4TH AND SUSTAINABLE...

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4TH AND SUSTAINABLE...

A Design Thesis Submitted to the
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By

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In Partial Fulfillment of the Requirements
for the Degree of
Bachelor of Landscape Architecture

Primary Thesis Advisor

Thesis Committee Chair

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STATEMENT OF INTENT

Abstract

With a lack of appreciation and the underestimation of the importance and benefits a sustainable ecosystem can provide in today's society, it has become a topic that needs to be tended to. A great way to approach the design of sustainable sites, is to follow the guidelines of The Sustainable Sites Initiative(SITES), as well as find a project that can utilize them, and raise awareness in the publics eye. With the large budget and exposure a stadium receives, it is a strong development type to pair with the guidelines for SITES. This pairing can positively regenerate both sustainable ecosystems and an understanding of the importance they can carry today.

Problem Statement

There is a lack of attention and care when addressing the sites sustainability for the design of professional sporting venues.

Project Typology

Sustainable Sites, and Sporting Venue

Claim

Professional sporting venues fail to address the sustainability of their sites.
The sites sustainability is a very important aspect of any design,
and if designed properly it can greatly enhance of ecosystems and lives.

Actor

Landscape Architects and Engineers will develop sustainable strategies to meet guidelines.

Action

Using research, design practices and strategies will be installed to
decrease the impact on the site, as well as improve the sites natural state.

Object

The professional sporting venues site will be designed to better our lives and ecosystems.

Theoretical Premise

When projects that garner both the attention and budgets that these professional sporting venues receive. It often becomes a wasted opportunity to enhance and help regenerate the natural benefits and services we can receive from having a healthy and sustainable ecosystem. Which is why this thesis looks at introducing SITES to the project typology of professional sporting venues, and how they can help regenerate and spread word of the importance of sustainable sites.

Project Justification

Because of the way our society today has forgotten and underestimated the importance of having healthy and sustainable ecosystems, it has become important to not only revitalize and regenerate these ecosystems. But to reeducate the public on the importance and benefits that can come with this revitalization.

PROPOSAL

Narrative

Have you heard of sustainable design?
According to an article found on the U.S. General Services Administration website (2012), "Sustainable design seeks to reduce negative impacts on the environment, and the health and comfort of building occupants, thereby improving building performance. The basic objectives of sustainability are to reduce consumption of non-renewable resources, minimize waste, and create healthy, productive environments." Sustainable design has become increasingly common in developments today, but its carry over to the development of sporting venues has been subpar. Currently there are hundreds of thousands of sporting venues worldwide, and over 2,450 professional and collegiate sporting venues in the United States alone. The number of venues being constructed, and/or retrofitted continues to grow every year. Although in recent years they have started to address the lack of sustainable and green design in these sporting venues, the surface has barley been scratched when it comes to the importance and opportunities of sustainable and green design. So with the idea of greener and more sustainable practices in building and design becoming increasingly more important and accepted in today's culture, this thesis researched and evaluated the venues that have taken steps forward. It looks at the steps that have been taken, and how they may or may not have been successful. It also looks into the steps that may have been missed and the possibilities of utilizing these steps, as well as the benefits they may bring. After analyzing this research, ideas and strategies found successful and relevant have been installed into the design of a sporting venue which can be used to set the standards for sporting venue developments, as well as educate people on the importance of sustainable and green design. Upon completion this thesis will have successfully determined how sporting venues can effectively incorporate green and sustainable design in ways that will benefit the development of sporting venues, the environment, and the profession of Landscape Architecture.

User/Client Description

Client

The project will be designed for the Metropolitan Sports Facilities Commission (MSFC).

Used By

The site will have a wide variety of users, due to its range of activities. The site will be used by residents of the surrounding community for it's trail system as well as the an open space park. During game days, the site will be used by the teams who will be playing in the stadium, as well as the roughly 80,000 fans attending the event.

User.1

The primary user will be the roughly 80,000 attendees of the events that take place at the venue. These users will utilize the 24,000 parking spaces, the open park spaces for tailgating and various activities, as well as the trail systems to get to and from the site.

User.2

The Performers (Minnesota Vikings, Concerts, other teams/sports playing) at the Stadium/Venue will be a secondary user of the site. These users will use the practice facilities, Stadium/Venue, and the parking.

User.3

The roughly 50,000 people of the sites surrounding communities (Arden Hills, Mounds View, Shoreview, and New Brighton), will be additional users. The site will offer them large open space parks, and trail system for walking, biking, roller blading, running, etc.

Major Project Elements

Scope

This project will focus on designing a sustainable site for a sporting venue, using sustainable and green design strategies to develop the necessary amenities needed for a professional sporting venue. When designing this project The Sustainable Sites (S.I.T.E.S.™) Initiatives guidelines will be used to ensure sustainability.

Parking Facilities

The project will require a minimum of 24,000 parking stalls.

Trail System

Trails that connect to existing of site trails will be necessary to provide non-motorized transportation opportunities, as well as physical activity.

Plaza/Tailgating/Open Spaces

There will be a need for multi use spaces where people can carry out various activities. The main need is space for people to tailgate, other spacial needs are an entrance plaza, and the ability for some of these space to become open space parks on non-game days.

Site-K Remediation

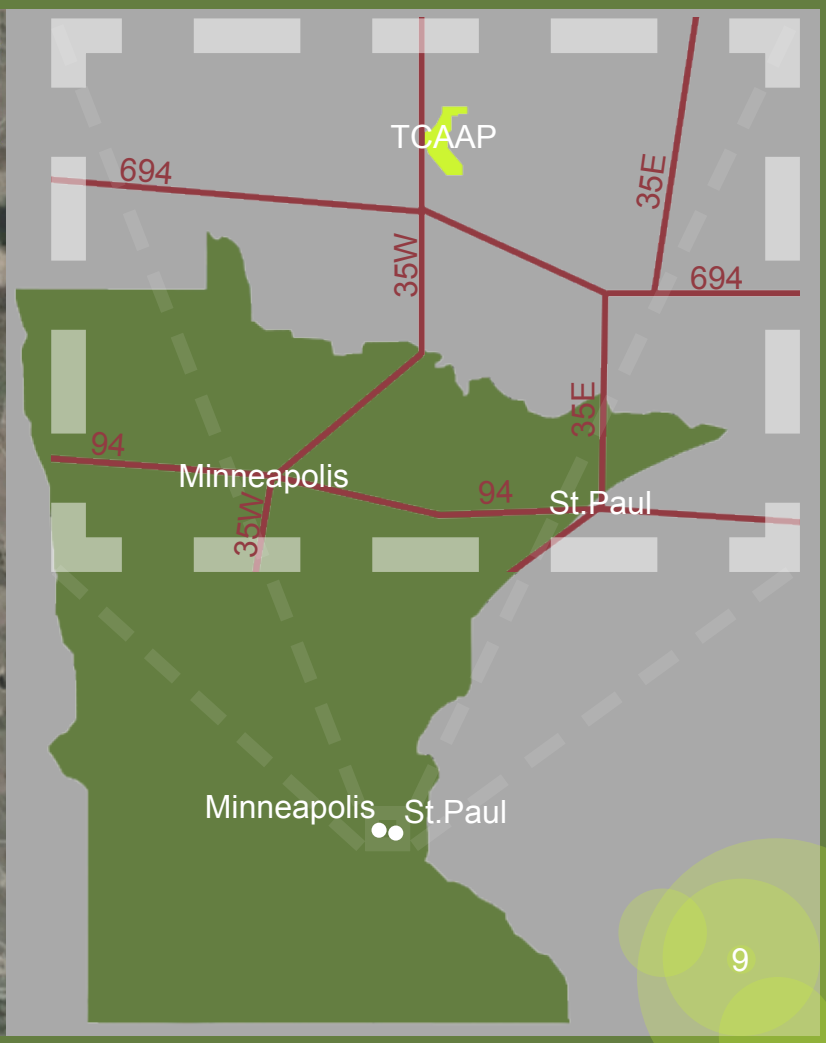
The site is Superfund Brownfield, and remediation of the site will become a must.

S.I.T.E.S.™ 5 Focuses

The S.I.T.E.S.™ five main areas of focus will be a guiding factor in the projects design, these five focuses are; Hydrology, Soil, Vegetation, Materials, and Human Health & Well-Being.

Proposed Site

The proposed site for this project is a ~300-acre tract of the former Twin Cities Army Ammunition Plant (TCAAP) located in Arden Hills Minnesota. Arden Hills is a suburb of the Twin Cities, and is located in Ramsey County. The site itself was formally used by the United States Army to manufacture ammunition. Due to improper disposal and the toxicity of ammunition manufacturing, the site has been listed as a federal Superfund Site. According to the Minnesota Pollution Control Agency (2012), "Contamination resulting from past ammunition manufacturing operations at the facility has been identified in groundwater, soil, sediment and surface water." Some aspects of the sites remediation have already been addressed, but far more work is still needed. This site provides a prime opportunity, and space for this project to be installed.



Project Emphasis

The emphasis of this project is the utilization of the S.I.T.E.S.™ guidelines in the development of a professional sporting venue, to create and educate people on the benefits and importance of having sustainable sites and ecosystems.

Plan for Proceeding

Definition of a Research Direction

Research will be conducted in the following areas:

- The Theoretical Premise
- Project Typology
- Historical Context
- Site Analysis
- Programmatic Requirements

Design Methodology

The design methodology that will be used for this project will be an approach of mixed method, quantitative, qualitative, and interviews. Data needed for this project will be in the following areas;

.What green strategies are out there?
.What green strategies have worked?
.What green strategies have not worked?
.What green strategies have not been tested yet?
.How will strategies fit into this project, and/or climate?
.What amenities are needed for the sporting venue?
.What toxins are present at the site?
.What are the affects of these toxins?
.Where are toxins at?
.What are the levels of these toxins?
.What levels do they need to be reduced to?

And more data that will arise during research. Once the necessary data has been collected, it will have to be analyzed on how it has worked before, how it should work in this installment, and how it can be improved.

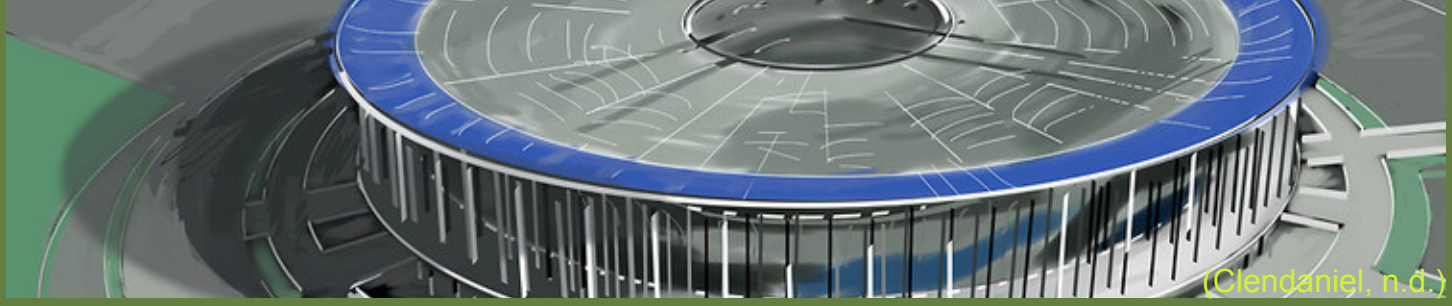
Documentation of the Design Process

Compilation will be done through a project booklet. The booklet will be digitally stored in an online archive where it can be viewed digitally or printed off as a hard copy. When I present the project at the conclusion of thesis I intend on using digital media.

Plan for Proceeding

WEEK	EVENT	DESIGN	PROGRAM	DRAWINGS
1	-	1%	5%	-
2	-	10%	15%	-
3	-	15%	20%	-
4	-	25%	25%	-
5	R&A Pres.	35%	35%	-
6	-	40%	45%	-
7	-	45%	50%	-
8	-	50%	55%	-
9	Design Dev. Pres.	55%	75%	-
SB	Spring Break	55%	80%	-
10	-	55%	85%	-
11	-	75%	100%	33%
12	-	100%	100%	66%
13	-	100%	100%	100%
14	Boards Due	100%	100%	100%
15	-	100%	100%	100%
16	Final Pres.	100%	100%	100%
17	Final Doc. Due	100%	100%	100%

PROGRAM


(Clendaniel, n.d.)

Research Results/Literature Review

Green and sustainable design is everywhere we look these days, but one place you may not find it is in sporting venues. Until recent years, when designing and constructing sporting venues people have often overlooked green and sustainable design practices. These practices serve an important role in protecting and helping our environment, and ensuring our planet will be healthy enough for the generations after us to thrive. So what green and sustainable design practices of Landscape Architecture can help improve the effects sporting venues have on our environment?

A Co. Exist article (Clendaniel, n.d.) explains how Brazil plans on renovating Estadio Mane Garrincha Stadium into a LEED Platinum, net-zero-energy stadium for the 2014 World Cup and the 2016 Olympics. If they succeed in fulfilling their lofty goals it will be arguably the biggest advance in sporting venue design and construction. Brazil is set to do double-duty hosting international sporting events, the 2014 World Cup and then the 2016 Olympics. The Estadio Mane Garrincha will evolve into the Estadio Nacional de Brasilia and become the focal venue for both events. Brazil plants on renovating the existing venue, and when finished they hope to reach LEED Platinum certification and become the first net-zero-energy stadium in the world. The renovation will bring seating capacity up to 70,000, making it the second largest World Cup Stadium. In order to achieve LEED Platinum certification they will have to utilize a number green and sustainable design practices. Some practices they intend on implementing are, a ring of solar photovoltaic panels along the roof to provide the stadium's power, as well as transfer power back to the grid, bicycle parking for 1,000 bikes inside the stadium plus another 2,500 bike parking spots, a photocatalytic membrane on the roof that captures air pollution as it falls, and breaks down the chemicals, removing them from the atmosphere, a rainwater collection and recycling system for landscape use as well as use in low-flow water fixtures in the stadium, an adequate mix of both natural lighting strategies and shading strategies to counter the hot Brasilia sun, and lastly the reuse of materials from the existing stadium. The solar panels proposed in the design are expected to perform for at least 25 years, and provide a return on investment in 10 to 12 years. The Estadio Nacional de Brasília is expected to be completed at the end of the year. (Clendaniel, n.d.)

This Article covers what may end being one of the biggest advances in the way we design sporting venues, but first it needs to be completed. The goals in this article are generally the same as those in this thesis, except the fact of this thesis focusing mainly on Landscape Architecture. The article only went into broad details on their plans to achieve these grand goals, and could have contributed more to this thesis if it better detailed how they plan on executing this plans. But all in all this article helps open eyes on many opportunities, and levels of the design that both need and can be approached when going green and sustainable in sporting venue development.

Research Results/Literature Review

In a MetLife Stadium article ("EPA, New," 2009) they address the partnership between the Environmental Protection Agency (EPA) and both the New York Jets and Giants for the design and construction of MetLife Stadium. The partnership outlined plans to incorporate environmentally-friendly materials and practices into the construction and operation of the new facility in East Rutherford, N.J. EPA Acting Regional Administrator George Pavlou made claims that the new venue would be one of the greenest stadiums in American professional sports, as well as stating that the plan by the two teams would be a blueprint for new sports venues. The agreement utilized strategies to reduce air pollution, conserve water, cut down on energy, improve waste management, and reduce the environmental impact from construction. The agreement also contained goals of cutting the stadium's yearly water use by twenty-five percent, becoming thirty percent more energy efficient than the ex-venue Giants Stadium, increase recycling by twenty-five percent and recycle seventy-five percent of waste from the venues construction. All the goals of the agreement will save emissions of nearly 1.68 million metric tons of carbon dioxide during the stadium's construction and first year of operations, which is equivalent to more than the yearly emissions of more than 300,000 cars or 150,000 American homes. Highlights of the project goals agreed on in the partnership are as follows, the use of 40,000 tons of recycled steel, and the recycling of 20,000 tons when ex-venue Giants Stadium is demolished, seating made partially of recycled plastic and scrap iron, using a rehabilitated former Brownfield as the site for the new venue, the reduction of air pollution by construction vehicles through practices of cleaner diesel fuel, diesel engine filters, and shortened engines idle time, the use of environmentally-friendly concrete, the reduction of water consumption and an increase in energy efficiency, the ability to provide public mass transit options for fans, and the use of compostable cups, plates, etc. On top of it all MetLife Stadium will report the progress of its goals to the EPA every six months. ("EPA, New," 2009)

The fact that the organization made an agreement with the EPA will make sure construction and designs won't steer away from the intended goals put forth. A lot of the measures taken in the MetLife Stadium project are small differences that add up in the long run, but one key strategy they utilized is constructing the stadium on a reclaimed Brownfield. This thesis is looking to put a stadium park on a Brownfield site and find ways that the venues can reestablish the land.


("EPA, New," 2009)

Research Results/Literature Review

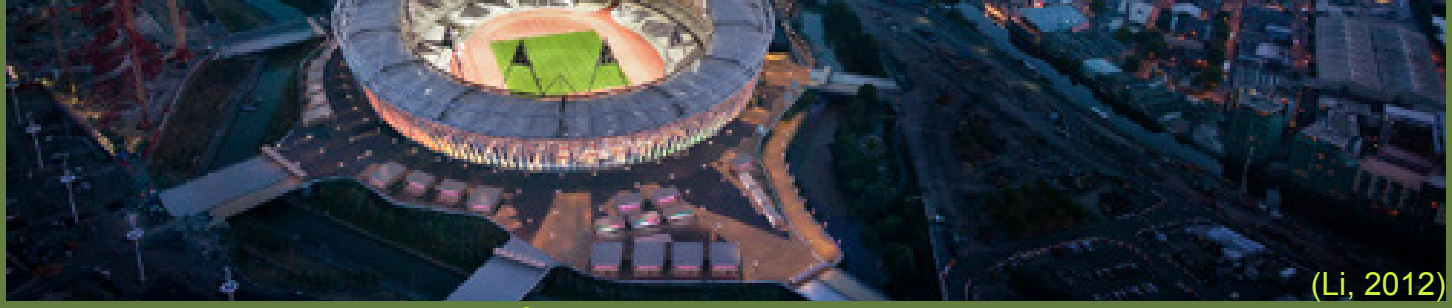
An article found on Greeniacs.com (King, 2010) discusses some of the "winning" sporting venues when it comes to green and sustainable design practices, as well as some simple practices that can be used. The first venue mentioned is located in the cold lands of Minnesota, The Target Center home to the NBA's Timberwolves. In 2009, the Timberwolves unveiled the first green roof in professional sports, at 2.5 acres it is the fifth largest green roof in the United States. The roof cost $5.3 million to construct and is covered with plants native to the Minnesota prairie such as lupine, wild strawberry, and dotted blazing star. The green roof is expected to last at least forty years, as well as capturing about a million gallons of storm water every year. That is just one of the many benefits that can come with a green roof. Some simple practices that can be used to turn losing stadiums into winning ones, switching from incandescent lighting to Low Emission Diode lighting (LED) to illuminate everything from walkways to Jumbotrons, conserving water by retrofitting with waterless urinals, adopting new ways of generating energy with solar panels or wind power, and plant trees or purchase credits to offset carbon emissions. If true energy efficiency is gained, a stadium might receive Leadership in Energy and Environmental Design (LEED) certification. In 2009 the Washington Nationals became the first Major League Baseball (MLB) team to have in a LEED certified venue. The venue earned LEED certification by using recycled materials, installing an innovative storm water filtration system, and it was built on a reclaimed Brownfield. The biggest contribution to sports carbon footprint is people driving to the game, says Michel Gelobter, the founder and CEO of Cooler, an Oakland, Calif.–based software firm that tracks carbon footprints and reduction methods. Too many sporting venues are located in the suburbs, where they are out of reach of public transportation. What can be the future for greening stadiums? Brownfield sites and promotions such as giving a free beer or hot dog to those who bike to games? While many venues are off to promising starts, the Environmental Hall of Fame remains far away for most. (King, 2010)

The article covered some simple, promising, and even Landscape Architecture strategies. The use of green roofs is obviously a new practice to sporting venues, but it should be an interesting strategy to research further and maybe even incorporate. The small and simple things like LED lights and waterless urinals show that every little detail needs to be addressed when looking at a holistic green and sustainable design. The use of building on a Brownfield is something this thesis incorporates, so it was reassuring to see it considered important as well as part of green venues future. Finally two important practices were touched on in the article. First, onsite renewable energy through both wind and solar power are something that really needs to be addressed in future sporting venues. Secondly, the utilization of Public Transportation is very important when reducing carbon footprint, not to mention many benefits environmentally, economically, and in safety.

Research Results/Literature Review

Next, a Temple University Communication article (Lausch, 2011) looks into the impacts of "Green" sports teams, and how they may affect or educate people. The article starts out with the Philadelphia Eagles who have been called the NFL's greenest team for their sustainability efforts ranging from tree-planting initiatives to employee-reimbursements that promotes the use of wind energy. The team has also announced plans to use solar power, wind turbines and biodiesel or natural gas to transform Lincoln Financial Field into one of, if not the most, environmentally friendly stadiums in the world. Scholars at Temple University's Sport Industry Research Center (SIRC) are testing the proposition that sport organizations, because of their diverse fan bases and far-reaching messaging, can create more positive social change. The research had found that corporate social responsibility can strongly influence a team's reputation, which can in turn promote positive word of mouth among fans and increased willingness to buy tickets or merchandise. But will it change fan behavior? The research said not so much. The fact that someone's favorite team believes in recycling doesn't alter the action of that person recycling. It really comes from the individuals internal values about recycling. (Lausch, 2011)

The fact that researchers have found that a sports organizations green and sustainable practice have little to no affect on a person or fans own green practices is a little discouraging. On a positive note, the articles research did find that fans will absorb the information of these practices and pass it on to others. This means that the awareness and education can be promoted through green and sustainable sporting venues, but it depends on the individuals internal morals to utilize these practices.



(Li, 2012)

Research Results/Literature Review

Greeniac.com is home to another interesting article (Li, 2012) on green stadiums to date. The article looks into a few examples of stadiums that have either planned to take steps to be greener or were built with green and sustainable design in mind. The first venue is none other than the Philadelphia Eagles Lincoln Financial Field (The Linc); The Linc is a notable stadium already succeeding in its green and sustainable planning, it has even been praised by President Obama himself. One future plan is to line the stadium with wind turbines to power the venue. At The Linc just about everything is recycled to minimize waste, from tarps to cooking oil. The Eagles have also made an agreement to solely purchase their power from SolarBlue at a fixed rate for the next 20 years, saving the Eagles $60 million. The eagles have a program entitled "Go Green" that aims to set a positive example to people as well as other stadiums by aiming to use 100% renewable energy, promoting recycling and the reduction of one's carbon footprint. The Eagles organization also offsets the emissions they create traveling by planting a well calculated 1,500 trees around the stadium. They have also been converting their waste cooking oil from concessions to biodiesel that can be used to power stadium equipment. Although plans to install wind turbines and solar panels have been on the way for a while, they have yet to actually accomplish this magnificent feat. They have recently partnered with NRG to further their environmental goals (they are in the process of installing these). The green stadium movement is not only present in the NFL and other professional sporting leagues, but also in collegiate sports. The University of North Texas Apogee Stadium was awarded LEED Platinum Certification and was the first newly constructed collegiate football stadium in the nation to achieve the highest level of LEED certification. Apogee Stadium's sustainability efforts include installing three wind turbines to power the entire facility and a landscape made up of fifty percent native plants to the Texas area. Twenty percent of the material used to build the stadium was recycled materials and then the stadium's contractor further recycled seventy-five percent of the construction waste to keep it from wasting landfill space. The stadium also encourages attendees to be more environmentally friendly by conveniently placing bus stops, secure bike storage, and parking for carpools. They utilized natural lighting in most indoor spaces which saves on electricity. Green and Sustainable design in sporting venues isn't only in North America, the 2012 London Summer Olympic Games utilized environmentally friendly in their food, venues, recycling program, and many other important aspects of the event. The main stadium was constructed with only twenty-five percent as much steel as the Beijing Olympic Stadium, was planned to have a renewable energy goal of twenty percent, but fell short at eleven percent. The stadium was built to be partially deconstructed after the Olympics, turning it into a large park on top of being a functioning sports arena. (Li, 2012)

Some things to take away from this article would once again include renewable energy, recycling, and transportation connections. Another key point found in this article is the flexibility, multipurpose, or future planning that can be utilized with sporting venue design.

Research Results/Literature Review

Green Building Elements website hosts an article (Meyers, 2012) that covers five of the greenest stadiums in the world and what unique strategies they help make them sustainable. The article starts out by touching on sustainability in sporting venues, and the approach taken before sustainability has a thought in sporting venues. Sustainability is one of the most important aspects of any new architectural design and in recent years we've seen this spread into the world of sports stadiums. Traditionally, the concept behind sports stadiums has been to create a coliseum like structure which adds theatre and creates an incredible atmosphere with little prior thought ever given to sustainability. We are now starting to see more sporting venues designed and constructed with attention to sustainability. The five venues acknowledged in the article are Dalian Shide Stadium in China, 2012 Olympic Stadium in London, Rectangular Stadium in Melbourne, World Games Stadium in Taiwan, and MetLife Stadium in New Jersey. Starting with Dalian Shide Stadium in China, the stadium hasn't been constructed yet it and is only in proposal stage at this point. The stadium looks as if it is growing from the ground, two of the exterior walls are completely covered in grass and plants while the other two open ends that allow a glimpse either in or out. Some key strategies in the proposal are the use of renewable energy, day lighting, and water recycling together with the natural green exterior, clad in living plants which change with the seasons. The article then moves to the 2012 Olympic Stadium which was constructed for the 2012 London Olympics. At the Center of the design was the desire to use as many different forms of low impact materials as possible, the design was emphasized on minimizing the amount of materials used in the project without reducing the stadiums performance. The key to this design was to form a lightweight, compact stadium and to significantly reduce the amount of material and energy used in creating the build. Also looking to reduce material use was the Rectangular Stadium that opened in 2011 in Melbourne, Australia. The design used state-of-the-art engineering, which featured a unique cantilever design partnered with a triangular panelized facade which reduced the amount of steel used by a typical cantilevered roof by fifty percent. The roof of the stadium is geodesic and uses some of the most advanced cladding in the world, this helps regulate the temperature of the building. Rectangular Stadium also utilizes a rainwater collecting system that can save as much as 500,000 gallons of water a year. The very same rainwater collection system can also provide four other area venues with water. Another astonishing venue cover by the article is Taiwan's World Games Stadium. The stadium implemented 8,844 solar panels in the design of its roof, these solar panels power the entire stadium as well as creating additional power that can be sold back to Kaohsiung. The solar panel roof of The World Games Stadium could potentially produce enough energy each year, to power as much as eighty percent of its surrounding neighborhood. The final stadium in the article is found in the United States, it is MetLife Stadium in East Rutherford, New Jersey home the New York Jets and Giants. The United States Environmental Protection Agency (EPA), the both New York teams came together to turn the MetLife Stadium into one of the greenest sporting venues. The partnership aimed to reduce air pollution, conserve energy, reduce water usage, improve waste management and reduce the environmental impact on construction. They saved an estimated 1.7 metric tons of carbon dioxide during the build, thanks to its recycling and conservation measures. (Meyers, 2012)

Material reduction seemed to be a common practice utilized when designing and constructing the venues found in this article. The first venues approach of green walls or green roofing systems is an interesting Landscape Architecture strategy that this thesis could take advantage of. The use of renewable energy, mainly solar power in these cases, has once again seemed to become a necessity in venue planning. Another Landscape Architecture strategy that this thesis can learn from this article is the use of water collecting, and recycling systems, either to recharge ground water or use as grey water in the projects facilities.

Research Results/Literature Review

(NFL, 2011)

Next is an article from the NFL (NFL, 2011) on ways the league is going green in their events and facilities. The NFL has been running a comprehensive Super Bowl Environmental program, along with the host communities, for over fifteen years. The program contains five main initiatives, waste management, material reuse, food recovery, book and sports equipment donation, and greenhouse gas reduction. The waste management initiative is implemented at all major Super Bowl facilities including the stadium, NFL Experience, Media Centers, and area hotels. The waste management and recycling efforts reduce waste that goes to landfills. As for the food recovery initiative, extra food from Super Bowl events is collected for donation. The food recovered through these efforts goes to soup kitchens, shelters and other local organizations. When it comes to the materials reuse initiative, decorative materials, building materials, office supplies and other reusable materials are donated to local nonprofit organizations. The sports equipment and book donation initiative collects used books and sports equipment from individuals who no long have a use for them, they then donated the goods to schools and youth organizations throughout the area. This initiative transfers tens of thousands of books and sporting items to kids in need each year. For the greenhouse gases reduction initiative the NFL uses renewable energy credits (REC) to offset all energy used at major Super Bowl venues. They also plant several thousand tree seedlings each year in the Super Bowls host community, and along with the US Forest Service/USDA they track the annual environmental benefits produced by the trees they have planted. Some NFL teams that have taken green steps are the Philadelphia Eagles, Who have recycled thousands of tons of waste, created a 6.5 acre forest where they have planted more than 4,000 trees and shrubs, and are currently converting their stadium to renewable energy through onsite wind and solar energy along with bio-diesel. Both New York teams, Giants and Jets, have established a partnership with the EPA for its new MetLife Stadium. Well the Arizona Cardinals offset 100 percent of the energy they use on game days. (NFL, 2011)

The article covered basic strategies used by profession venues and organizations. Some of the more advanced strategies touched on in this NFL article would be the use of onsite renewable energy, both solar and wind, and tree and shrub plantings to offset emissions from team traveling. Both of these can be used as Landscape Architecture strategies when moving forward with this thesis.

(NFL, 2011)

Research Results/Literature Review

("Our Tribe is Green", n.d.)

The Cleveland Indians website has an article ("Our Tribe is Green", n.d.) on the ways they go "Green" when it comes to their organization and venue, the Indians are a Major League Baseball (MLB) team. Progressive Field has been recycling plastic, cardboard, and aluminum since its first season in 1994. The venue the Cleveland Indians call home continues to be among the industry leaders in taking a proactive approach to supporting various environmental initiatives to reduce their carbon footprint. The Indians run a campaign "Our Tribe is Green," it launched in 2008 and focuses on recycling during all game days with recyclable containers plastic bottles. The Tribe recycling efforts are extended into the front office and include recycling all paper and cardboard products. In 2010 they added organic waste composting to the campaign and then expanded on it in 2011. The Cleveland Indians organization is also committed to exploring opportunities renewable energy, in 2012 the organization became the first in Major League Baseball to implement wind power with an installation of experimental wind turbines. The turbines came from a partnership between The Cleveland Indians and Cleveland State University (CSU). The pioneering wind turbine is located on the south-east corner of the ballpark. Development of the wind turbine has been funded through grants from the U.S. Department of Energy and the State of Ohio.
The structure installation is an ongoing effort of the Cleveland Indians to continue and promote sustainability initiatives within Northeast Ohio. The "helical wind turbine" design is more conducive for urban areas and confined spaces than a traditional long-blade wind turbine and rated at 25,000kWh per year. The Indians Progressive Field was also the chosen host location for the 2011 National Recycling Day led by Natural Resources Defense Council (NRDC). On a regular basis items recycled are cardboard, paper, aluminum, plastic #1, scrap metal, cooking oil, florescent bulbs and ballast, batteries, electronics, organics (compost), and wood pallets. Since 2007 they have generated 47 percent fewer tons of trash, and cut the number of trash pickups by 60 percent. All signs installed since 2008 are LED, they use Green Seal certified towels and tissues, compostable cutlery and hot serve cups, and biodegradable retail bags. Progressive Field was the first American League ballpark to go solar; the solar installation provides 8.4 kilowatts of clean, renewable electricity.

("Our Tribe is Green", n.d.)

The Indians article addresses some of the small things they have incorporated into their venues, such as compostable cup and more. What I found more interesting in this article the renewable energy like the solar panels, but mainly their locally designed wind turbines. The helical turbines show the creativeness and willingness to advance the ways sporting venues are approaching green and sustainable design, it shows that each practice way have different ways of approaching them.

Research Results/Literature Review

Moving on, an article from the Triple Pundit website (“Six Ways,” 2010) addresses how the National Football League (NFL) was trying to get a little greener when it came to Super Bowl XLIV. The article first asked two questions, is the NFL taking steps to reduce the environmental impact of the Super Bowl? And, what is the league’s view of sustainability, in general? When looking for answers the article talked to Jack Groh, director of the NFL’s Environmental Program, and he explained six ways the NFL was trying green up Super Bowl XLIV. First of all, the NFL had teamed up with NextEra Energy Resources, the largest wind and solar energy producer in North America, to power the 2010 Pro Bowl and Super Bowl with renewable energy. NextEra Energy Resources, through its EarthEra initiative, supplied Green-e certified Renewable Energy Certificates (RECs) to match the electricity consumption during the NFL’s preparations leading up to both Bowls Pro and Super, as well as usage during both games. This was the fourth year in a row that the NFL had used RECs to match electricity consumption during the Super Bowl and its related events. It was the first year the NFL had used RECs for the Pro Bowl. Secondly, in partnership with the US Forest Service and the Florida Division of Forestry, hundreds of trees were planted at various locations throughout South Florida. Thousands of trees have been planted over the past six years in connection with the Super Bowl and Pro Bowl. Thirdly, solid waste was reduced through recycling at Dolphin Stadium (home of the Miami Dolphins, and host of Super Bowl XLIV), the Greater Fort Lauderdale/Broward County Convention Center (the Super Bowl XLIV Media Center), the stadium compound, and other selected venues. Fourth, Extra prepared food from Super Bowl events were collected and donated to community agencies. Fifth, All leftover materials from Super Bowl and Pro Bowl events were inventoried and donated to local non-profit agencies in South Florida. The donations included decorative materials, building materials, office supplies and equipment. And lastly, the Super Kids – Super Sharing project provided an opportunity for local school children to donate their used books and sports equipment to other needy children in the South Florida community. All in all, Super Bowl XLIV had sponsored more than 50 charitable activities and community outreach programs. Groh said these programs evolved from simple recycling initiatives that the NFL began 17 years ago, before “going green” became as mainstream. Groh also added, the league continued to embrace sustainability programs for two main reasons. One, it’s a smart operational move, if being environmental means less waste and more efficiency then that’s just a better way to run a business. And two, the NFL has a long-standing commitment to a variety of different social programs. The NFL has a tradition of being the best possible guest and leaving positive improvements in the communities that host the Super Bowl. (“Six Ways,” 2010)

The article is helpful in keying on common ways professional sporting venues and organization have approached green and sustainable practices, but it also show the lack of Landscape Architecture strategies that haven’t been utilized. This article strengthens the point of venues realizing the problem, but not attacking in a holistic approach.

Research Results/Literature Review

An article from Environmental Leader ("Sports Teams," 2010) touches on professional sports organizations that are planning on improving their environmental sustainability programs, as well has list a small number of examples on how teams are doing that. As of February 4, 2010 eighty percent of professional sporting teams in North America were planning on improving their environmental sustainability programs, and about half of them were looking at having plans with both long term and short term goals. In addition, nearly sixty percent have formed in-house "Green Teams." Some examples of how these teams and their venues have stepped towards a greener tomorrow include energy conserving improvements, recycling programs and meeting U.S. Green Building Council's (USGBC) and Leadership in Energy and Environmental Design (LEED) requirements. In Canada, the Alberta World Cup 2010 cross-country event was powered by 100 percent renewable energy, primarily wind and hydro from Bullfrog Power. The sports event had also pledged a zero waste initiative that included the recycling of all wires used for television cabling and the use of recycled paper for the printing of marketing material.

("Sports Teams," 2010)

The fact that eighty percent of organization were looking to expanded their green programs, and that sixty percent wanted to establish internal "Green Teams" shows that the industry is moving in the right direction for green and sustainable venues to become the norm at some point in time sooner rather than later. The examples listed proved to be very broad, which doesn't narrow down if any practices pertained to Landscape Architecture.

Research Results/Literature Review

After evaluating the above articles, the information gained from them can be summarized into the following. Although green and sustainable design in sporting venues has been over looked for some time, it has been making a push in recent years and is looking to be moving in the right direction. The ways sporting venues can address green and sustainable design are both small and large, but need to be design in conjunction to reach a holistic green and sustainable sporting venue. The main keys to making sporting venues both sustainable and green pertain to, waste reduction; recycling; water reuse, collection, and use reduction; onsite renewable energy; emission offsets; reduction of construction waste, energy, material, and emission; environmental friendly transportation option; site reclamation or reuse; natural lighting; passive systems; heat island effect; and stadium flexibility or multiuse. Strategies and keys that pertained to the field of Landscape Architecture were, green roof and walls; water collection, storage, filtration, and reuse; water efficient planting; planting to offset emissions, renewable energy; composting; material selection, reuse, and recycling; Brownfield reclamation; environmental friendly transportation options; and pollutant reduction through landscapes.

This thesis could benefit sporting venue development and Landscape Architecture by addressing new ways to approach green and sustainable design in both areas. It can become a guide for using reclaiming Brownfield through sporting venue projects, or any project type. The Midwestern climate and cold winters of Minnesota can also show how these green innovations can be utilized in more than warm cities. Hopefully this project will be able to show the importance of green and sustainable design in all project types, as well as identifying the connecting Landscape Architecture can have with these large scale sporting venue projects.

If sporting venues can become a greener, people will be able to see and understand the benefits of green and sustainable design, as well as making benefit our environment, economy, and the venues community.

So with most sporting venues missing sustainable design practices, this thesis will ask, what sustainable design strategies of landscape architecture can be installed to improve the sustainability of this development type?

This thesis hypothesizes that with the proper utilization of green and sustainable Landscape Architecture design, sporting venues will be able to help the immediate community and environment through its reduced stress on the eco-system and economy, as well as making a small impact on the environment in whole. Future communities that host sporting venues can benefit from the new trend of greener venues. The development type of sporting venues will benefit as well, there will be another green venue to study and advance on for future design and construction. Finally it can help educate people on the importance of green sustainable design in today's culture.

("EPA, New," 2009)

Case Studies

Moving on to the case studies, we will start with MetLife Stadium in East Rutherford, New Jersey. MetLife Field is home to both the New York Giants and New York Jets of the National Football League (NFL). Design by architects, Ewing Cole and 360 Architecture, the stadium opened as New Meadowlands Stadium on April 10, 2010. In 2011, MetLife, an insurance company based in New York City, acquired the naming rights to the stadium. At a construction cost of approximately $1.6 billion (all private financing), it is the most expensive stadium ever built and is the largest stadium in the NFL in terms of permanent seating capacity.

The two teams joined forces with the Environmental Protection Agency (EPA) when they approached the design of this sporting venue. Some key features that brought the development of this facility to such a high level are; the use of 40,000 tons of recycled steel; when demolishing old Giants Stadium 20,000 tons of steel was recycled; new seating to consist of partially recycled plastics and scrap iron; building the stadium on a former Brownfield; the use of environmentally-friendly concrete; reduction of water consumption; increasing energy efficiency; the incorporation of mass transit options for fans; and replacing concession plates, cups, and carriers with compostable alternatives. Some main similarities and differences between MetLife Stadium and the proposed venue are. Proposed Capacity, MetLife Stadium holds 82,566, which is nearly identical to that of the proposed venue. MetLife Stadiums primarily designed for use by NFL teams, this is also the primary use for this thesis's design as well. The climate in East Rutherford, New Jersey is not the same as Arden Hills, but it is pretty similar. Both climates deal with cold winters and snow, which will be very useful when analyzing the design strategies of MetLife Field. When it comes to Landscape Architecture strategies used in the development of this case study, you can see the incorporation of Mass Transit options, and environmentally-friendly materials. These are some practices that can be analyzed when looking into the development of this thesis. As for the existing site, before MetLife Stadium stood at 1 MetLife Stadium Drive, East Rutherford, New Jersey it was a reclaimed Brownfield site. The approach of building on a Brownfield is the one of the key strategies this thesis will utilize. The only problem is the fact that I have been able to find little to no information about the former Brownfield at East Rutherford.

("EPA, New," 2009)

("EPA, New," 2009)

("Go Green Executive Summary 2011", 2012)

Case Studies

The other case study was Lincoln Financial Field (The Linc) located in Philadelphia, Pennsylvania. The Linc was designed by the architecture firm NBBJ and cost $512million dollars to construct from 2001-2003. It's the innovations since that have made The Linc one of the greenest stadiums. The Linc has hosted all sorts of events, football, soccer, lacrosse, concerts, and Monster Jam. ("Stadium Facts," n.d.)

The Linc has earned its status of being one of the greenest stadiums with its additions of both small and large green and sustainable practices. Some of the small things they have done are; motion senor light switches; energy efficient light bulbs; GreenSeal™ certified cleaning products; all paper work is done on 100% recycled paper; encourage employees to make the switch to wind power at their homes, and reimburse them for cost differences; have tree planting to help insulate building heat in the winter; have tree plantings to block the suns heat in the summer; use cups produced from corn rather than plastic; used cooking oil from the stadium is converted to biodiesel, and in turn used in stadium equipment; traditionally printed items, such as the cheerleaders calendar, are offered electronically rather than being printed on paper; and food waste and other compostable waste from game day is collected and composted. Two larger practices utilized at The Linc are onsite solar panels and wind turbines, these produce renewable energy for the venue. If for some reason the venue has to use traditional grid power, the organization purchases Renewable Energy Credits (RECs). From 2003 until 2010, The Linc produced a total of 7,662 tons of waste. Of that waste, 1,566 tons or 20.4% has been recycled. There recycling and composting efforts have prevented the release of more than 6,823 metric tons of greenhouse gas into the atmosphere. The Linc has been using RECs and onsite renewable energy to power starting in 2004, and starting in 2009 it has used those resources for all 100% of its power needs. ("Go Green Executive Summary 2011", 2012)

Some ways The Linc can be studied to help increase to the knowledge needed for the proposed design of this thesis. The capacity at The Linc Is only 65,574 people, which is less but still relatively similar to that of the venue proposed in this thesis. The climate of Philadelphia Is pretty close to that of Arden Hills, this will make it really easy to analyze the success and failure of various design strategies at The Linc. Some key strategies used at The Linc are the installation of onsite solar panels, as well as wind turbine additions. These are two practices believed to important in this thesis. The planting of trees and shrubs to offset emissions from the team's travels and other organizational activities is a strategy that will be used. The composting and recycling of almost everything on game day will a practice that this project can adopt. Before The Linc, the site was a warehouse. This won't help with analyzing how sporting venues can be used to help reclaim and remediate a Brownfield, but can't win them all.

Thesis Goals

Main Goal

To create a successful sporting venue site, that is practical and sustainable.

Alternate Goals

Create a successful space that can fulfill the needs of both, gameday tailgating and non-gameday open space park.

Remediate the contaminated Site-K

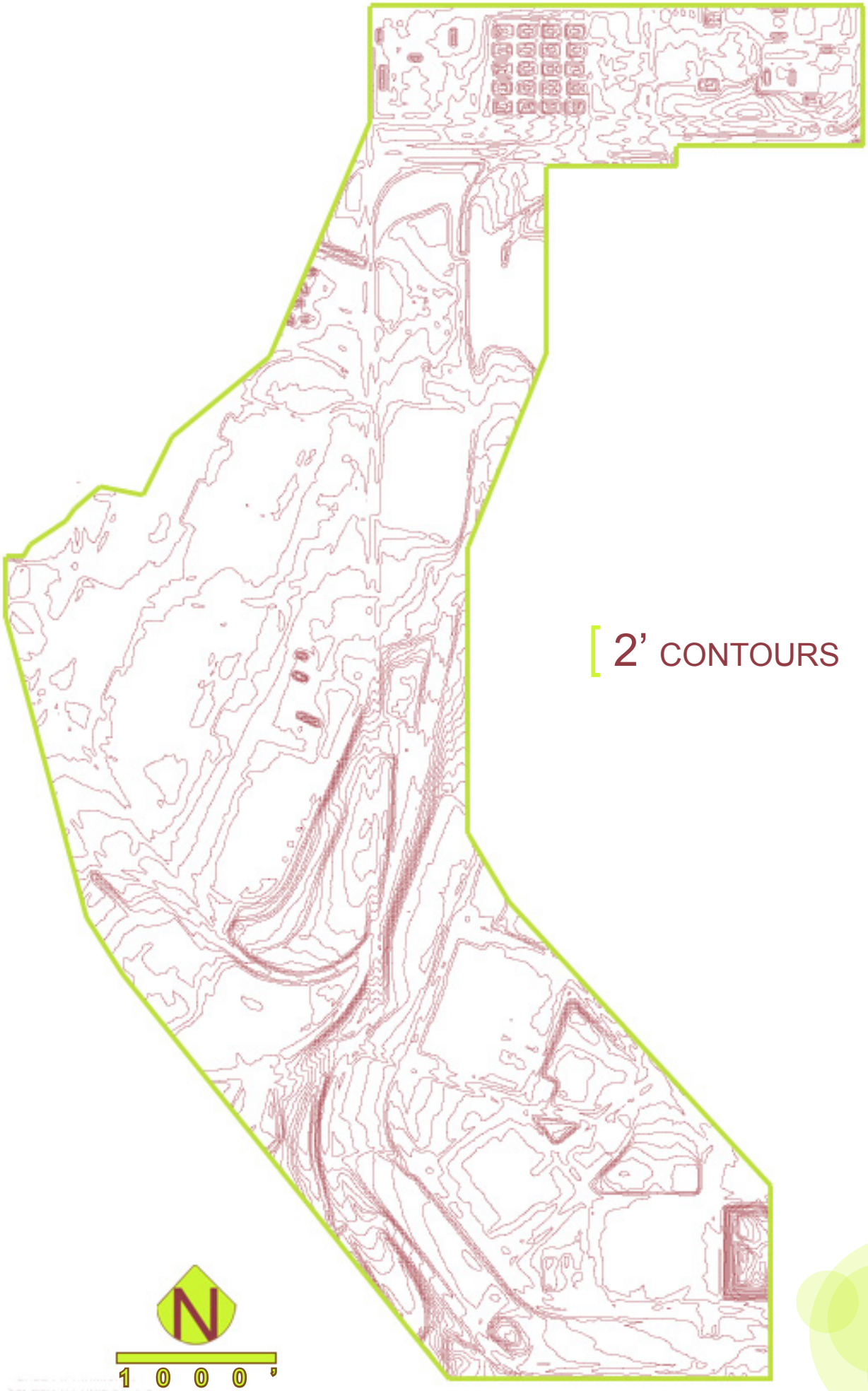
Harvest rain water for reuse on site.

Create connections with the surrounding trail systems

Inform and educate site users, on the TCAAP's interesting history.

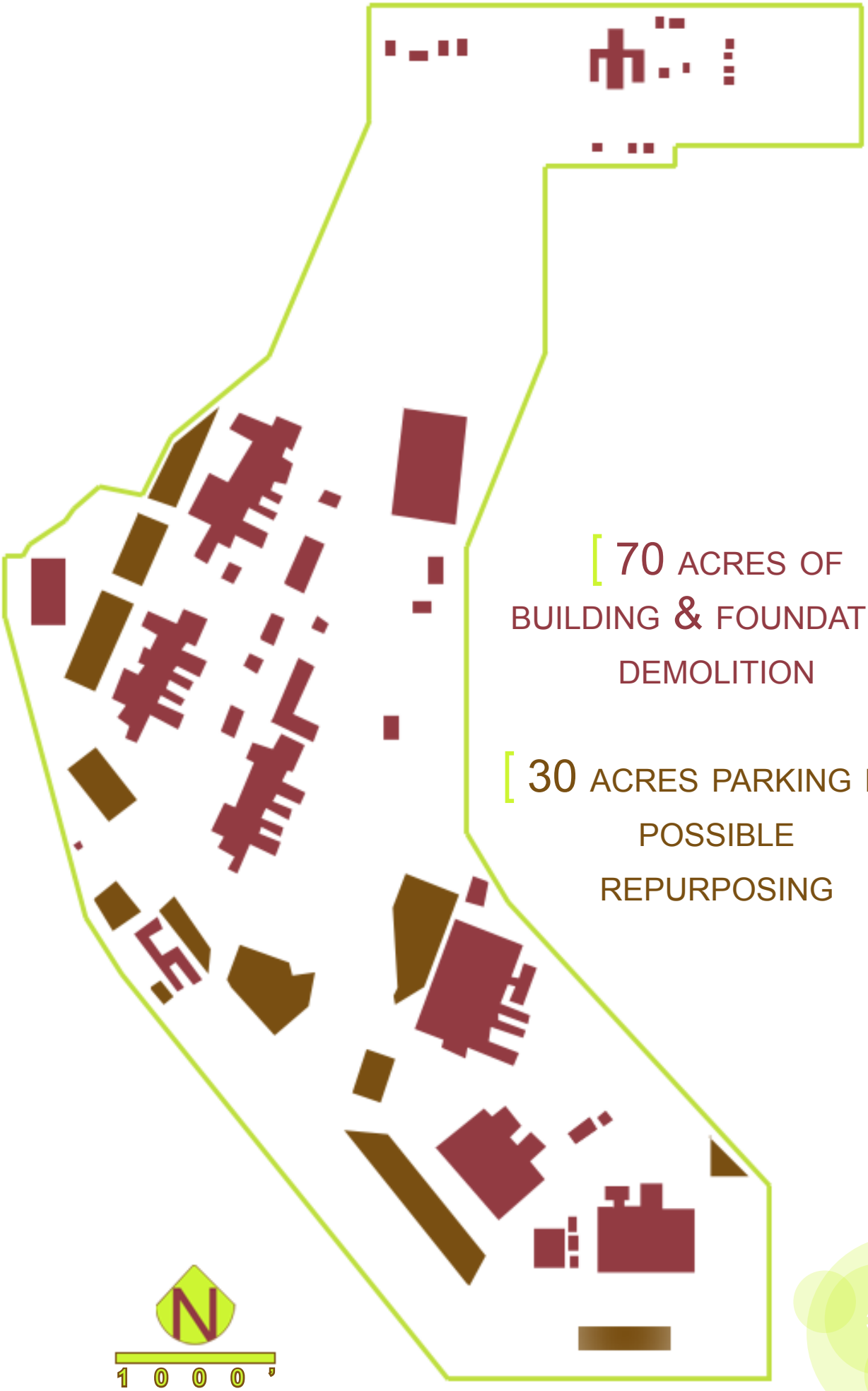
INVENTORY AND ANALYSIS

TOPOGRAPHY



[2' CONTOURS

EXISTING INFRASTRUCTURES



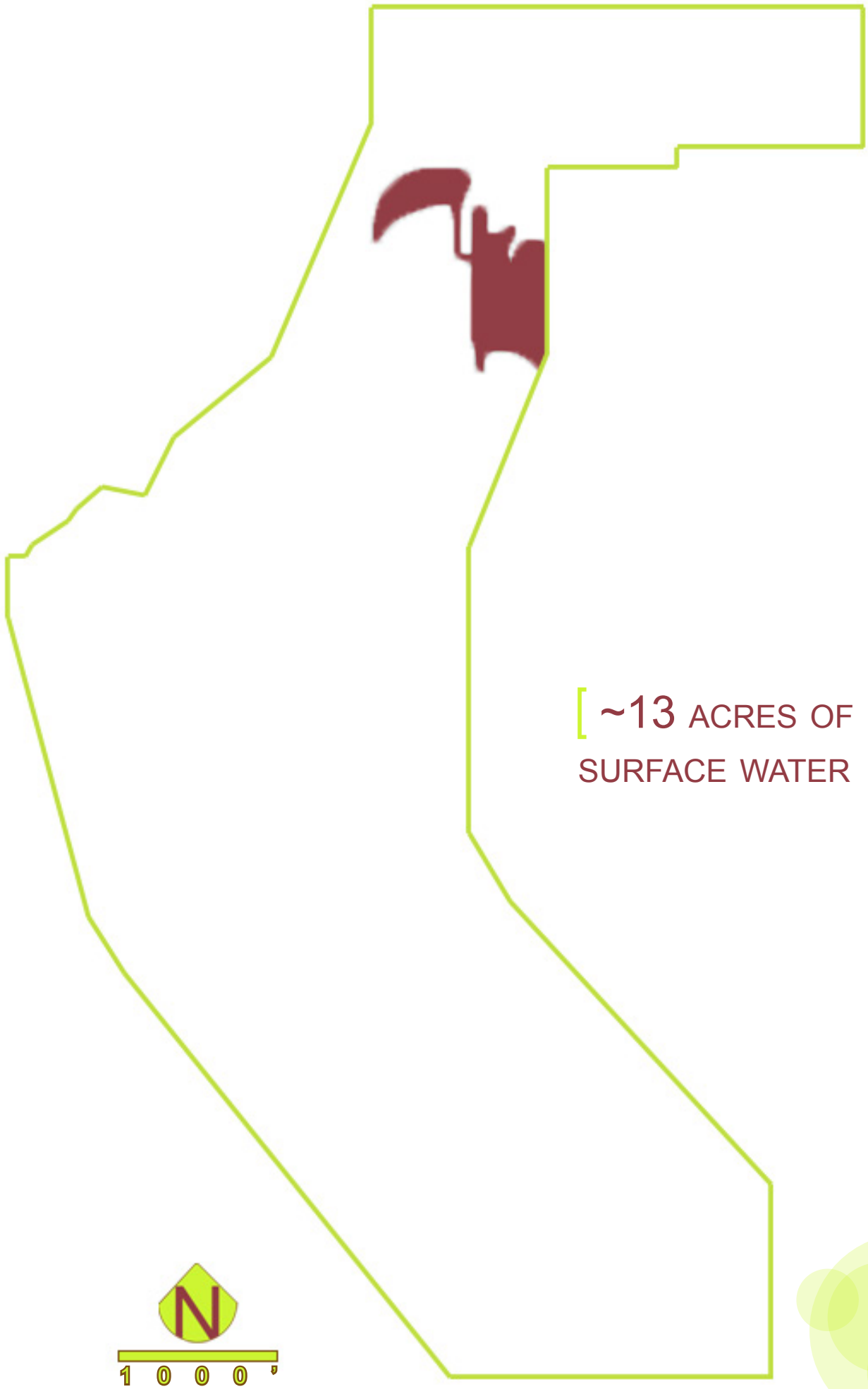
[70 ACRES OF BUILDING & FOUNDATION DEMOLITION

[30 ACRES PARKING FOR POSSIBLE REPURPOSING

EXISTING ROADWAYS

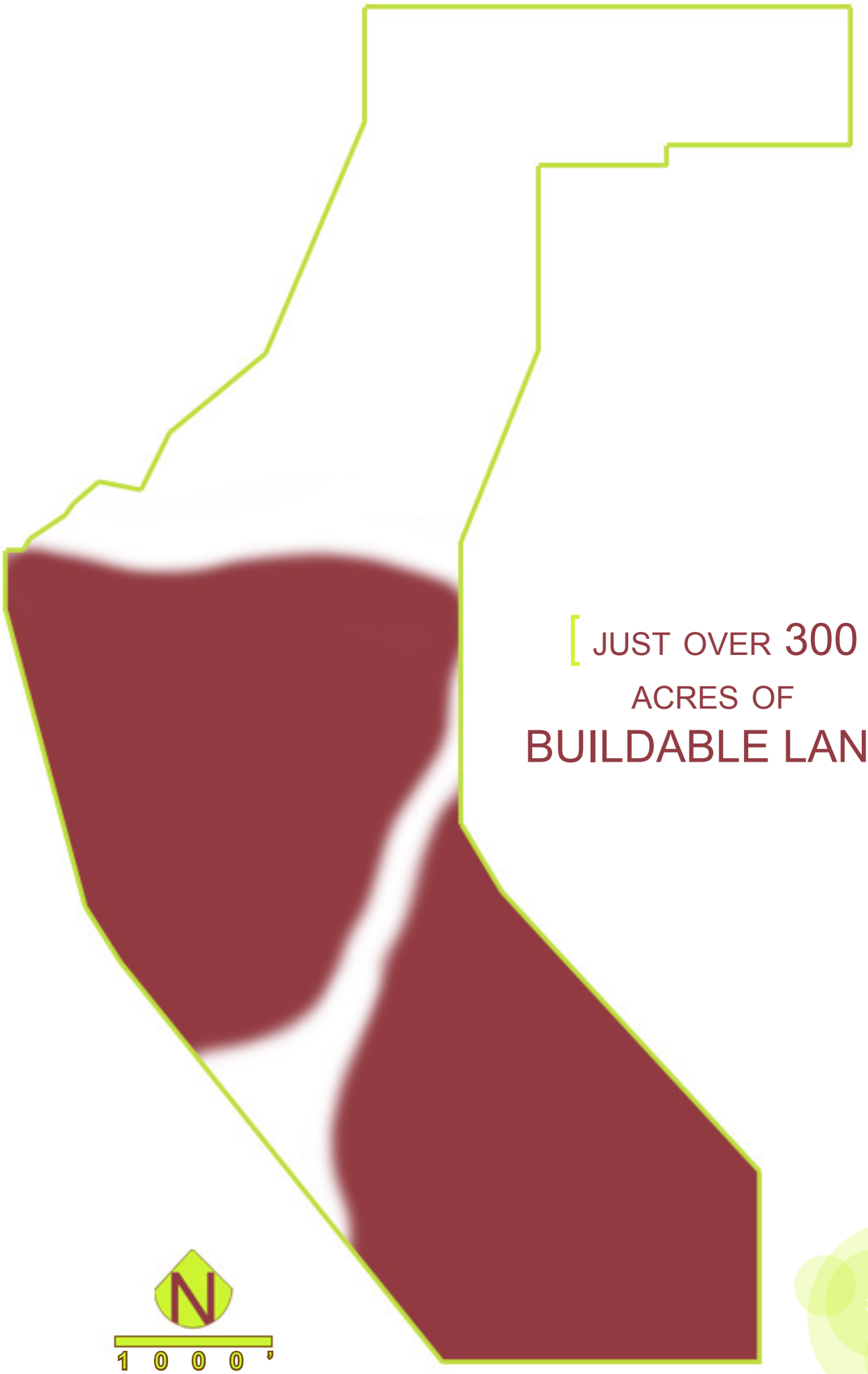
[70 ACRES OF ROADWAYS FOR DEMOLITION OR REUSE

SURFACE WATER



~13 ACRES OF SURFACE WATER

BUILDABLE LAND



JUST OVER 300
ACRES OF
BUILDABLE LAND

WETLANDS

WILDLIFE CONNECTIONS

WILDLIFE CONNECTIONS

EXISTING VEGETAION

JUST OVER 10 ACRES OF EXISTING TREE CLUSTERS

CLIMATE INVASIVE SPECIES

[LEAFY SPURGE

JAPANESE KNOTWOOD]

[WILD PARSNIP

YELLOW IRIS]

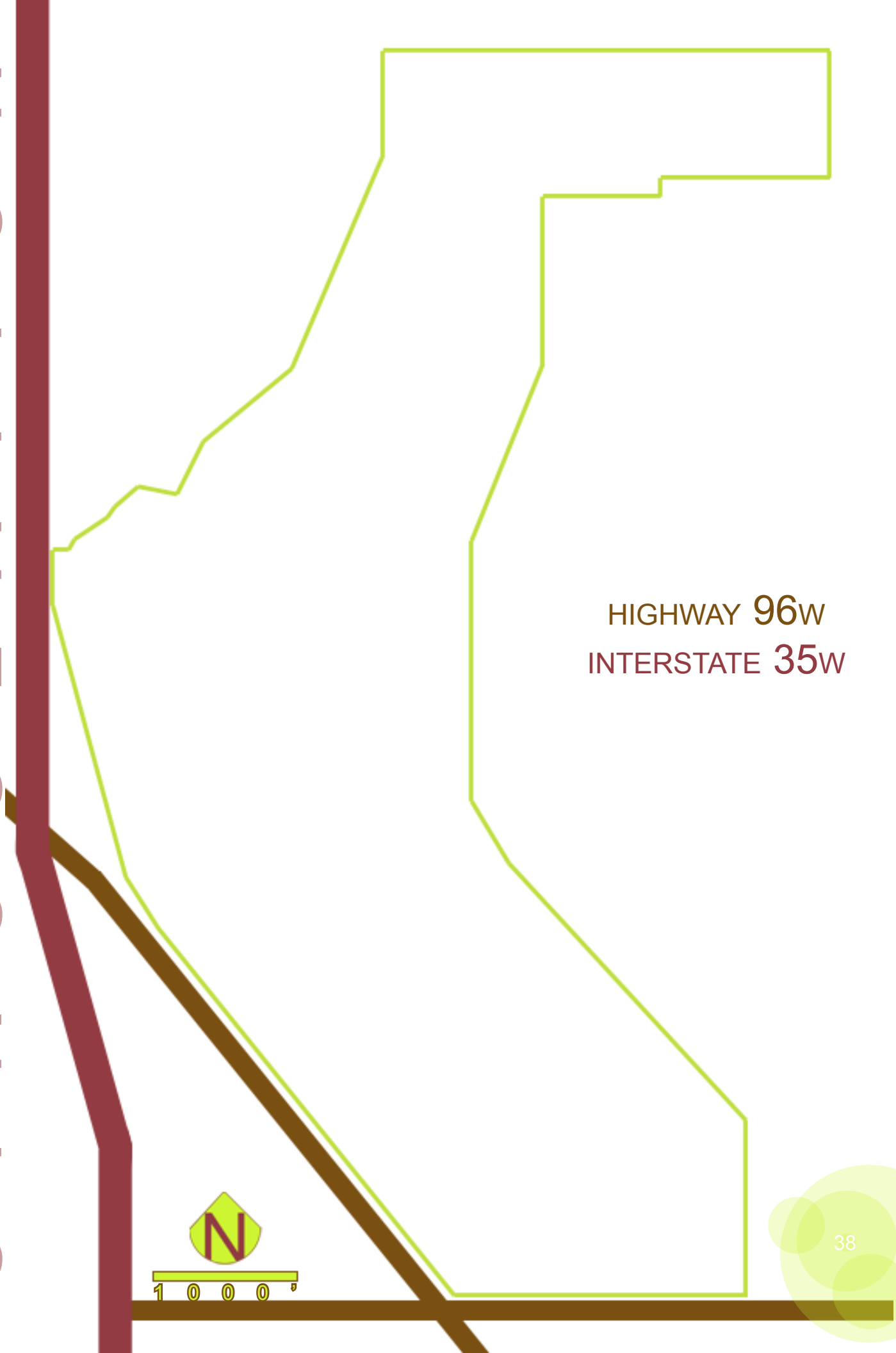
[TANSY

MISCANTHUS]

PURPLE LOOSESTRIFE]

HUMID TEMPERATE
COLD WINTERS
30-35” ANNUAL PRECIPITATION
RICE CREEK WATERSHED

CIRCULATION



ZONING \ LAND USE

HISTORY

1850 — SETTLERS BEGIN FARMING LAND

1941 — FEDERAL GOVERNMENT ACQUIRES LAND

1943 — SMALL ARMS AMMO MANUFACTURE STARTS

1976 — AMMO MANUFACTURE CEASES

1981 — SOLVENTS DISCOVERED IN GROUNDWATER WELLS

1983 — TCAAP IS PLACED ON SUPERFUND LIST

1987 — CLEANUP IS STARTED BY ARMY, EPA, & MPCA

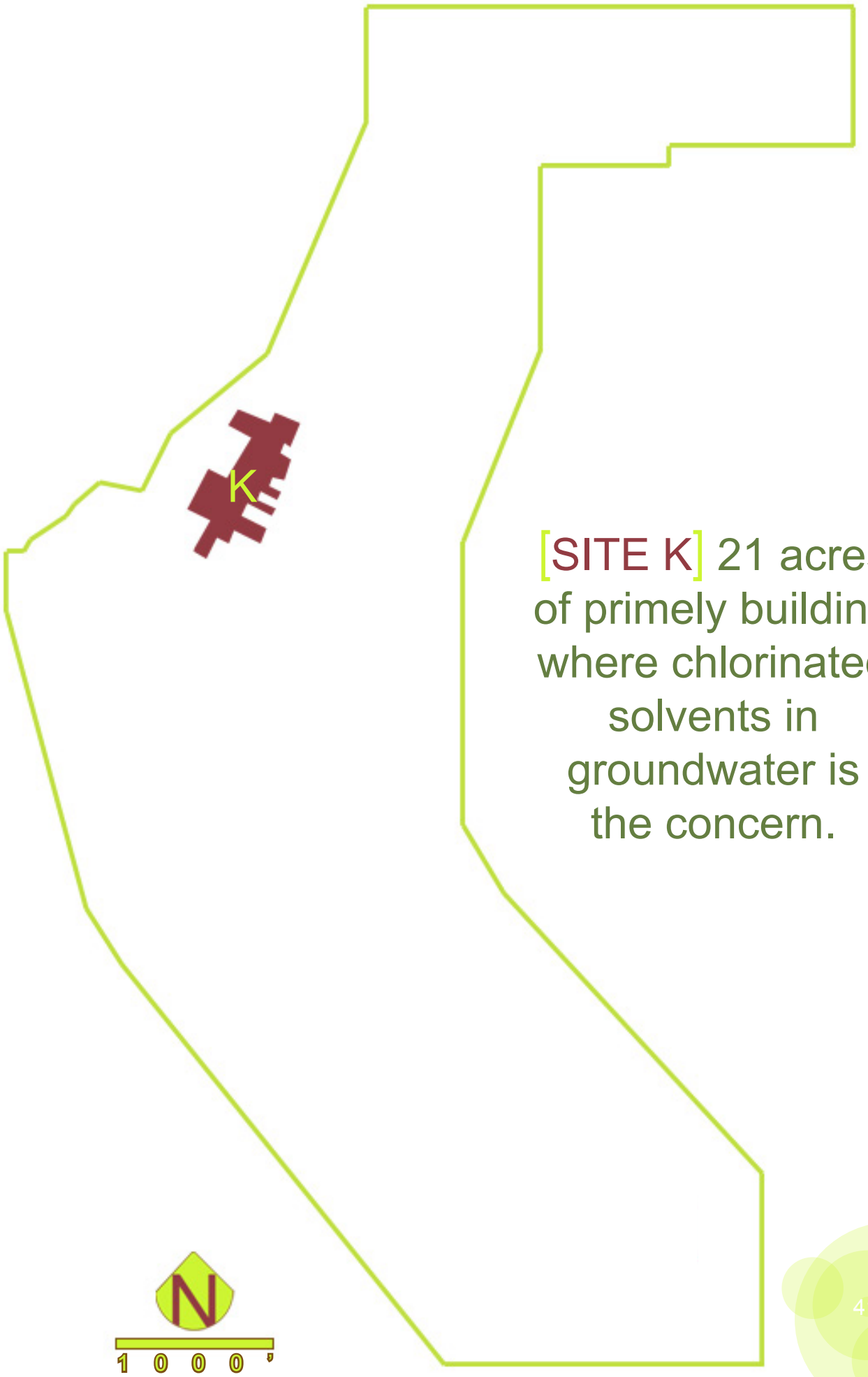
1991 — REMEDIAL INVESTIGATION IS COMPLETED

1994 — ARMY DECLARES TCAAP EXCESS PROPERTY

1995 — TCAAP REUTILIZATION COMMITTEE APPOINTED

2002 — 585 ACRES DECLARED SURPLUS

CONTAMINATED AREAS



[SITE K] 21 acres of primely building where chlorinated solvents in groundwater is the concern.

SITES™ is an interdisciplinary effort to create voluntary guidelines and benchmarks for sustainable land design, construction and maintenance practices.

SITES™ five main areas of focus are:

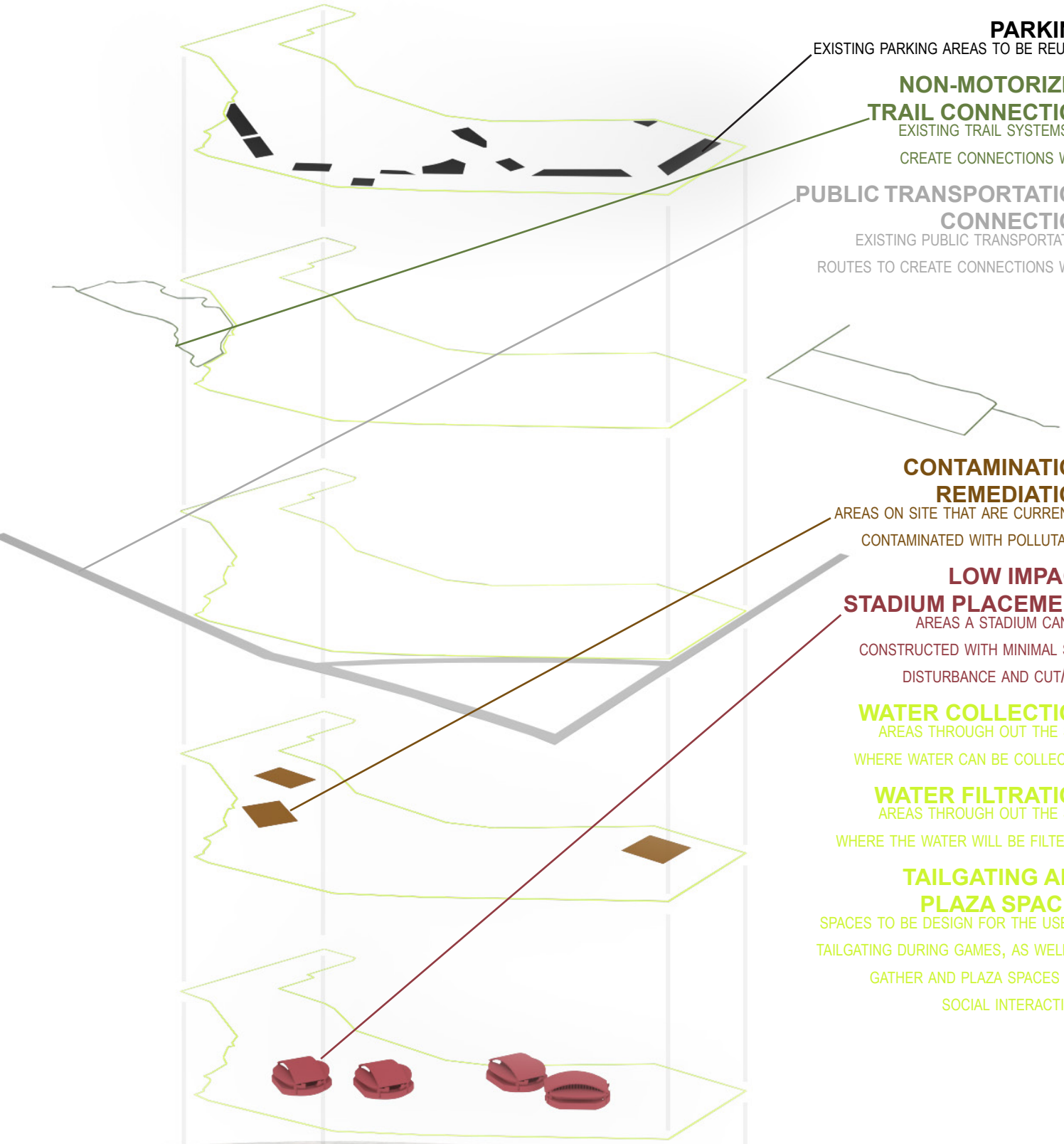
[Hydrology

[Soils

[Vegetation

[Materials

[Human Health & Well-being



PARKING
EXISTING PARKING AREAS TO BE REUSED

NON-MOTORIZED TRAIL CONNECTION
EXISTING TRAIL SYSTEMS TO CREATE CONNECTIONS WITH

PUBLIC TRANSPORTATION CONNECTION
EXISTING PUBLIC TRANSPORTATION ROUTES TO CREATE CONNECTIONS WITH

CONTAMINATION REMEDIATION
AREAS ON SITE THAT ARE CURRENTLY CONTAMINATED WITH POLLUTANTS

LOW IMPACT STADIUM PLACEMENT
AREAS A STADIUM CAN BE CONSTRUCTED WITH MINIMAL SOIL DISTURBANCE AND CUT/FILL

WATER COLLECTION
AREAS THROUGH OUT THE SITE WHERE WATER CAN BE COLLECTED

WATER FILTRATION
AREAS THROUGH OUT THE SITE WHERE THE WATER WILL BE FILTERED

TAILGATING AND PLAZA SPACES
SPACES TO BE DESIGN FOR THE USE OF TAILGATING DURING GAMES, AS WELL AS GATHER AND PLAZA SPACES FOR SOCIAL INTERACTIONS

Moving Forward

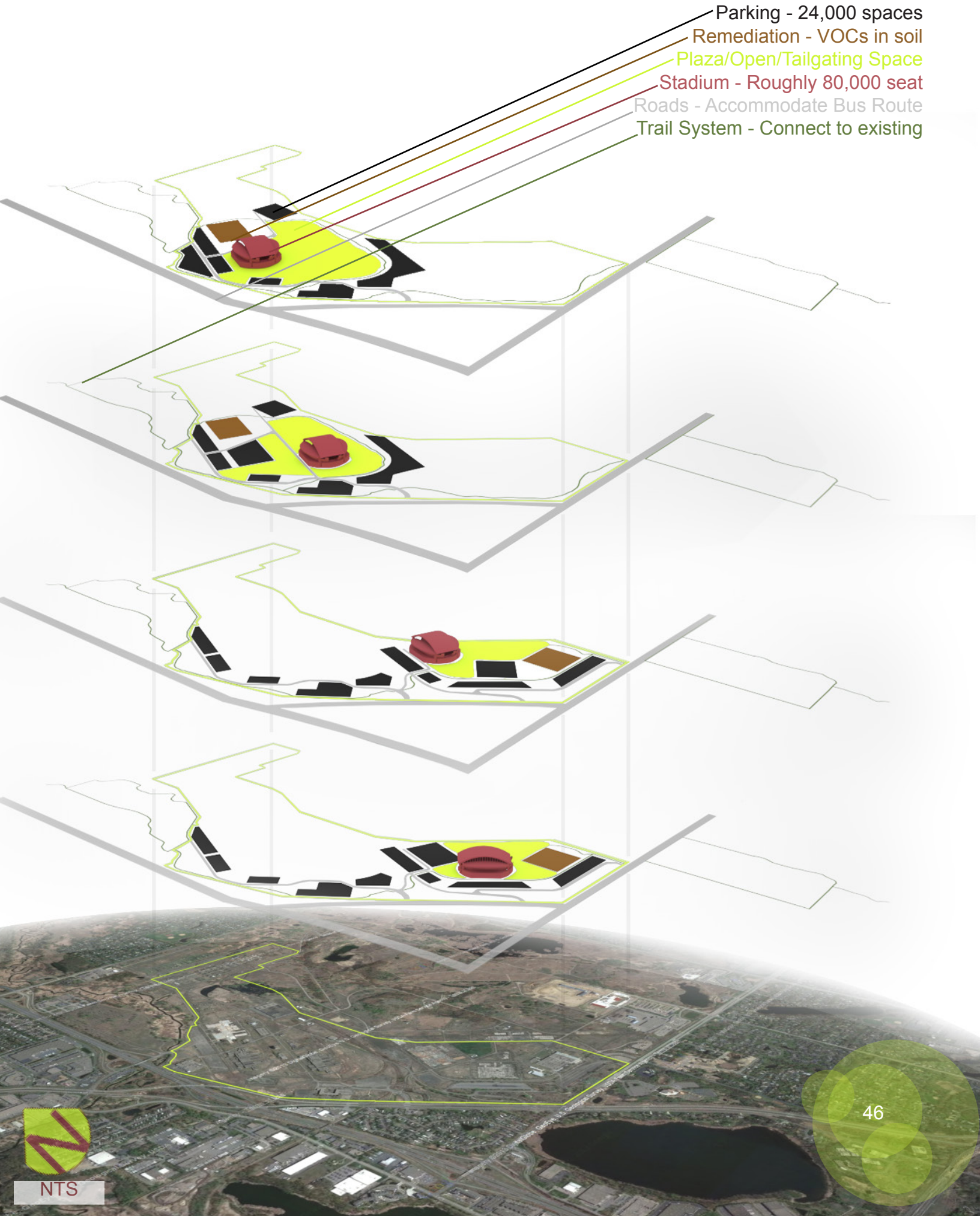
[1 EFFICIENTLY TREAT CONTAMINATED AREAS

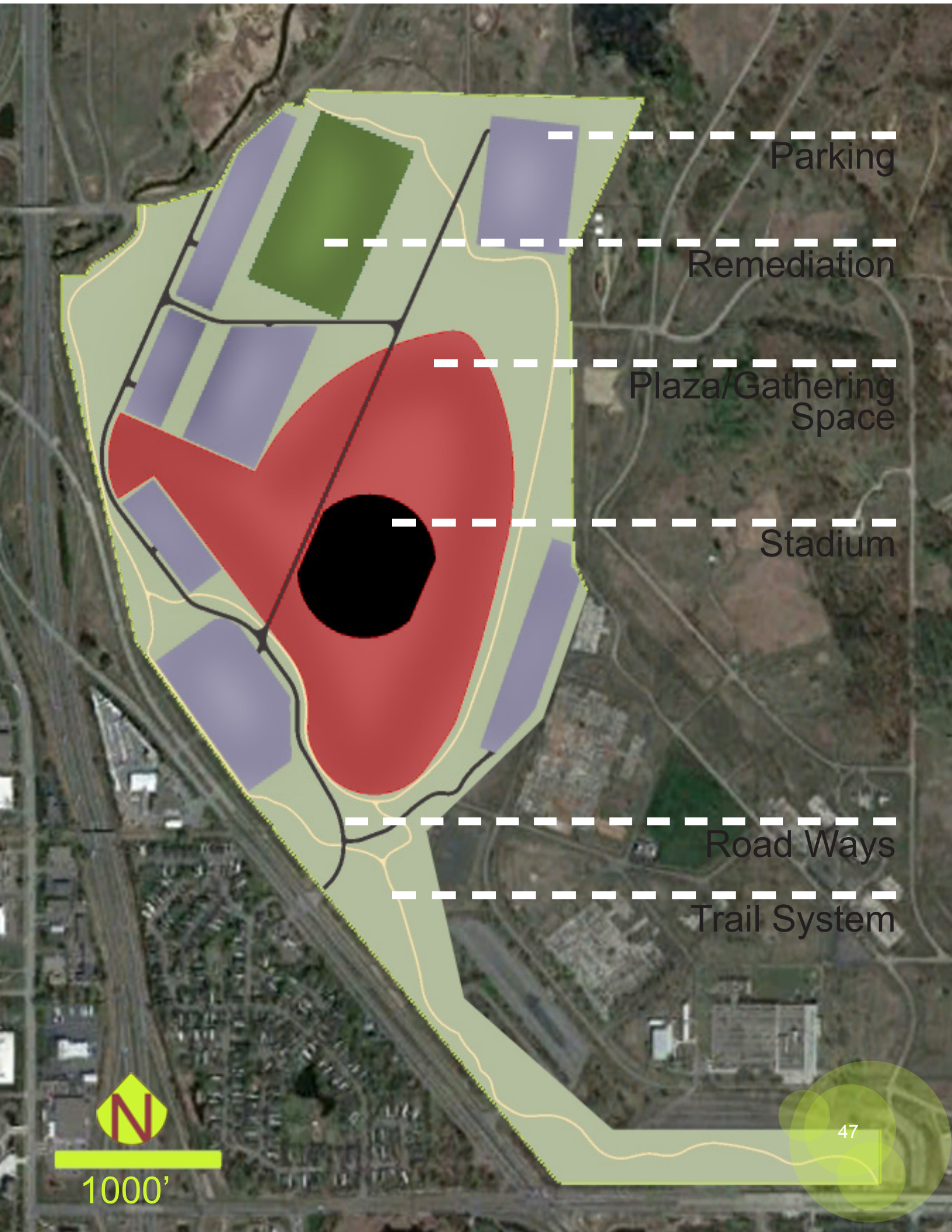
[2 CREATE WETLAND & WILDLIFE PRESERVED CORRIDOR

[3 FOCUS ON PARKING & TRANSPORTATION ISSUES

[4 FIND EFFICIENT & FEASIBLE AREA FOR STADIUM PLACEMENT

CONCEPTUAL DESIGNS


Parking - 24,000 spaces
Remediation - VOCs in soil
Plaza/Open/Tailgating Space
Stadium - Roughly 80,000 seat
Roads - Accommodate Bus Route
Trail System - Connect to existing
NTS


Parking
Remediation
Plaza/Gathering Space
Stadium
Road Ways
Trail System
N
1000’

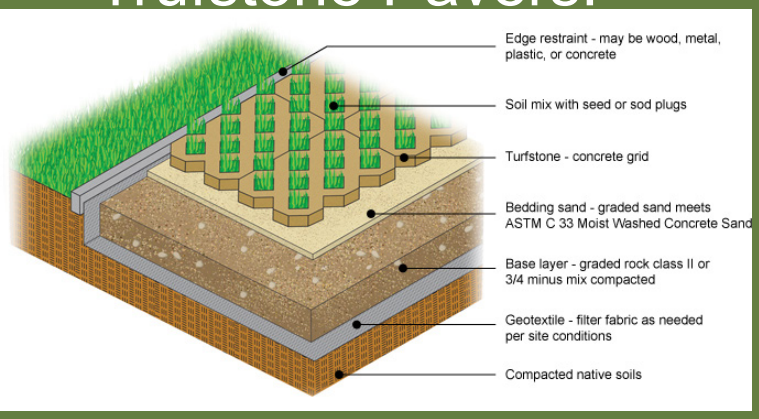
FINAL DESIGN

PROJECT ELEMENTS

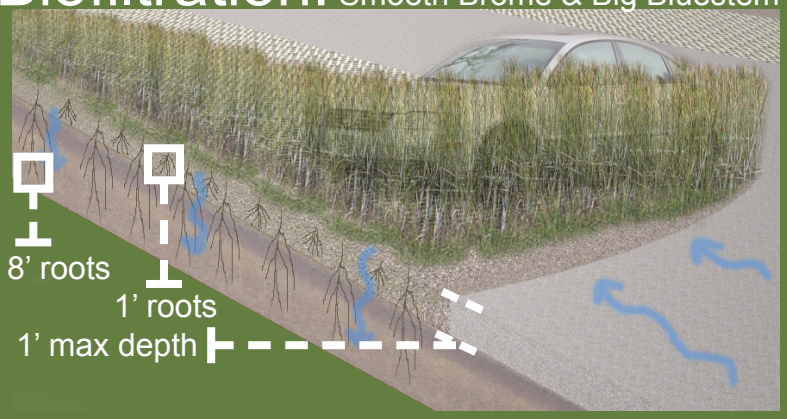
Parking
Trail System
Tailgating/Open Spaces
Site-K Remediation
Connections
S.I.T.E.S.™ 5 Focuses


35W
TRAIL
PARKING RAMP
REMEDIATION/ PRACTICE FACILITY
PARKING LOT
detention pond
TRAIL
PARKING LOT
TAILGATING/OPEN SPACE
PARKING LOT
bus stop
band shell
PARKING LOT
STADIUM
detention pond
TRAIL
PARKING RAMP
PARKING RAMP
TAILGATING/OPEN SPACE
cisterns
TRAIL
35W
TRAIL
TRAIL
0'
2' contours
1000'
N

Trufstone Pavers:



Biofiltration: Smooth Brome & Big Bluestem



Hydrology - The harvesting and storage of rain water from the parking ramps. The reduction of runoff in parking lots, from the installment of turfstone and bioswales. The reuse of collected water for irrigation purposes, and potential gray water uses.

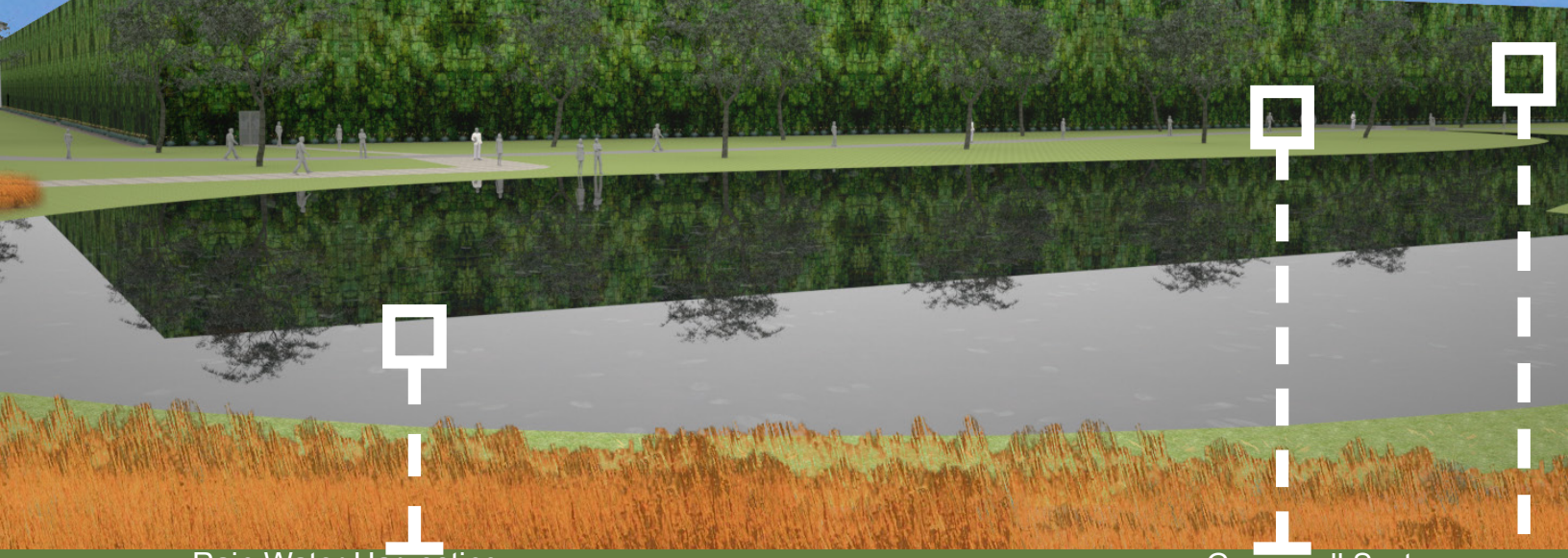
Soil - Utilizing existing parking and building locations to construct the new parking lots and structures will minimize soil cut/fill, and the disturbance.

Vegetation - The installment of bioswales and greenwalls at the parking facilities will improve the sites vegetative diversity.

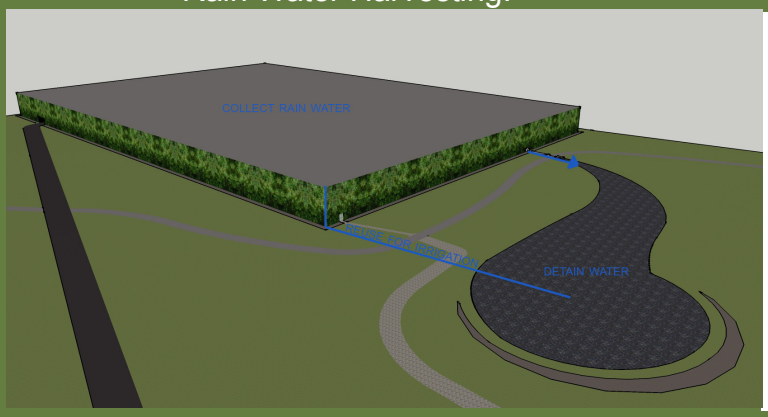
Materials - The choice of using a greenwall facade, will reduce heat island effects.

Human Health & Well-Being -
The greenwall and bioswales will provide a natural and soothing feel, and improve mental well-being. The same light poles as the trail system will be used, and will help tie in the character and history of the site.

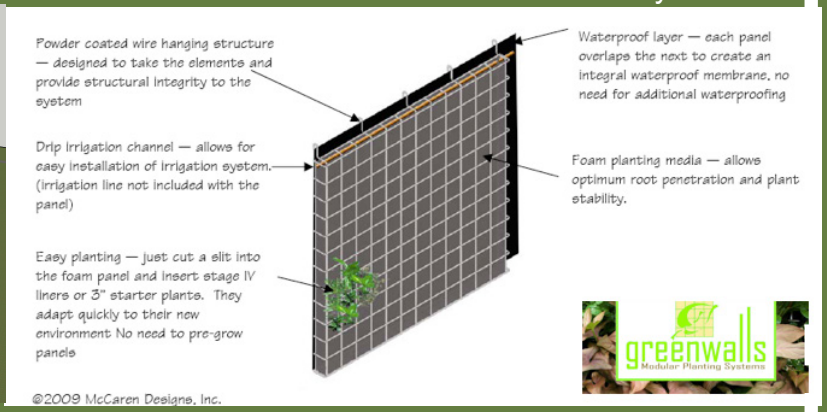
PARKING



Rain Water Harvesting:



Greenwall System:



Site parking will consist of four parking lots, and three parking ramp structures. Two of the structure will be five stories of parking and the third structure will be four stories. The combination of these seven parking facilities will be able house just over 24,200 vehicles. All seven facilities are located in same place as existing buildings or parking lots, to minimize the disturbance of soil.
The parking lots will have paved lanes, but since the parking stalls receive less abuse they will be surfaced with turfstone. The turfstone will allow the soil to absorb water, reducing runoff and allowing the small dips of pollution to be biodegraded naturally. To handle the runoff from the paved lanes, bioswales are integrated in to the lots design as well. The parking ramps are encased in greenwall systems. The greenwalls will not only be aesthetically pleasing, but they will reduce urban heat island effects. All rainwater from the parking structures will be harvested and stored in the appropriate detention pond, or cistern. This water will then be used for greenwall watering as well as other irrigation through out the site. Small solar panels will also be installed on parking ramp roofs, to offset the small power usage of the greenwalls irrigation pumps.

Greenwall Plants:

Full Sun Plants:


Sedum album


Juniperus horizontalis 'Lime Glow'

Partial Sun Plants:


Sedum 'Bailey's Gold'

Shade Plants:

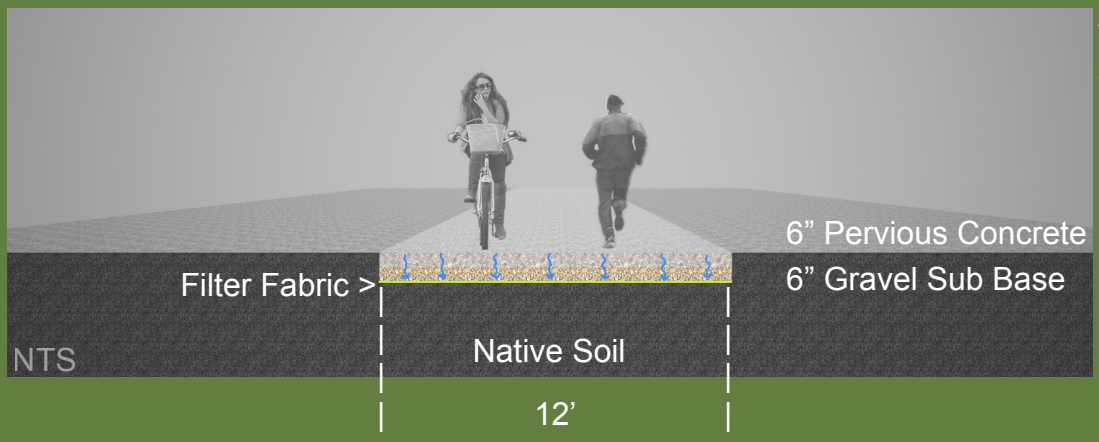

Galium odoratum


Polystichum acrostichoides


Lysimachia nummularia 'Aurea'

TRAILS

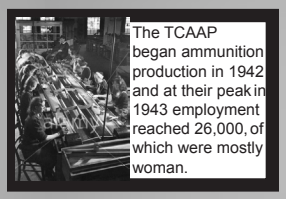
The trail system will cater to both bike and walking traffic. On the south end of the site it links up with an existing community bike and walking path, to the North there are two outlets that connect with the existing Rice Creek Trail System. The path ways are 12 feet wide, and have a porous concrete surface. Along the trail will be 5 rest areas, each stop will be part of a TCAAP history time-line to educate site users of the unique site. The 5 time-line points will be; The opening of the TCAAP and the start of ammunition production in 1943. The cease of ammunition production in 1976. The listing of the TCAAP as a Superfund site in 1983. The commencement of site remediation in 1987. And the new era of the site with the installation of this design.



Typical Section of Trail

Trash Receptacle -
The shape mocks an empty handgun casing, this is to incorporate the important history of the site.

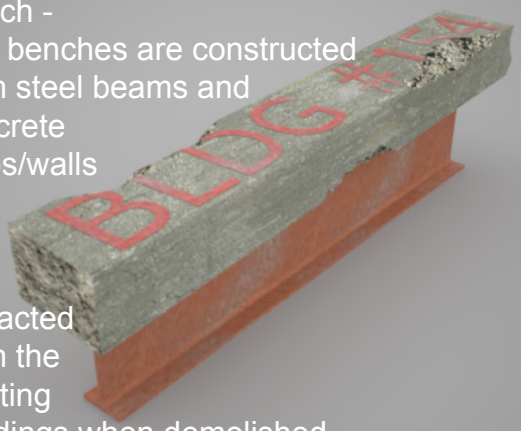
Solar Panel



Time-line Information Sign

Light Pole -
The base mocks a rifle shell, while the light housing on top mocks handgun round. These are meant to remind users of the sites unique history.

Bench -
The benches are constructed from steel beams and concrete slabs/walls that will be extracted from the existing buildings when demolished. The building that the materials were extracted from, will be painted on top to inform users about the unique bench and the site history.



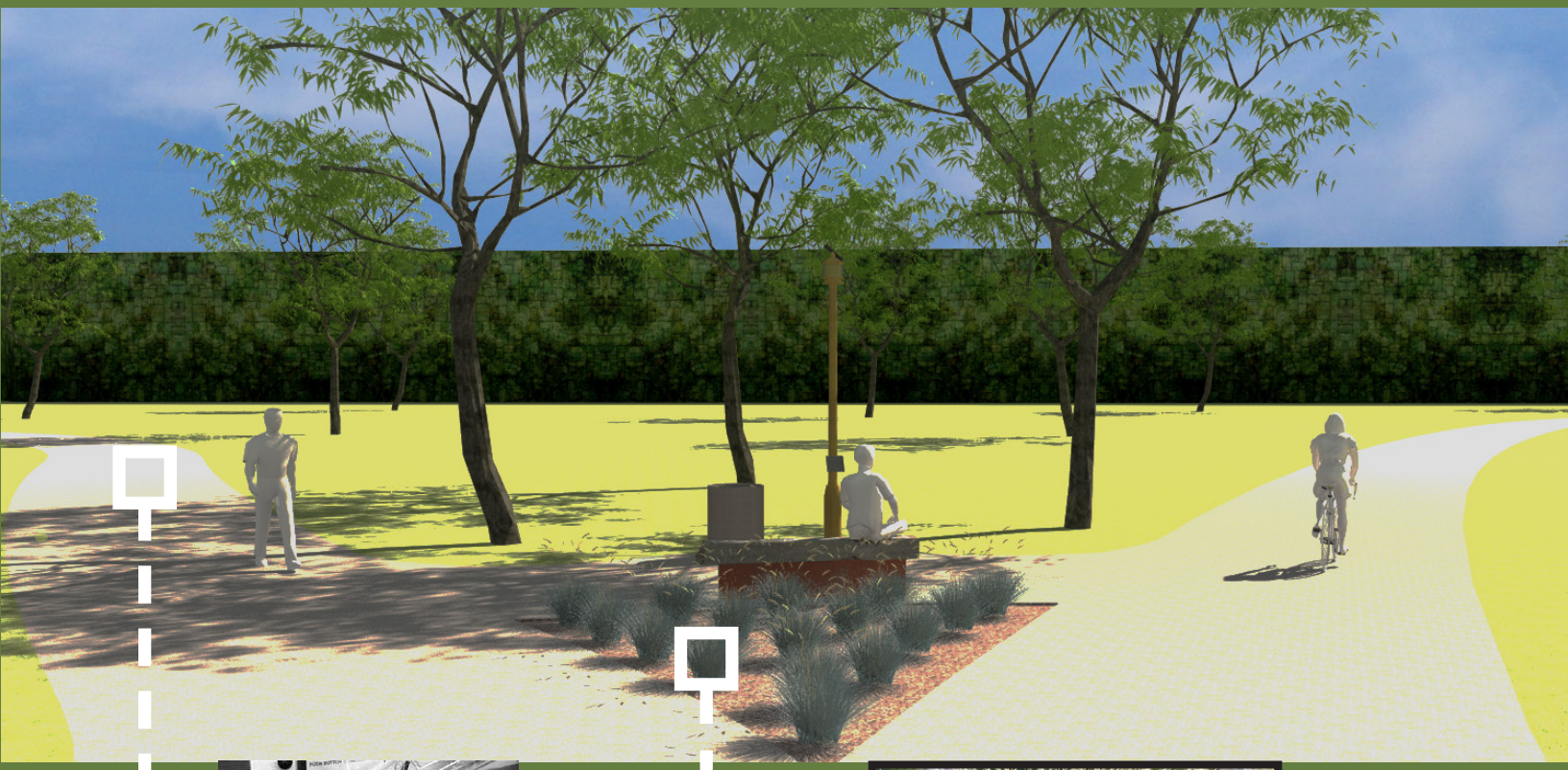
Hydrology - Pervious concrete reduces runoff, and allows water to percolate through and into the soil beneath.

Soil - The trails construction and planned route minimizes grading. The trail also utilizes old roadways and railways to take advantage of predisturbed soil, and help reduce the disturbance of soil.

Vegetation - The path is planned around existing vegetation to eliminate the need to remove existing vegetation. Native, non-invasive species will also be planted along the trails.

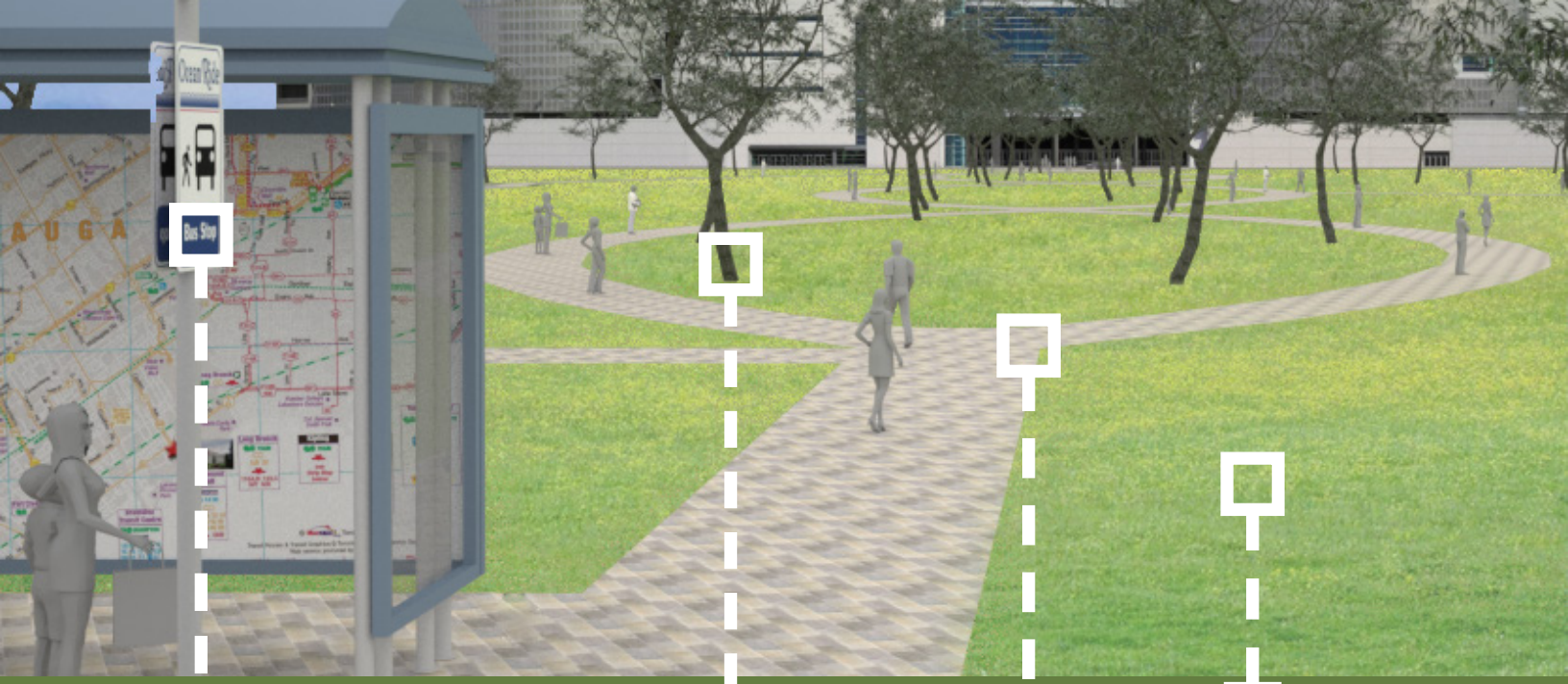
Materials - Benches will be constructed from steel beams and concrete slabs/walls that will be extracted from the existing buildings that need to be demolished.

Human Health & Well-Being -
This trails system will provide opportunities for physical, social, and mental activities, to help increase the well-being of site users. The trail system also incorporates the site history with the time line, benches, lighting, and trash receptacles.



Pervious Concrete

Helictotrichon sempervirens



Turf Grass

Paver Stone Paths

Tree Plantings [Oak, Maple, Poplar]

Public Transportation Route/Stop

Two open green spaces will serve as tailgating grounds on game day, and open park space the rest of the year. The open space to the north of the stadium also has a band shell. The band shell is a raised concrete stage with a green roof for shelter. The entrance space on the West side of the stadium is connection way between the stadium and various amenities, such as parking, public bus stop, and the trail system.

Hydrology - Besides the paths the whole space is grass covered, including the band shell roof. This eliminates runoff and allows the soil to naturally absorb water.

Soil - Outside of the paths and the band shell, no regrading or soil disturbance will be done. As for the band shell, it is located on predisturbed soil.

Vegetation - All existing vegetation is still intact, and new trees will be planted too. The band shell's green roof will make up for the grass removed to construct the band shell.

Materials - These spaces require little material, as they are being kept natural.

Human Health & Well-Being - These spaces provide many great opportunities for Mental, Social, and Physical activities.

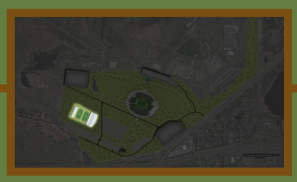
SPACES


VIKINGS
GAMEDAY
NON-GAMEDAY

SITE-K

The TCAAP several polluted sites, and Site K is one of them. Site K is the only area in my site that is contaminated. Site K is a concrete slab that used to be the foundation of an ammunition production building. Both the soil and shallow ground water are contaminated, the soil contains VOCs and the water has chlorinated solvents. The shallow ground water already has a remedial plan, this plan has been in action for over five years and has been successful the whole time. With that said, these actions will remain intact. The soil on the other hand is yet to be treated. My first plan was to use Hybrid Poplar trees to extract the VOCs from the soil, but after further planning and research it was clear that VOC levels are to high for the Poplars to be a feasible option. These high levels leave me with a simple, but less desirable option, the soil will be excavated and hauled off site to an appropriate dump site.

After the site is remediated, it will become the site for the Minnesota Vikings practice facilities. The facility will have two outdoor practice fields and one indoor practice field. The facilities will also require office spaces, and an equipment shed. The facilities will be able to utilize the sites parking lots, and reuse the harvest water for field watering and maintenances. Bellow to the left is a birds eye view of what a NFL practice facility would consist of (New York Giants practice facility, by Ewing Cole Architects), and bellow to the right is a conceptual mock up how the facilities could be laid out..



Hydrology - Reuse harvest rain water for field watering and maintenance.
The remediation of contaminated shallow groundwater.

Soil - Removal of contaminated soil, and the utilization of predisturbed soil.

Vegetation - Will use planted barriers outdoor facility.

Materials - Use local materials to minimize shipping related effects.

Human Health & Well-Being - Will provide a cleaner, and safer site for users after the remediation. It will provide opportunities for both social and physical activities.

S.I.T.E.S.™ SCORE

The Sustainable SITES Initiative Rating System:

One Star:	100 points
Two Star:	125 points
Three Star:	150 points
Four Star:	200 points
	250 points total

4th and Sustainable completes all required credits, and 46 opportunities for a total of 195 optional credits.
195 out of 250 credits equals a Three Star rating.

In addition to this site, the TCAAP has roughly 100-150 acres of mostly wetlands bordering the north end of this site. If those acres were to be restored to their natural wetland habitat, this project would exceed 200 points and receive the highest rating of Four Stars.

CONCLUSION

Previous Studio Experience

2nd Year	Fall Kathleen Pepple	Tea Garden, Fargo, ND Halverson Park, Battle Lake, MN
	Spring Mark Lindquist	Canora Green Park, Winnipeg, Manitoba One Way Corridor, Fargo, ND
3rd Year	Fall Stevie Famulari	Defiant Garden, Fargo, ND Regent, ND Snow Symposium, Winnipeg, Manitoba Fargo Analysis, Fargo, ND
	Spring Kathleen Pepple	Roosevelt Neighborhood, Fargo ND UTTC, Bismarck, ND
4th Year	Fall Jay Kost	Urban Design, Duluth, MN
	Spring Stevie Famulari	Phytoremediation, Fairbault, MN Hesco Basket, Fargo, ND
5th Year	Fall Dominic Fischer	Red River Basin Intervention, Pembina County, ND
	Spring Jay Kost	Practice Thesis, Duluth, MN
Other		Winnipeg Snow Symposium ‘10 Winnipeg Snow Symposium ‘11

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"NDSU has given me the experience and knowledge I will need to move forward in life."

(Johnson, 2011)