff to sheet towards the existing bio-swale that runs the length of the site and eventually empties into the pond. As storm water travels across the impervious surface of the parking lot, it commingles with oil deposits from vehicles. To prevent any further contamination of the pond water, two smaller bio-swales have been constructed to help in the process of treating and purifying the storm water. The first is located in the center of the parking lot and will treat a little less than half of the storm water that falls on the parking lot. Within this bio-swale, a constructed walking path extends down the sides allowing visitors safe passage to the plaza from the parking lot. The second, and larger, swale is located just outside of the lower edge of parking lot. It catches the remainder of the water from the asphalt as well

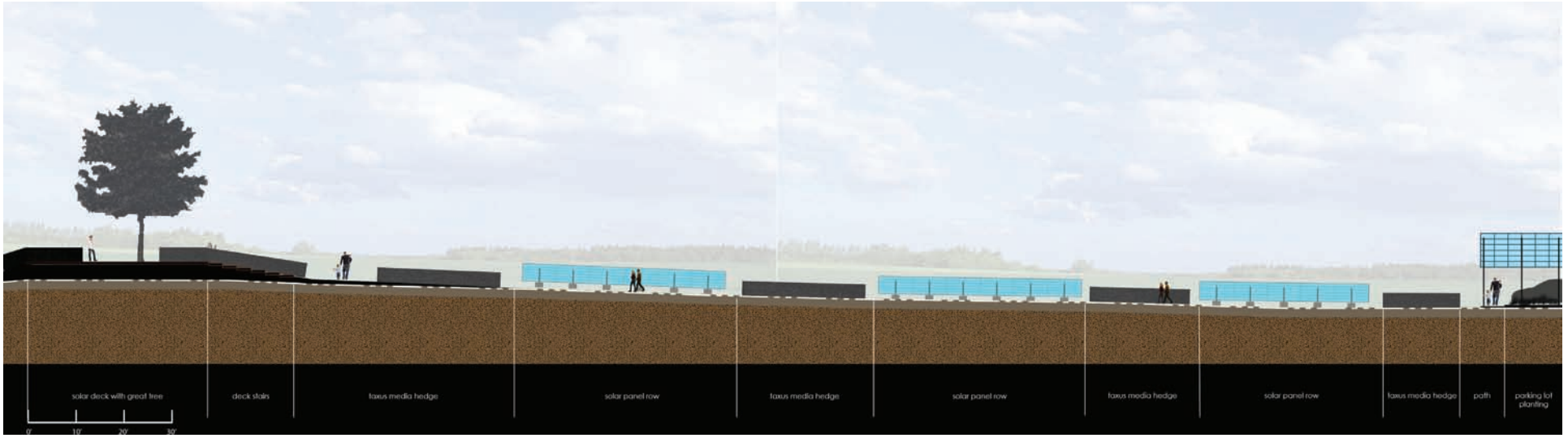


Figure 31. section e-e'. Section looking south through solar garden and solar array along path from parking lot.

as water from more remote rows of solar panels in the solar array.

The solar array itself was designed to accommodate human interaction with this wonderful technology. Green technology is often praised for its environmental benefits, but at the same time is hidden overhead on rooftops or behind fences preventing interaction and tactile experience with the technology. The panels themselves, in plan view, are 6-feet wide and have a 10-foot gap in between. At the highest edge they are roughly 5-feet off of the ground, bringing the technology down to human scale. One concern with placing solar panels on top of a landfill is that they concentrate an area of rainfall into finite rows. Most of the water that lands on the panel will sheet off

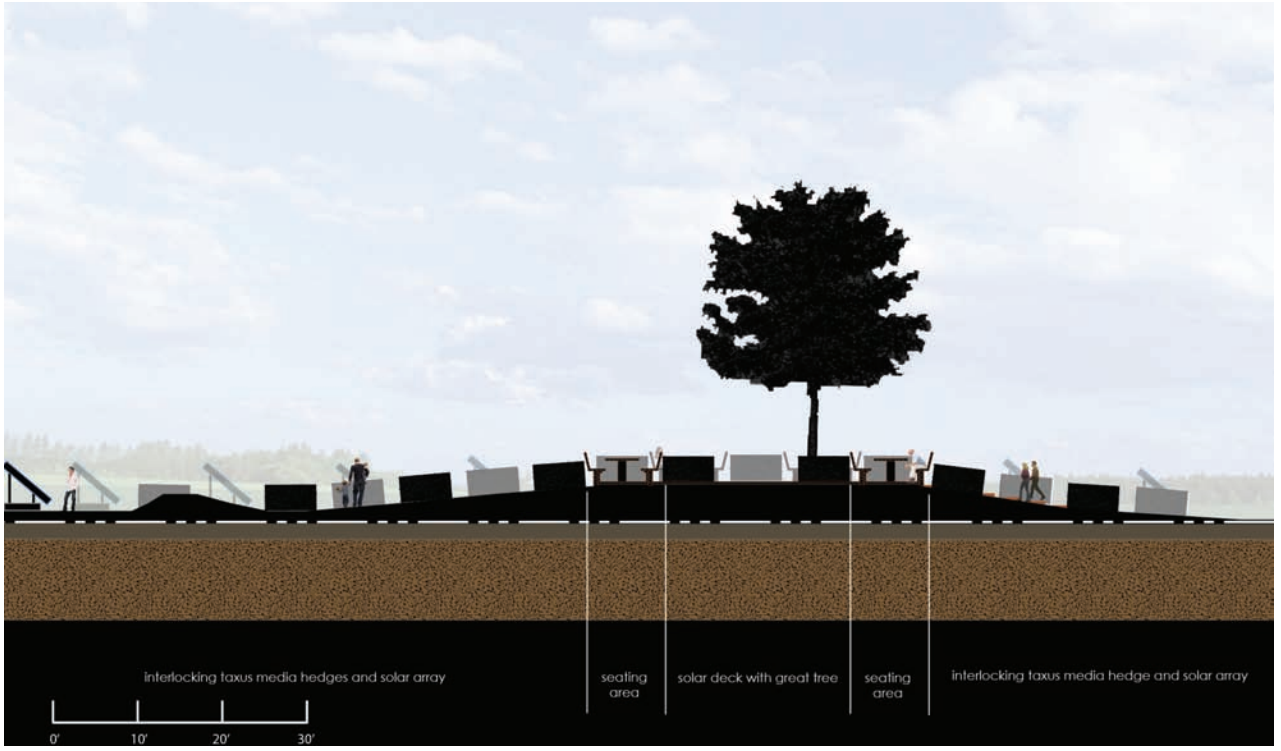


Figure 32. section f-f'. Section looking east through solar garden.

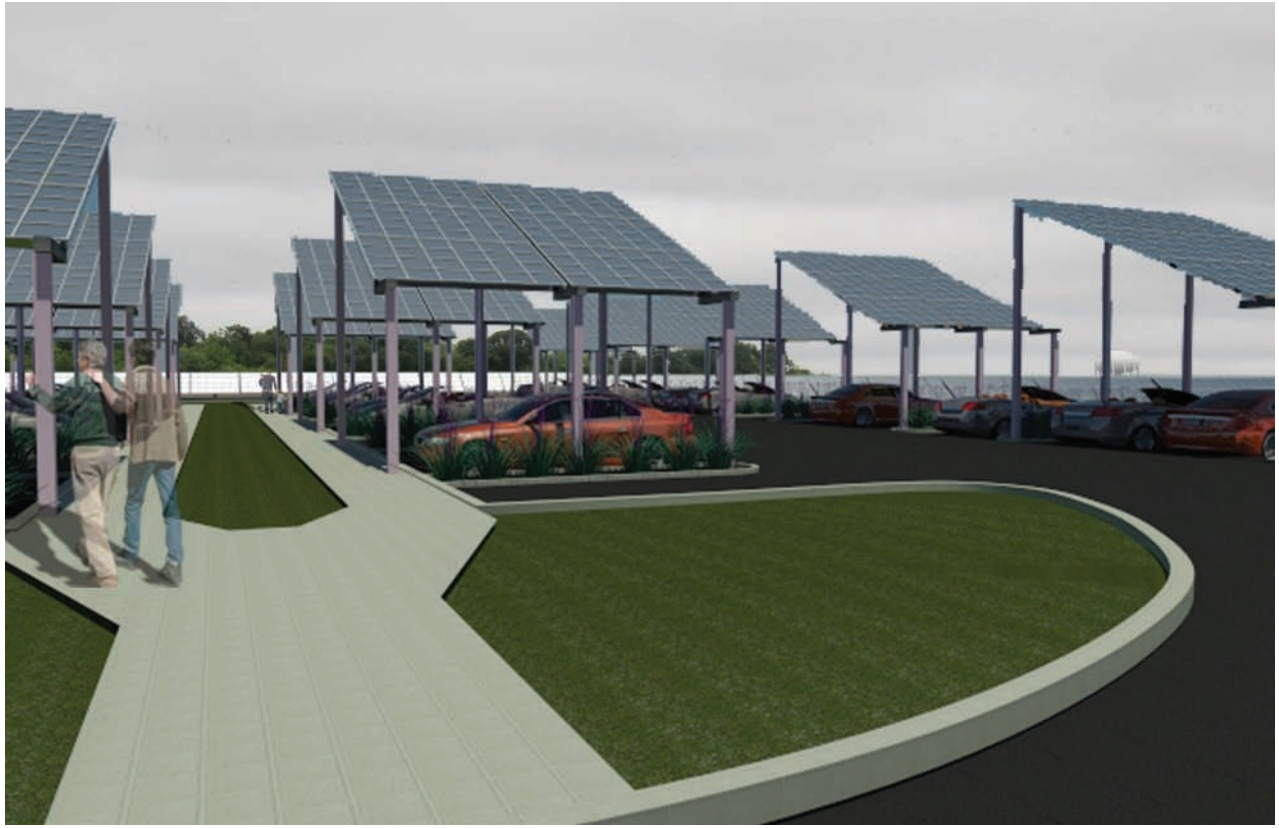


Figure 32. Parking lot with overhead solar structures.

the front of the panel, and, if not managed, will eventually begin to incise and erode the cap in those areas.

In this design the solar array is split along the natural ridge of the terrain. This provides a main axis to the solar garden as well as controlling exactly where the storm water from the solar panels will travel. A number of panels on the parking lot side of the ridge will be fit with a gutter system to catch most of the water that runs off of the panel and allow it to be collected in a water collection tank. This water can then be used to water the trees in the bosquets around the plaza. Rather than hide this system, the gutters will also be visible to visitors and the water collection tank will not only be above ground but provide a border for one side of the parking lot. Gravity will but the primary use of controlling the flow of water but if need be, through solar energy, pumps can be used to move it elsewhere. Any of the panels that are not fitted with a gutter will have a small trench system that consists of a pipe and crushed gravel to carry the water away from the cap and prevent erosion. This water will led to bio-swales where plants will help to absorb the water. Any storm water landing on a solar panel on the parking lot side of the ridge not fitted with a gutter will pass through the large bio-swale on the edge of the parking lot described earlier. All rainwater landing on a solar panel on the eastern side of the ridge will be fed into a bio-swale just inside of the ring road before it moves through the existing detention basin constructed and managed by General Electric (GE). This system of rain gardens on the eastern side of the ridge will slow the flow of storm water sheeting through this system during a rain event and help in preventing a rush of storm water released to nearby streams and lakes.

The most interesting part of this design is the solar garden located at the highest point of the site and right in the heart of the solar array. Punctuated by a single great White Oak tree in the middle of rows and rows of solar panels, this deck provides the only refuge from the sun's rays in this area of the park. Five-feet of fill at the highest point have been added to lift the deck and the tree up and above the solar field providing a great vantage point to not only look out across the array but also back across the vastness of the GE landfill. At this moment visitors can truly get a sense of how grand this landfill was and an understanding of its transformation from what it was into the new park that it is. The grading of this section will require 770 cubic yards of fill (208 tons).

From the parking lot the solar garden is marked by three taxus media hedges that act as entrance markers to guide visitors down the correct path to reach the solar garden. The three foot high hedges continue in rows offset all around the solar garden and even make their way up the slope onto the deck to carve smaller seating niches out of the larger space. Looking towards the GE landfill the design shows these hedges that are continuation of the solar rows completely interlocked. This continues with the conceptual theme and makes the visitor feel like the rows of solar panels have been intentionally pulled apart for the purpose of creating this refuge and planting the great tree. The solar garden starts the main axis that extends through the park. It is fitting that the axis begins from an interlocked position with the hedges and opens through the landform volumes of the central space and the boardwalk in the meadow and pond.

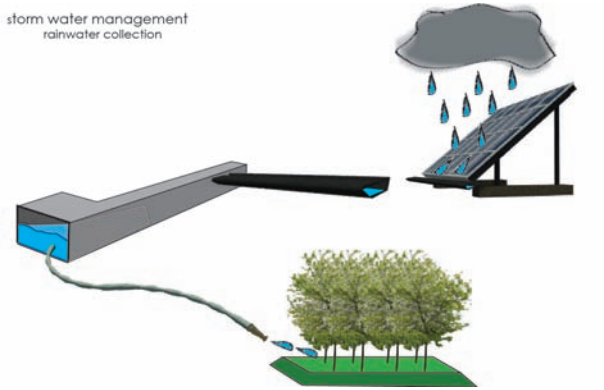


Figure 33. Rainwater collection from solar panes and irrigation.

Water Collection

The hard surface of the solar panels that feed into the water collection system have a surface area of 22,216 square feet. Assuming an average of 45.95-inches of rainfall per year in Voorhees, New Jersey, we have the potential of collecting 7,343 gallons of rainwater per week (factoring an estimated water recovery of 60%) from the panels with the gutter collection system.

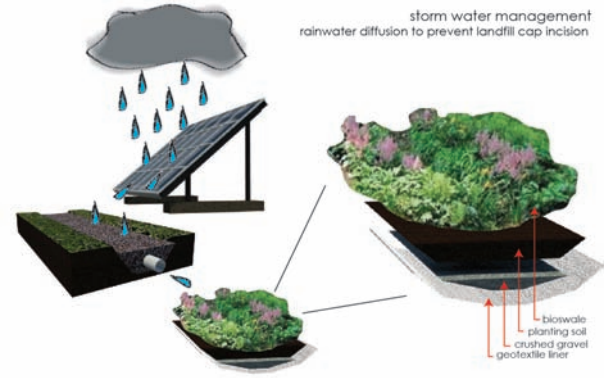


Figure 34. Rainwater diffusion to bio-swales to prevent incision into landfill cap.

Figure 35. Perspective looking into solar garden.