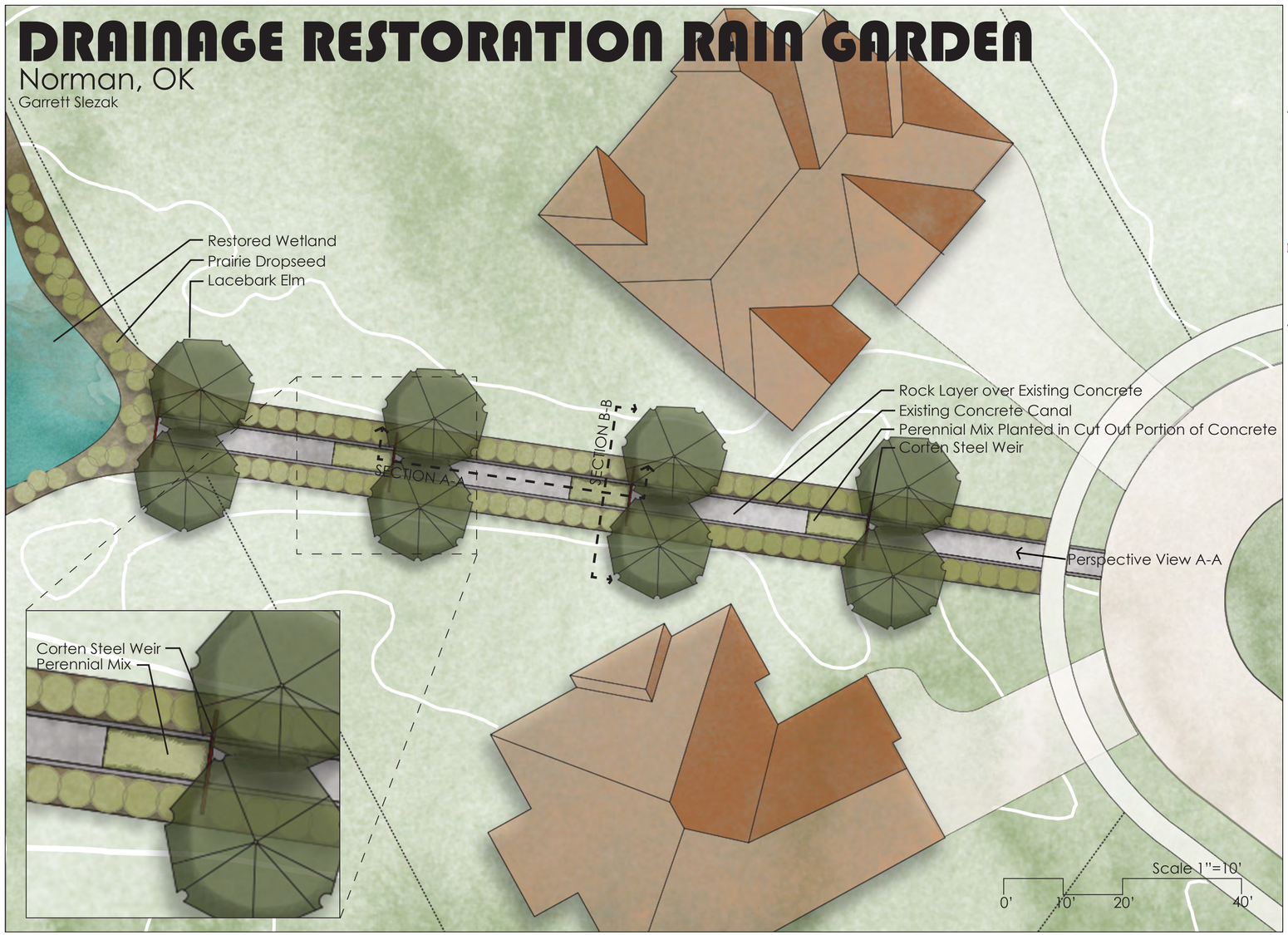
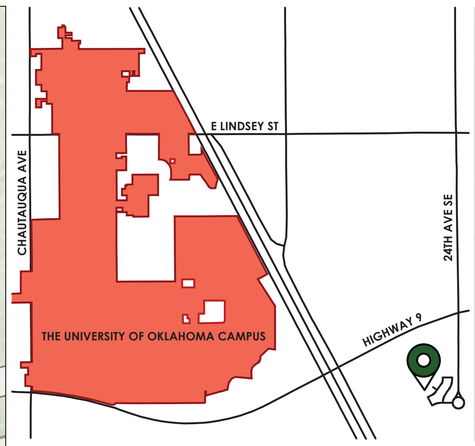
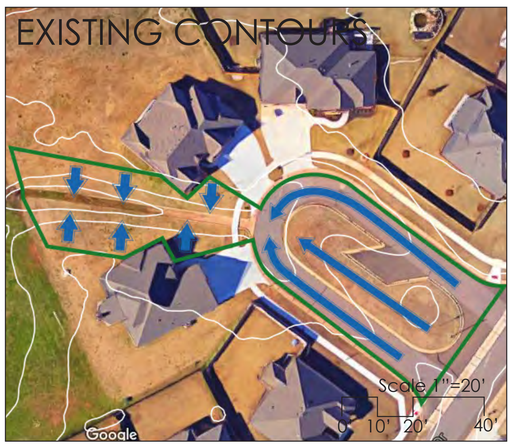
DRAINAGE RESTORATION RAIN GARDEN

Norman, OK

Garrett Slezak

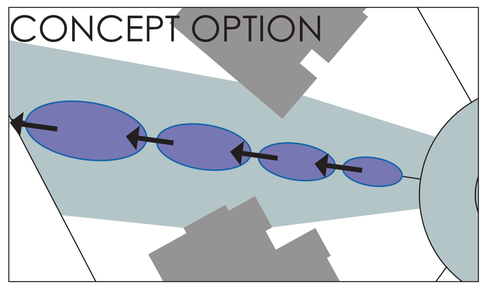


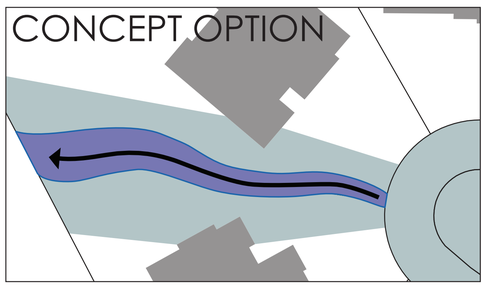




q=CiA **Stormwater Runoff Calculations Based on a 25 yr Storm for 60 Minutes**

PAVEMENT	q=(.95)(3 iph)(.2134 ac)	= .60819 cfs	**Peak Runoff Rate** .87993 cfs	**Volume= cfs x s** v= .87993 x 3600s
GRASS	q=(.35)(3 iph)(.2588 ac)	= .27174 cfs		**Peak Runoff Rate** v= 3,710 ft^3



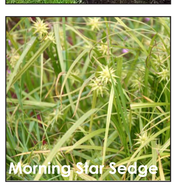


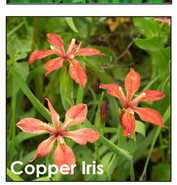
PLANT SCHEDULE

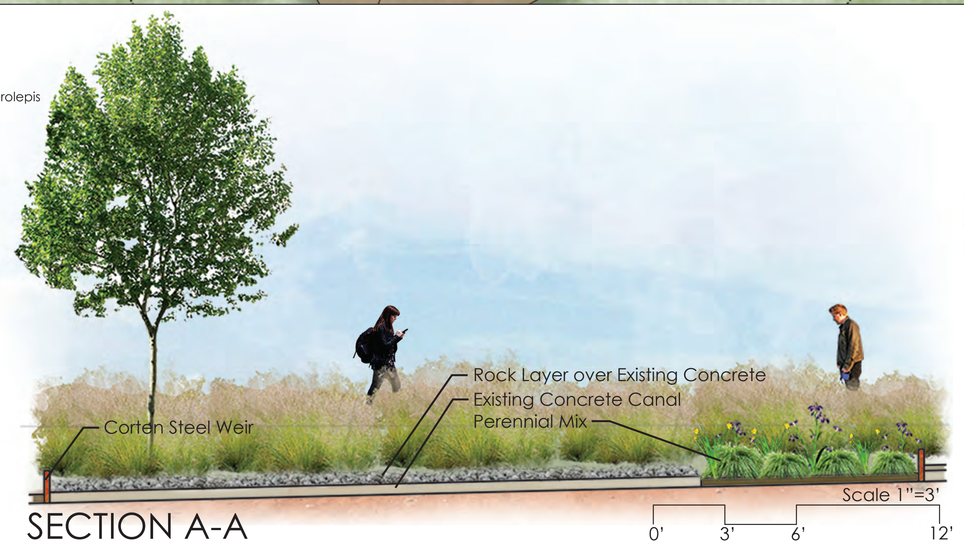
TREES
Lacebark Elm / Ulmus parviflora

GRASSES
Prairie Dropseed / Sporobulus heterolepis

PERENNIAL MIX
Morning Star Sedge / Carex grayi
Copper Iris / Iris fulva
Blue Flag Iris / Iris virginica



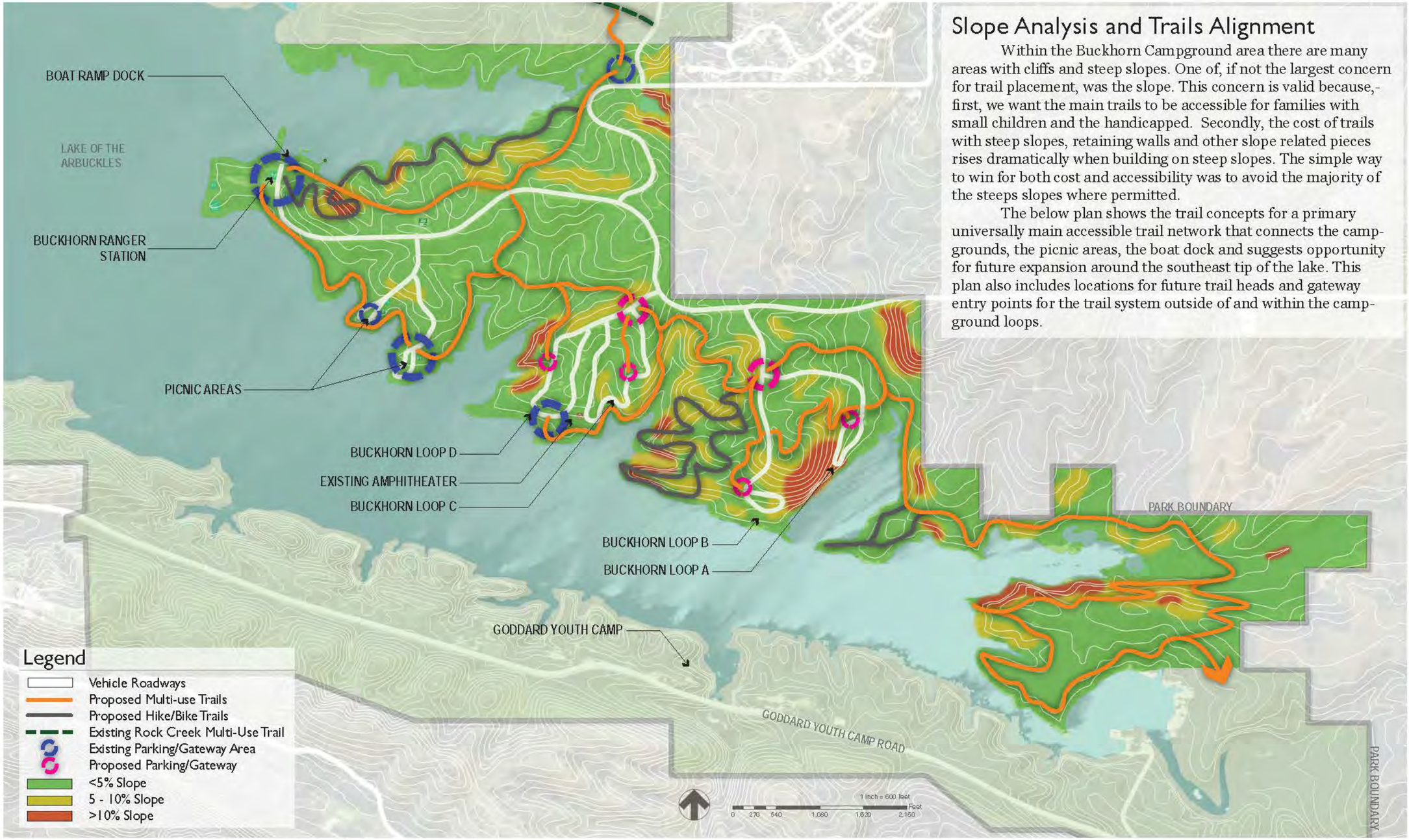




SECTION A-A

SECTION B-B

PERSPECTIVE VIEW A-A



Slope Analysis and Trails Alignment

Within the Buckhorn Campground area there are many areas with cliffs and steep slopes. One of, if not the largest concern for trail placement, was the slope. This concern is valid because,- first, we want the main trails to be accessible for families with small children and the handicapped. Secondly, the cost of trails with steep slopes, retaining walls and other slope related pieces rises dramatically when building on steep slopes. The simple way to win for both cost and accessibility was to avoid the majority of the steeps slopes where permitted.

The below plan shows the trail concepts for a primary universally main accessible trail network that connects the campgrounds, the picnic areas, the boat dock and suggests opportunity for future expansion around the southeast tip of the lake. This plan also includes locations for future trail heads and gateway entry points for the trail system outside of and within the campground loops.

SLOPE ANALYSIS AND TRAILS ALIGNMENT

Trail Phasing Plan

Trails can be a worthwhile, but costly investment. To help lessen the initial cost of a trail implementation plan I have suggested a phasing plan that keys in on the areas that are currently used most in the Buckhorn Campground area.

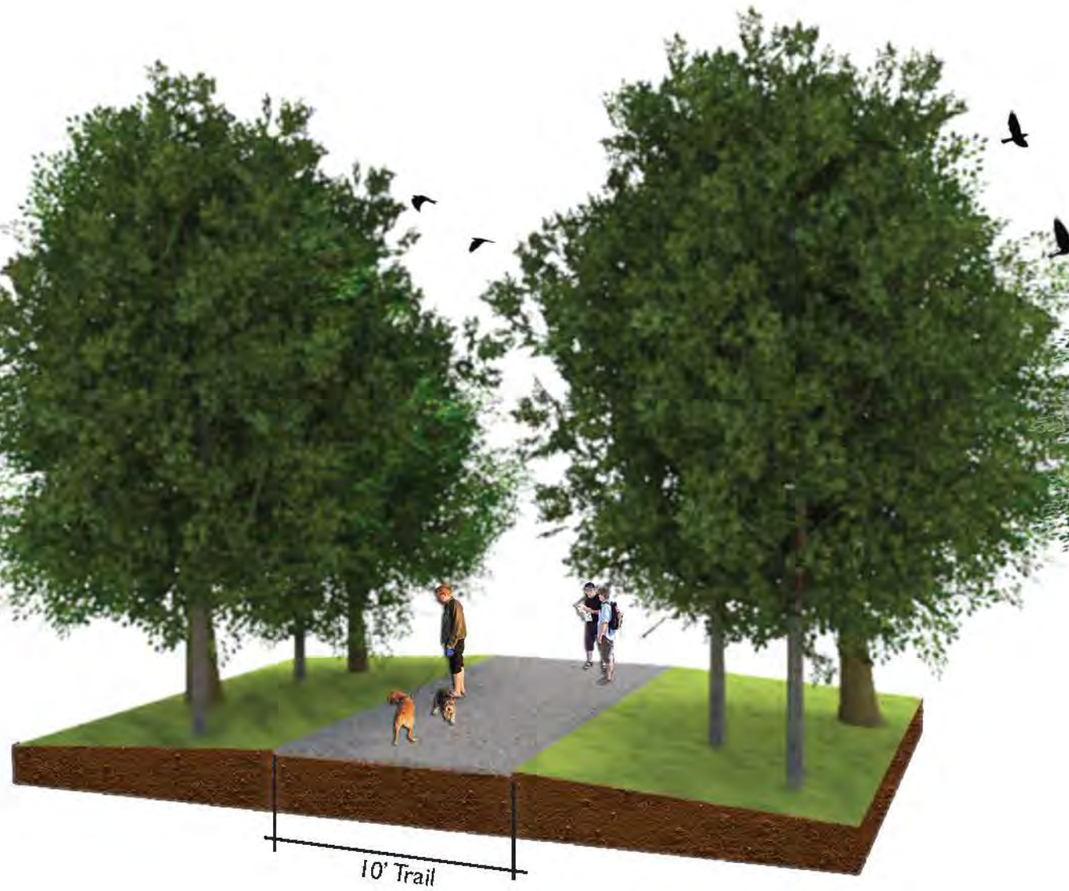
Phase 1: Links the picnic areas and the boat dock to the existing Rock Creek Multi-use Trail on the North end of this map.

Phase 2: Connects the phase one trails to the campground loop D and C. These loops are opened year round and at the completion of phase one and two can be utilized year round by the visitors in these areas.

Phase 3&4: These will Build upon the linkage of the entire water front and campground loops by extending the connections throughout all the campground loops.

Phase 5: This area is known as the Catfish Bottoms area. Catfish Bottoms is currently underutilized and has tremendous potential to offer a backcountry nature experience. With the topography in this area there are opportunities for scenic vistas overlooking the lake Phase five could attract a new group of users looking for more of a backcountry experience.

TRAIL PHASING PLAN



Multi-Use Accessible Trail (Orange on Trail Plan)

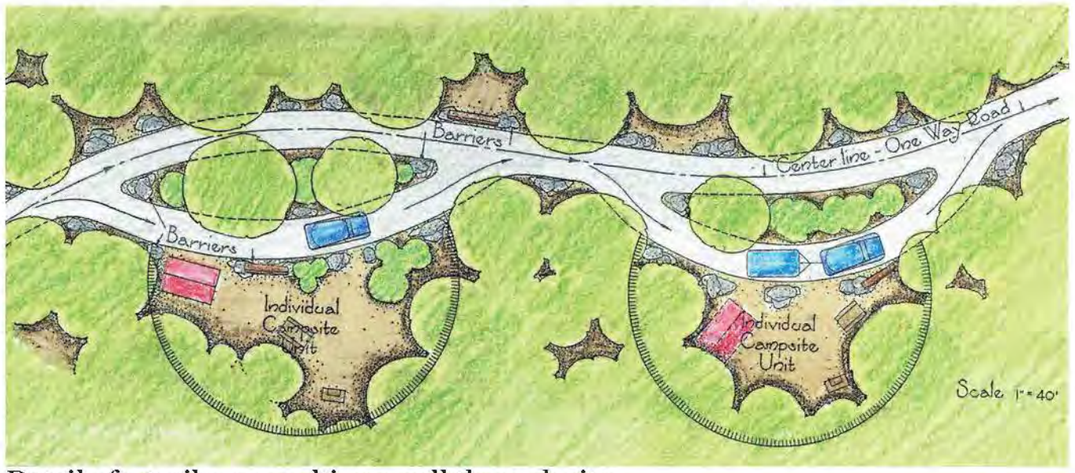
Above is an example of what the main spine of the accessible trail connecting the camping loops together could look like. This trail is approximately 10' wide, which allows two visitors to walk side by side and be comfortable passed by cyclists or other users. The trail is composed of a maintained, compacted aggregate that allows a person to push a stroller or wheelchair. The trail would also have a 2' buffer along each edge that is clear of debris if someone wanted to safely step off the trail for a moment. If possible the trail would meet ADA Accessibility Guidelines. This trail would ideally provide someone a nice stroll through the woods to the neighboring camp loop or picnic area.

Hike and Bike Trail (Dark Grey on Trail Plan)

The hike and bike trail is a less maintained trail for hikers and bikers. The slope of this trail would not always meet accessibility guidelines and it can vary in width depending on the landforms. This trail would have small obstacles such as tree roots, berms and existing rock formations. This trail attracts the hiker or biker that wants a challenge located off the beaten path, but still within reach of the car. This trail might be a great option in the Southeast corner of the lake near Catfish Bottoms in Phase Five.

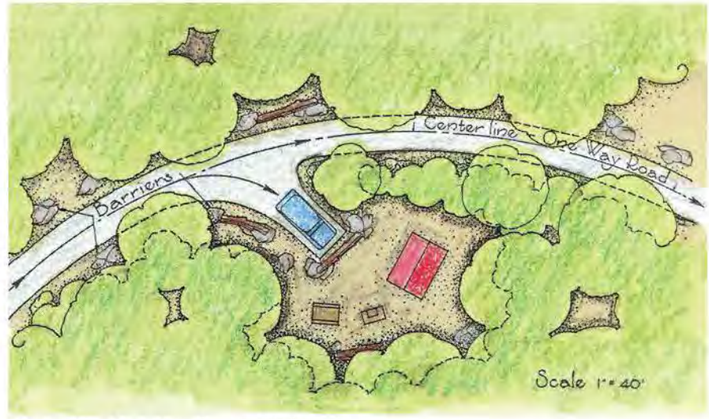
GATEWAY AND TRAIL EXAMPLES

These details were taken from *Park and Recreation Structures* as a historical reference to past campsite layout and used to influence the proposed layout for the new campground. Each site has a 20 foot radius minimum to allow more than 50 feet between each camper.



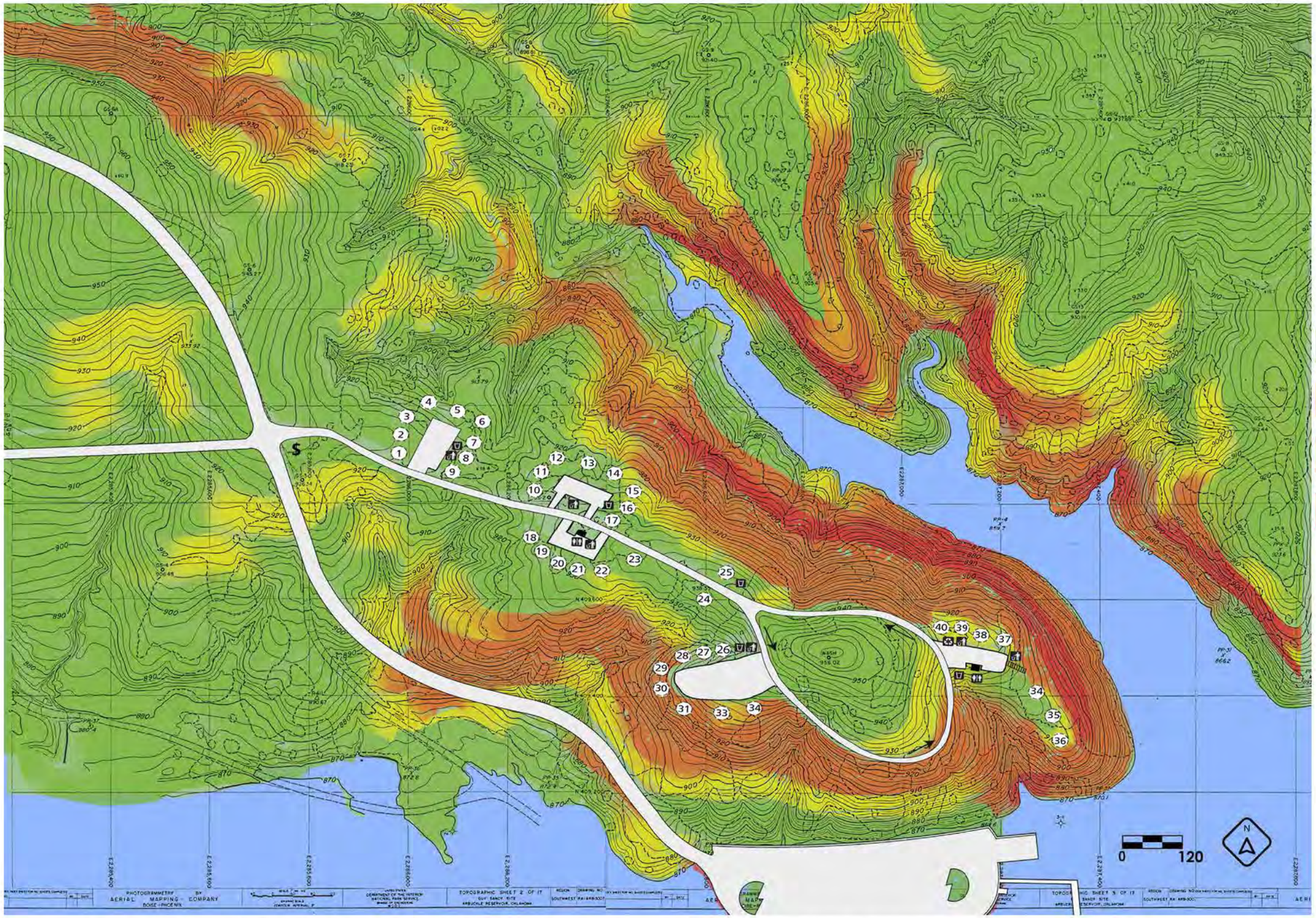
Detail of a trailer or multi-car pull through site

Detail of an RV or trailer pull through site



Detail of a single pull in site

Good, Albert H. Park and Recreation Structures. New York: Princeton Architectural, 1999. Print.



LEGEND

- Campsite
- Restroom
- Water
- Recycle
- Waste Receptacle

- 0% - 5% Slope
- 6% - 10% Slope
- 11% - 15% Slope
- >15% Slope

Slope Percentage of the Existing Guy Sandy Campground to highlight steep terrain

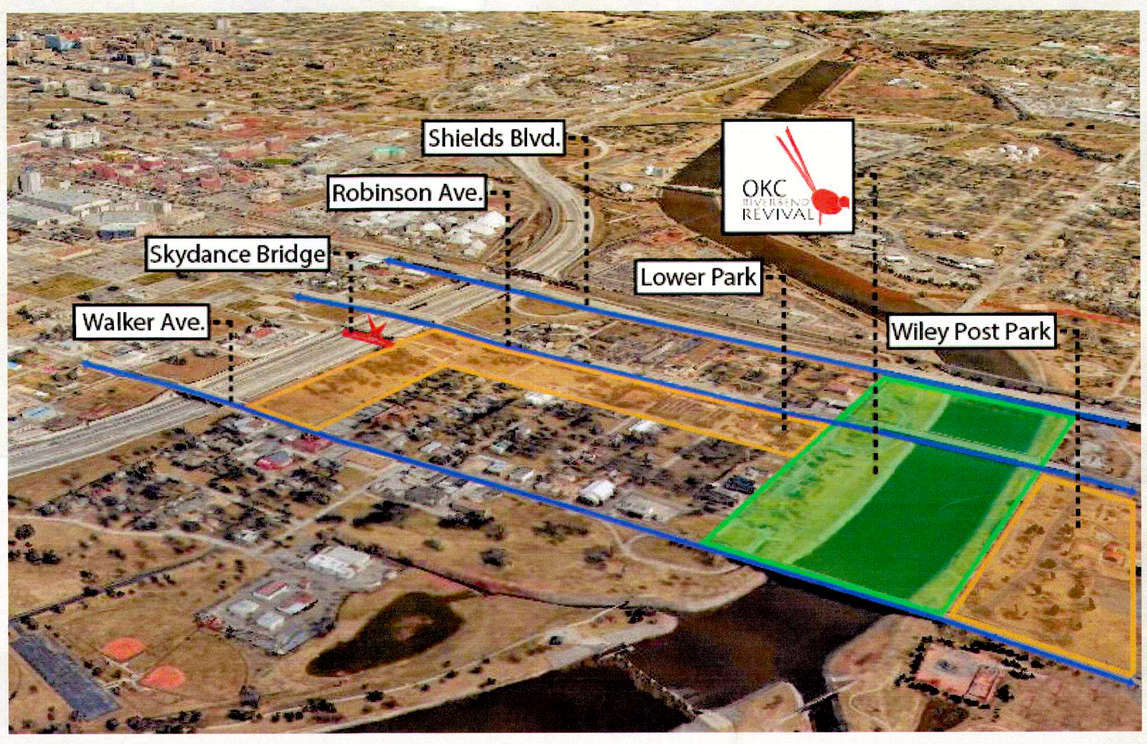
OKC RIVERBEND REVIVAL

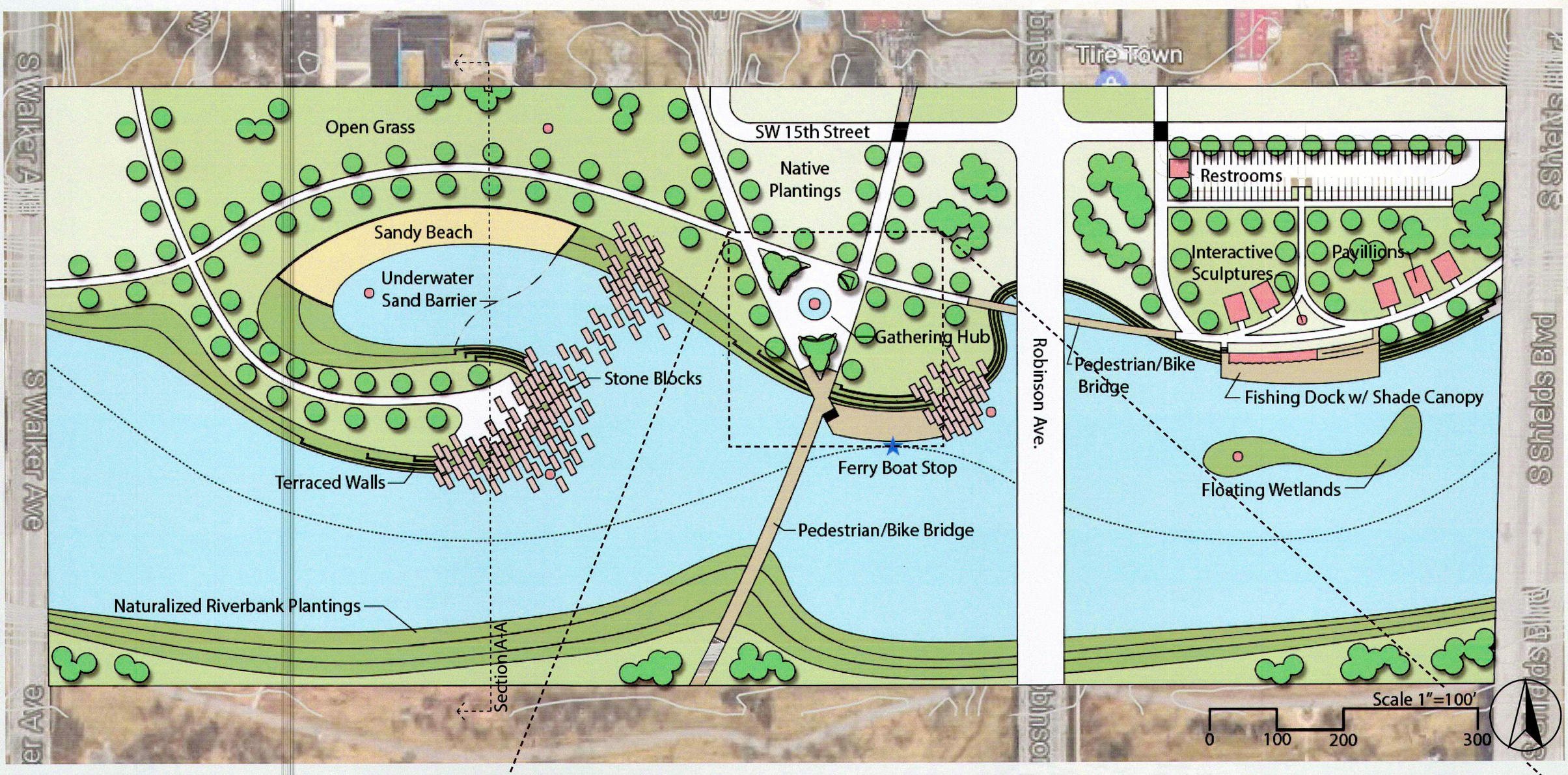
The Oklahoma City Riverbend Revival project is a central node within the soon to be thriving hot-spot along the Oklahoma river. The aim of this design is threefold: to make connections, naturalize the space, and create interaction with the site.

CONNECT - With the merging of multiple biking and walking trails on this site, it creates a perfect hub for gathering and redirecting toward other areas of the surrounding neighborhood. The site is designed with multi-functional and passive areas for gathering and relaxing. It also provides vehicular access and parking as well as access to the water taxi.

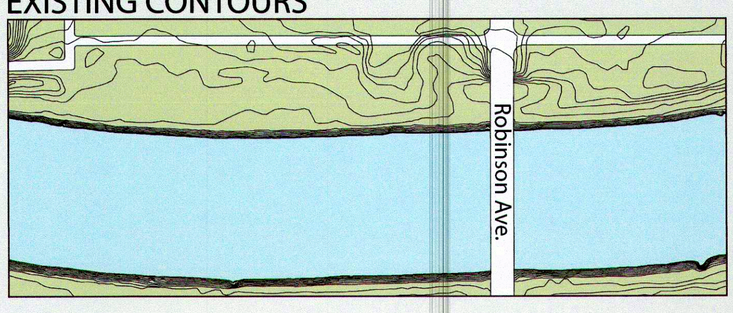
NATURALIZE - Improving the riverbank from rip-rap to gentle slopes and terraces allows for the planting of native water plants. These plants will act as purifiers to clean the water as well as provide opportunities for wildlife to live in and interact with the space.

INTERACT - Along with naturalizing the river bank, there are also opportunities for people to interact with the water and the new natural habitats created. Areas such as the beach, water taxi, and climbing rocks allow for direct interaction with the river. The open green areas and large expanses of native grass plantings allow for interaction with plants and animals.

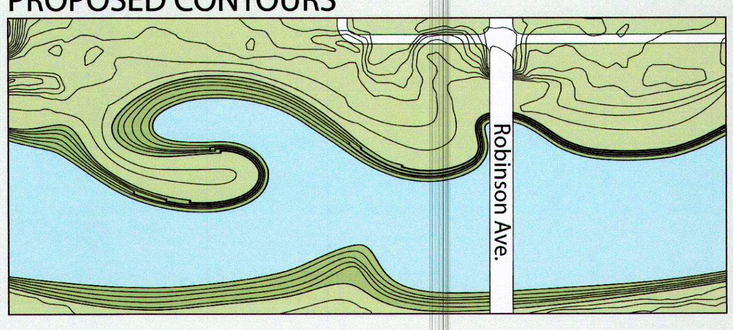




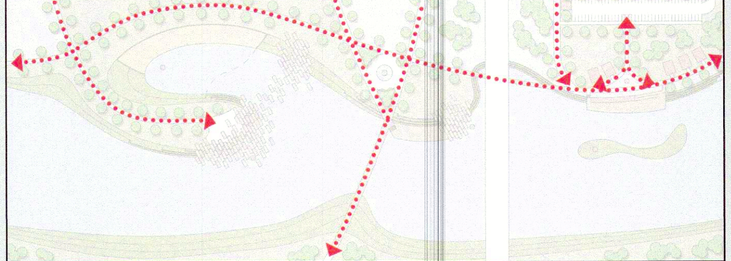
EXISTING CONTOURS



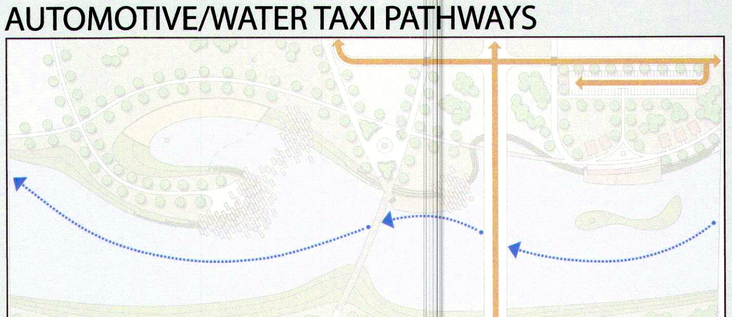
PROPOSED CONTOURS



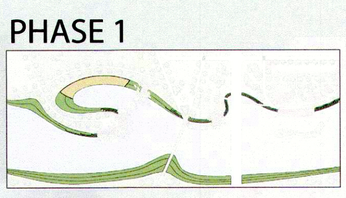
PEDESTRIAN/BIKE PATHWAYS



AUTOMOTIVE/WATER TAXI PATHWAYS

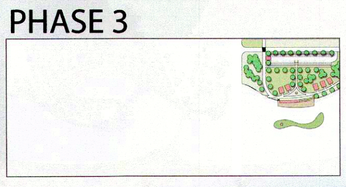


PHASE 1

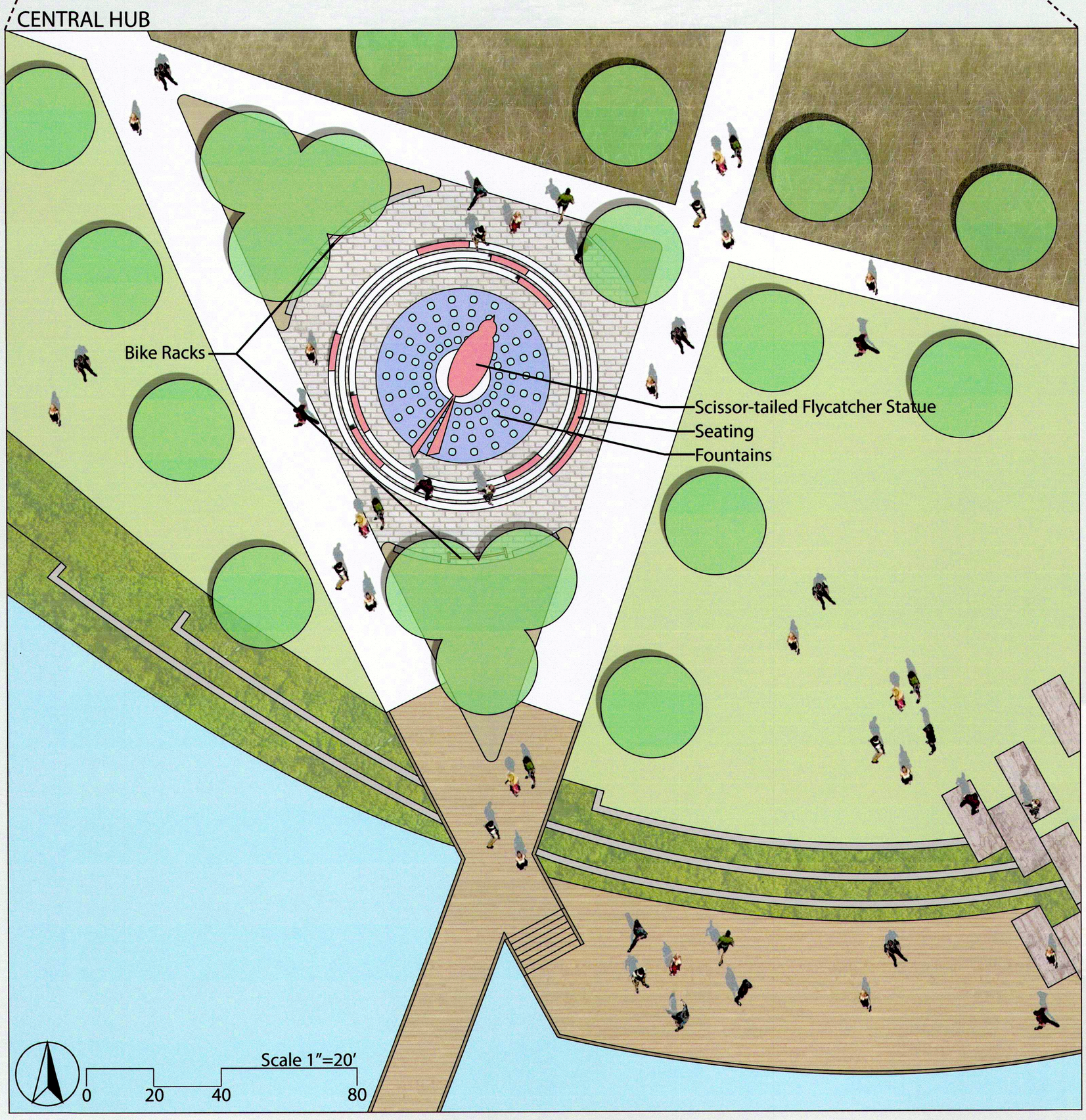


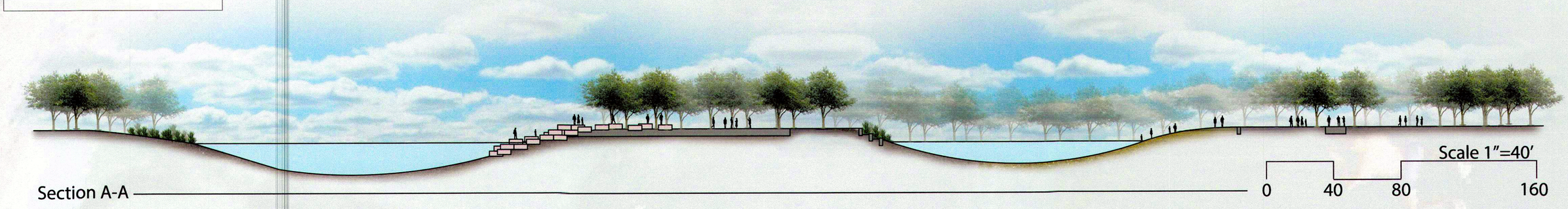
PHASE 2

PHASE 3



CENTRAL HUB

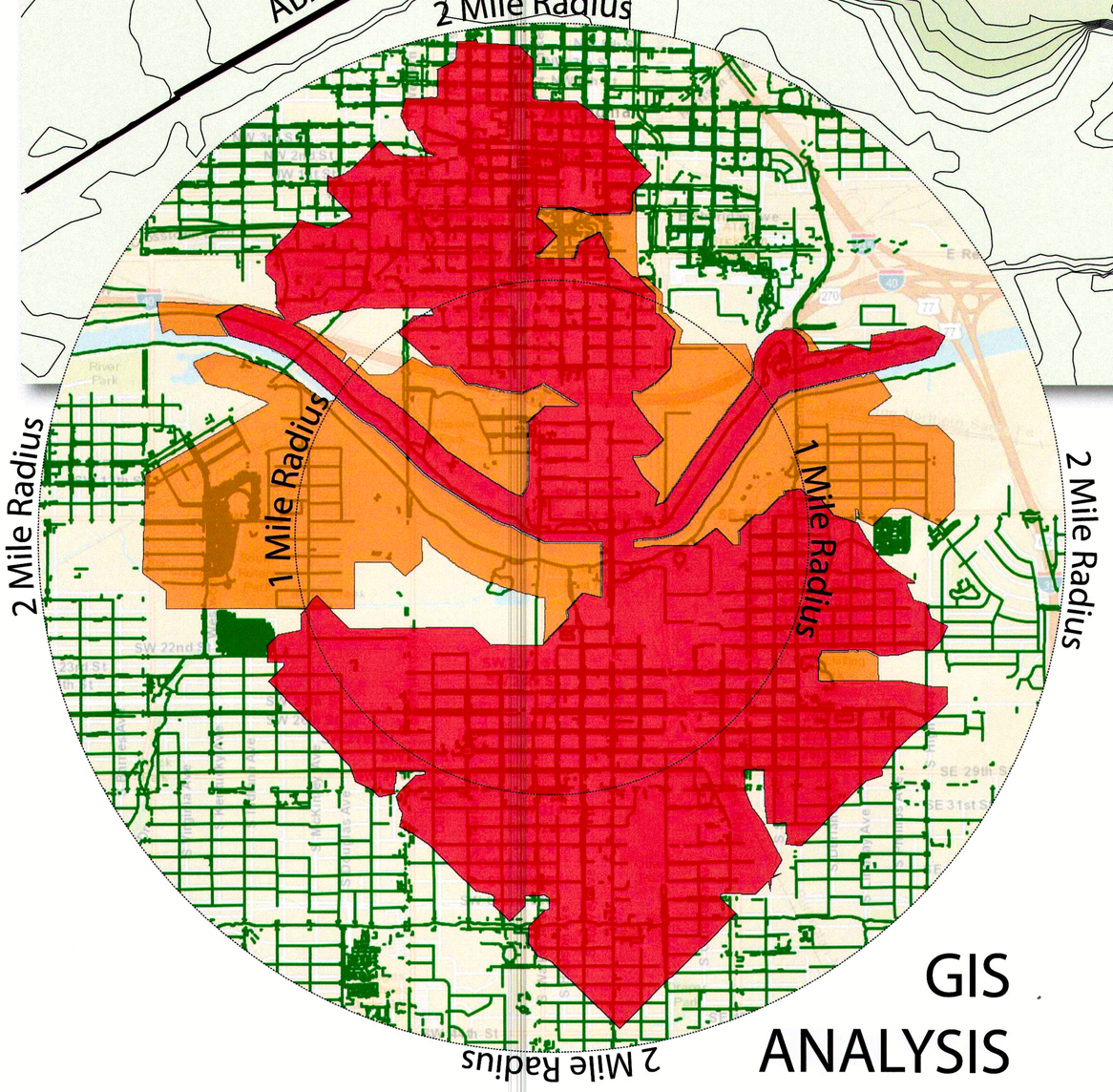




BRIDGING THE WETLANDS

CREATING CONNECTIONS, ENHANCING ENVIRONMENTS

I-40 INTERSTATE
EXCHANGE AVE
RIVER INLET
SECONDARY TRAIL
FILTER WETLAND
PRIMARY TRAIL
WESTERN AVE OFF RAMP
SECONDARY TRAILS
STORMWATER INLET
A
RIVER INLET
SOUTH RIVER TRAIL
RAIL BRIDGE
PRIMARY TRAIL
FILTER WETLAND
STREAM OUTLET
B
WESTERN AVE
ABANDONED RAIL LINE
RIVER OUTLET
SOUTH RIVER TRAIL
N
0 100 200 300 FEET
1″=100′



GIS ANALYSIS

ERIC SABIN
LA 5545 STUDIO 4
DIVISION OF LANDSCAPE ARCHITECTURE

COLLEGE OF ARCHITECTURE
The UNIVERSITY of OKLAHOMA

OKC RIVERBEND REVIVAL

Wheeler Park

LifeTogetherCommunity

I-40

S Western Ave

S Walker Ave

Oklahoma City River

01 02 03 04 05 06 07 08 09 10 11 12 13 14 15

Aubrey Ryland Pontious

Semester Final
LA 5545- Studio IV
Spring 2017

The University of Oklahoma,
College of Architecture,
Division of Landscape Architecture

North

0 200 400

Scale 1:100

CLIMATE CHANGE AND THE FUTURE OF THE SNOW SPORTS INDUSTRY

Changes in the onset of spring, variability in snow pack from one year to the next and overall climate change data. These things are having an impact on the winter sports industry as we know it. The winter sports industry consists of skiing, snowboarding, cross-country skiing and snowmobiling. The consumer spending in these areas is in the billions each and every year. This number can change dramatically depending on the timing and amount of snow in any one part of the world. The climate is changing and the snow sports industry is trying to change with it.

Key Words

Climate Change
Recreation
Snow
Precipitation
Winter Tourism
Winter Sports
Environmental Threat
Climate
Adaptation
Skiing
Snowmobiling
Tourism
Snow making

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Burakowski , E., & Magnusson, M. (2012, December). Climate Impacts on the Winter Tourism Economy in the United States. Retrieved January, 2017, from https://www.nrdc.org/sites/default/files/climate-impacts-winter-tourism-report.p

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Karl, T. R., Groisman, P. Y., Knight, R. W., & Heim, R. R. (1993). Recent Variations of Snow Cover and Snowfall in North America and Their Relation to Precipitation and Temperature Variations. Journal of Climate, 6(7), 1327-1344. doi:10.1175/1520-0442(1993)006<1327:rvosca>2.0.co;2

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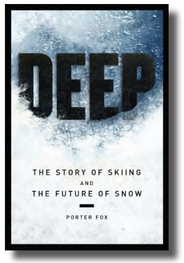
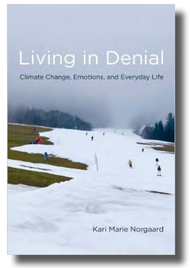




POW
PROTECT OUR WINTERS

Jeremy Jones
Professional Snowboarder
Founder of POW

Daniel Scott
Professor at Waterloo University Canada
Sustainable Recreation Professor

Auden Schendler
VP of Sustainability Aspen Ski Co.
Author of Getting Green Done

Porter Fox
Writer and Editor at Powder Magazine
Author of DEEP: The story of Skiing and The Future of Snow

GREEN INFRASTRUCTURE IN OKLAHOMA CITY

Making a case for the use of green infrastructure in the Oklahoma River watershed

Rachel Ware | University of Oklahoma | Case Studies for Final Study

INTRODUCTION

Purpose

The purpose of this document is to inform a study on the use of green infrastructure to mitigate flooding and pollution of the Oklahoma River. The river has become a vital economic resource for the City of Oklahoma City, but there have been few efforts to address the potential for pollution of the river. As use of the river increases through river-front development, a study of the potential use of green infrastructure becomes important.

Intent

The intent of this study is to provide a valuable resource of information, and potentially a case study to utilize as development continues along the river. Potential deliverables include:

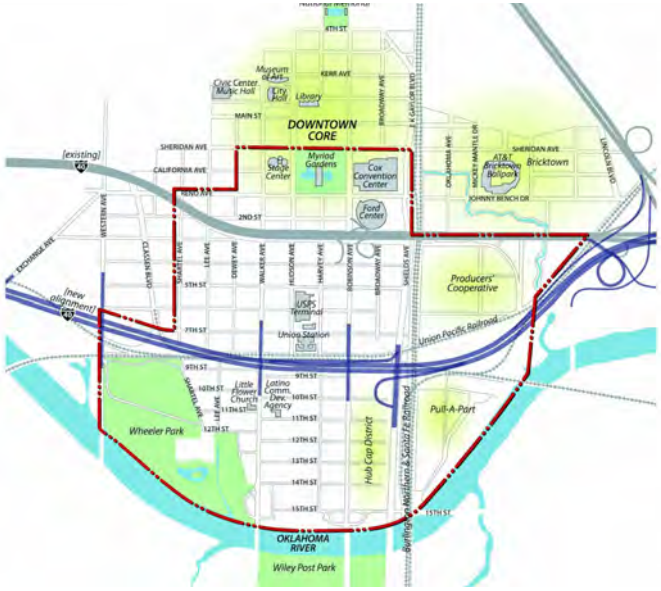
- Pamphlet for homeowners of best management practices
- GIS analysis of tributaries leading into the Oklahoma River
- GIS analysis of land use around the Oklahoma River
- Green infrastructure strategy at a neighborhood scale
- Site designs for several types of green infrastructure or low impact development tools along a suggested green infrastructure network
- Cost-analysis for the use of green infrastructure versus traditional infrastructure

Steps

1. Determine goal, overall concept, target audience/deliverables (average home owners? Neighborhood associations? Okc leaders? Planning department? Developers? River trust?)
2. Analyze water patterns, water quality, any initial research that has been completed (including OKC Plan, Sustainability commitments, River trust, additional research)
3. Identify neighborhood/site for retrofitting with green infrastructure (but how?)
4. Utilize EPA stormwater modeling software to identify number & type of green infrastructure techniques to be implemented
5. Identify WHERE those should/could go in the neighborhood (vacant lot development, streetscape, etc)
6. Site design for a few specific interventions/retrofits

Green Infrastructure Tools

- stormwater tree trenches
- stormwater bump-outs
- stormwater planters
- pervious pavement
- green roofs
- rain barrels/cisterns
- rain gardens
- flow-through planters
- parks
- community gardens



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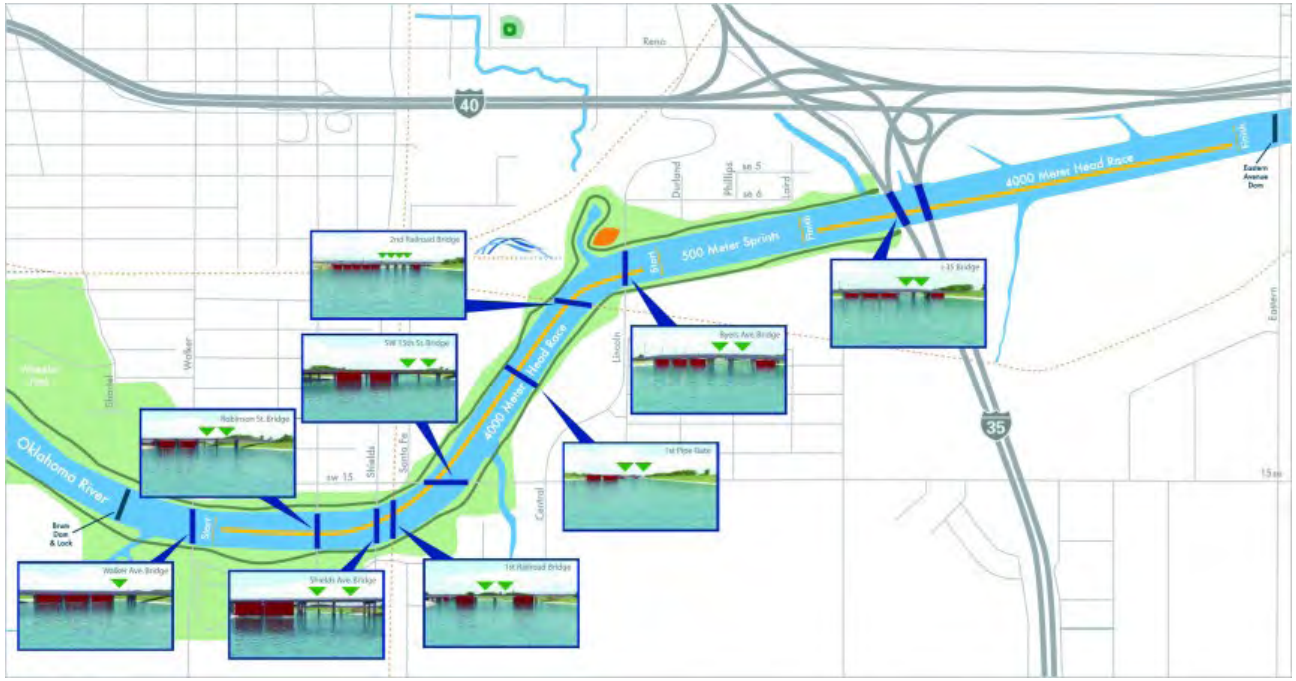

CASE STUDY 1

ECO-VILLAGE AT ITHICA

Location: Ithica, New York
Date Completed: 2014

"The EVI development's estimated cost is $2.4 million for materials and activities related to the site and landscape. A conventional suburban development of 100 homes would cost $8.3 million for the site/landscape. This represents a 70% savings.[1]"

Project Background

The Eco-Village in Ithica, New York is a residential development project focused on sustainable living. It is a planned community, with 100 housing units placed on a tight 15-acre site, which preserves the other 175 acres for community gardens, wetlands, a community center, and shared open space. The landscape architect incorporated green infrastructure, such as meadows and wetlands, to capture stormwater runoff, however these areas also serve recreational and educational purposes for residents. The intention of the eco-village is to be a model for sustainable, experiential living.

Lessons Learned

Many of the post-construction challenges faced by residents involve transportation issues. The site is ~20 miles from the local town, which makes a bicycle and pedestrian-oriented transit option difficult. Additionally, the materials used for entry driveways are not holding up to expected standards and other pathways are difficult for those in a wheelchair to move around. Other issues include the costs of pumping city water to the site and fire hazard issues.

The project is composed of three different neighborhoods and surrounding farmland and natural spaces.

Challenges

- Traditional zoning limitations
- Proximity to other services
- Access to city's water

Project Significance

Although the eco-village model is based on a sustainable co-housing lifestyle that may not fit the lifestyle of everyone, there are valuable components that can be utilized for green infrastructure planning, including:

- Compact development, to preserve natural land for open space, community space, stormwater management, habitat, and food production.
- Pedestrian-oriented spaces to encourage interaction with nature
- Careful attention to site planning, implementing green infrastructure in vital locations to both capture stormwater runoff and provide health and ecological services for those who inhabit the space.
- Strategies for implementing green infrastructure into residential space, including immediate surroundings and land-use outside of the immediate site.

Contacts

OWNER/CLIENT: EcoVillage at Ithaca, Inc.
LANDSCAPE ARCHITECT: Rick Manning Landscape Architect
WEBSITES: http://ecovillageithaca.org/
https://landscapeperformance.org/case-study-briefs/ecovillage-at-ithaca#/project-team

Keywords

eco-village, co-housing, stormwater management, water quality, green communities, community garden, green neighborhood

IMAGE RESOURCES

https://landscapeperformance.org/case-study-briefs/ecovillage-at-ithaca

https://landscapeperformance.org/case-study-briefs/ecovillage-at-ithaca

https://landscapeperformance.org/case-study-briefs/ecovillage-at-ithaca#/sustainable-features

[1]https://landscapeperformance.org/case-study-briefs/ecovillage-at-ithaca#/cost-comparison

CASE STUDY 2

PHILADELPHIA: GREEN CITY, CLEAN WATERS

Location: Philadelphia, Pennsylvania
Date Completed: Adopted June 2011, Ongoing

Project Background

In 2009, the city of Philadelphia address their aging Combined Sewer System (CSS) and sought a cost-effective solution to managing the overflow caused by moderate to heavy rain events. The option of replacing the entire traditional infrastructure meant billions of dollars and many years of construction for neighborhoods. They identified that the greatest benefit and lowest cost option was green infrastructure and adopted a green infrastructure plan in June 2011.

Green Infrastructure

Types of green infrastructure tools utilized in the city include:

- stormwater tree trenches
- stormwater bump-outs
- stormwater planters
- pervious pavement
- green roofs
- rain barrels/cisterns
- rain gardens
- flow-through planters

Above: Street runoff is captured at this rain garden at 47th St. and Gray's Ferry Ave. in the Combined Sewer Area within the Schuylkill River Watershed.

Above: The West Mill Creek Green Streets demonstration project in the Schuylkill Watershed includes a tree trench, permeable pavers and modified street inlets to divert stormwater into a subsurface infiltration bed.

Examples from Philadelphia's implemented green infrastructure plan

Keywords

stormwater management, water quality, green communities, green city, green neighborhood, green infrastructure, green streets, green parking

IMAGE RESOURCES

http://www.phillywatersheds.org/doc/GCCW_AmendedJune2011_LOWRES-web.pdf

http://www.phillywatersheds.org/what_were_doing/green_infrastructure/projects/cliveden_park

Project Significance

While Philadelphia's project is at the city-scale, they use many low impact development techniques that can be implemented at a neighborhood-scale. They have developed and implemented a plan which outlines their goals as well as the steps they are taking to reach those goals.

Many useful elements from this case study can inform this final study, including:

- Incentives to homeowners and businesses for managing stormwater on site
- Informational graphics and how-to guides for homeowners
- Types of green infrastructure used/suggested
- Goals, obstacles, etc.
- Cost-benefit analysis, including the many benefits associated with green infrastructure that are in addition to stormwater management.

Programs

- Green Streets
- Green Schools
- Green Public Facilities
- Green Parking
- Green Parks
- Green Industry, Business, Commerce, and Institutions
- Green Alleys, Driveways, and Walkways
- Green Homes

Contacts

CLIENT: City of Philadelphia

WEBSITES: http://phillywatersheds.org/what_were_doing/documents_and_data/cso_long_term_control_plan

http://www.phillywatersheds.org/doc/GCCW_AmendedJune2011_LOWRES-web.pdf