



WAGGONNER  
& BALL

w Sherwood Design Engineers  
& Carbo Landscape Architects

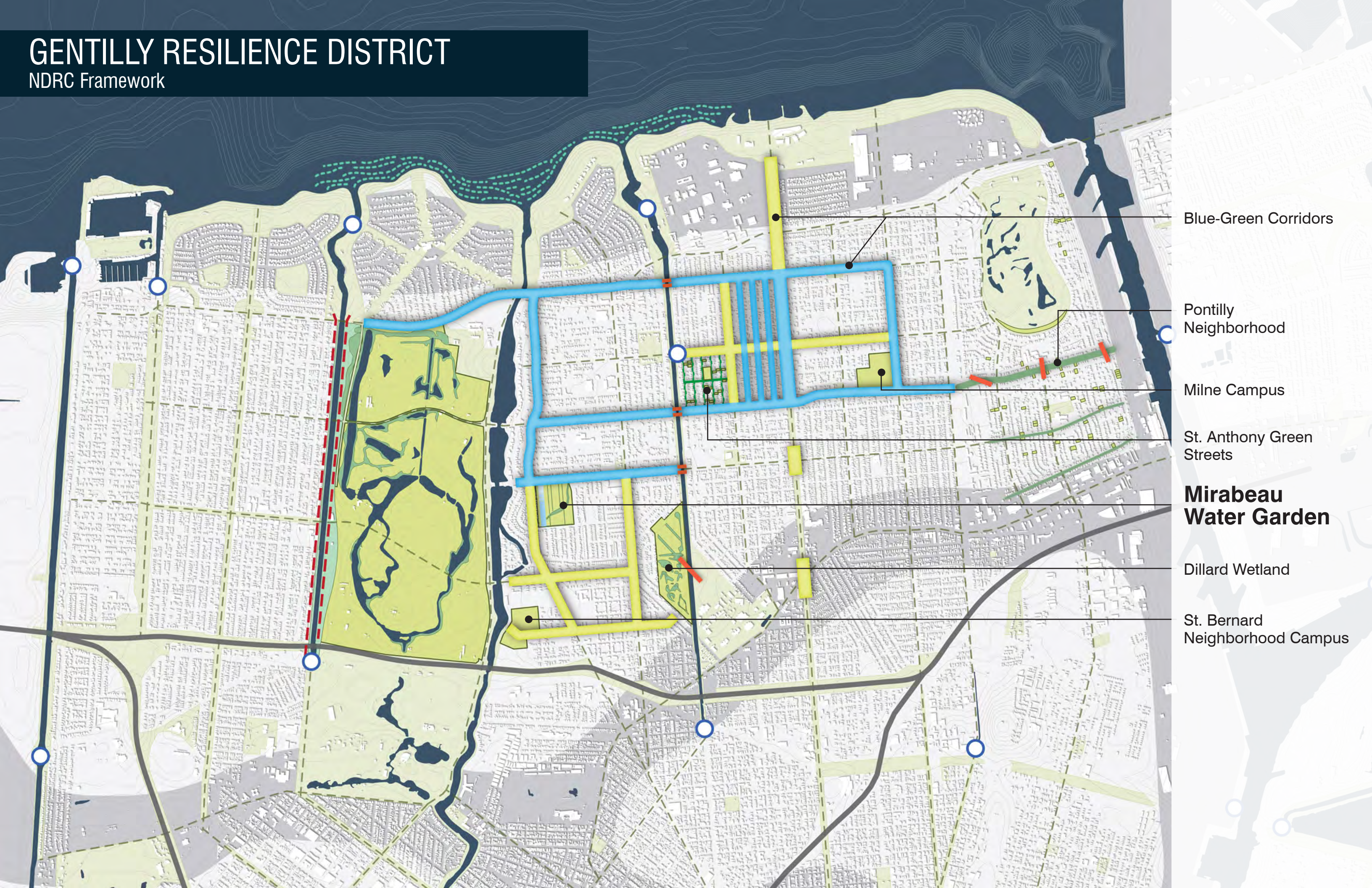
MIRABEAU WATER GARDEN

September 25, 2017



# GENTILLY RESILIENCE DISTRICT

NDRC Framework



Blue-Green Corridors

Pontilly  
Neighborhood

Milne Campus

St. Anthony Green  
Streets

**Mirabeau  
Water Garden**

Dillard Wetland

St. Bernard  
Neighborhood Campus



# PROBLEM

Existing Flooding - DPS 04 Service Area

2-Year Storm



5-Year Storm



10-Year Storm



Depth (Ft)

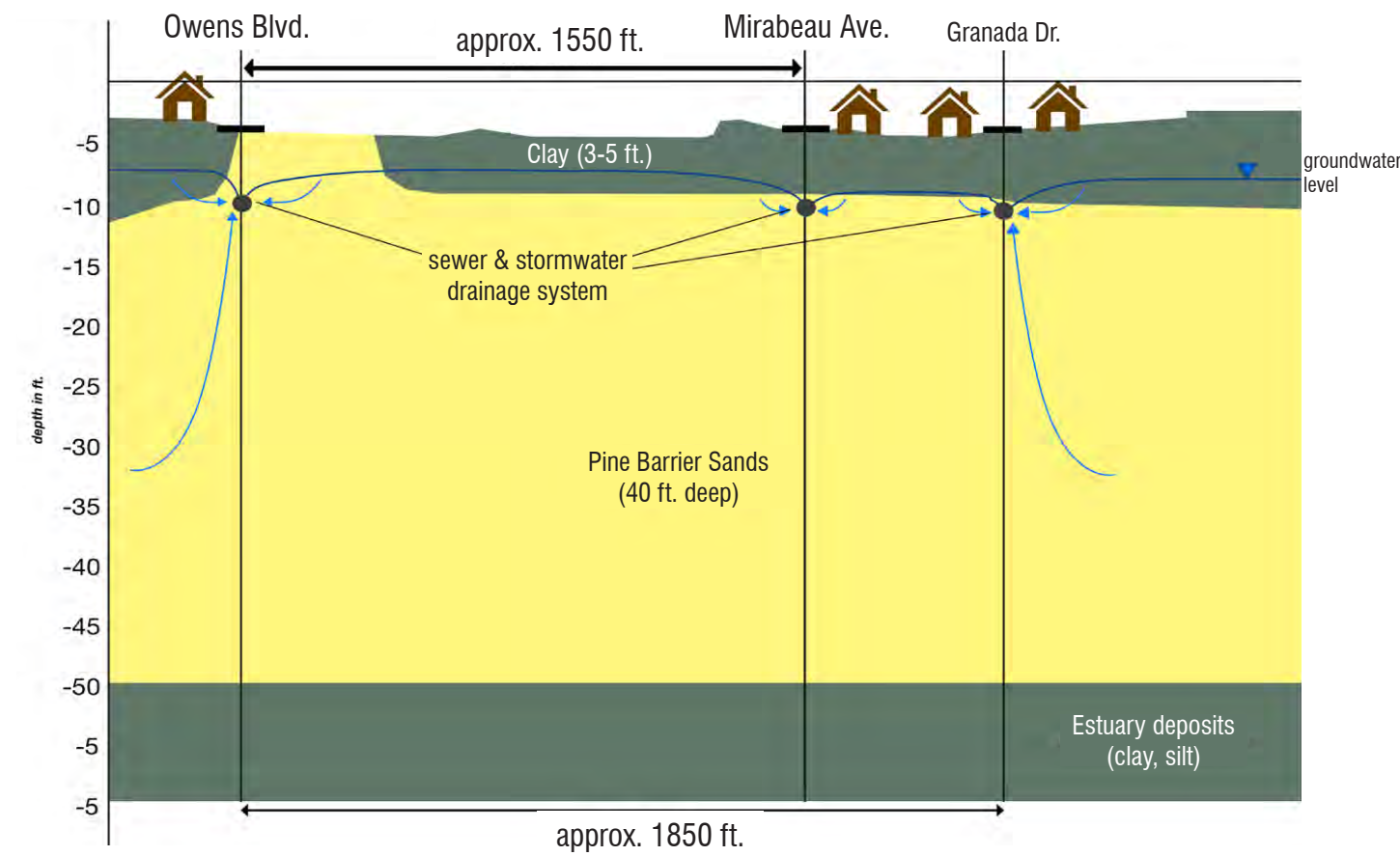
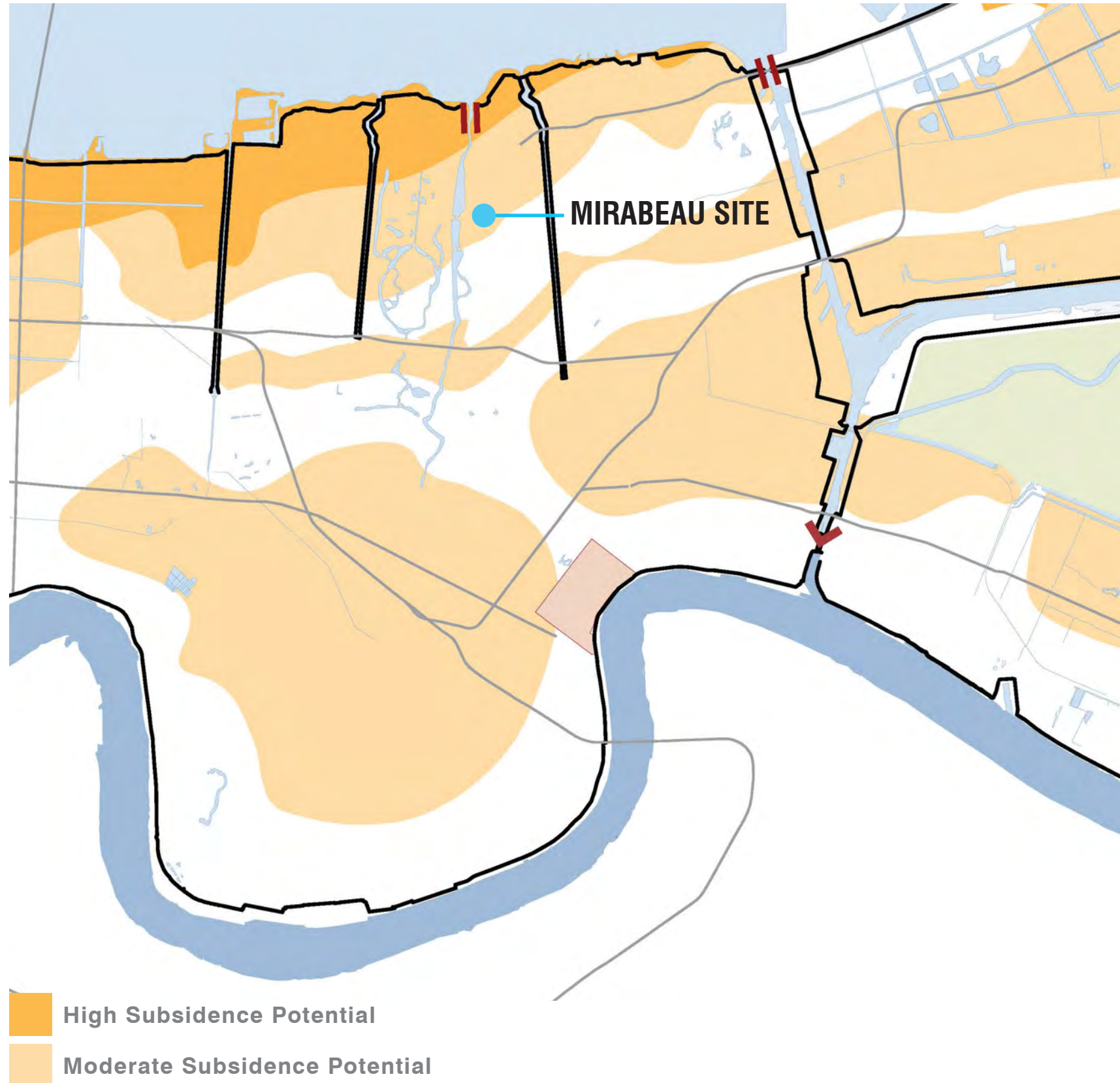




# PROBLEM

District & Neighborhood Issues Identified

## Subsidence



Subsidence-damaged House on Mirabeau Avenue

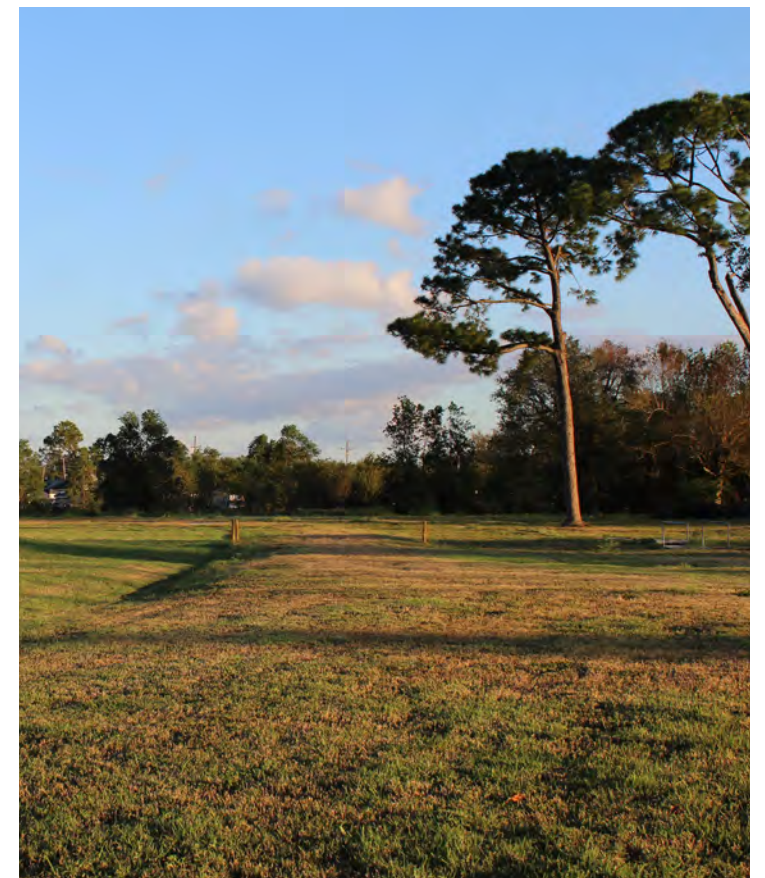
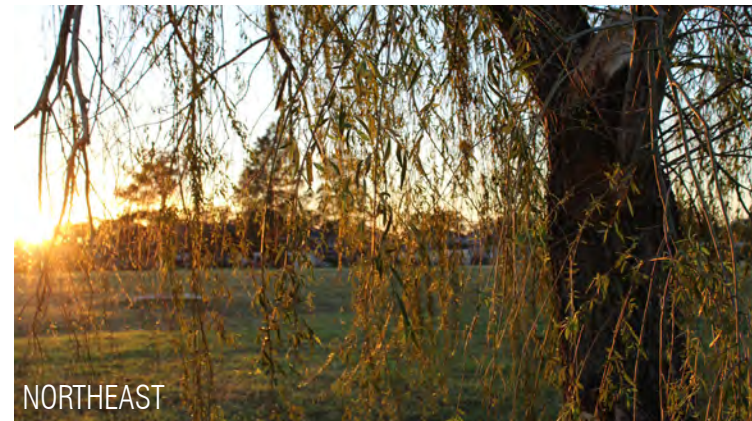


Subsidence-caused Street Damage on Owens Boulevard



# MIRABEAU SITE

Existing Conditions



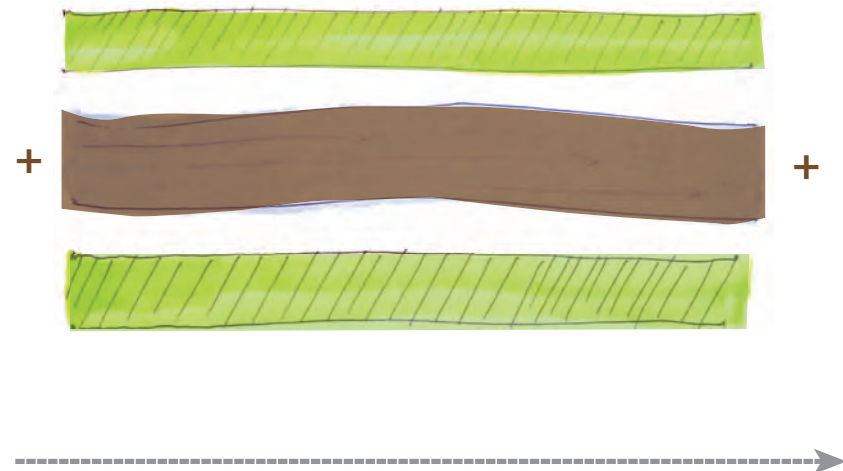


# MIRABEAU OBJECTIVES

HMGP & NDR Funding

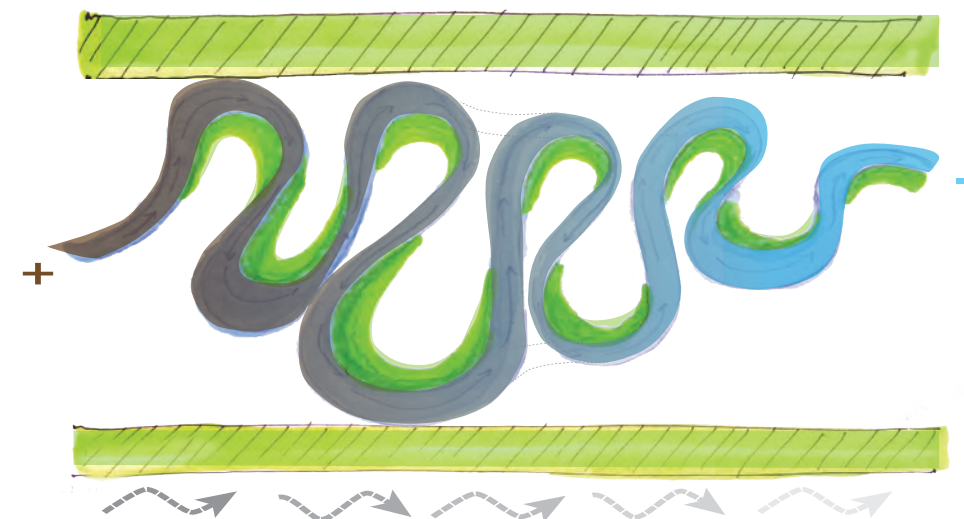
## HAZARD MITIGATION GRANT PROGRAM

- Reduce localized street flooding
- Reduce flooding damages to private and public structures
- Reduce traffic delays due to roadway flooding
- Meet min. Benefit Cost Ratio of 1:1



## HUD NATIONAL DISASTER RESILIENCE

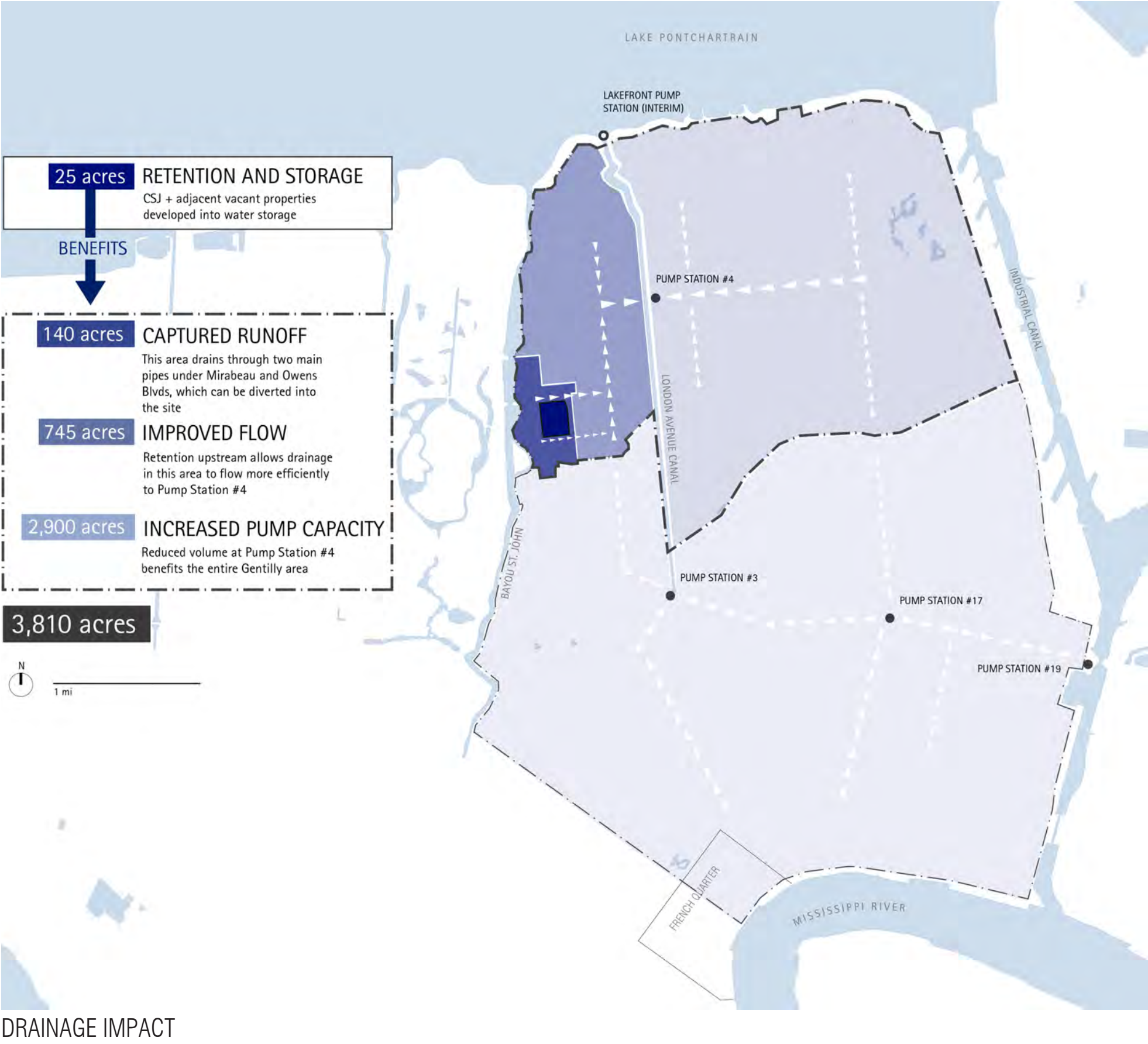
- Reduce localized street flooding
- Control subsidence
- Improve water quality
- Add aesthetic value to the neighborhood
- Improve quality of life for residents
- Provide replicable model
- Benefit low- and moderate-income residents
- Spur economic development
- Provide environmental education





# MIRABEAU IMPACT AREA

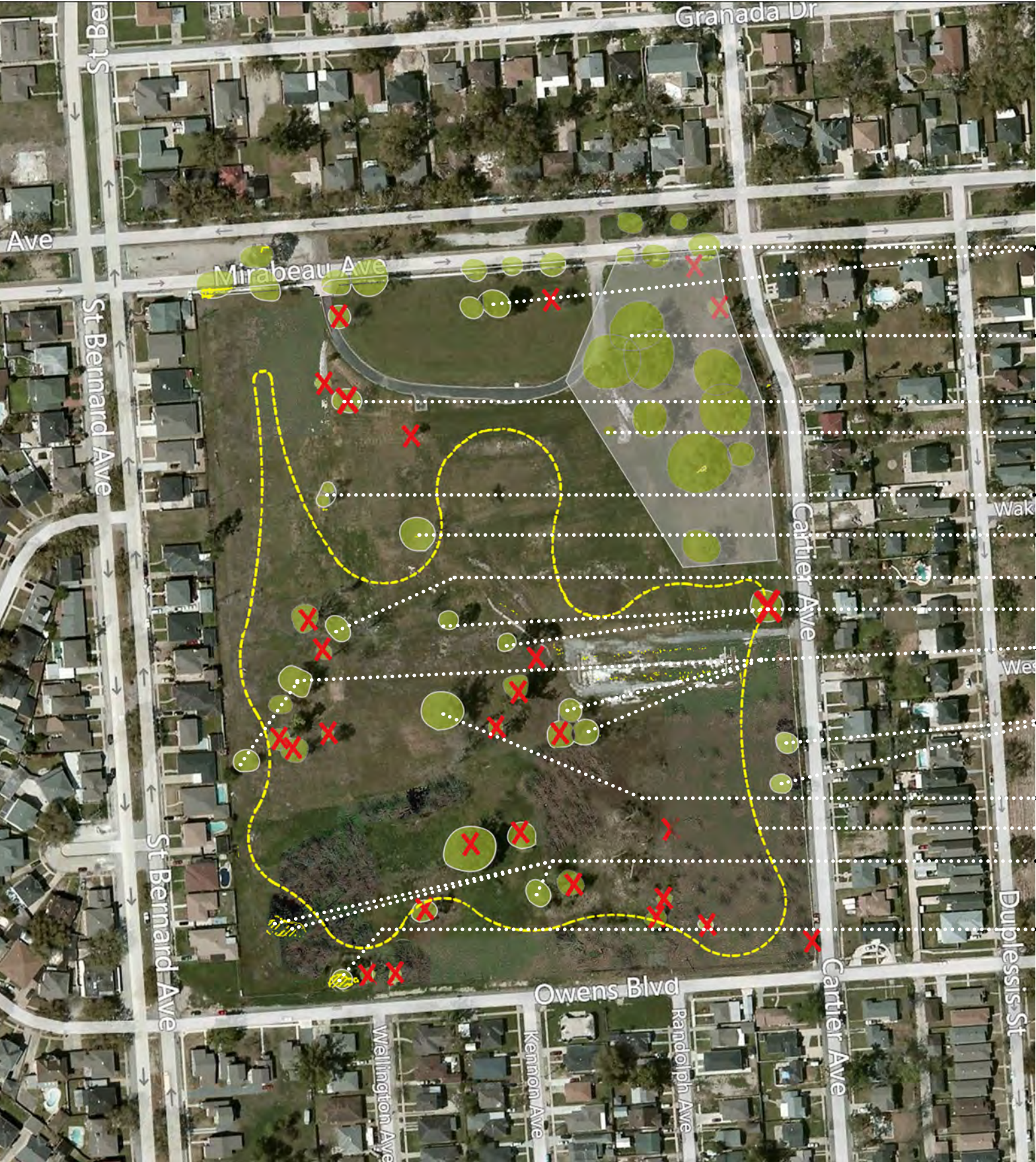
Drainage Analysis





# ECOLOGY

Tree Inventory, Evaluation, and Excavation



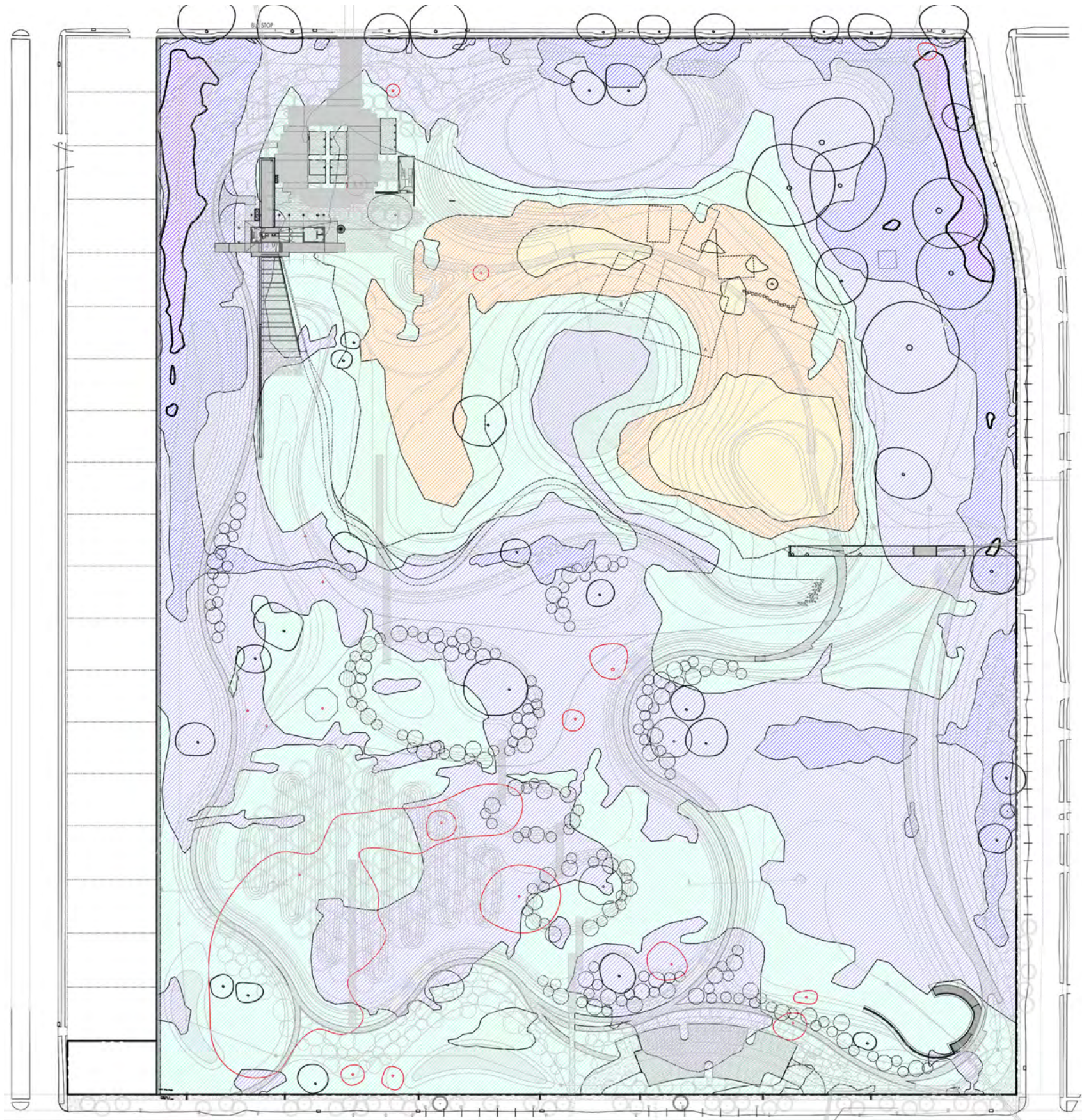
- Live Oak Trees (19"-32" line of ten)
  - Live Oak Trees (22"-70" grove of eight)
  - Elm Tree
  - Lemon Tree
  - Cypress Trees
  - Pecan Tree
  - Golden Rain Tree
  - Pine Trees
  - Live Oak Trees (21"-32" line of three)
  - Pine Trees
  - Sweet Gum
  - Extents of Excavation
  - Pine Trees
  - Maple Tree
- LEGEND**
- X Trees to be removed
  - Selective Removal within undisturbed zone
  - Approximate Limits of Basin Excavation





# SURVEY

## Topographic Analysis & Minimizing Excavation



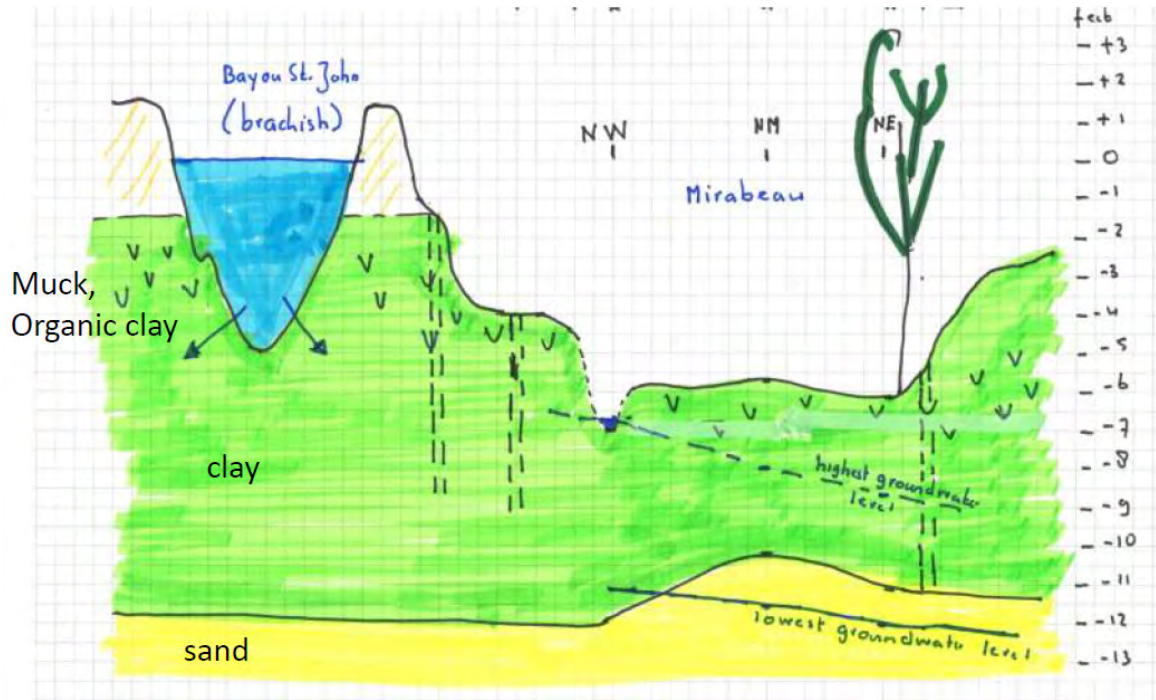
- Existing -1.5 Feet
- Existing -2.5 Feet
- Existing -3.5 Feet
- Existing -4.5 Feet
- Existing -5.5 Feet
- Existing -6.5 Feet



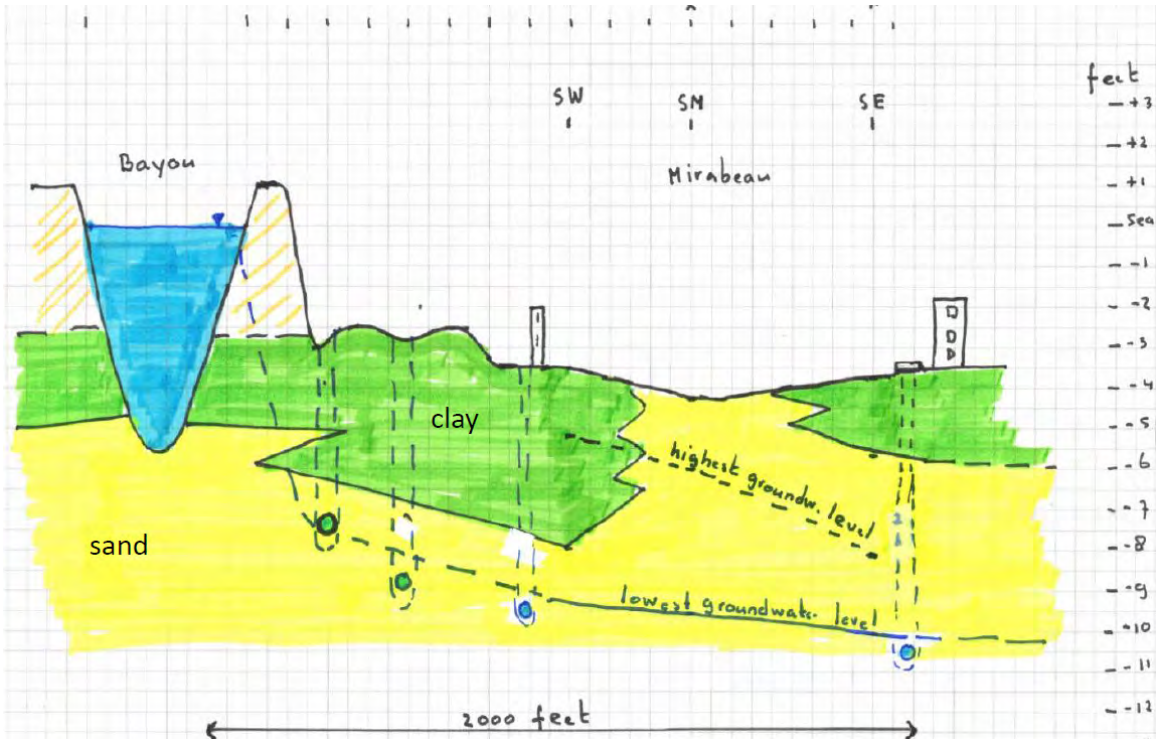
# GEOHYDROLOGY

## Soil Analysis

W-E TRANSECT SECTION AT MIRABEAU AVE (NORTH)



W-E TRANSECT SECTION AT OWEN STREET (SOUTH)



CLAY LAYER THICKNESS (FEET) BASED ON FEMA'S ARCHAEOLOGICAL SOIL ASSESSMENT





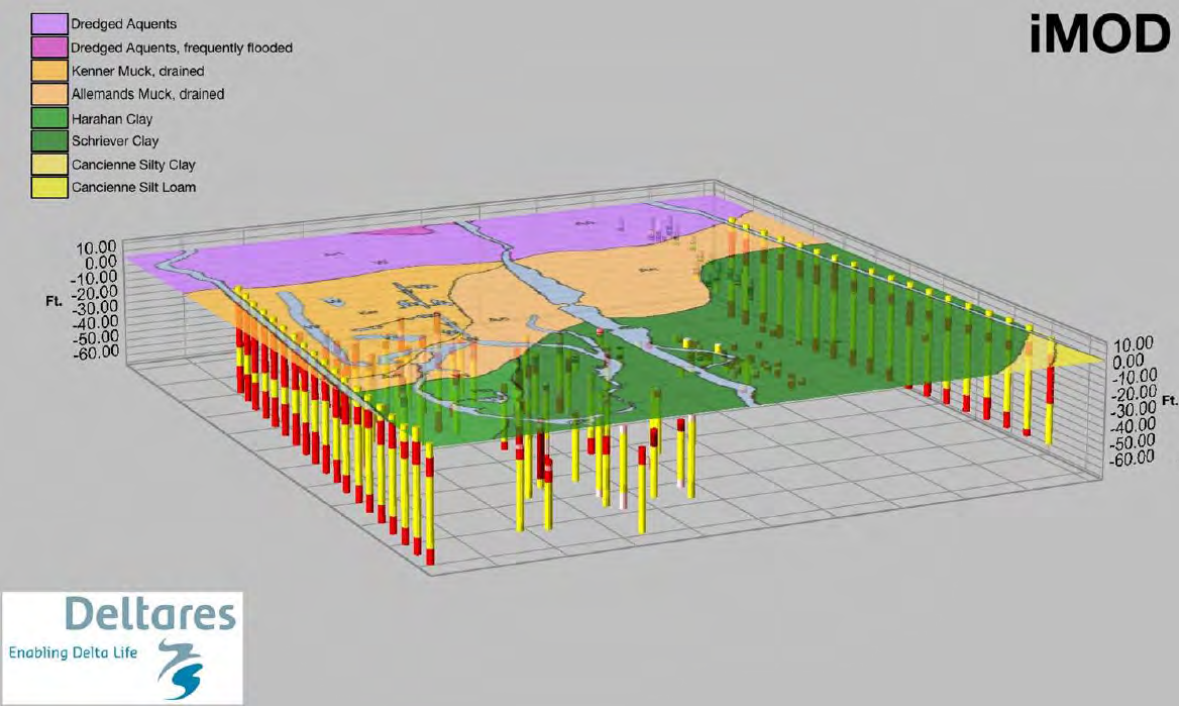
# GEOHYDROLOGY

## Groundwater Analysis

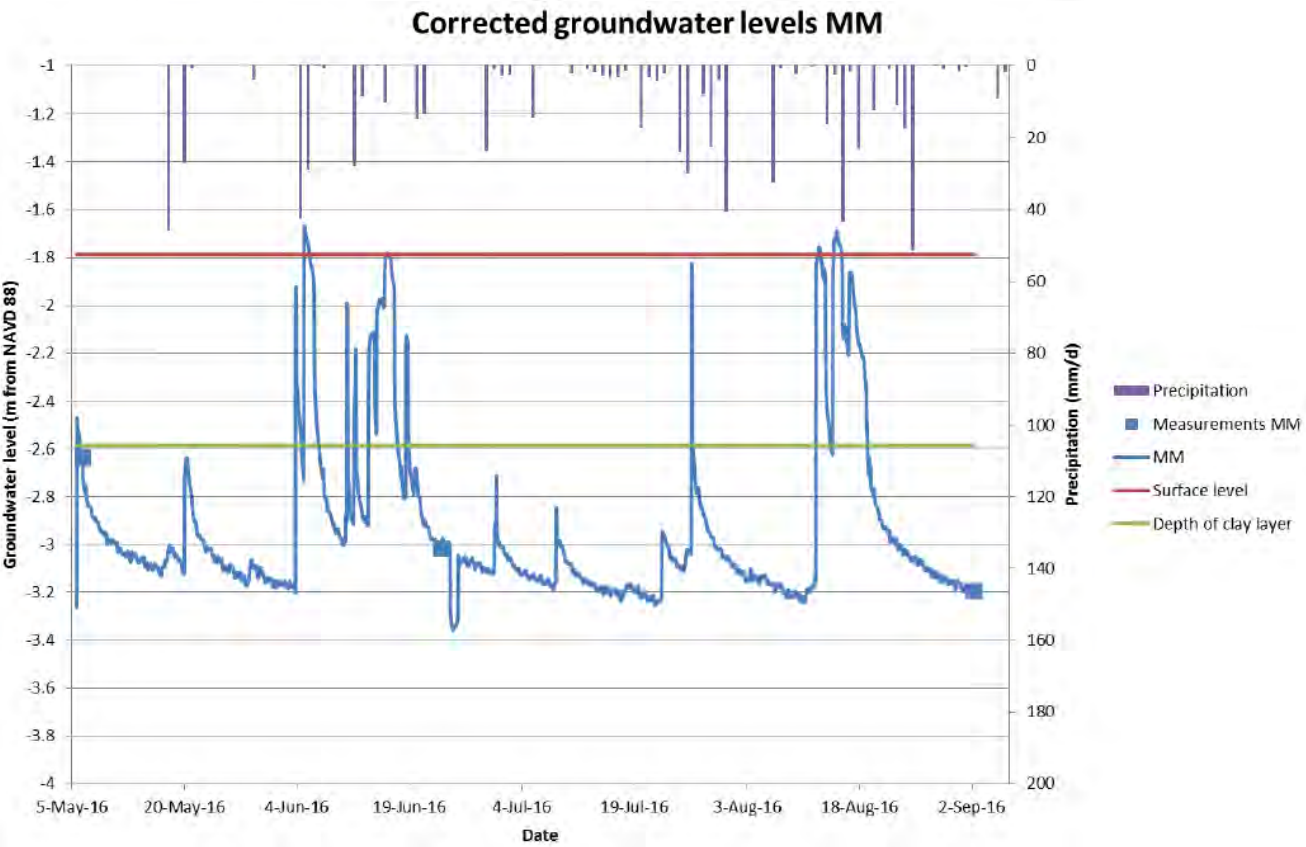
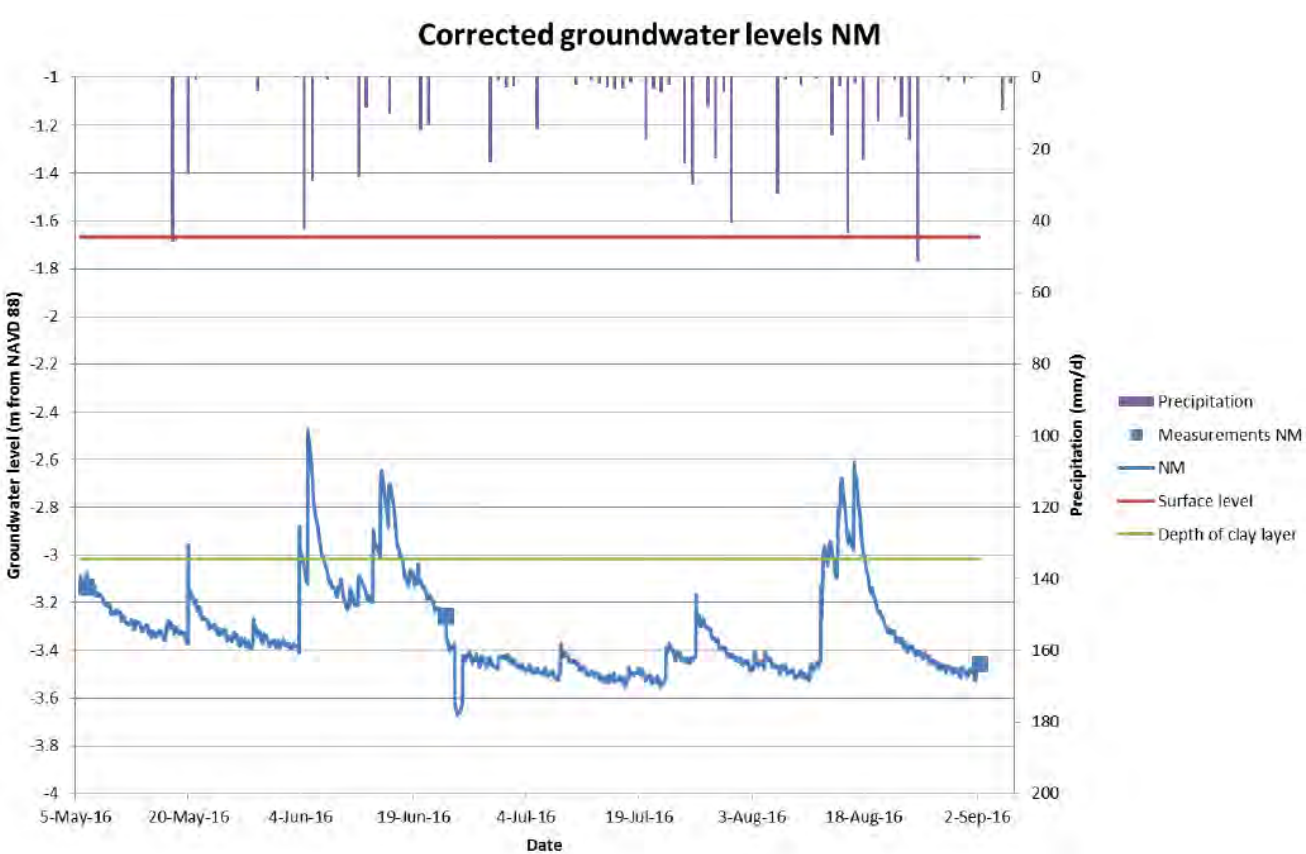
GROUNDWATER MONITORING NETWORK & WATER LEVEL CONTOURS IN FEET BELOW SEA LEVEL



3D MODEL - SOILS & SUBSURFACE



DIVER READINGS EXAMPLES

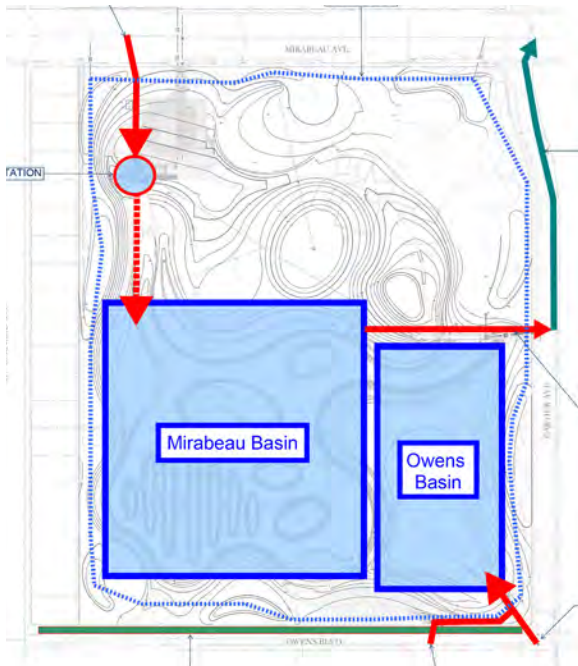




# HYDRAULICS

Engineering Analysis

**Max. Capacity:**  
**8.5M Gallons**  
Stormwater gets  
pumped into pond

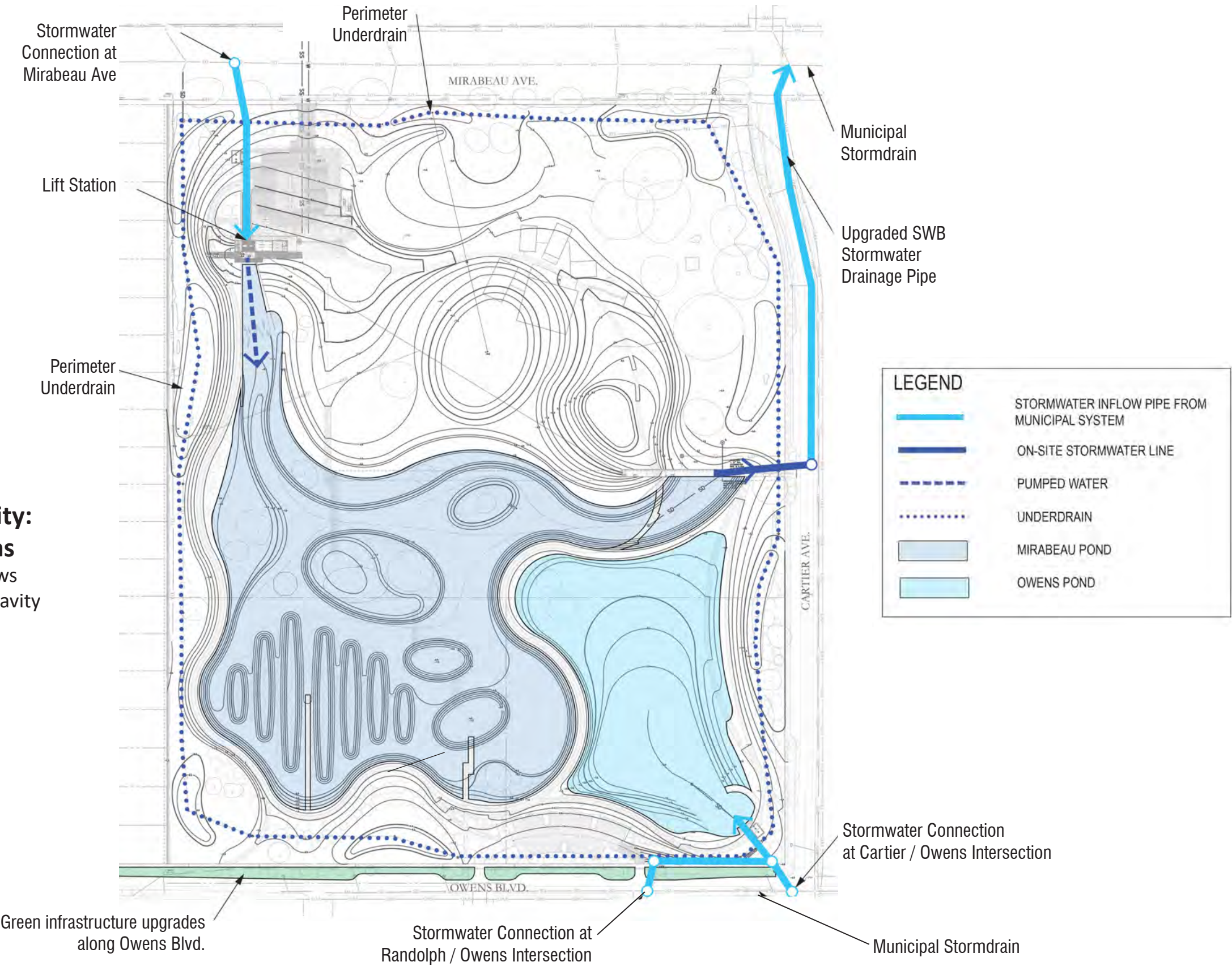


**Max. Capacity:**  
**2.5M Gallons**  
Stormwater flows  
into pond via gravity

Mirabeau  
Pond Elevation per Storm Event

Mirabeau Pond	
Storm Event	Elevation of Water
1 YR	-5.57'
2 YR	-5.09'
5 YR	-4.59'
10 YR	-4.25'

Owens Pond	
Storm Event	Elevation of Water
1 YR	-5.46'
2 YR	-4.65'
5 YR	-3.92'
10 YR	-3.58'





# HYDRAULICS

## Water Flow Analysis

### Typical Storm: 1 to 3 inch Events

#### Mirabeau Pump:

0.50 to 2.25 Million Gallons

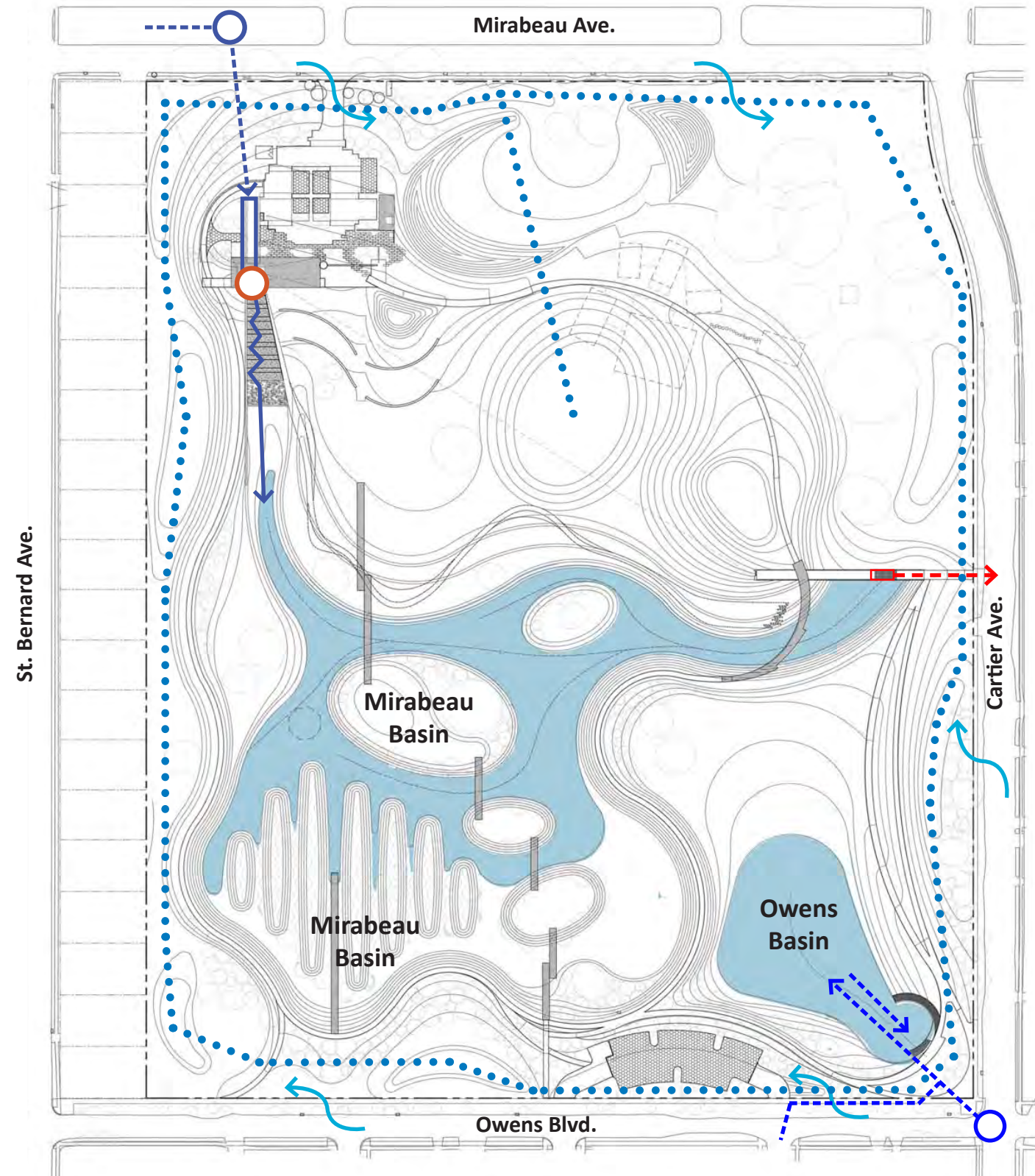
68,000 to 300,000 Cubic Feet

Stormwater from the municipal drainage system is conveyed by pipe from Mirabeau Avenue by gravity through a trash and sediment separating forebay to a wet well, where it is pumped into the Mirabeau detention basin.

Perimeter swales capture runoff from surrounding streets and biofiltration zones filter and percolate stormwater into the water table.

Permeable pavers and gravel surfaces help to capture and infiltrate runoff from the site.

Minor ponding but likely all water infiltrated





# HYDRAULICS

## Water Flow Analysis

### 1 Year Storm

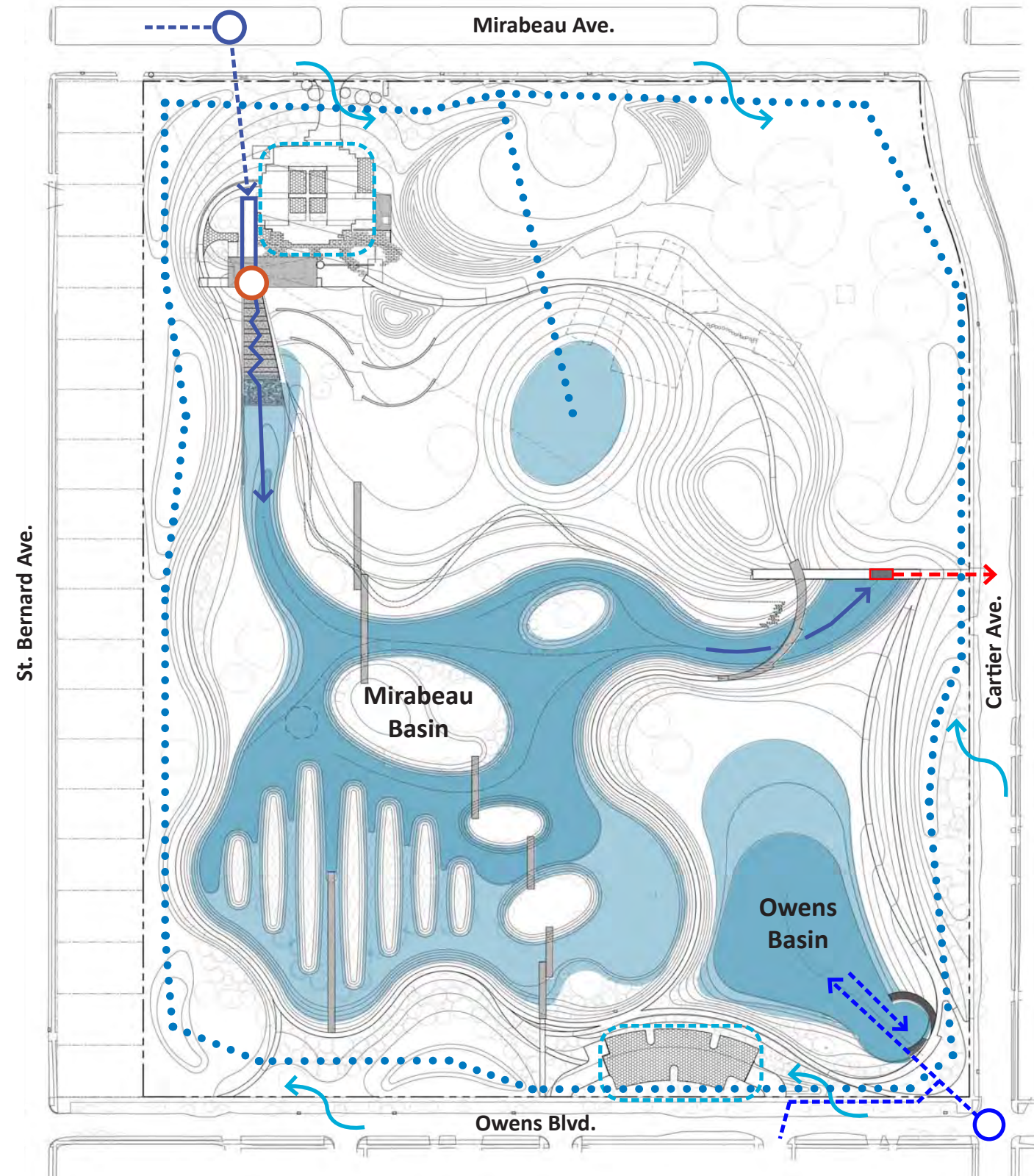
**Mirabeau Pump:**  
2.85 Million Gallons  
380,000 Cubic Feet

**Owens Intake:**  
0.5 Million Gallons  
65,000 Cubic Feet

In larger storm events, there is enough water pressure head in the Owens Blvd and Cartier Ave drainage pipes to begin to fill the Owens Basin, while the pump continues to fill the Mirabeau Basin.

Both weir structures slowly discharge the basins water back into the municipal drainage system.

Central bioswale filled approximately 6" deep. The perimeter bioswales remain predominantly dry as most water infiltrates and runs to underdrain system





# HYDRAULICS

## Water Flow Analysis

### 2 Year Storm

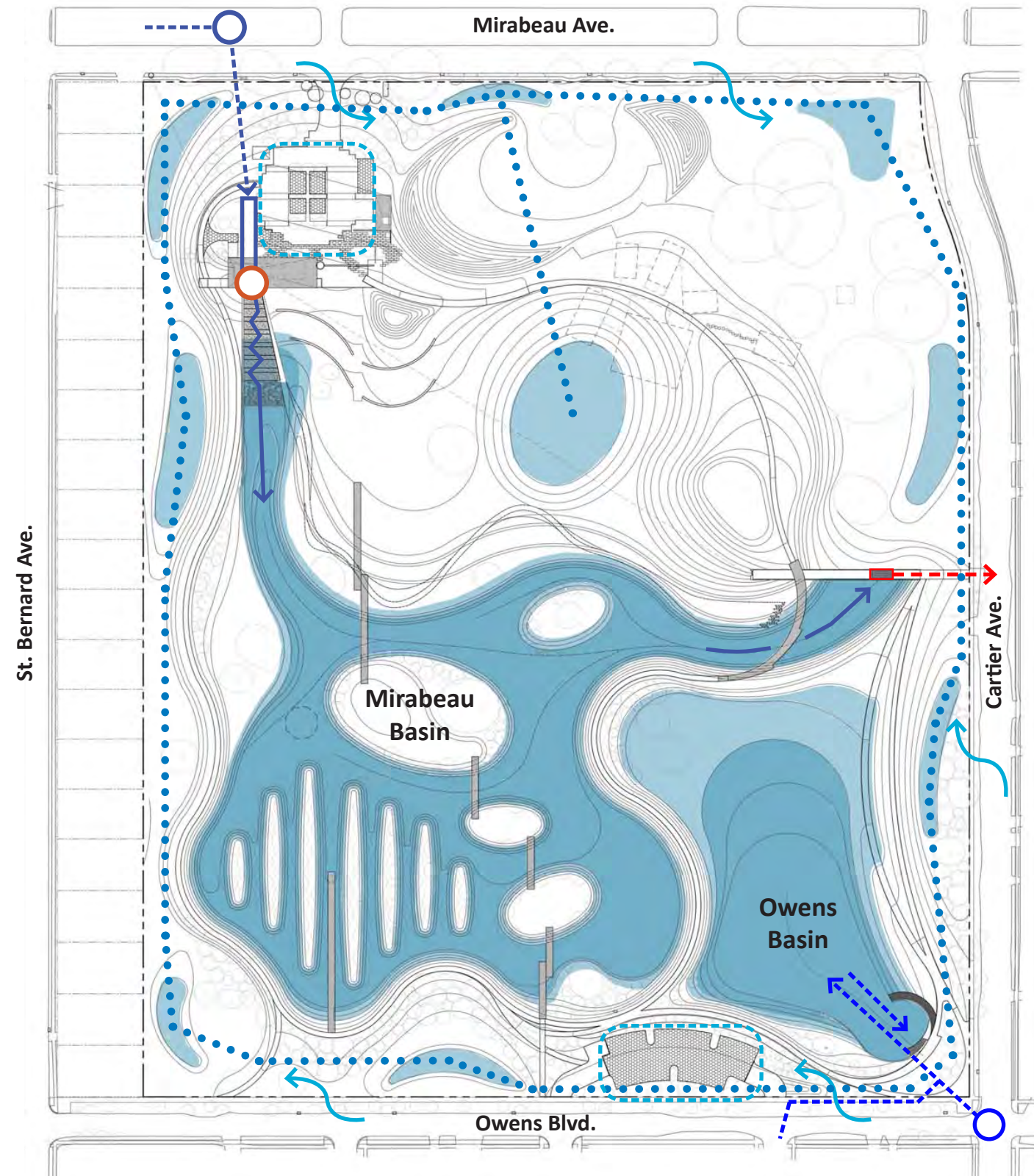
**Mirabeau Pump:**  
3.9 Million Gallons  
520,000 Cubic Feet

**Owens Gravity Intake:**  
1.0 Million Gallons  
124,000 Cubic Feet

With larger storms and increased volumes, the islands in the Mirabeau detention basin are inundated.

Both weir structures slowly discharge water from the basins back into the municipal drainage system.

The central bioswale is filled approximately 1' deep. The perimeter bioswales fill approximately 6" as the majority of the water infiltrates and drains to the underdrain system. Discharge from both underdrain and PaveDrain systems discharge into the wet well north of the pumphouse.





# HYDRAULICS

## Water Flow Analysis

### 10 Year Storm

**Mirabeau Pump:**  
6.0 Million Gallons  
800,000 Cubic Feet

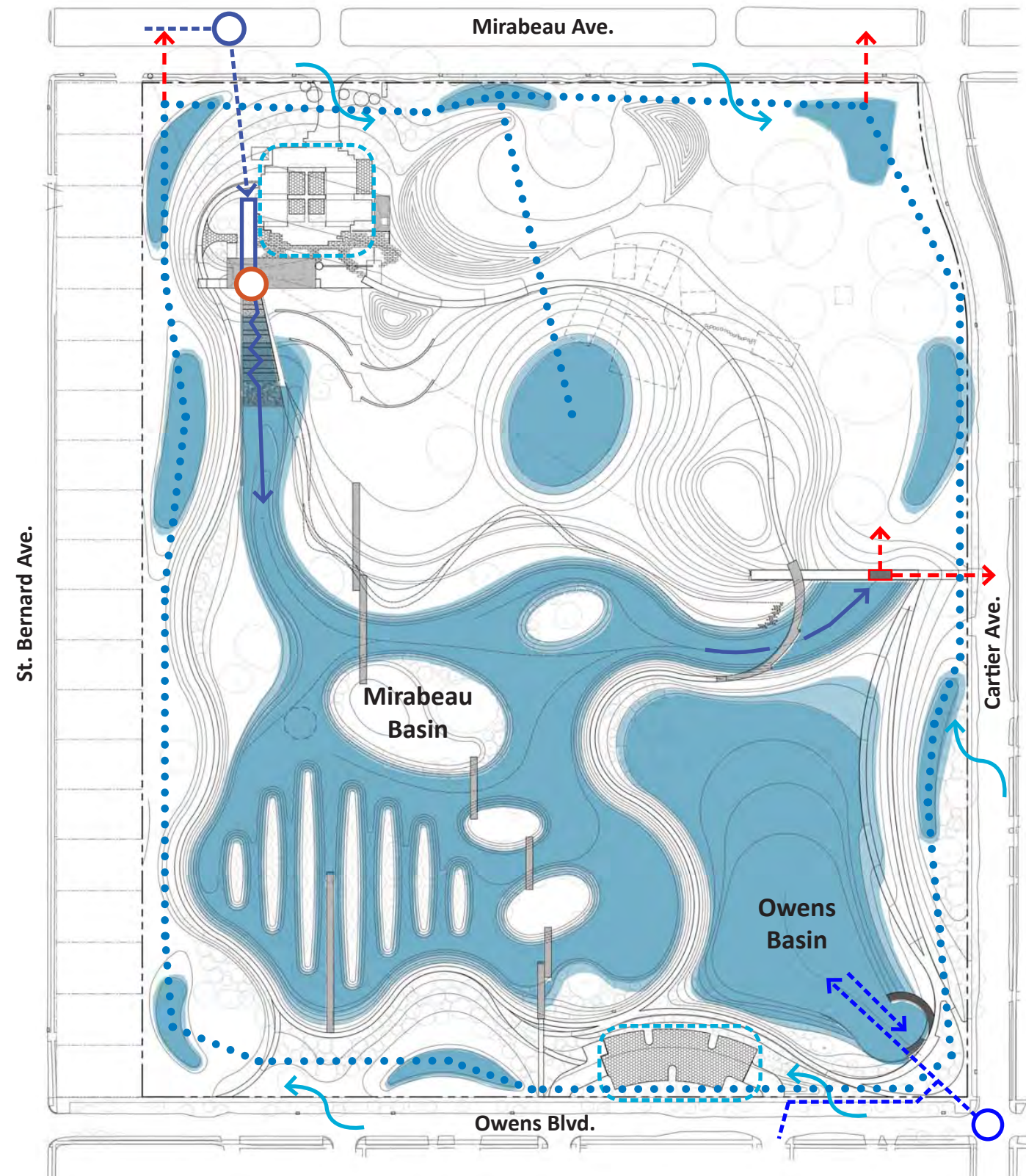
**Owens Gravity Intake:**  
1.8 Million Gallons  
231,000 Cubic Feet

In 10 year storm events, the water pressure head fills the Owens Basin to its maximum height of -3.58' feet. The Mirabeau Basin pump shuts off when the flood volume reaches a maximum height of -2.5' feet. An additional one foot of freeboard provides a safety factor.

An emergency overflow structure in the north weir provides a discharge path in case the system is overfilled. Both weir structures slowly discharge water from the basins back into the municipal drainage system.

The central bioswale is filled approximately 1' deep. The perimeter bioswales fill approximately 6" as the majority of the water infiltrates and drains to the underdrain system. Discharge from both underdrain and PaveDrain systems discharge into the wet well north of the pumphouse.

A final underdrain/groundwater control system design is yet to be determined, with final discharge going either to the Mirabeau culvert or the pond system.

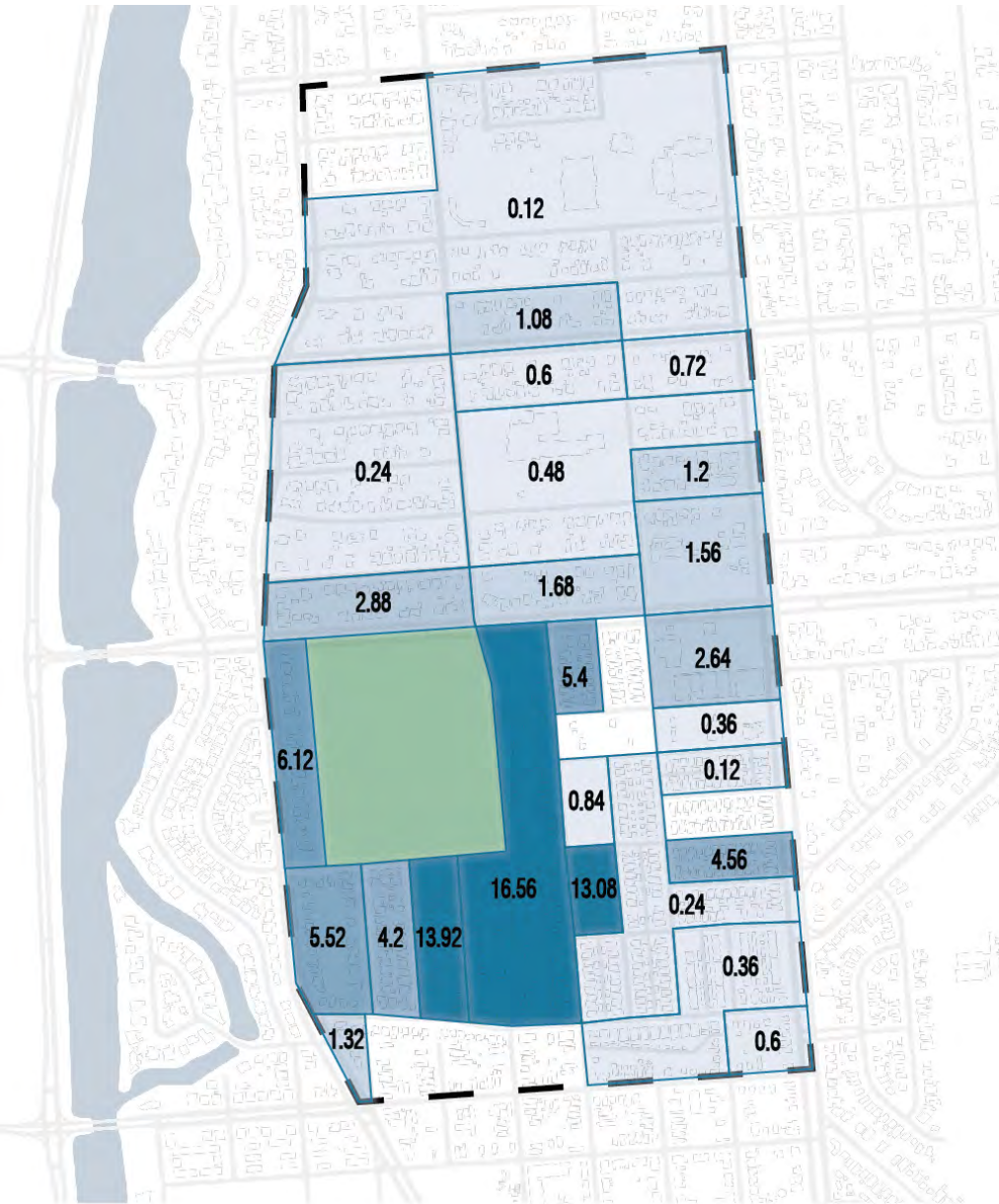




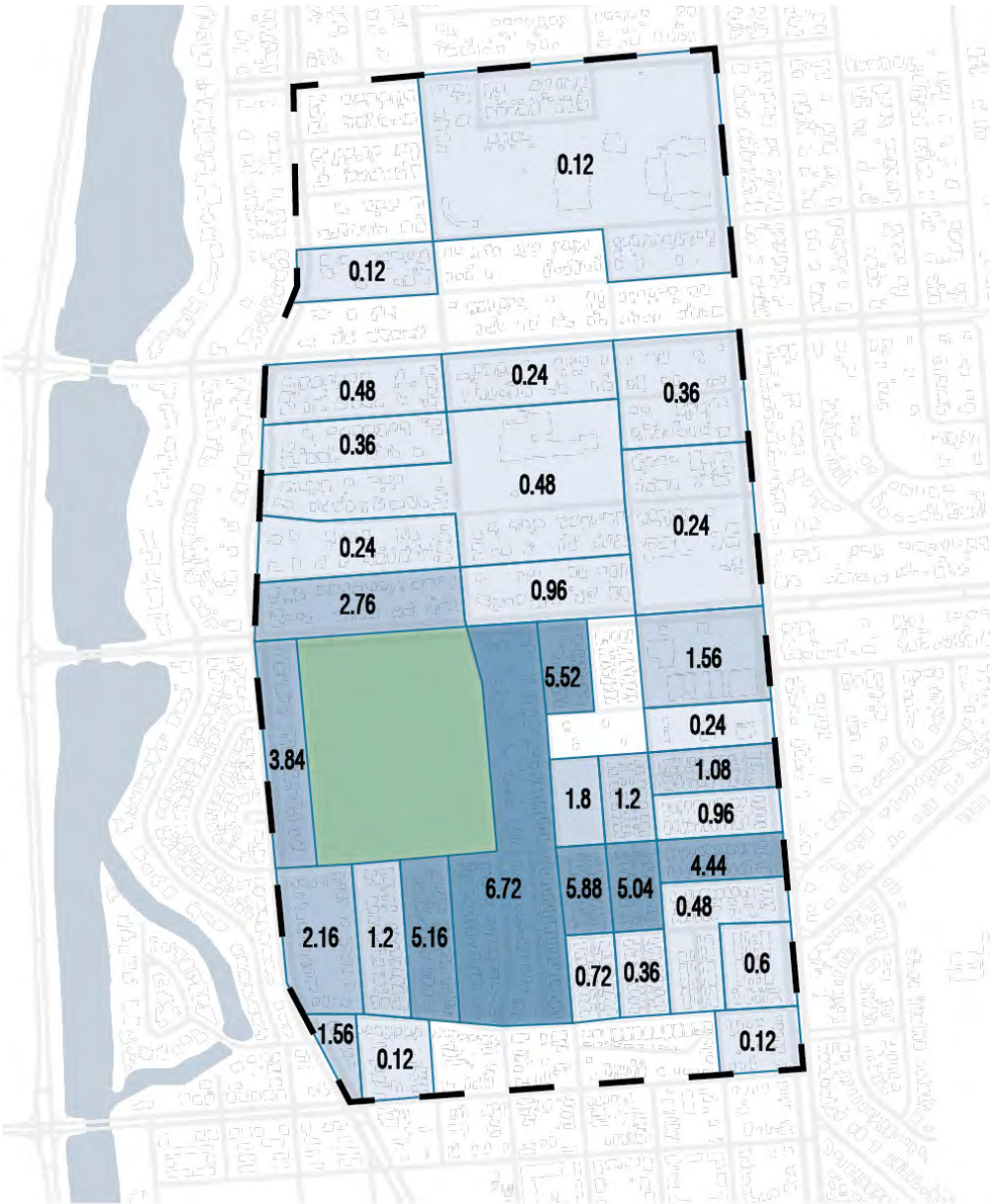
# BENEFIT

Flood Stage Reduction within Beneficiary Area

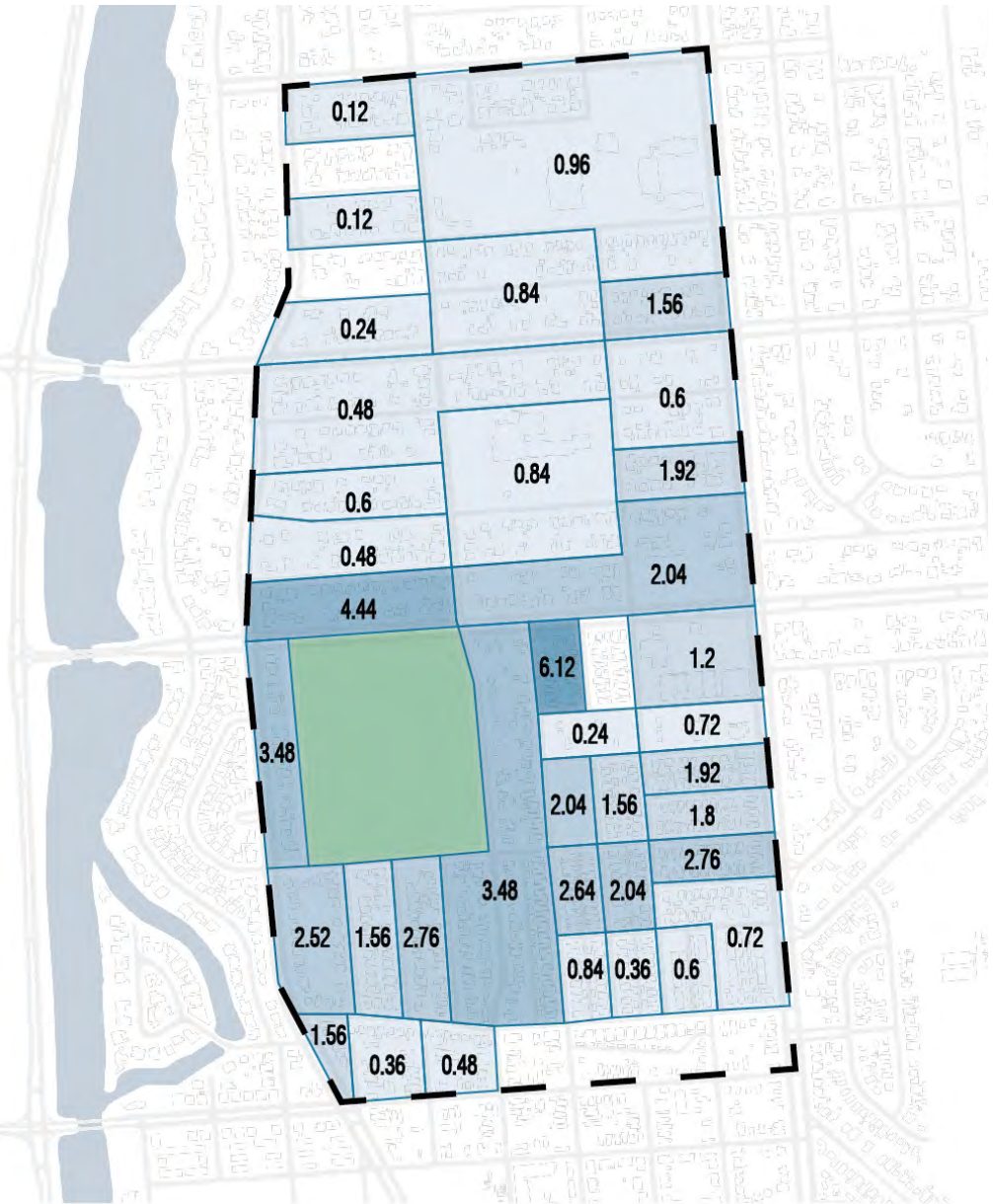
## Reduced Flooding and Increased Capacity within Existing Drainage System



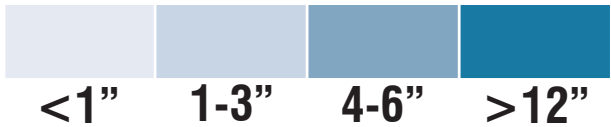
**2-Year Storm**  
Flood Stage Reduction (inches)



**5-Year Storm**  
Flood Stage Reduction (inches)



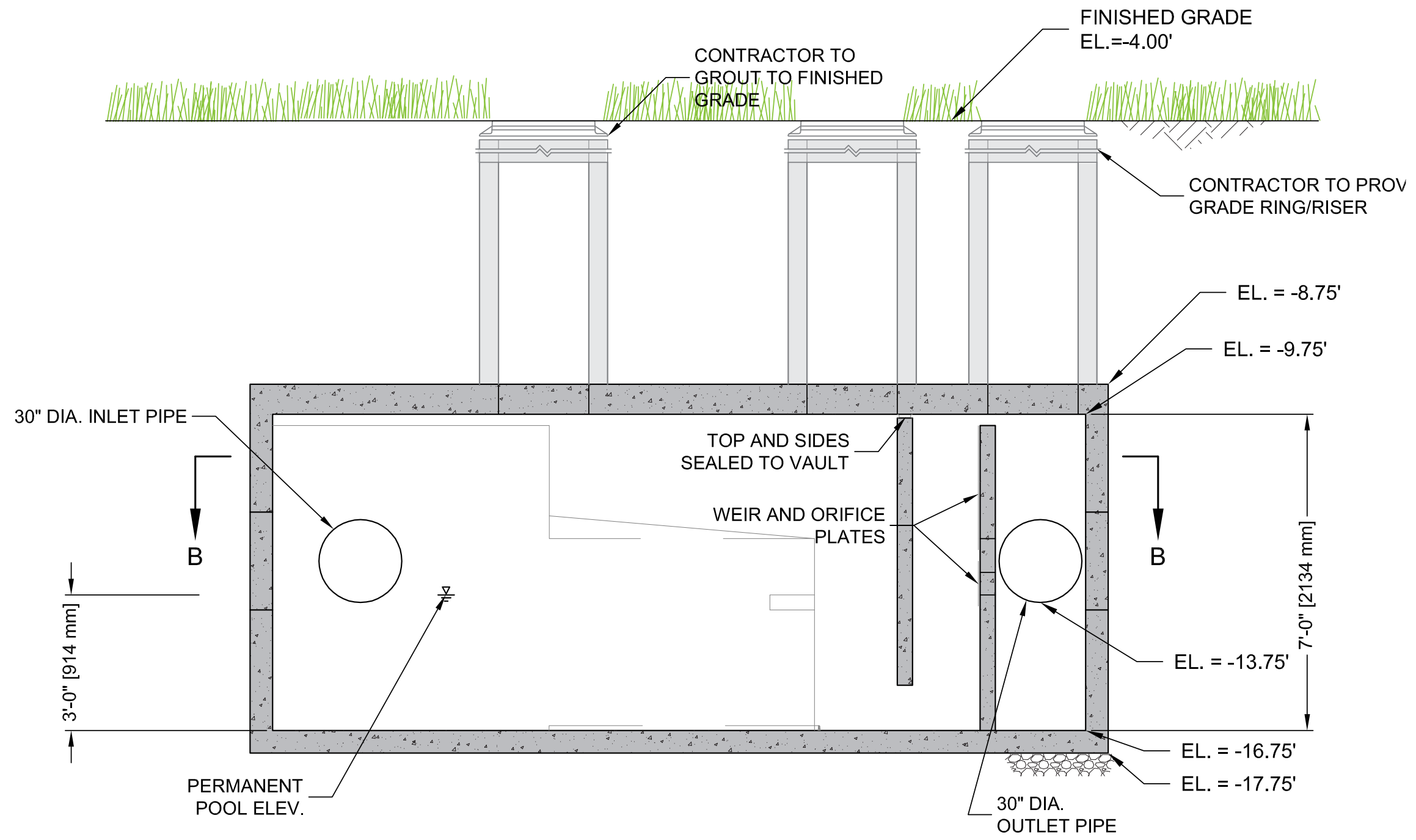
**10-Year Storm**  
Flood Stage Reduction (inches)





# CIVIL ENGINEERING

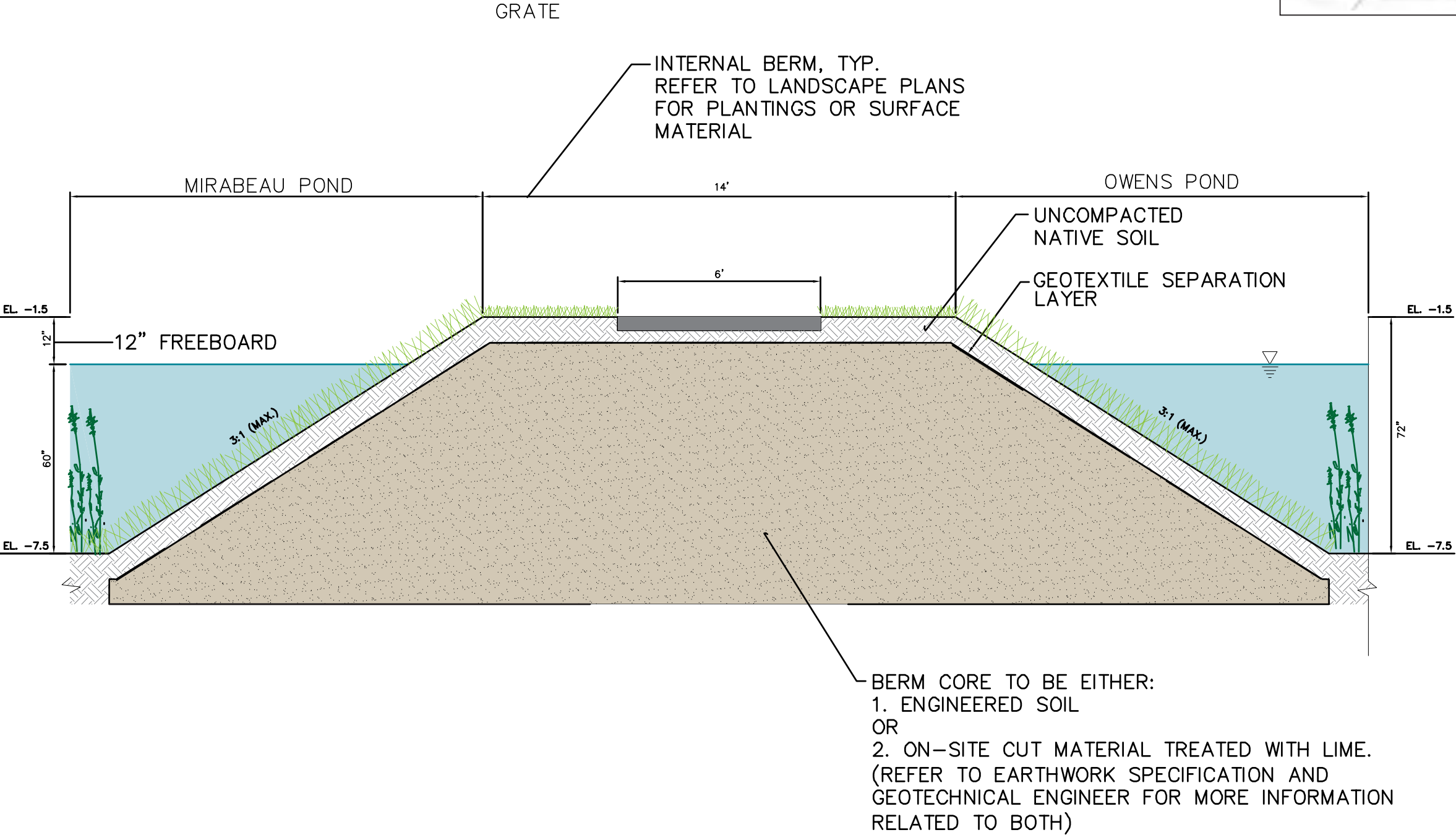
Vortechnics Pre-fabricated Forebay





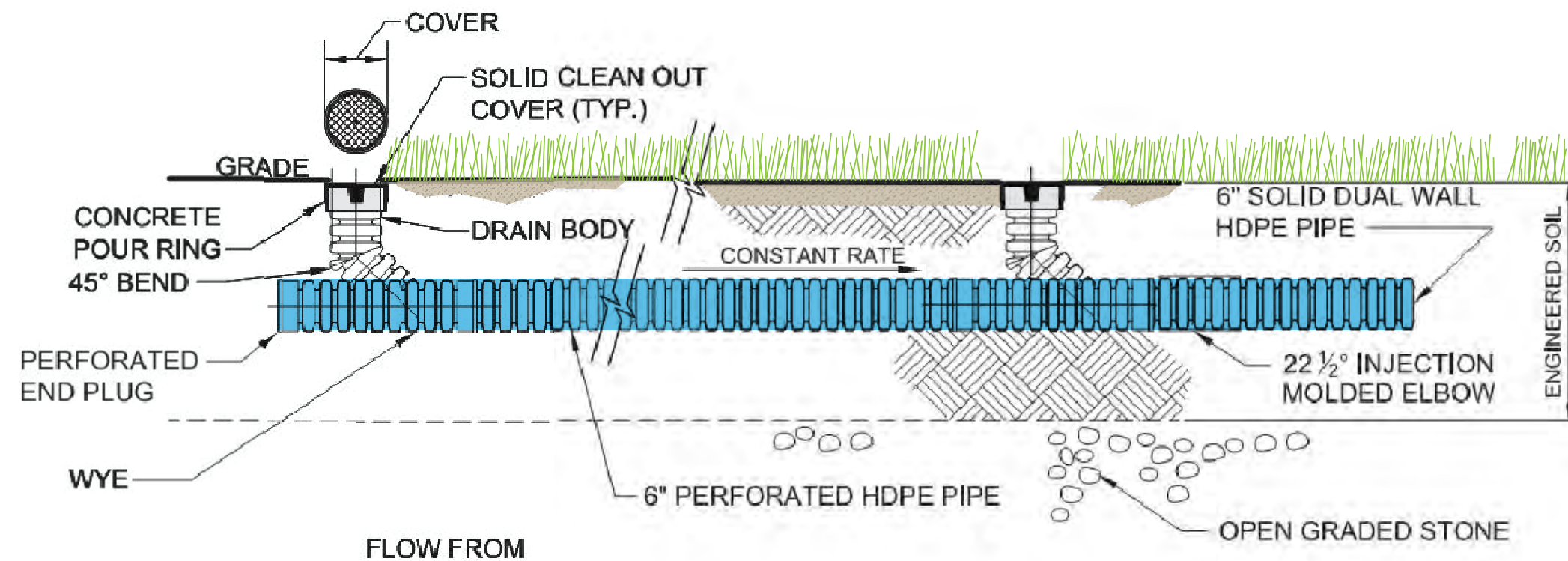
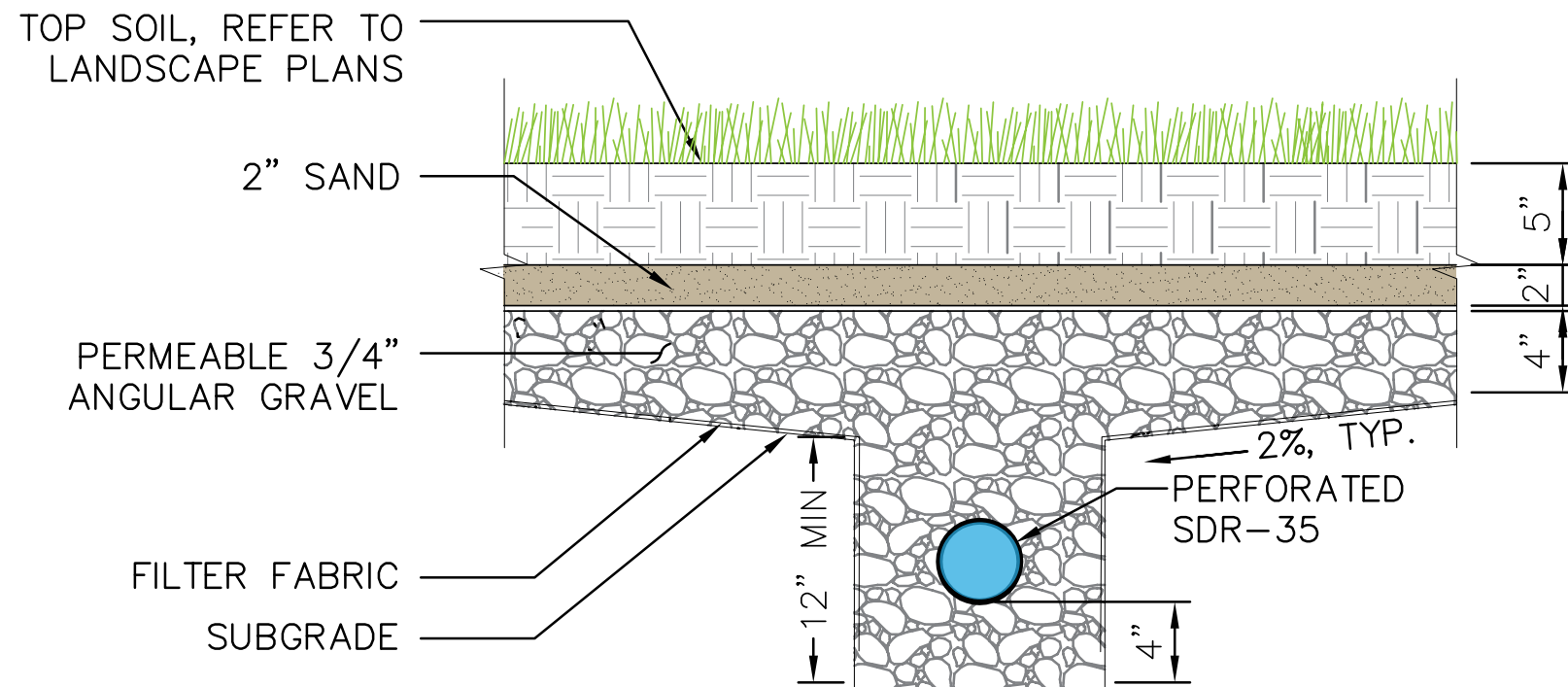
# CIVIL ENGINEERING

Detention Basin Berm Section





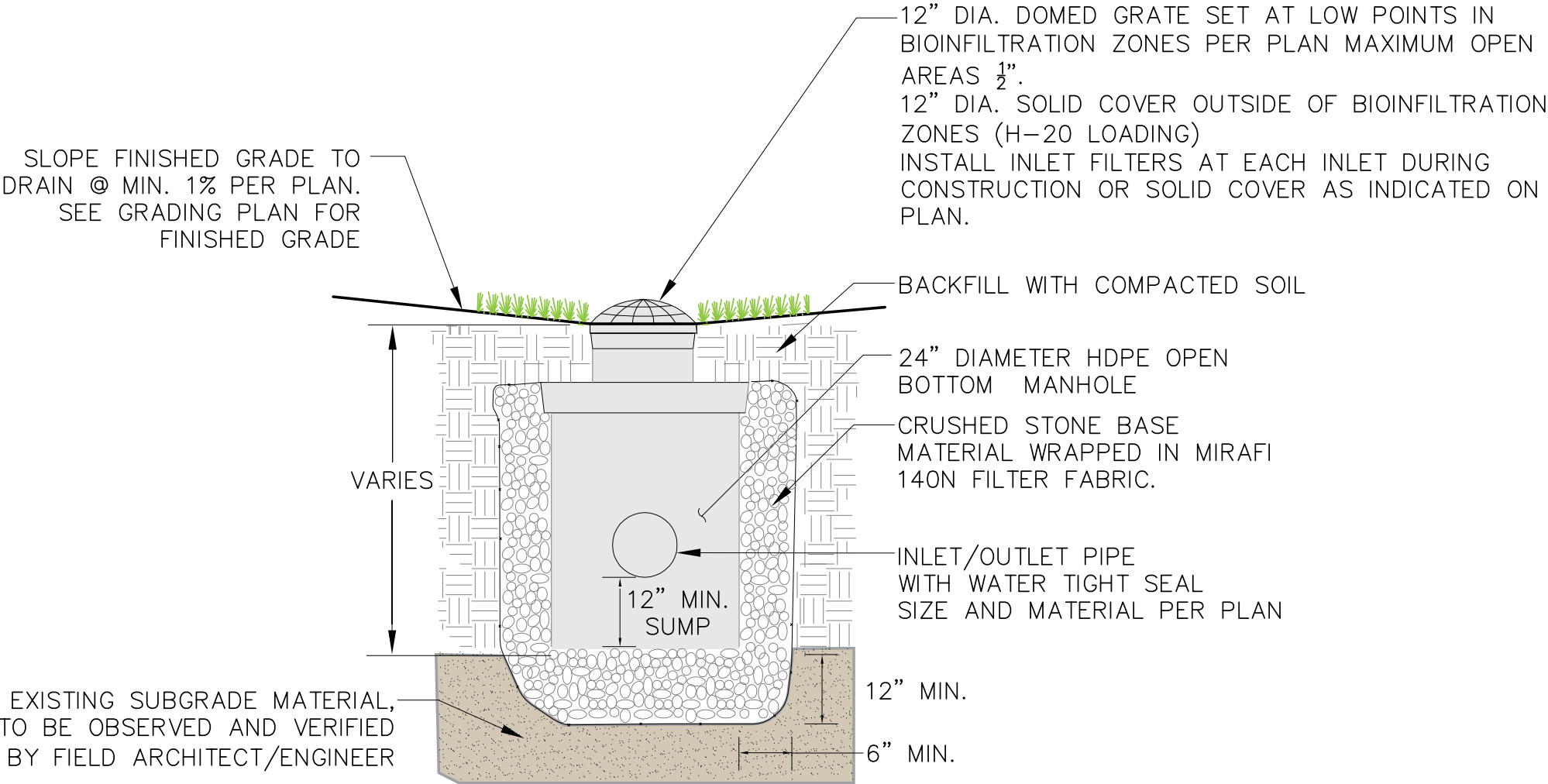
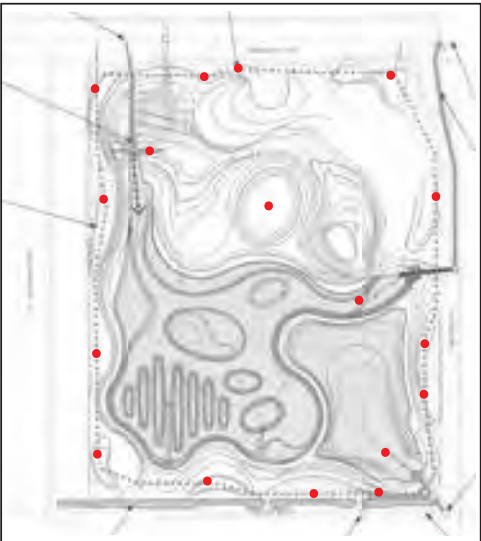
## Perimeter Underdrain





# CIVIL ENGINEERING

Area Drain



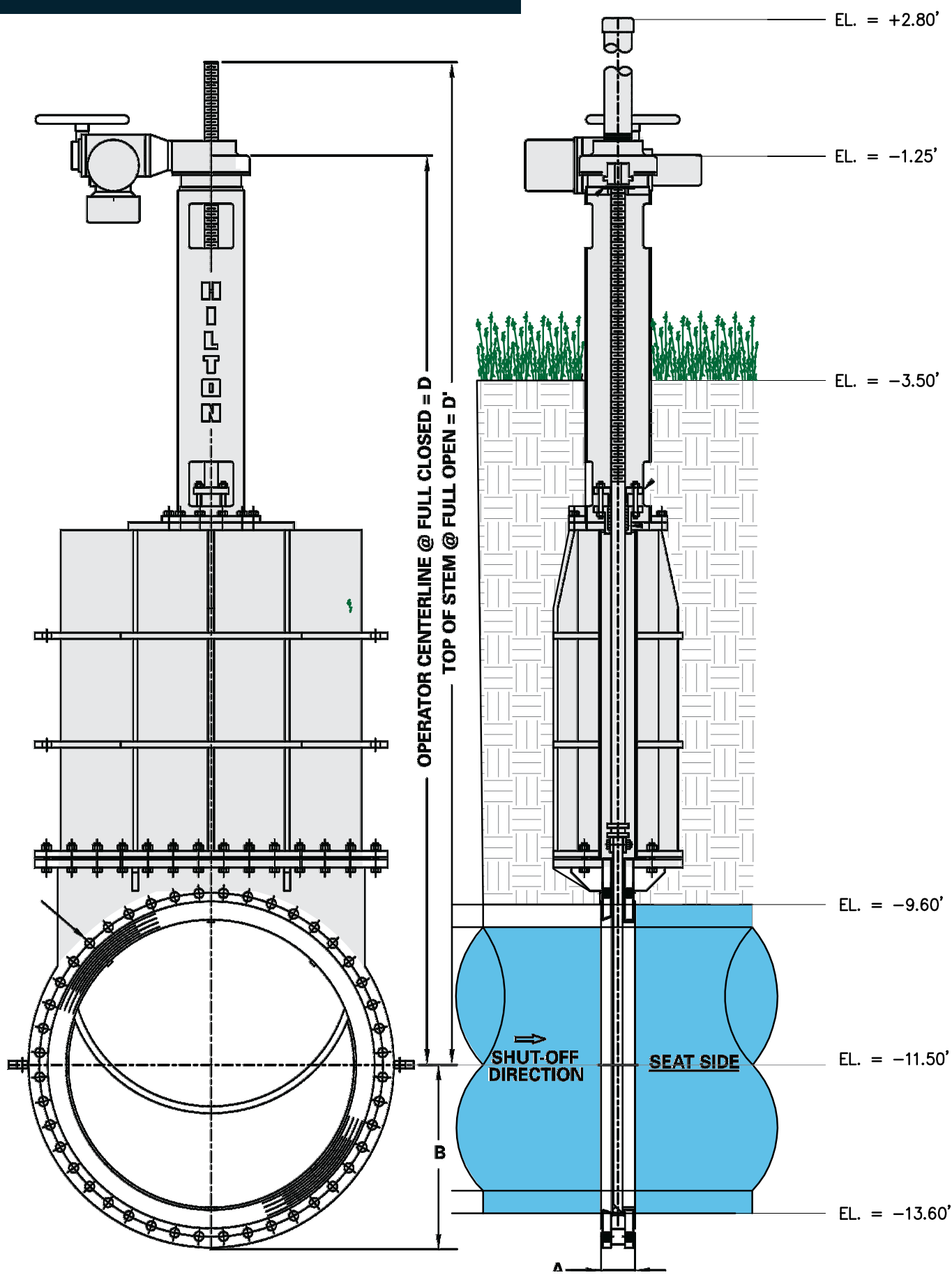
NOTES:

1. ALL AREA DRAIN GRATE COVERS SHOULD BE 12" DIA. AND H-20 LOADING.
2. CONTRACTOR TO COORDINATE WITH LANDSCAPE ARCHITECT AND SITE CIVIL ENGINEER REGARDING GRATE COLOR PRIOR TO INSTALLATION.



# CIVIL ENGINEERING

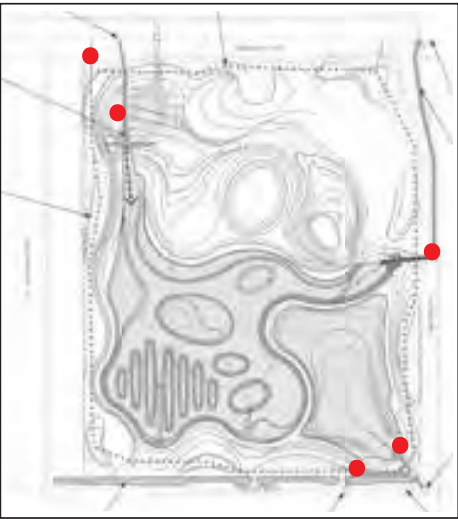
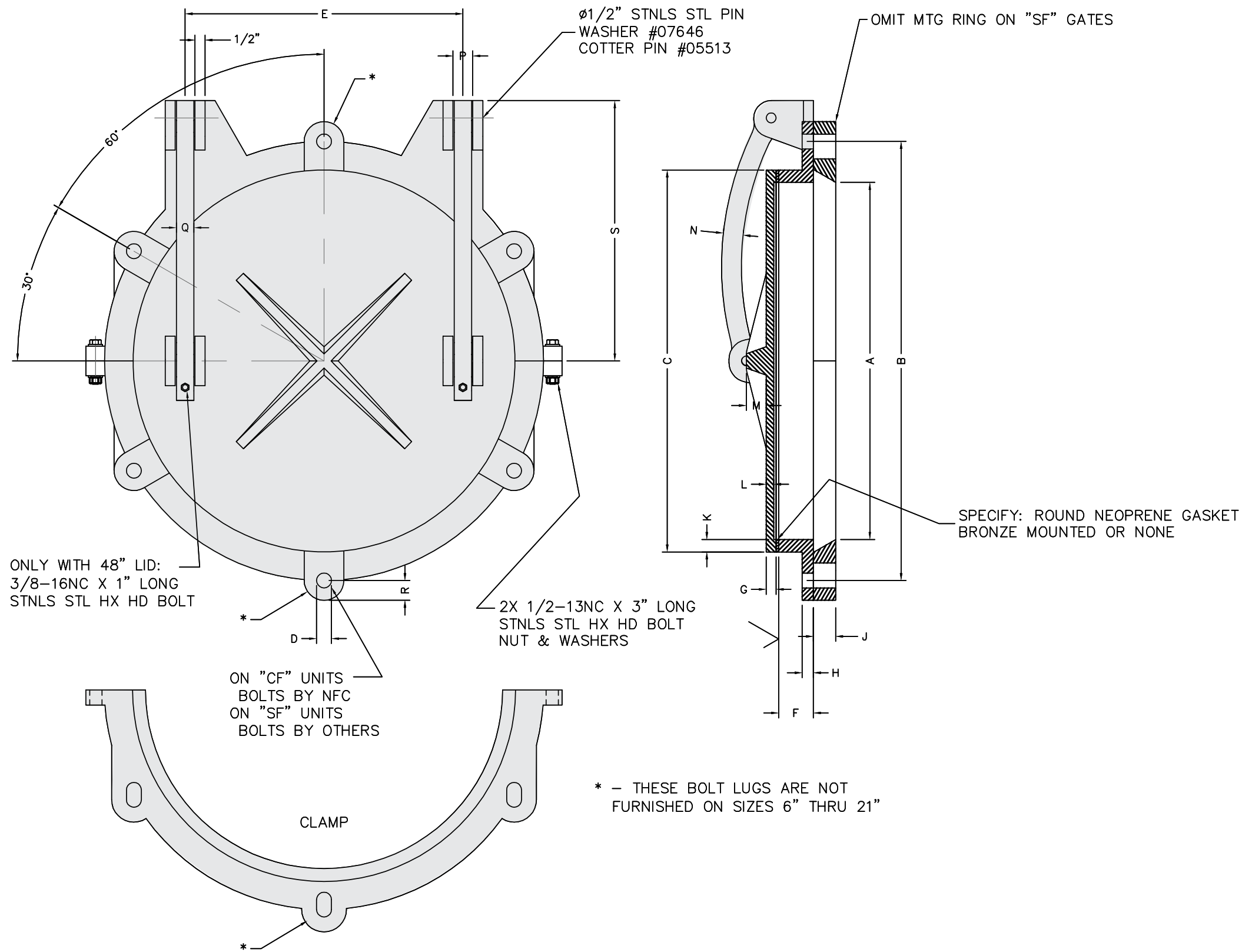
## Knife Gate





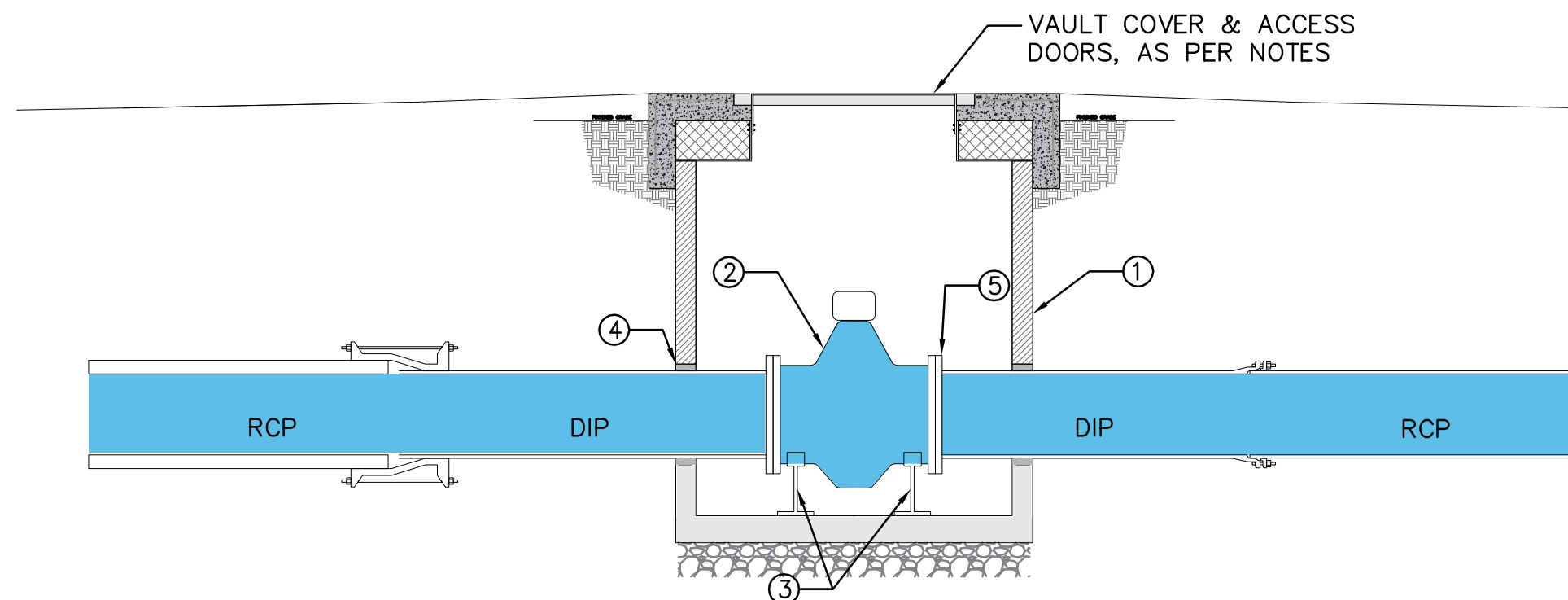
# CIVIL ENGINEERING

## Flap Gate





## Shutoff Valve



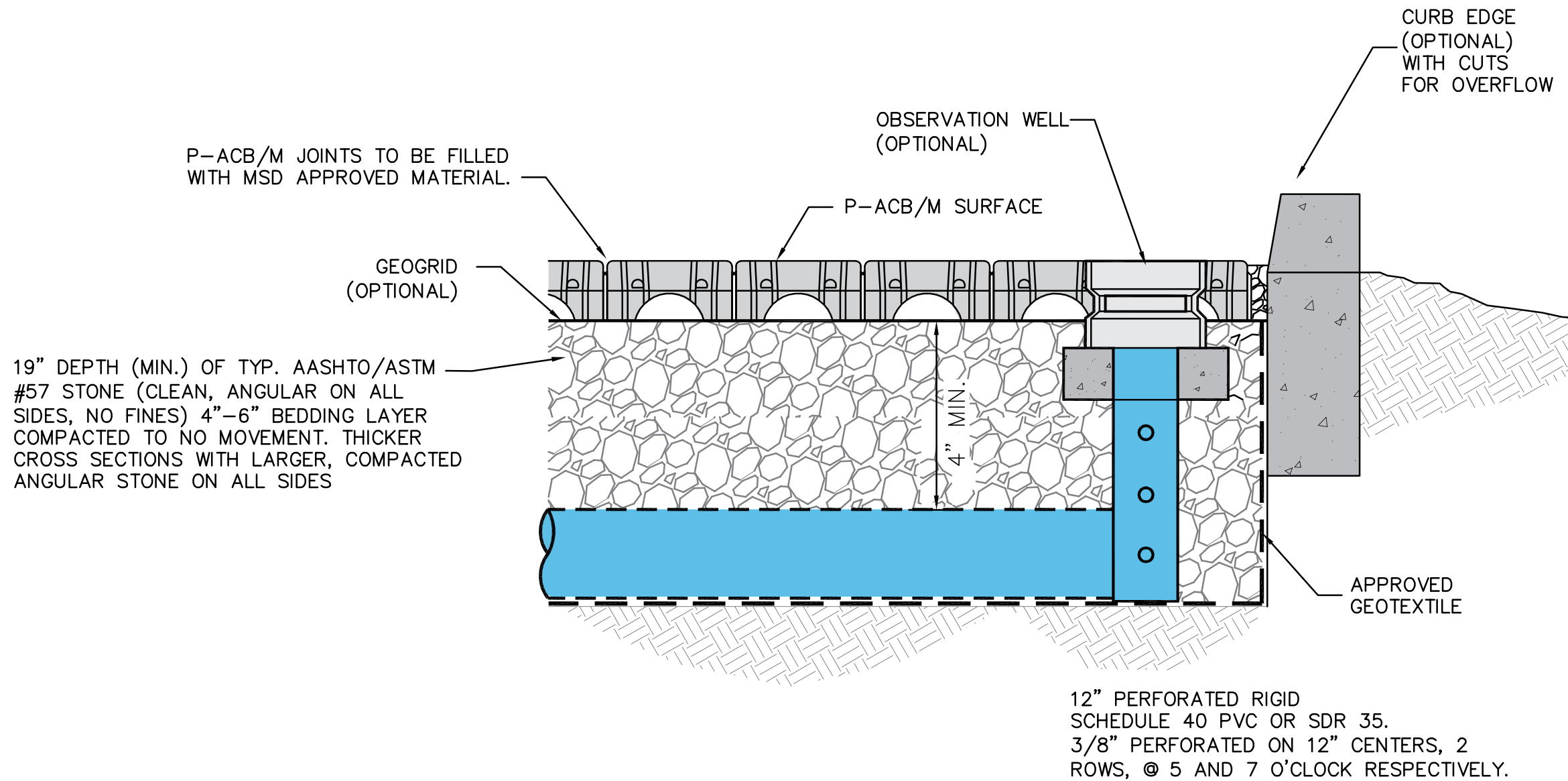






# CIVIL ENGINEERING

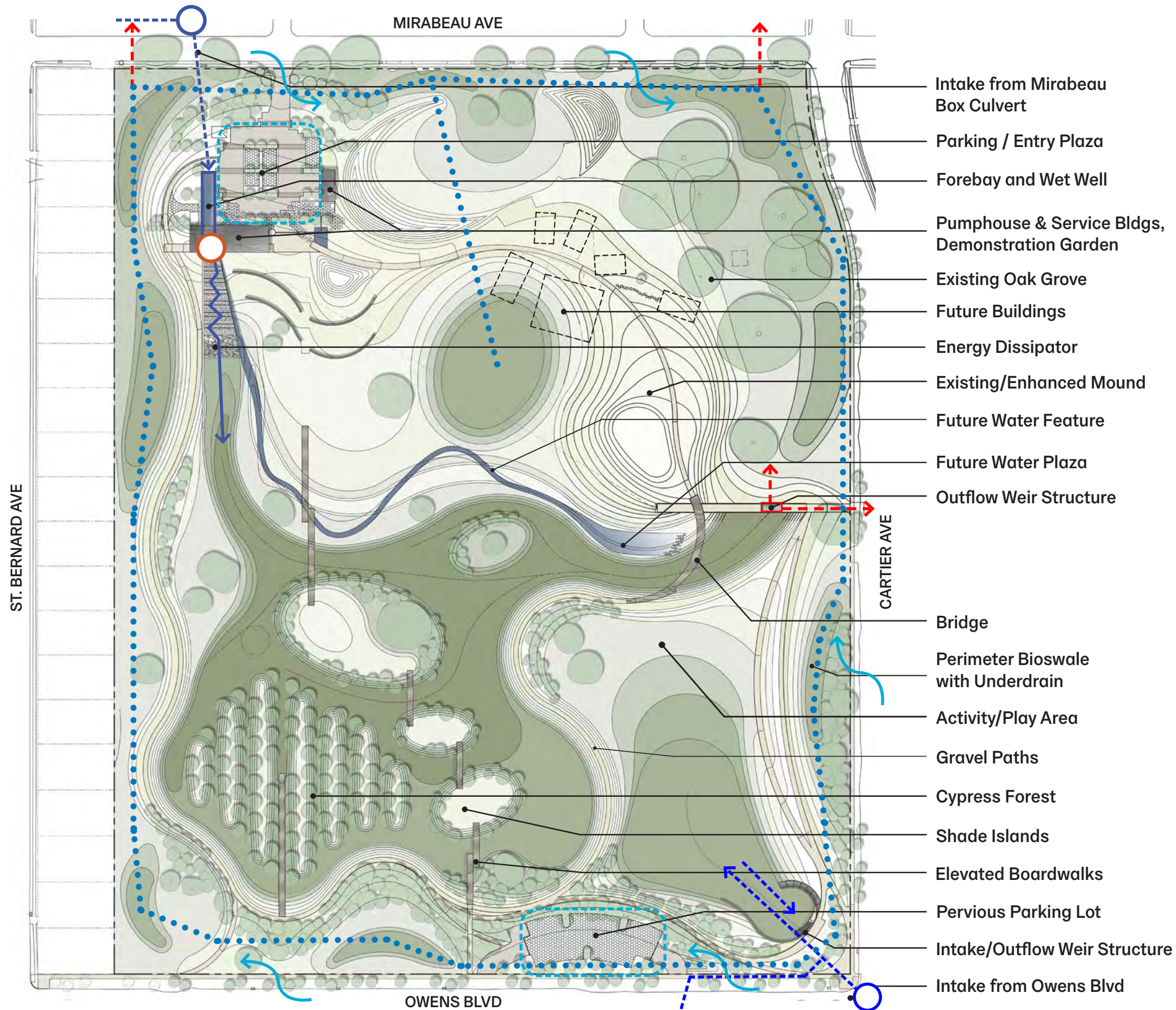
## PaveDrain Pervious Paving





# SITE PLAN

90% Design



**HMGP Budget**  
**\$12.5M**

## Interventions

drainage diversions into detention basins  
perimeter bioswales  
water treatment  
pervious parking  
subsurface storage

**Water Storage Capacity**  
**11 Million Gallons**

## Key Benefits

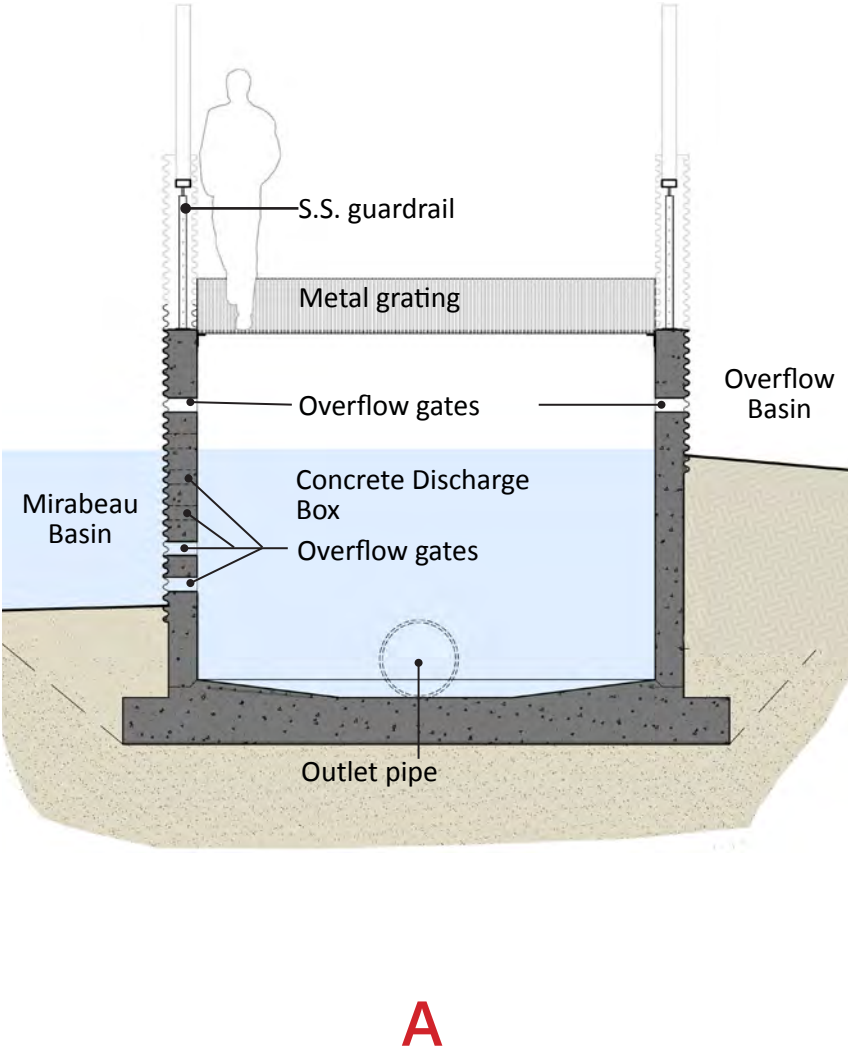
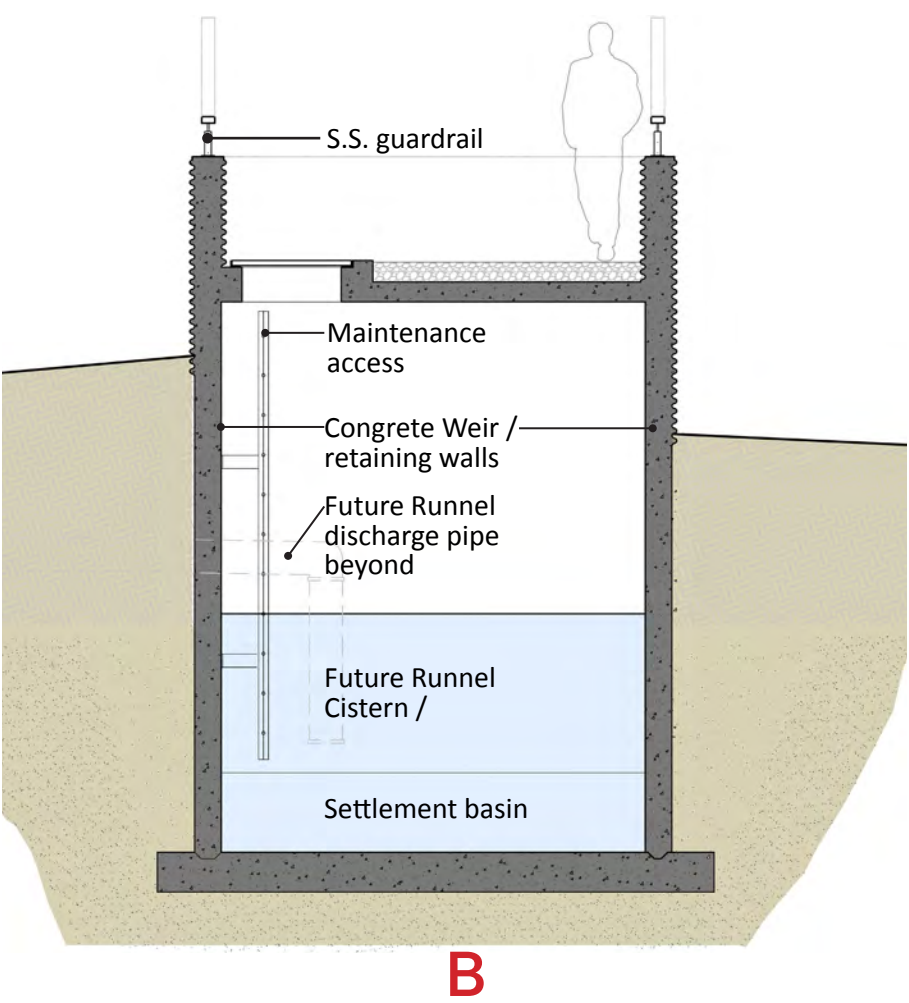
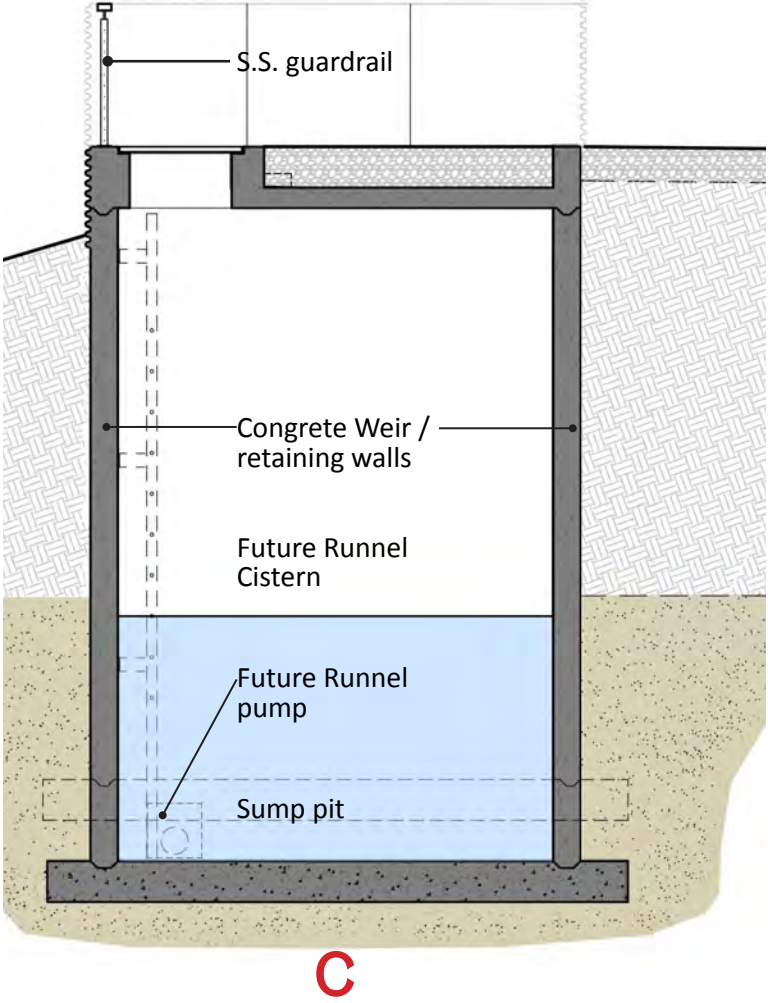
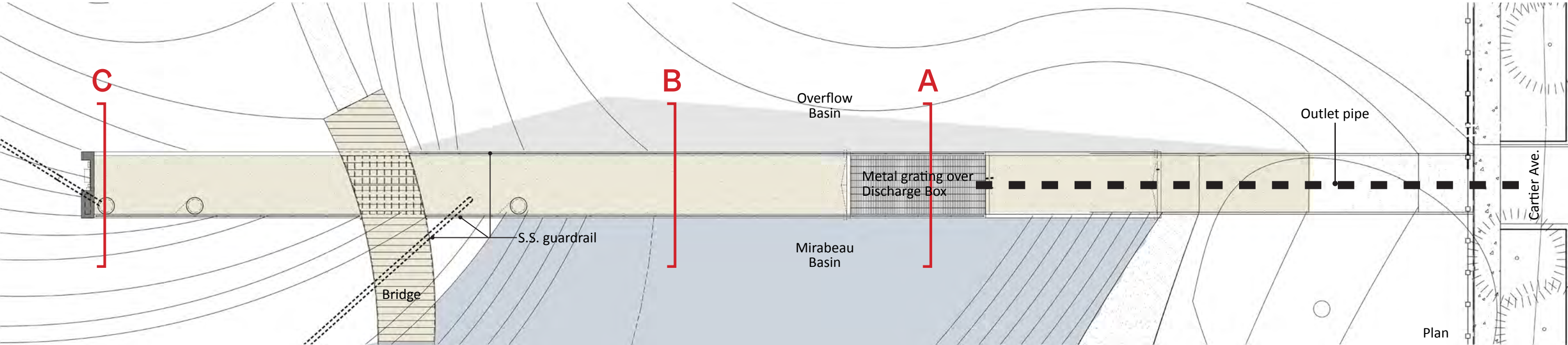
50 - 60% flood reduction from 2-year storm  
30 - 40% flood reduction from 10-yr storm  
Recreation  
Environmental education

**Flood reduction benefit is  
estimated at more than double  
the cost estimate**



# NORTH WEIR

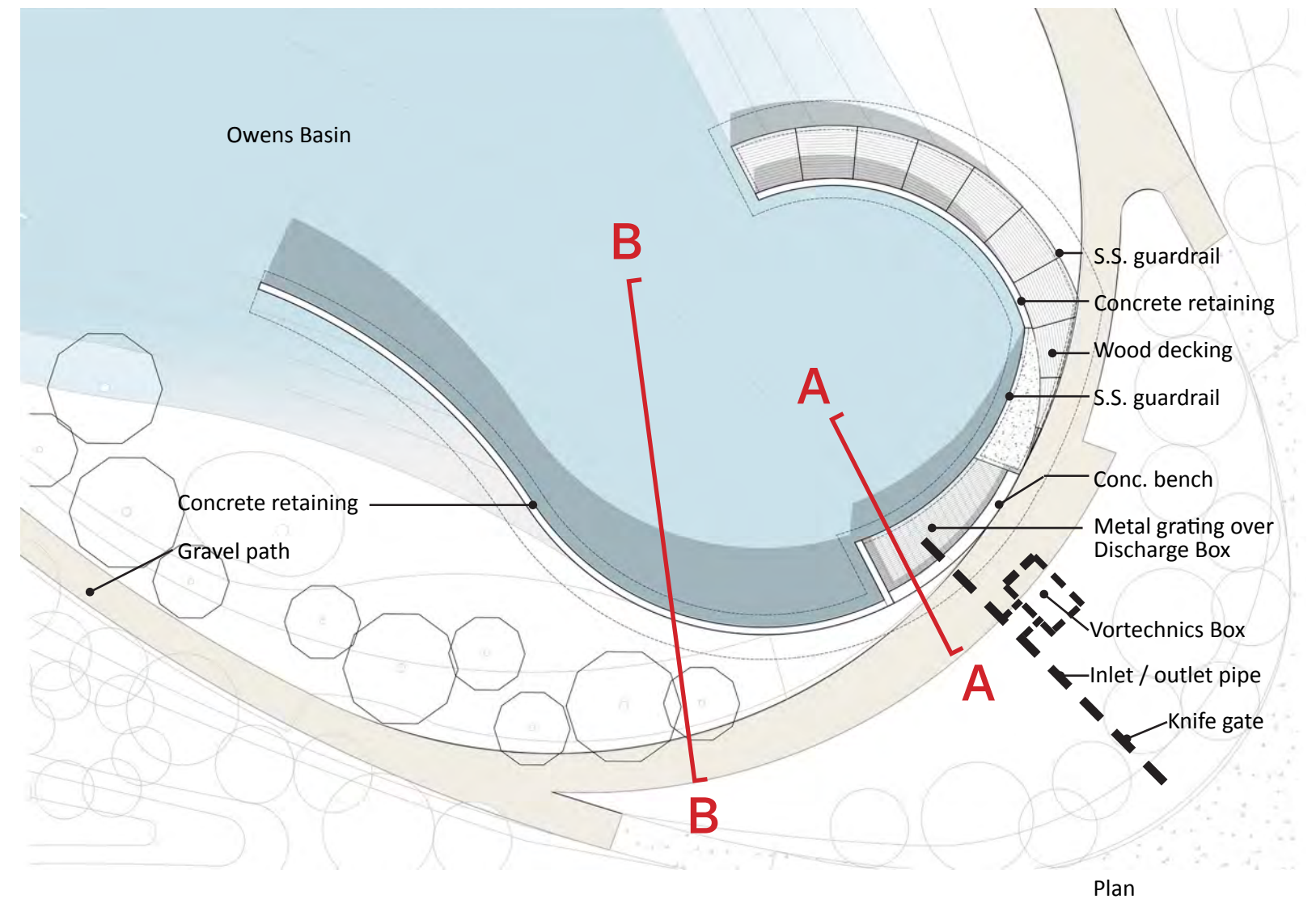
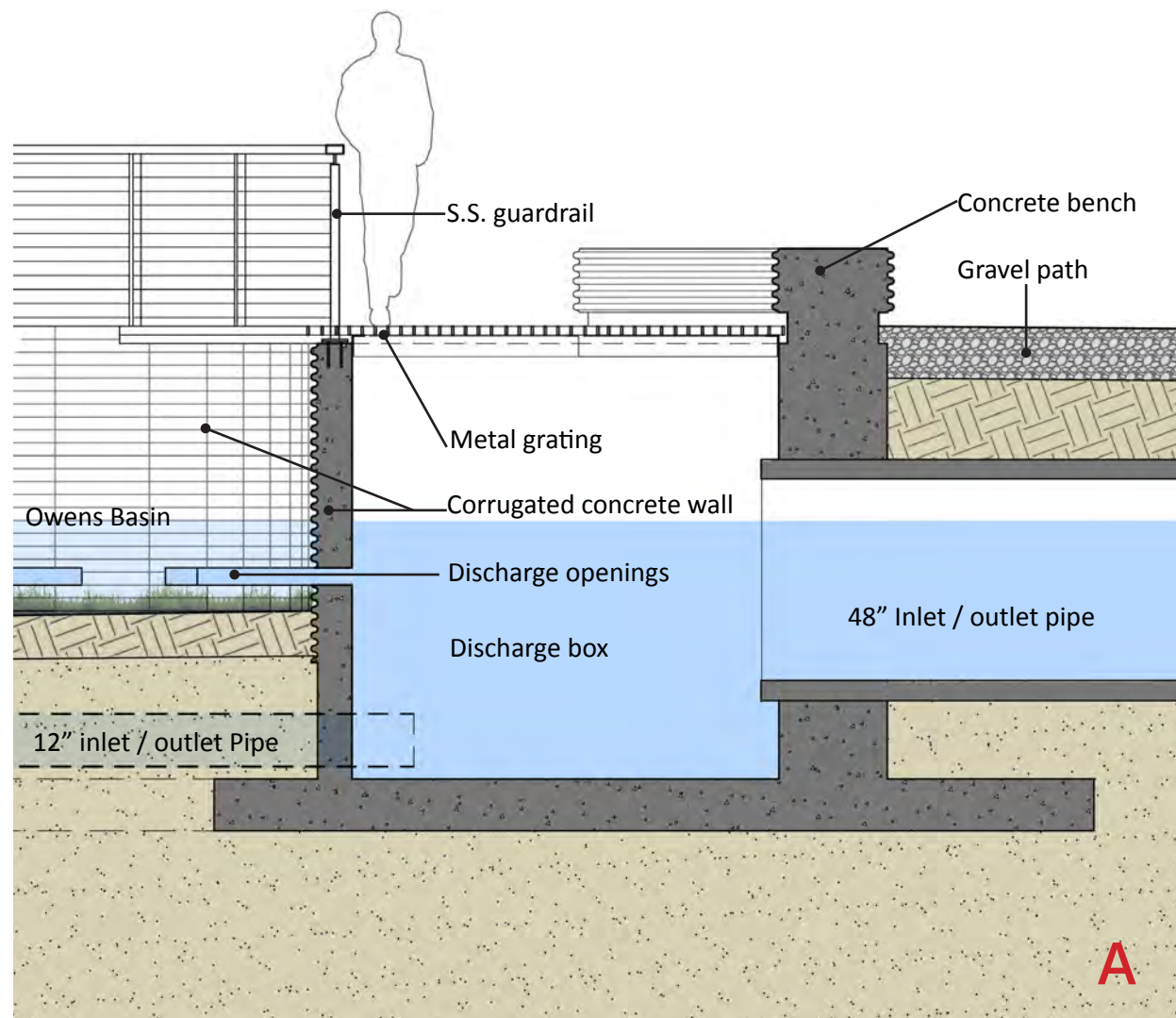
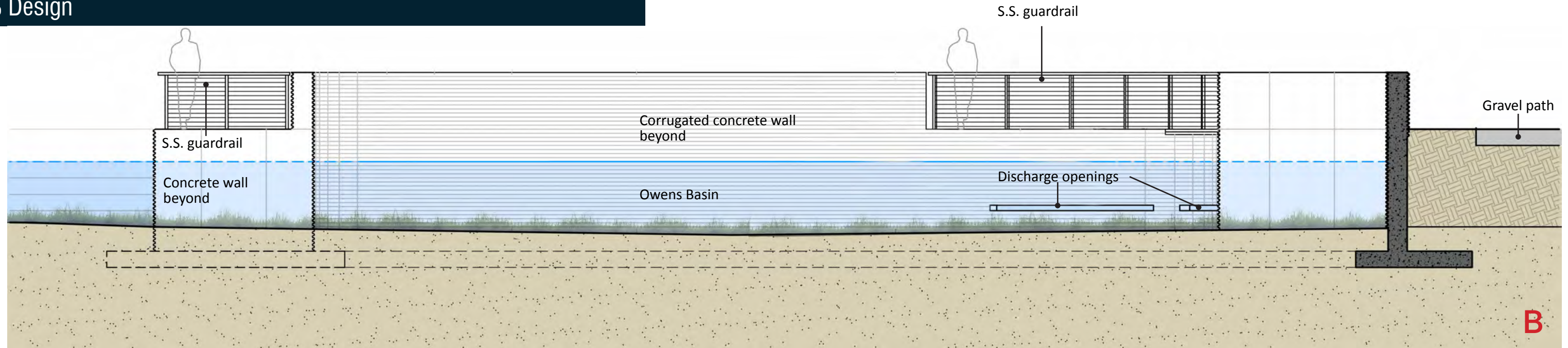
90% Design





# SOUTH WEIR

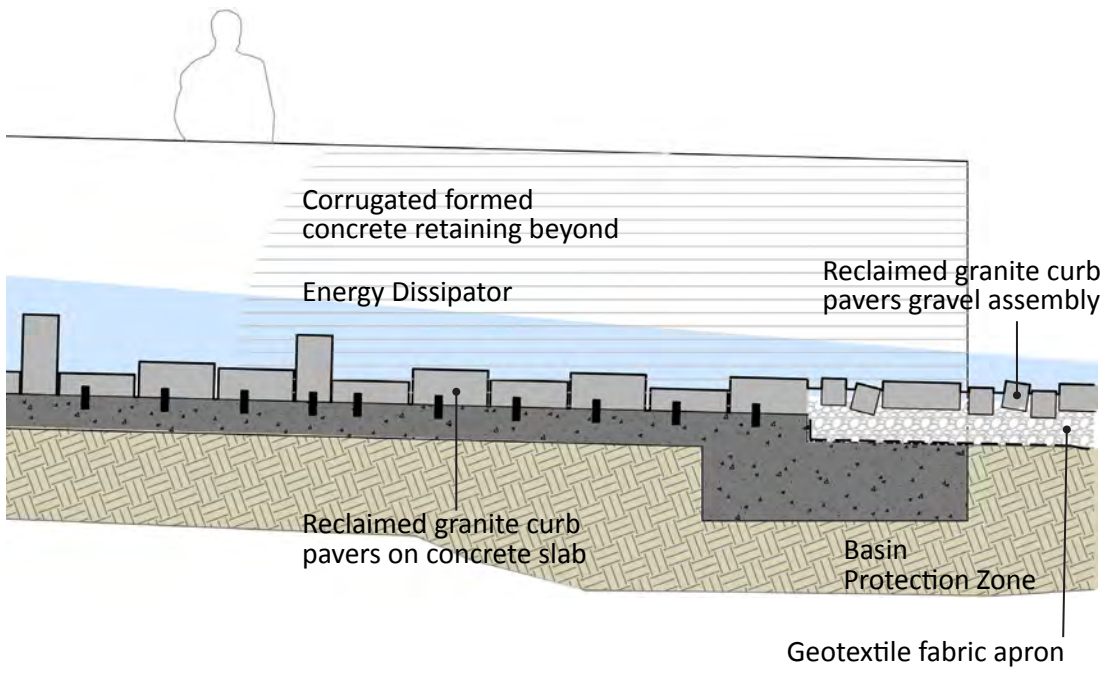
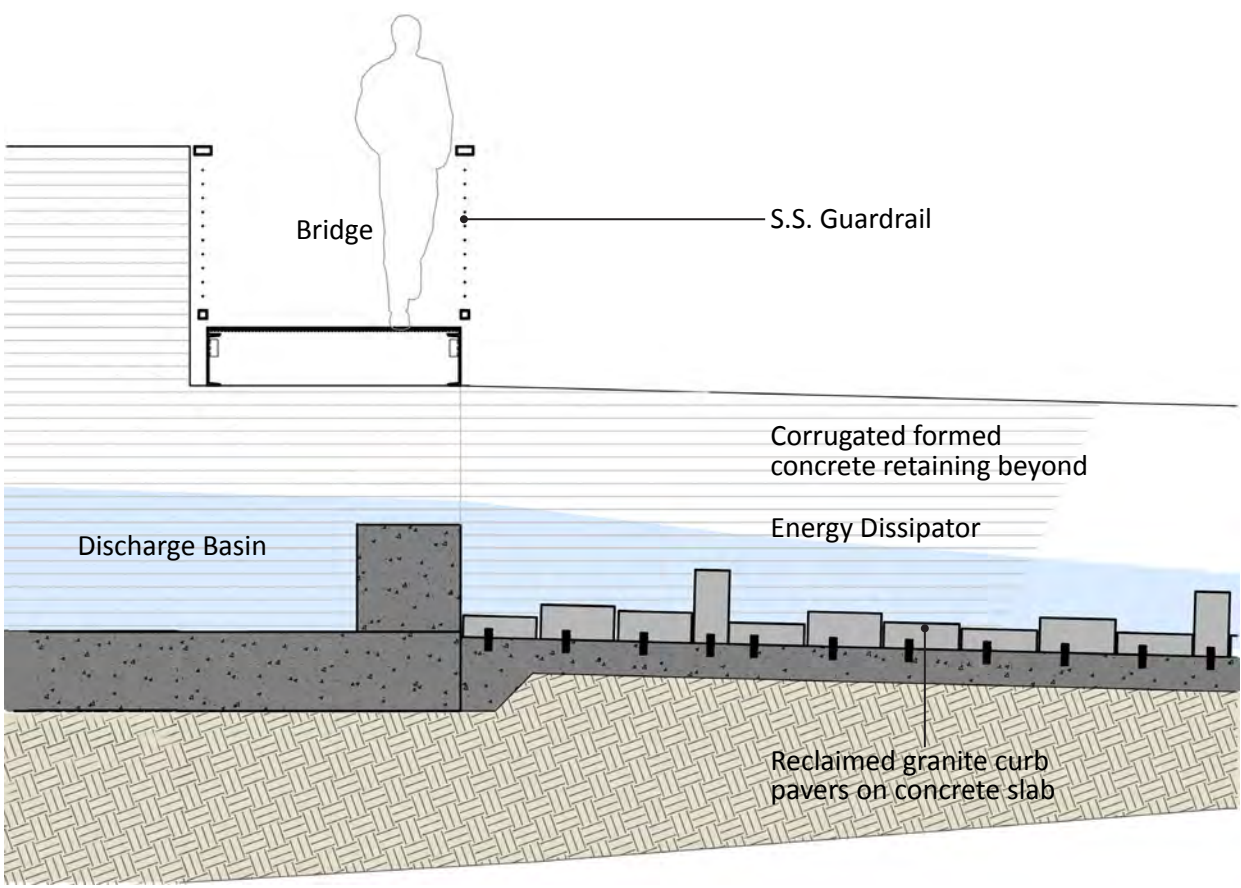
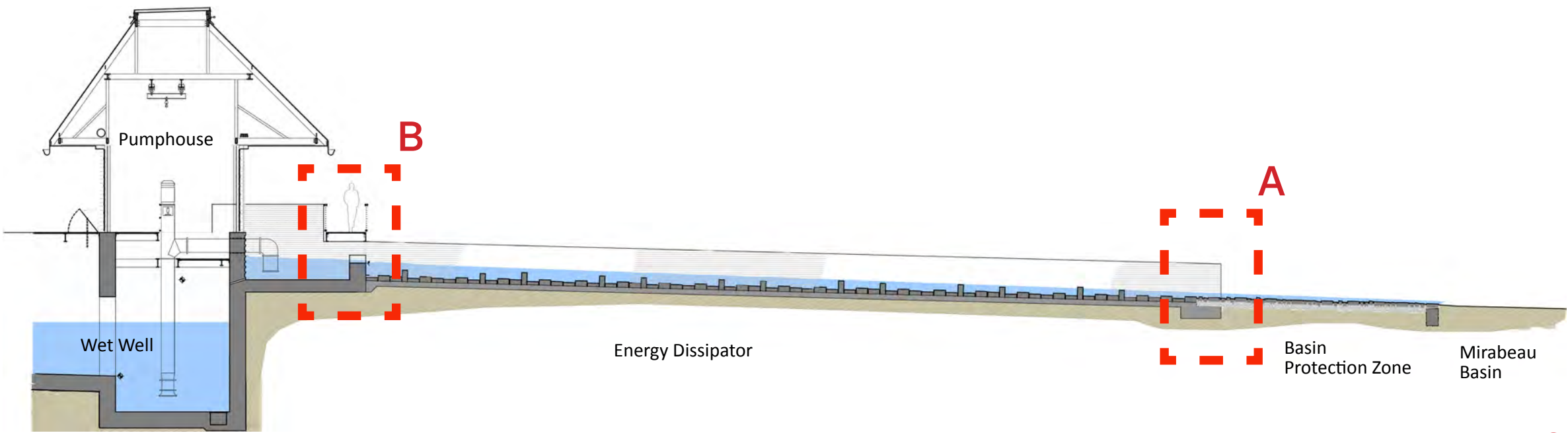
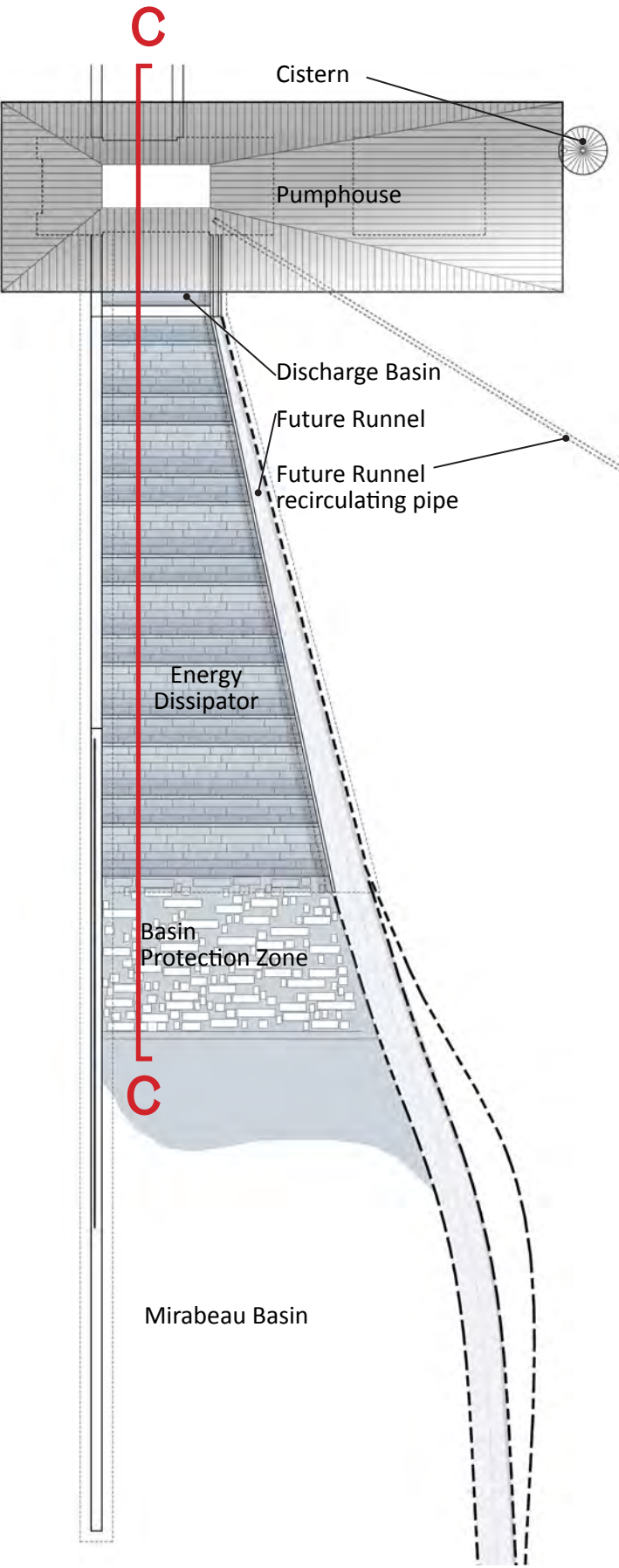
90% Design





# ENERGY DISSIPATOR

90% Design



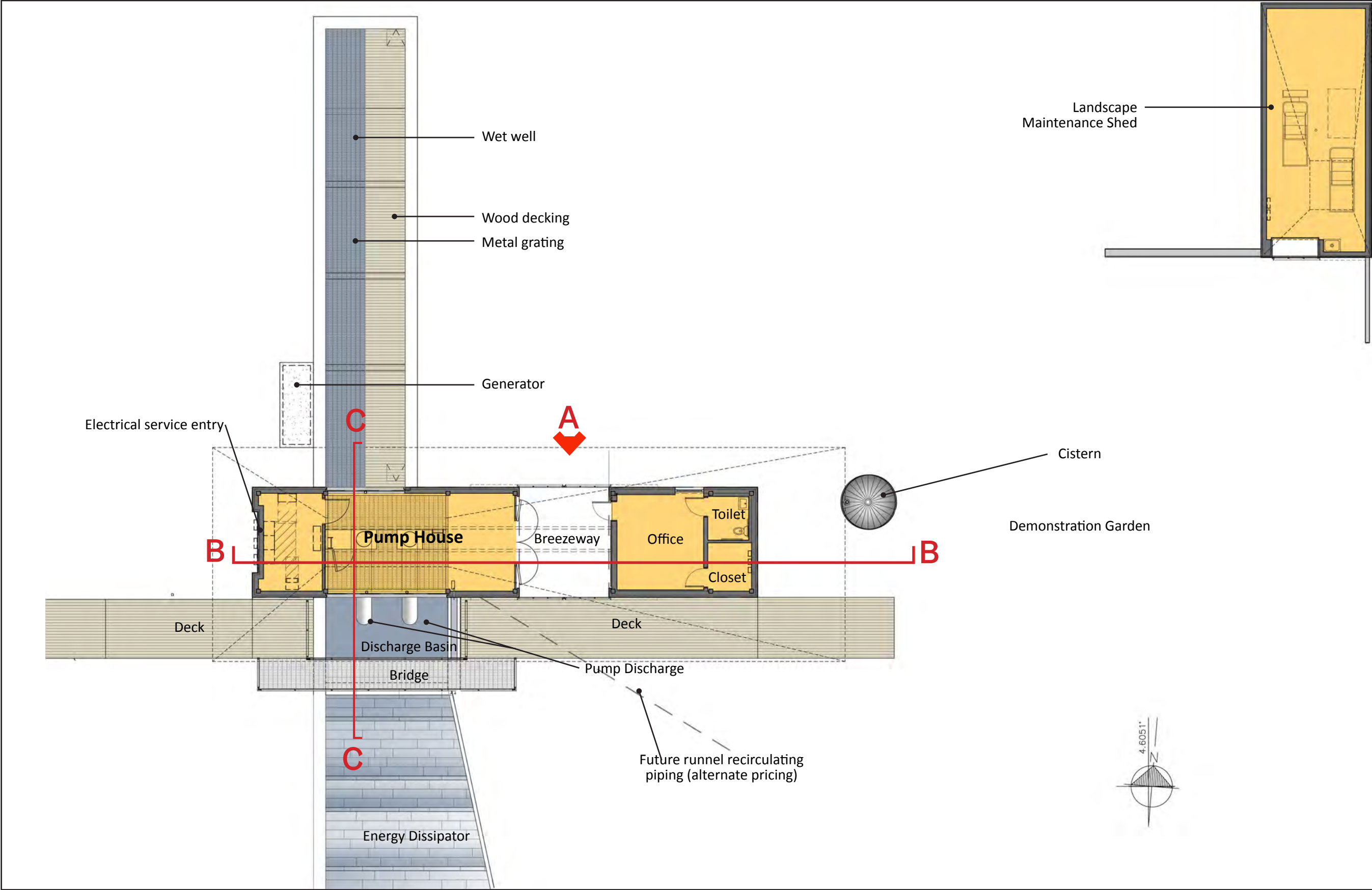
B

A



# PUMPHOUSE PLAN

90% Design





# PUMPHOUSE SECTION

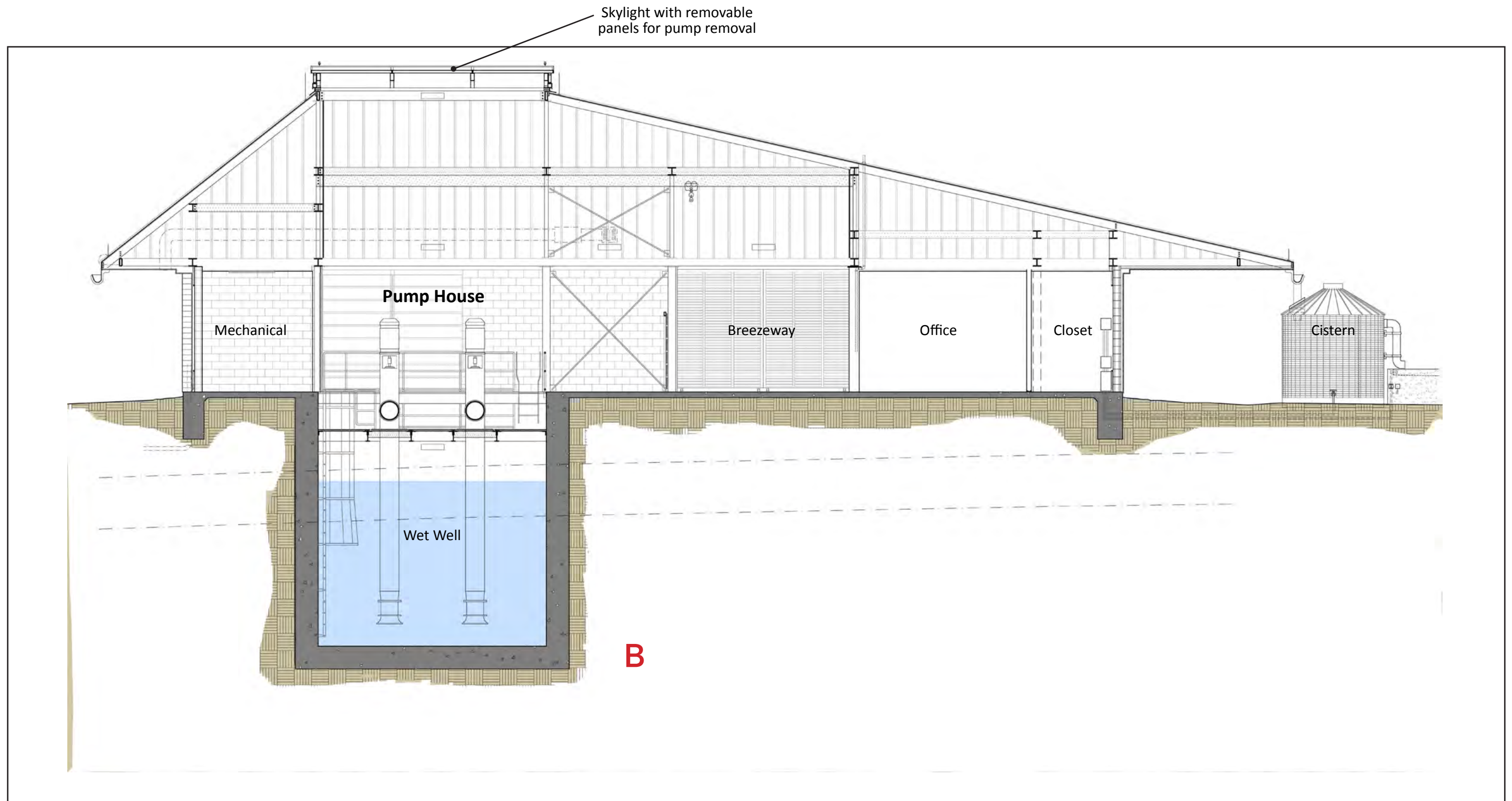
90% Design





# PUMPHOUSE SECTION

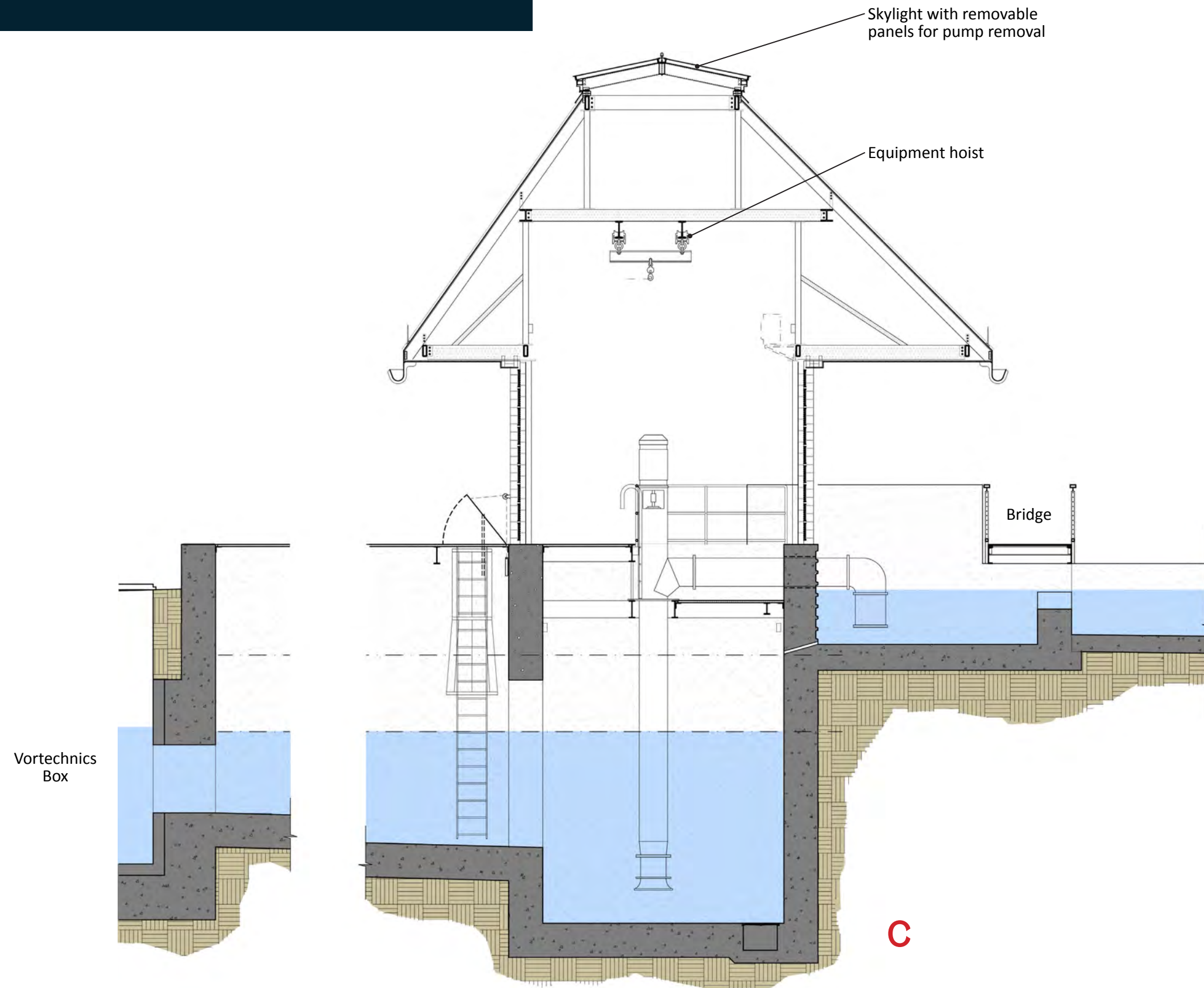
90% Design





# PUMPHOUSE SECTION

90% Design





# LANDSCAPE

## Planting Zones



### LEGEND

- Pine Island Forest
- Bottomland Forest
- Turf Grass
- Basin Meadow
- Cypress Forest
- Sloped Meadow
- Bioswales/Bioretenention cells
- Understory Planting
- Existing Native Bamboo

- Maidencane
- Switchgrass
- Eastern Gamagrass
- Bermuda Sod
- Paving
- Gravel
- Decking
- Bald Cypress, 12' ht.
- Bald Cypress, 8' ht.
- Slash Pine, 10' ht.
- Slash Pine, 8' ht.
- Swamp Chestnut Oak, 12' ht.
- Swamp Chestnut Oak, 10' ht.
- Swamp Blackgum
- Red Swamp Maple

0 30' 60' 120'





# LANDSCAPE

## Plant Examples



**PINE ISLAND FOREST**



**DWARF PALMETTO**



**WAX MYRTLE**



**TITI TREE BLOOM**



**BOTTOMLAND FOREST**



**RED MAPLE LATE WINTER COLOR**



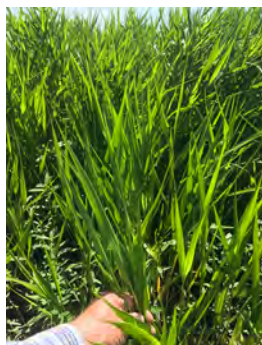
**BASIN MEADOW**



**SWTICHGRASS**



**EASTERN  
GAMAGRASS**



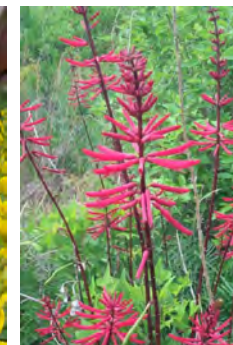
**MAIDENCANE**



**WILD WHITE INDIGO**



**YELLOW WHITE  
INDIGO**



**CORALBEAN**



**SWAMP ROSEMALLOW**



**SLOPED MEADOW**



**LITTLE BLUESTEM**



**LITTLE BLUESTEM:  
FALL/WINTER**



**MARSH BLAZING STAR**



**RATTLESNAKE MASTER**



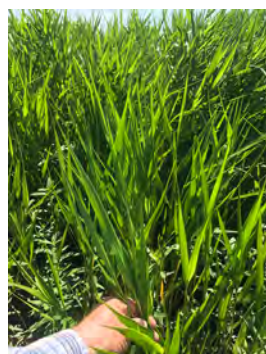
**SHINY CONEFLOWER**



**TEXAS CONEFLOWER**



**BIOSWALES AND  
BIORETENTINO CELLS**



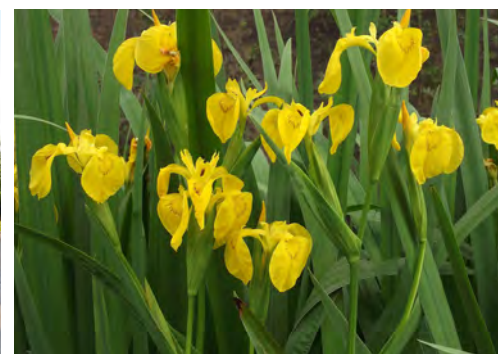
**MAIDENCANE**



**SWAMP ROSEMALLOW**



**UNDERSTORY PLANTING:  
PARKING LOTS**



**YELLOW FLAG IRIS**

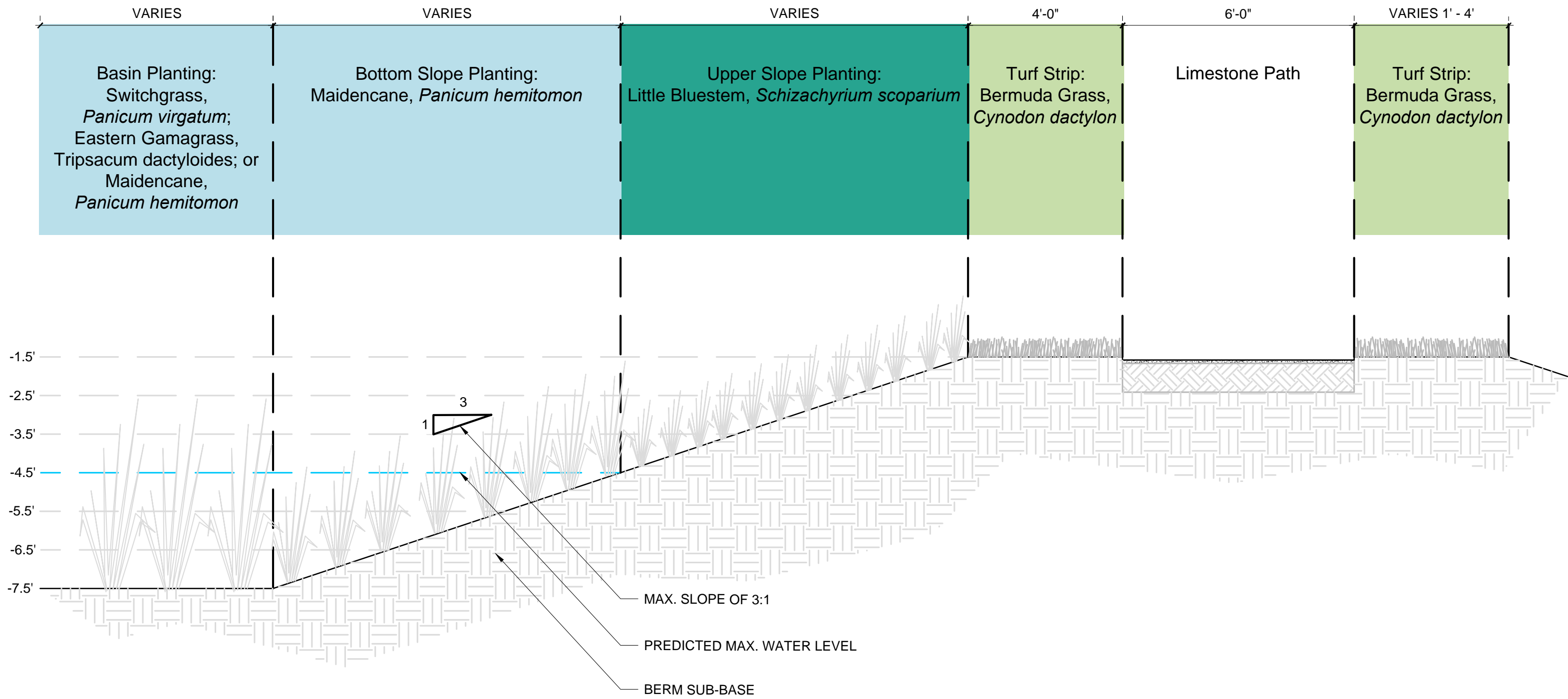


**BLUE ARROW JUNCUS**



# LANDSCAPE

Basin Berm Section



BERM MEADOW PLANTING DIAGRAM

SCALE: 1/4" = 1' - 0"

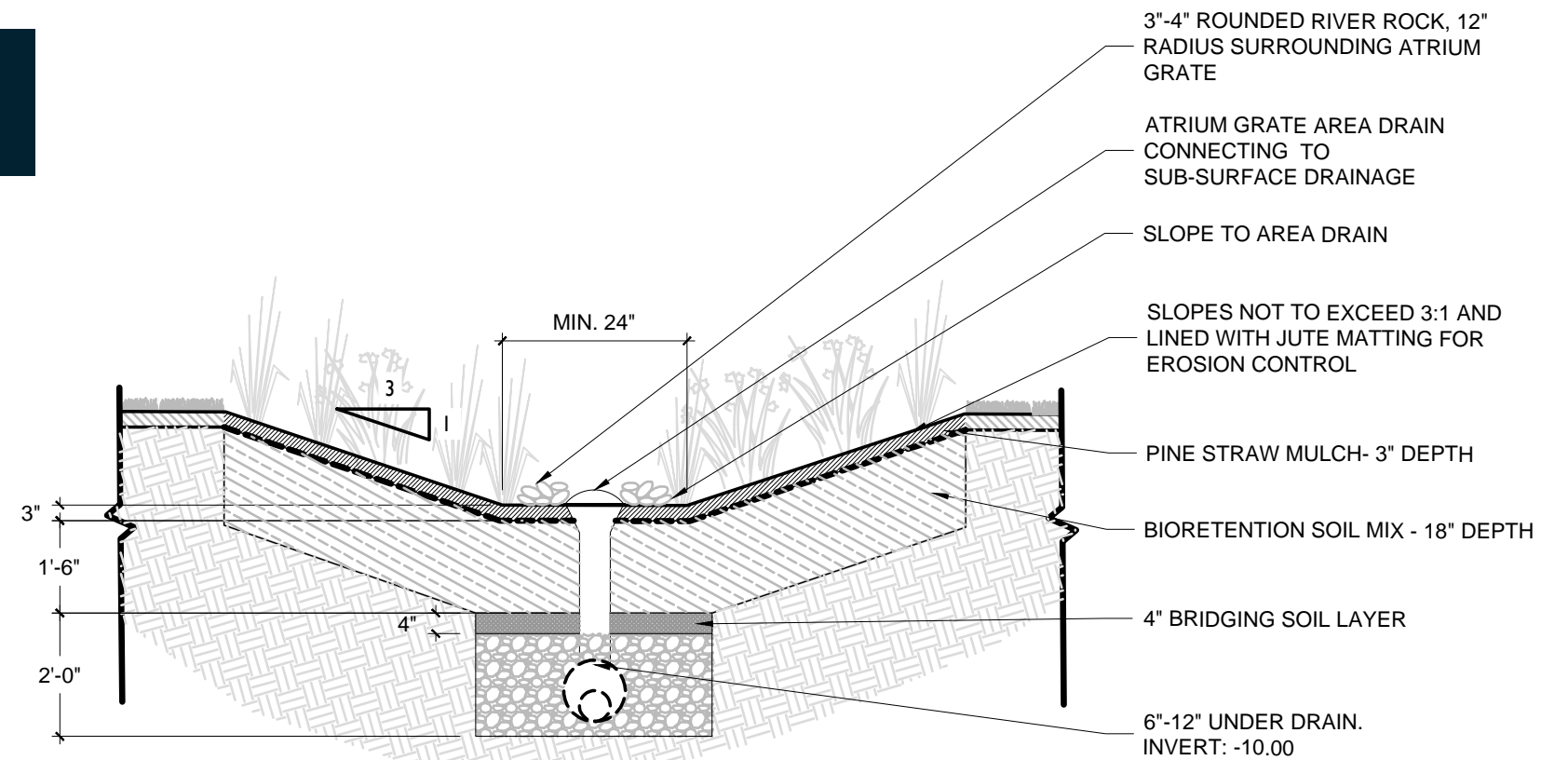


# LANDSCAPE

## Bioswale and Bioretention Cell Sections



Bioswale example, Shangri La

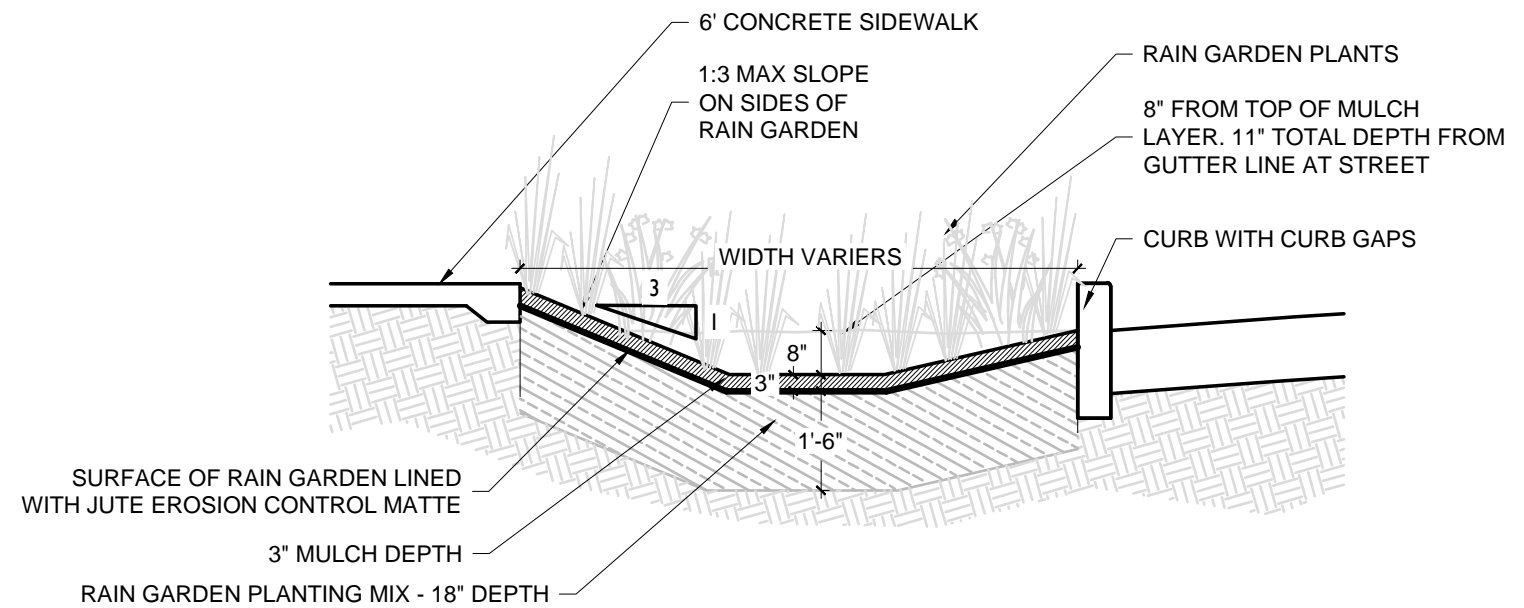


### TYPICAL BIOSWALE SECTION

SCALE: 1/4" = 1' - 0"



Urban bioretention cell



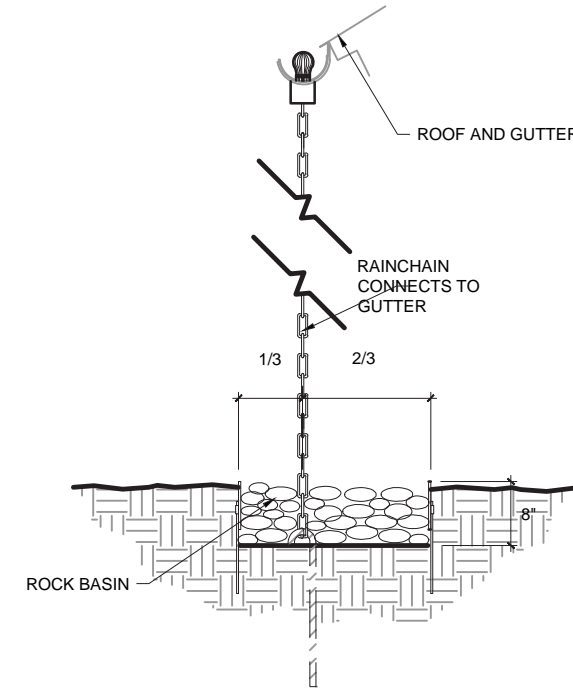
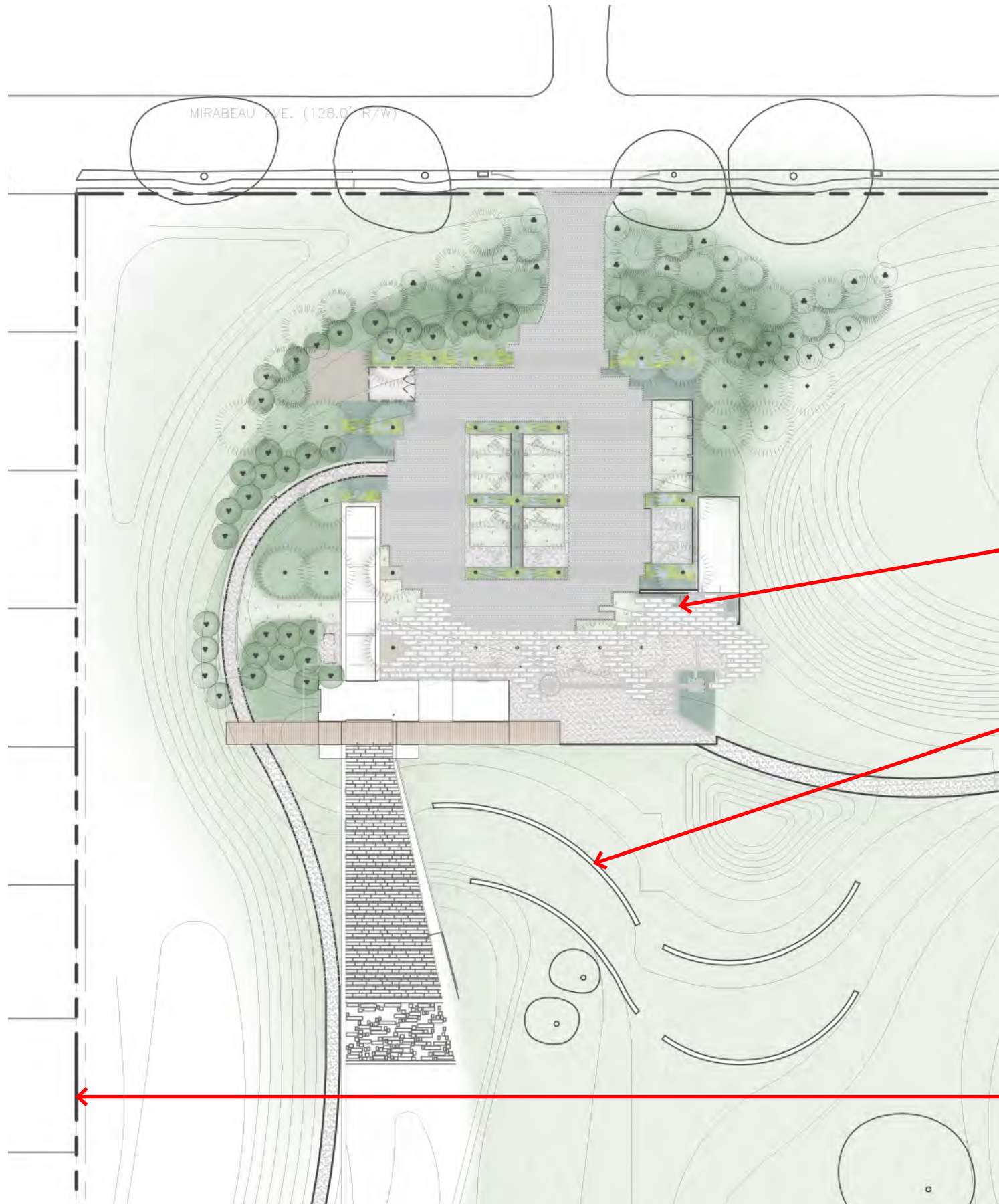
### TYPICAL BIORETENTION CELL SECTION

SCALE: 1/4" = 1' - 0"

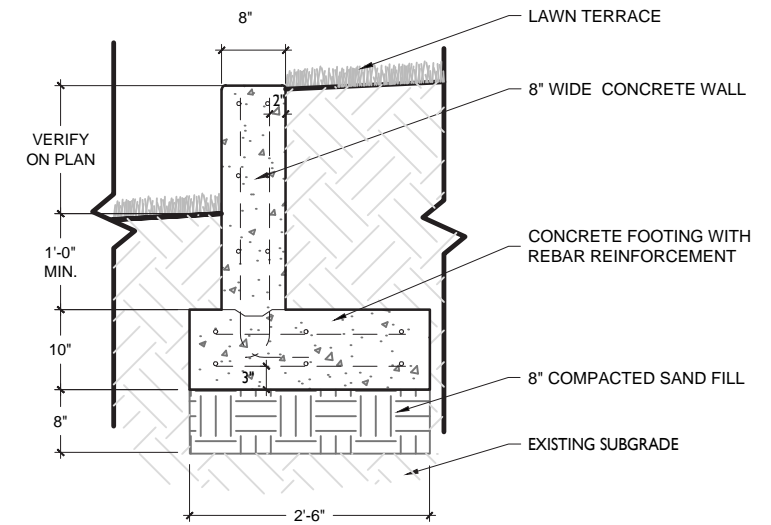


# LANDSCAPE

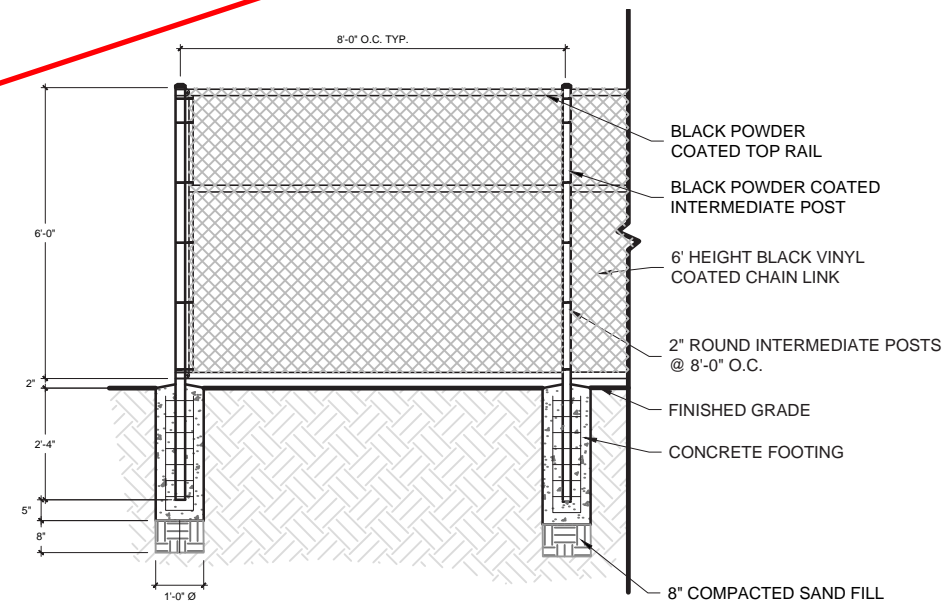
## Detail Sections



**RAIN CHAIN DETAIL**  
SCALE: NTS



**TERRACE WALL DETAIL**  
SCALE: NTS

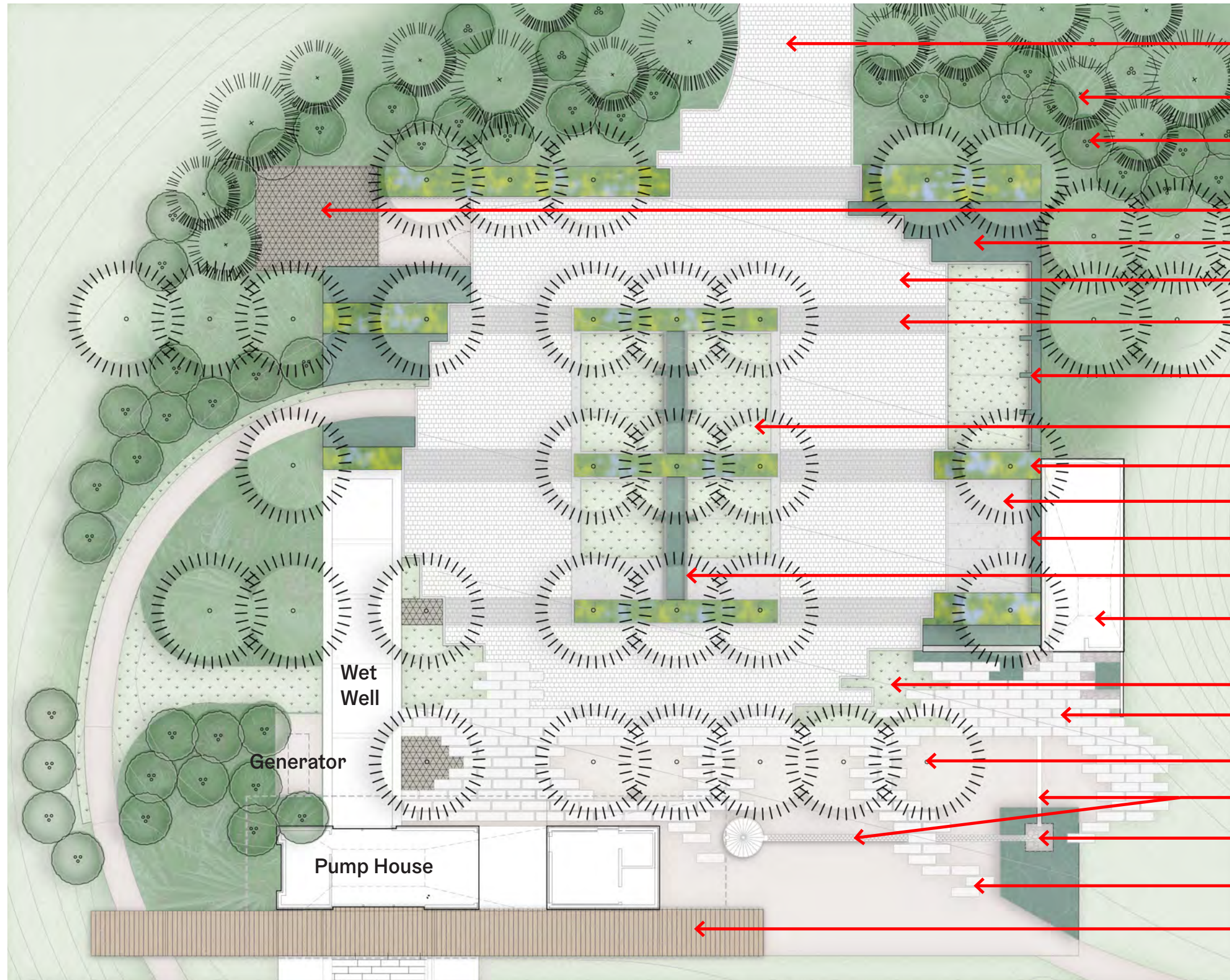


**FENCING DETAIL**  
SCALE: NTS



# LANDSCAPE

## North Parking and Entry Plaza



Entry drive from  
Mirabeau Ave

Pine Island Forest

Wax Myrtle Screen

Dumpster Pad with  
Blue Arrow Juncus Planting

PaveDrain, standard

PaveDrain, charcoal color

Juncus planting to delineate  
parking stalls

Reinforced Turf parking stalls

Iris Planting

Handicapped Accessible  
Parking

6" barrier curb as wheel stop

6" barrier curb as wheel stop

Maintenance Building

Reinforced Turf

Concrete step pads

Limestone entry plaza with  
Cypress planting

Runnels

Rock basin collects water from  
runnels

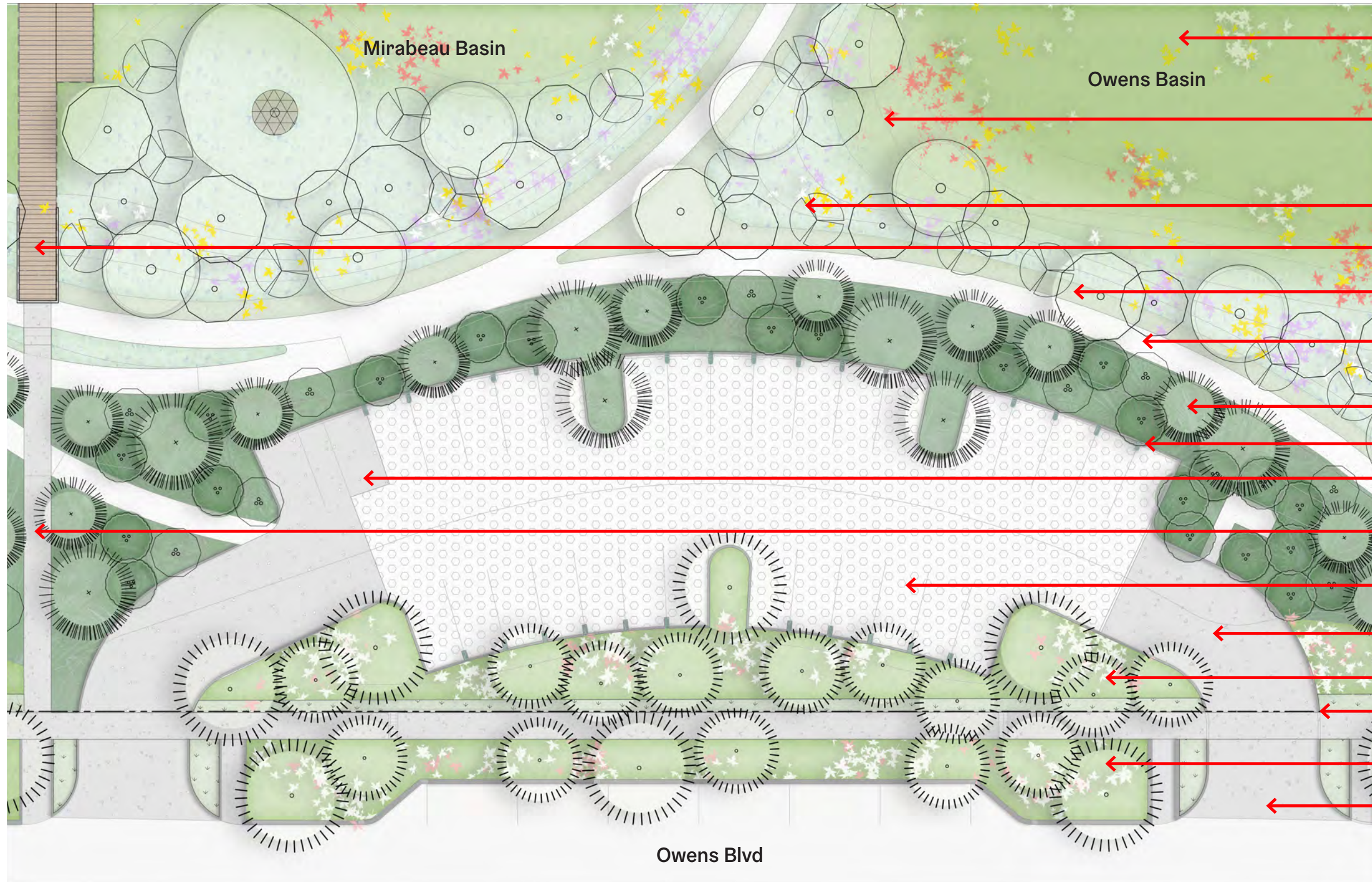
Blue Arrow Juncus Planting

Black Locust deck



# LANDSCAPE

South Parking



Lower Basin meadow planting with wildflowers

Maidencane bottom of slope planting

Little Bluestem and wildflower planting

Black Locust boardwalk

Grass maintenance strip

Limestone Path

Pine Island Planting

6" barrier curb as wheel stop  
Handicapped Accessible  
Parking

Concrete walk to stairs and  
boardwalk

Reinforced gravel parking

Concrete entry drives

Bioswale planting

Property line

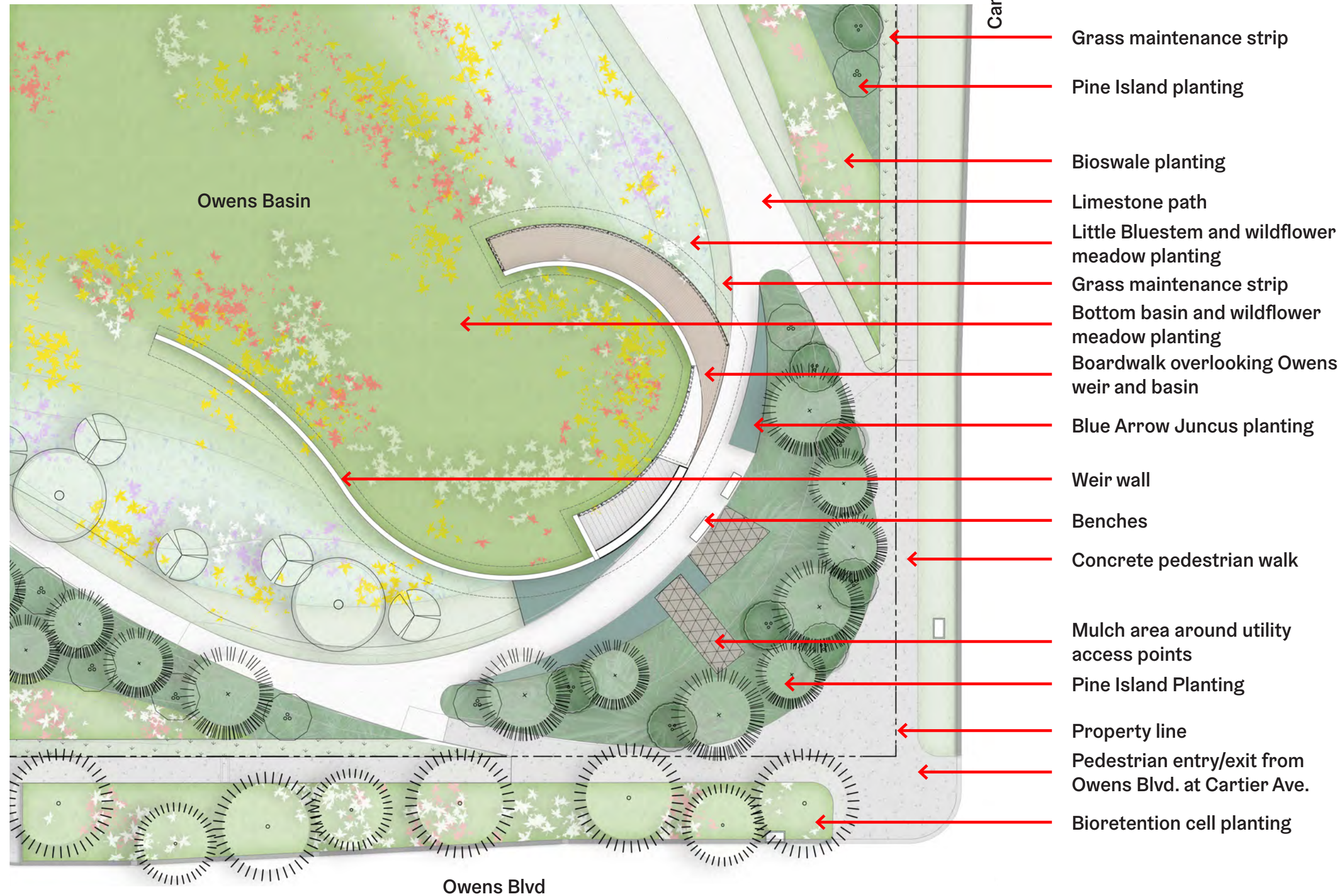
Bioretention cell planting

Entry/exit from Owens Blvd.



# LANDSCAPE

South Entry



Cartier Ave

Owens Basin

Owens Blvd

Grass maintenance strip

Pine Island planting

Bioswale planting

Limestone path

Little Bluestem and wildflower meadow planting

Grass maintenance strip

Bottom basin and wildflower meadow planting

Boardwalk overlooking Owens weir and basin

Blue Arrow Juncus planting

Weir wall

Benches

Concrete pedestrian walk

Mulch area around utility access points

Pine Island Planting

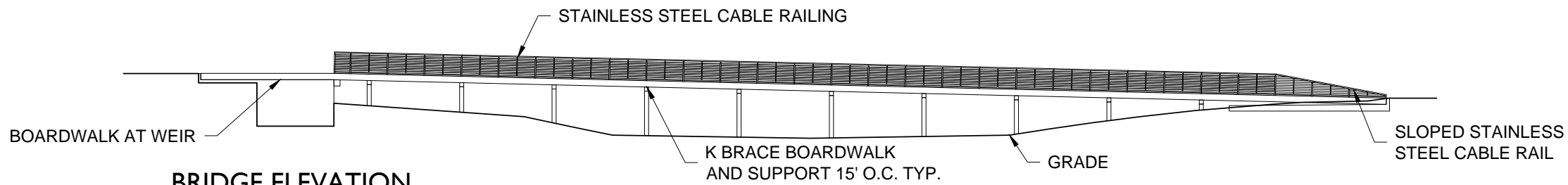
Property line

Pedestrian entry/exit from Owens Blvd. at Cartier Ave.

Bioretention cell planting

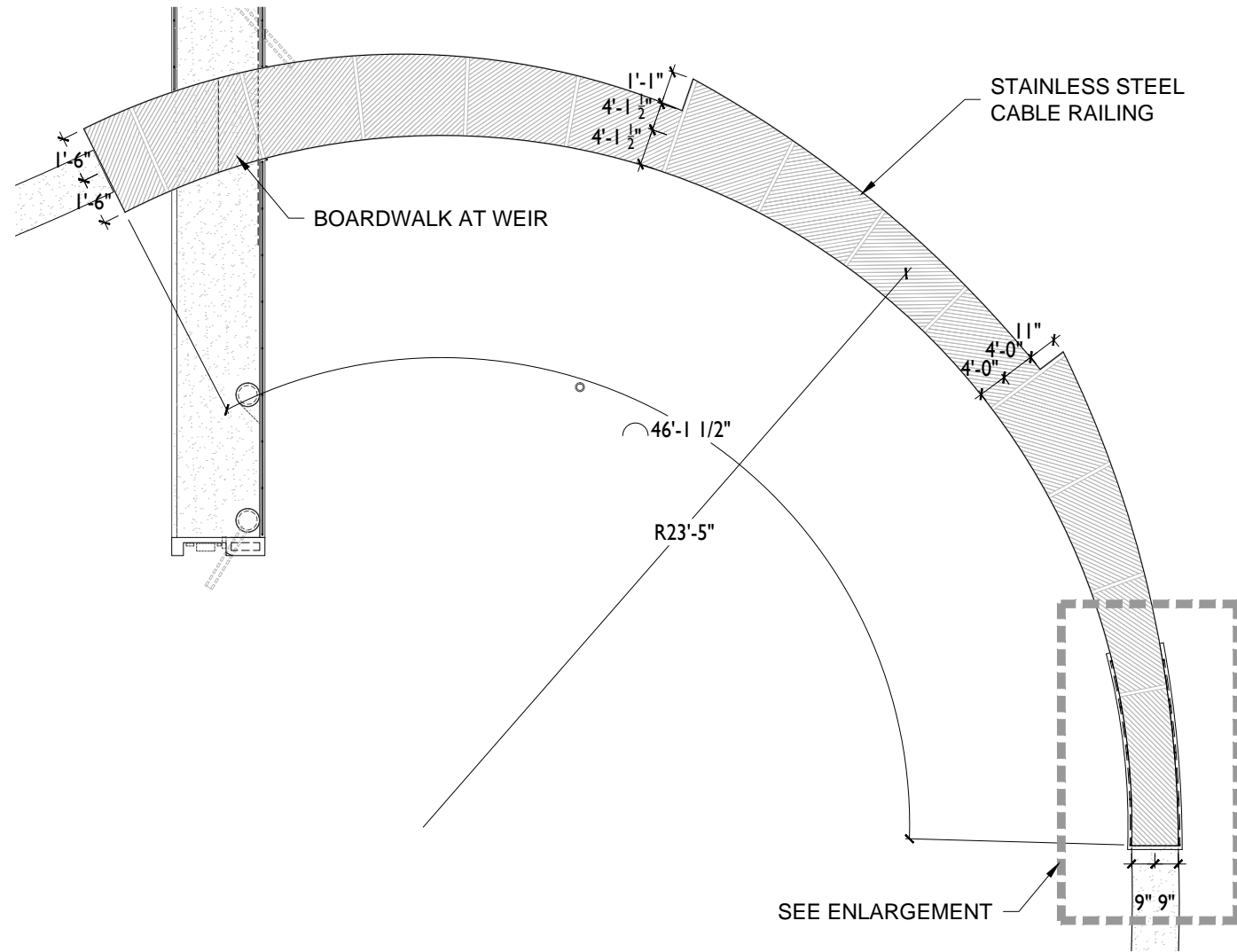


## Bridge Details



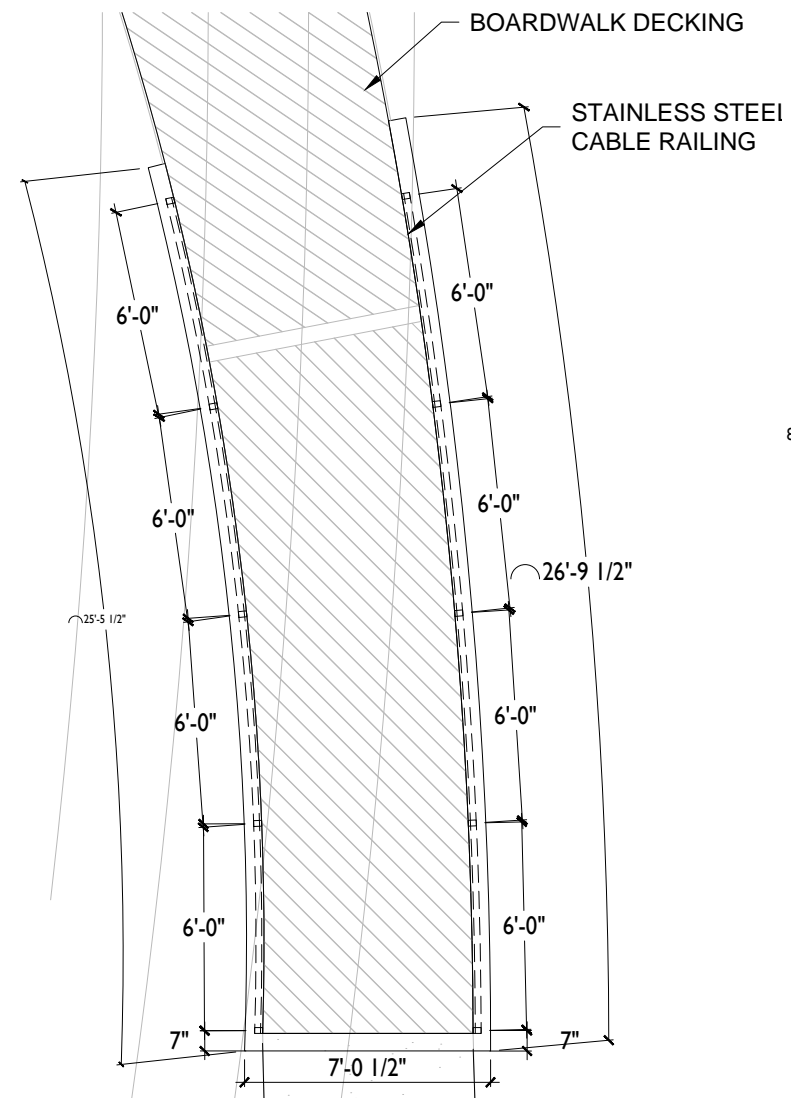
## BRIDGE ELEVATION

SCALE: NTS



## BRIDGE PLAN

SCALE: NTS

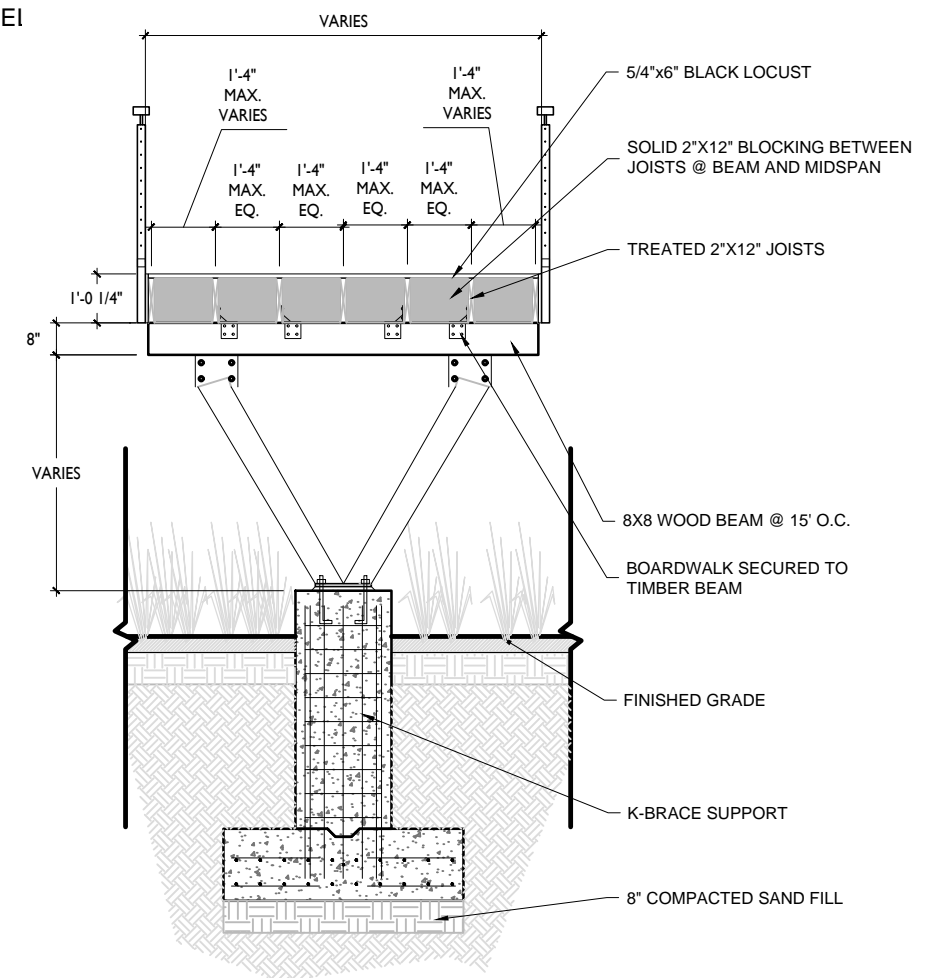


# BRIDGE PLAN ENLARGEMENT

SCALE: NTS



Example of curving bridge over grassland



### "K" BRACE BOARDWALK DETAIL

SCALE: NTS

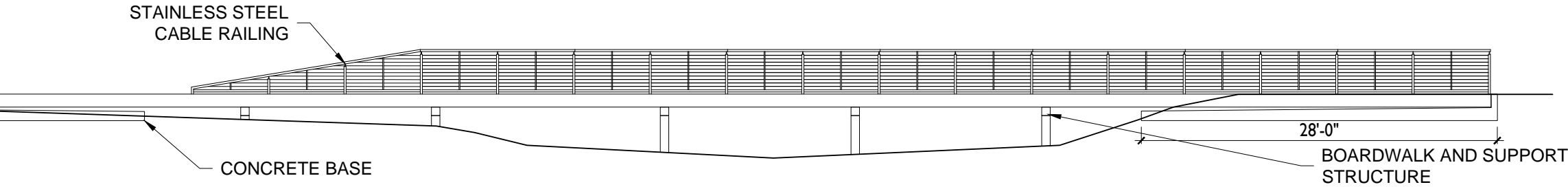


# LANDSCAPE

## Boardwalk Details

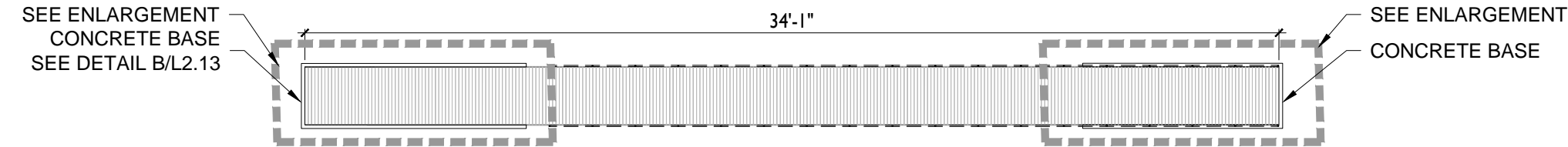


Black Locust boardwalk



BOARDWALK

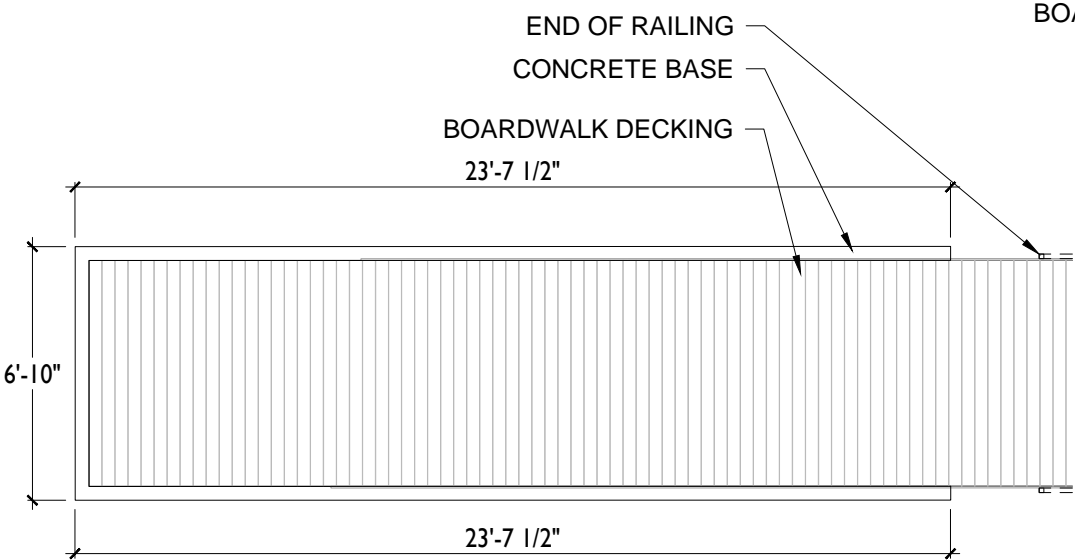
ELEVATION



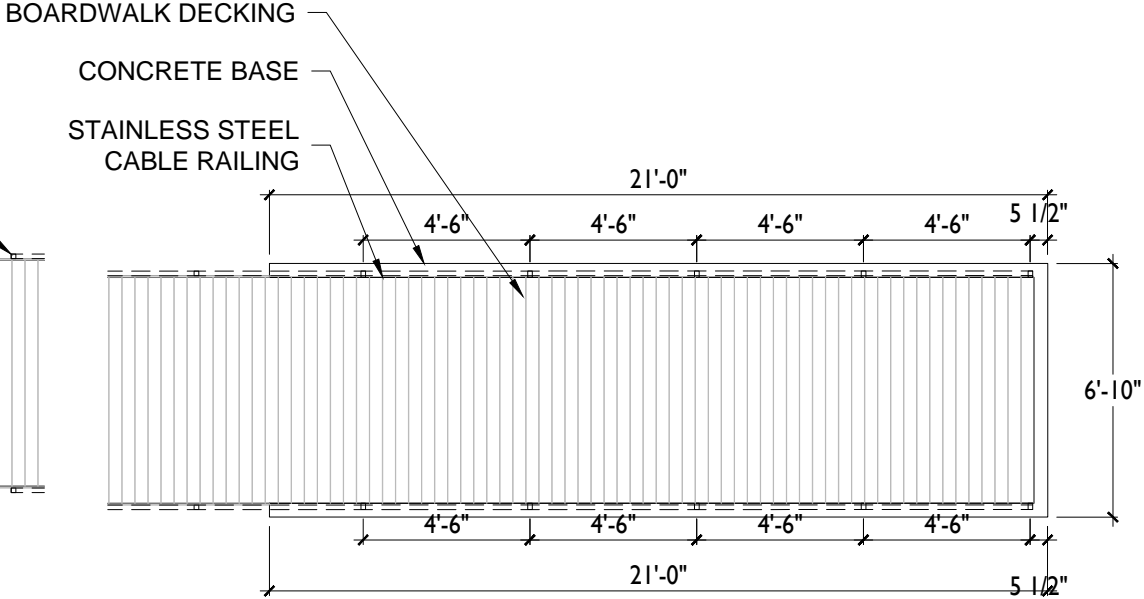
BOARDWALK

PLAN

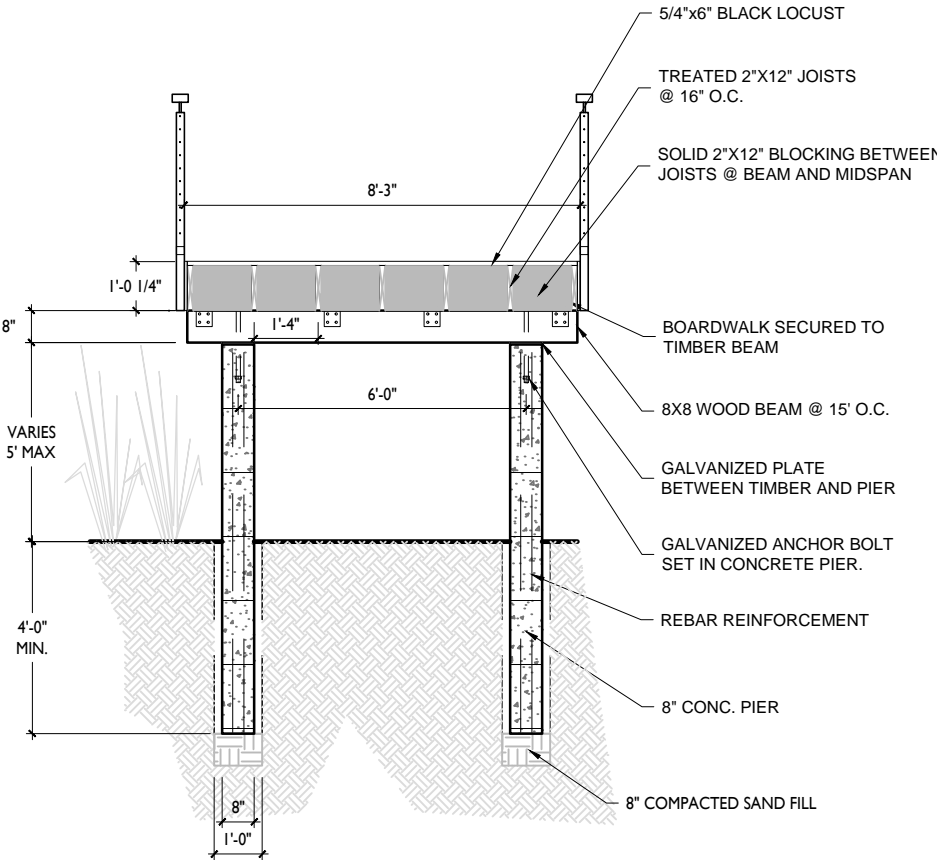
SCALE: NTS



BOARDWALK PLAN ENLARGEMENT  
SCALE: NTS



BOARDWALK PLAN ENLARGEMENT  
SCALE: NTS

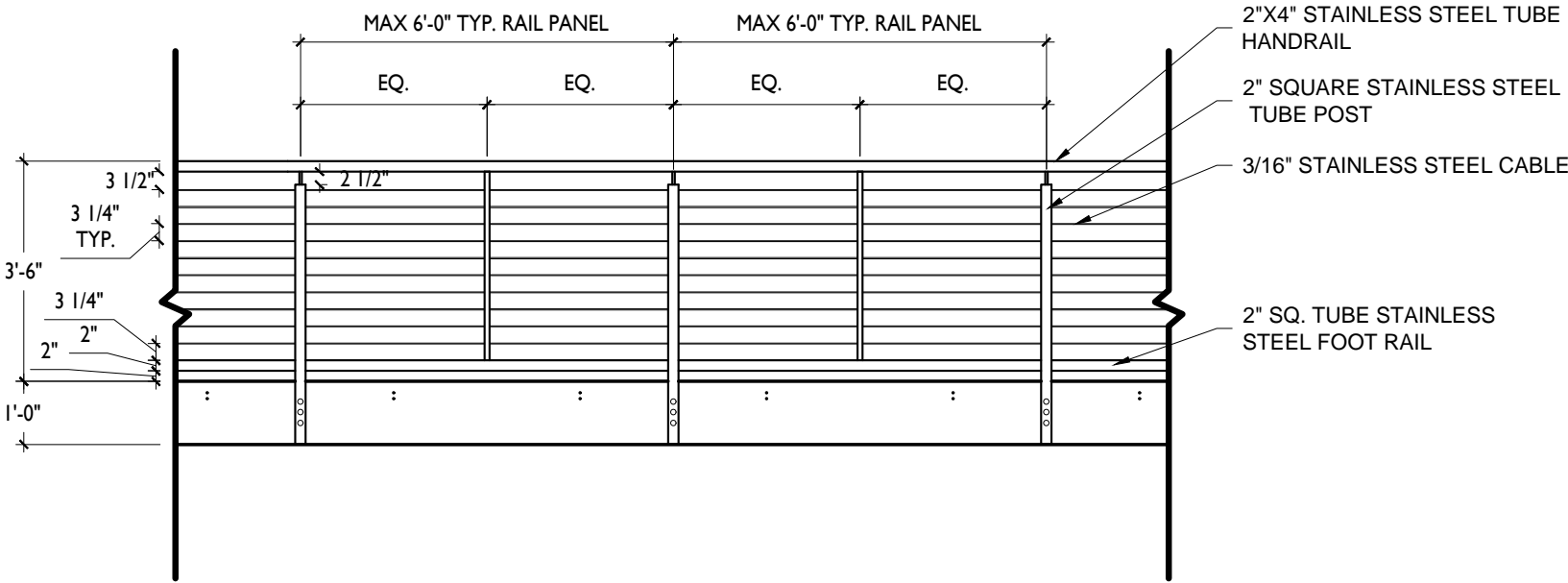


TYPICAL BOARDWALK DETAIL  
SCALE: 1/2" = 1' - 0"



# LANDSCAPE

## Stainless Steel Cable Railing Details

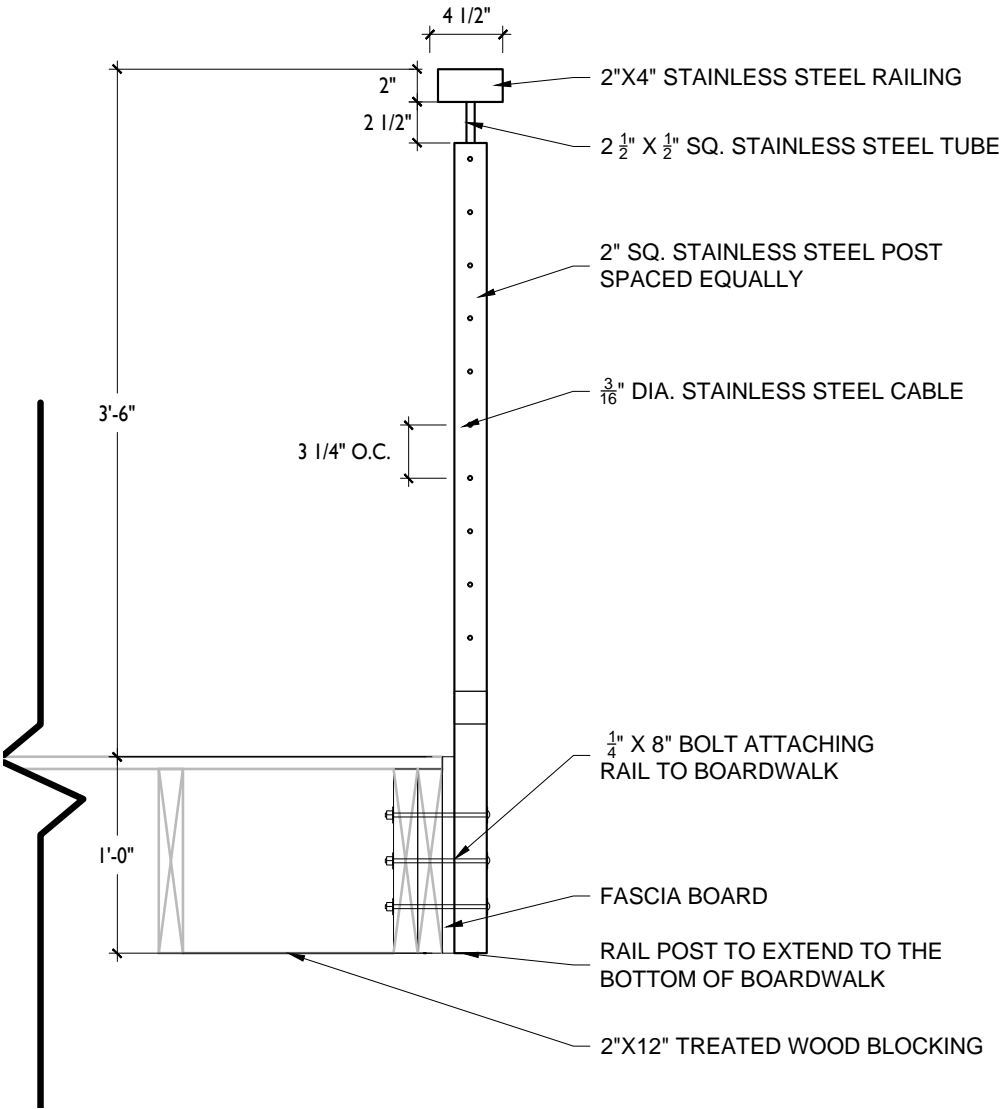


STAINLESS STEEL CABLE RAIL ELEVATION

SCALE: NTS



Stainless steel cable railing



CABLE RAILING ATTACHMENT SECTION

SCALE: NTS



# OPERATIONS & MAINTENANCE

Landscape Components (estimated annual cost ~ \$180.2K)

## 1. Weekly Maintenance ~ \$67K

- Removal of litter, debris, broken branches, and leaves from beds, paths and parking
- Mulch and gravel inspection; Replacement as needed
- Plant and arbor tie inspection; Adjust/replace as needed
- Blow walkways, curbs, and parking
- Watering during drought

## 2. Bi-Monthly ~ \$31K

- Mowing lawn areas
- Blowing walkways, curbs, and parking clean
- Manually removing weeds from bioswales, shrub areas, and meadows (after second growing season)
- Removing dead or broken branches from trees and shrubs

## 3. Following Severe Rain Events (15 visits estimated) ~ \$19.2K

- Inspection of focal point equipment in bioswales; Removal of sediment and debris
- Removal of debris and trash from detention basins
- Replacing missing/dead plants and displaced mulch and gravel
- Inspection of pave drain and removal of sediment and debris using air compressor equipment

## 4. Meadows ~ \$15K

- Mowing 2 times annually
- Raking and gathering debris to be disposed of off-site.
- Applying herbicide 3 times annually, more often after first 2 years

### -Alternative to mowing-

*Controlled burning ~ \$9K*

*Controlled burning once annually with mowing prep and 3 herbicide applications, herbicide applications lessening each year. To be employed **instead** of mowing when possible. Not considered as a cost in addition to mowing, resulting in a lower annual cost.*

## 5. Mature Trees ~ \$10K

- Pruning and fertilizing by licensed arborist every 3 years
- Maintaining mulch rings, re-mulching biennially

## 6. New Trees ~ \$38K

- Pruning and fertilizing by licensed arborist every three years (after first 3 years)
- Disease/pest inspection and treatment (after 9 years)
- Maintaining mulch rings, re-mulching biennially

30 JUNE 2017

## Mirabeau Water Garden O&M Plan - Landscape Components

WAGGONER & BALL  
ARCHITECTURE/ENVIRONMENT

2200 PRYTANIA ST  
NEW ORLEANS, LA 70130  
504 524 5308  
WBARCHITECTS.COM



# OPERATIONS & MAINTENANCE

Structured Components (estimated annual cost ~ \$45K)

1. Vortechs Devices (Forebays) ~ \$12K
  - Inspections as needed, at least twice a year
  - Cleaning floatables, sediments, and other pollutants with vacuum truck during dry weather
2. Wet Well ~ 2K
  - Periodic visual inspection
  - Cleaning via entry into well and/or manually pulling metal screens (at least quarterly)
3. Axial Flow Pump and Station ~ \$24.5K
  - Pump maintenance can be provided by pump installer, if desired
  - Inspection & Maintenance Schedule included in O&M Plan
  - Good record keeping required
  - Pump replacement on average every 15-25 years
4. Recirculation Pump and Cistern ~ \$2.5K
  - Recirculation Pump involves routine inspections, quarterly maintenance tasks and annual inspections for capacity, pressure, and power
  - Cistern involves periodic trash and sediment removal
5. Generator ~ \$3.3K
  - Monthly testing per federal requirement
6. Discharge Trough and Energy Dissipator ~ \$0.13K
  - Visual inspections for concrete cracking and repairs as needed
7. Owens Inlet Weir ~ \$0.13K
  - Periodic inspections for cracking, debris and/or excessive sediment build-up
  - Debris/sediment removal and structural repairs as needed
8. Outlet Control Structure / Automated Butterfly Valve ~ \$0.13K
  - Outlet Control Structure maintenance - same as Weir above
  - Valve requires annual cycling to verify operation and annual inspections for leakages
  - Major rework typically requires valve removal and return to manufacturer
9. Flap Gate ~ \$0.13K
  - Periodic removal of accumulated debris, lubrication of pivot points, cleaning and repainting of exposed non-operating surfaces

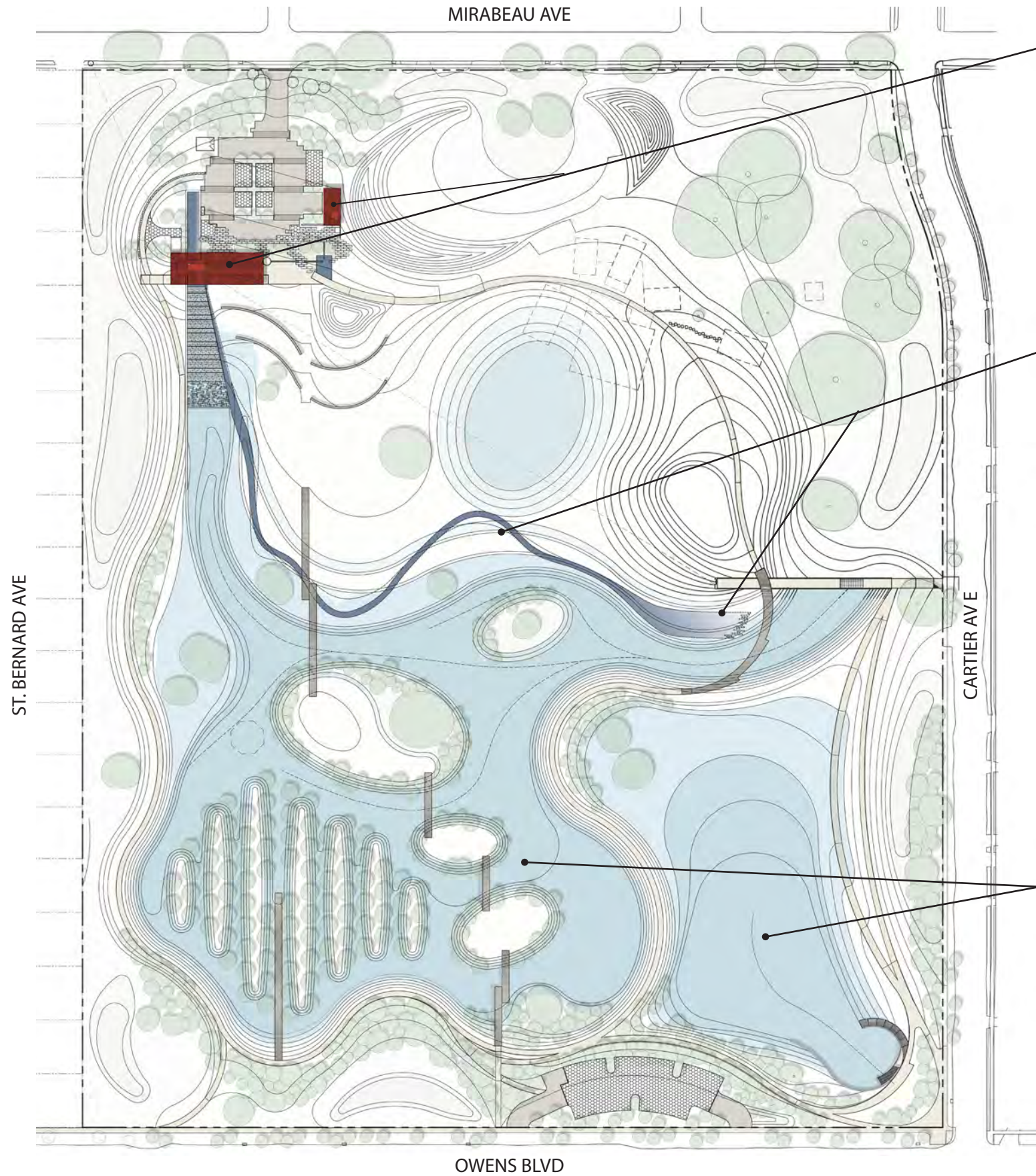
21 OCTOBER 2016

## Mirabeau Water Garden O&M Plan - Structured Components



# PROGRAM

## Stormwater Storage



### EXAMPLES/INSPIRATION

#### Pumphouse & Maintenance Shed



Katsura Imperial Villa - Kyoto

#### Water Runnel & Plaza (recirculating water feature)



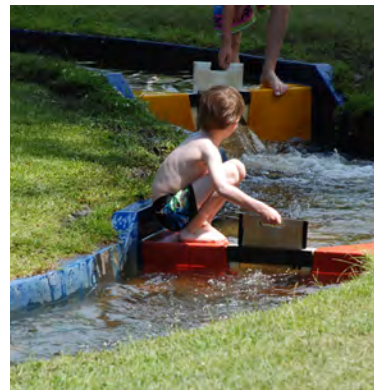
Largo, FL



Princess Diana Memorial Fountain, London



San Francisco, CA



Netherlands

#### Dry Detention Basins (temporary water storage)



Inner Nørrebro, Copenhagen



# PROGRAM

Perimeter Buffering & Groundwater Control

## EXAMPLES/INSPIRATION

### Perimeter Bioswale and Underdrain



Bioswale example, Bolton Ave Streetscape



Urban bioretention cell, Alexandria, LA



Curb gaps, Alexandria, LA

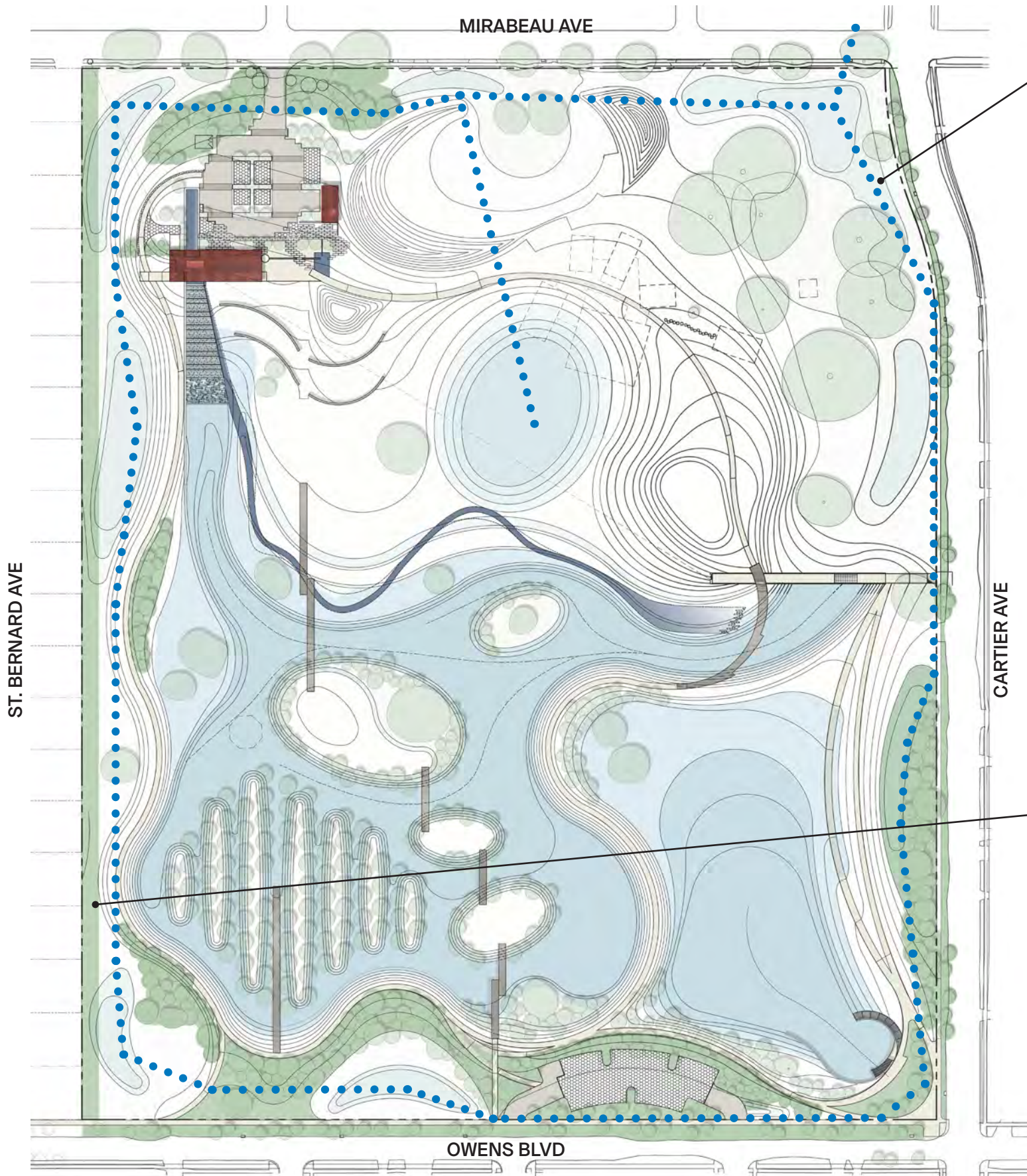


Grate connecting to street bioretention cells

### West Edge: Native Bamboo



Existing Native Bamboo will be allowed to spread





# PROGRAM

## Forested Areas



### EXAMPLES/INSPIRATION

#### Sacred Oak Grove



Existing Live Oaks Grove



Salvaged CSJ Terrazzo Crest

#### Shaded Islands (aquatic shade trees)



Swamp Chestnut Oak



Swamp Blackgum



Swamp Red Maple

#### Cypress Forest



Watergraafsmeer Polder, Amsterdam, NL



Shorter growth habitat of Maidencane on Polders makes elevation changes visible



# PROGRAM

## NDR Phase - Programmable Areas



## EXAMPLES/INSPIRATION

Lawn (potential landscaped entry to future education pavilion)

Bowl Landform (potential amphitheater)



Grass Amphitheater, Aarhus University, Denmark

Mound (potential stepped landform or play mound)

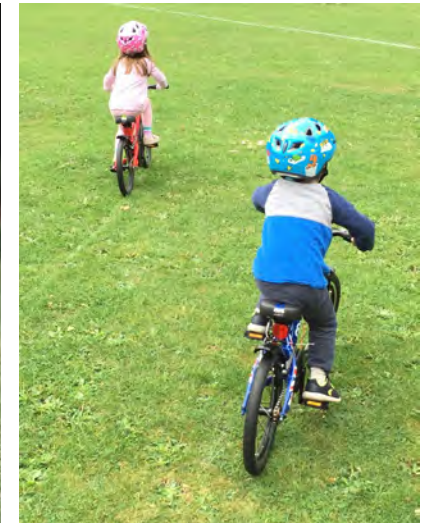


Landform Ueda, Edinburgh, Scotland



The Hills, Governor's Island, NY

Open Field (potential play area)





# PROGRAM

NDR Phase - Potential Building Sites



## EXAMPLES/INSPIRATION

### Potential Buildings / Campus



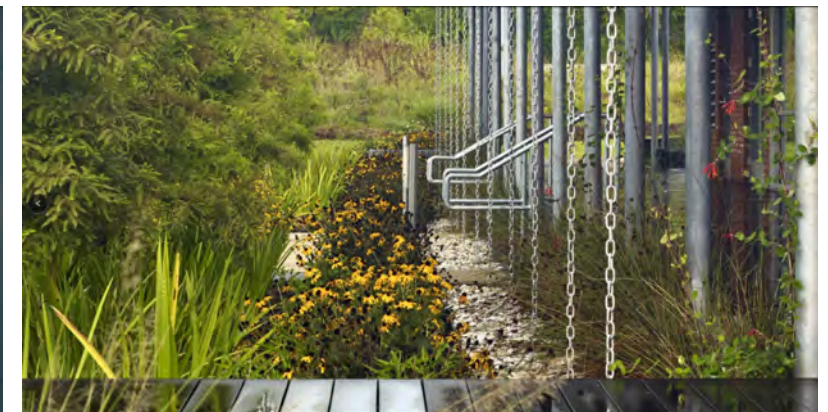
Atlantic Center for the Arts, New Smyrna Beach, FL



Hilltop Arboretum, Baton Rouge, LzZA



Visitor Center, St. Landry Parish, LA



Visitor Center, St. Landry Parish, LA

### Potential Pavilions



Crosby Arboretum, Picayune, MS



Queen Victoria Gardens, Melbourne, Australia



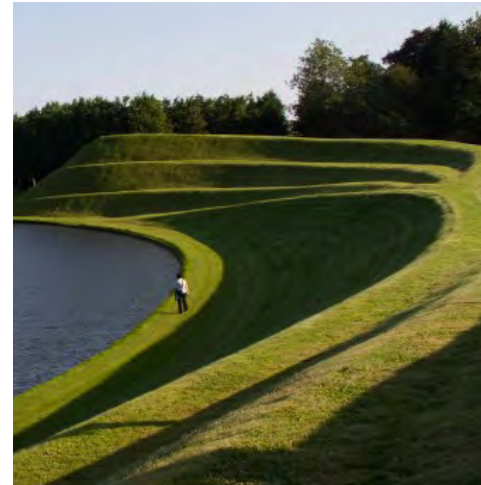
# PROGRAM

Circulation, Parking, and Maintenance



## EXAMPLES/INSPIRATION

### Berm & Pathways

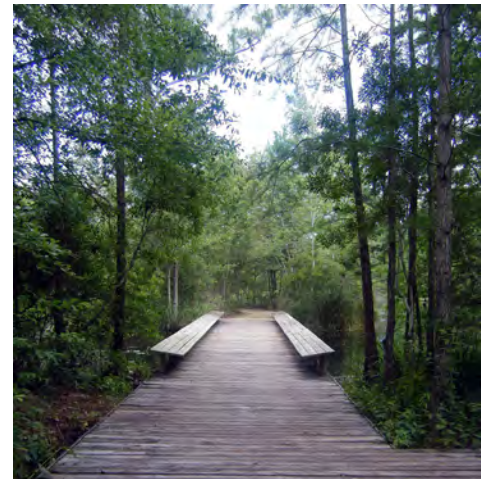


Landform Ueda, Edinburgh, Scotland



Minghu Wetland Park, Guizhou, China

### Boardwalks & Bridges



Crosby Arboretum, Picayune, MS



Shangri-La Botanical Gardens, Orange, TX



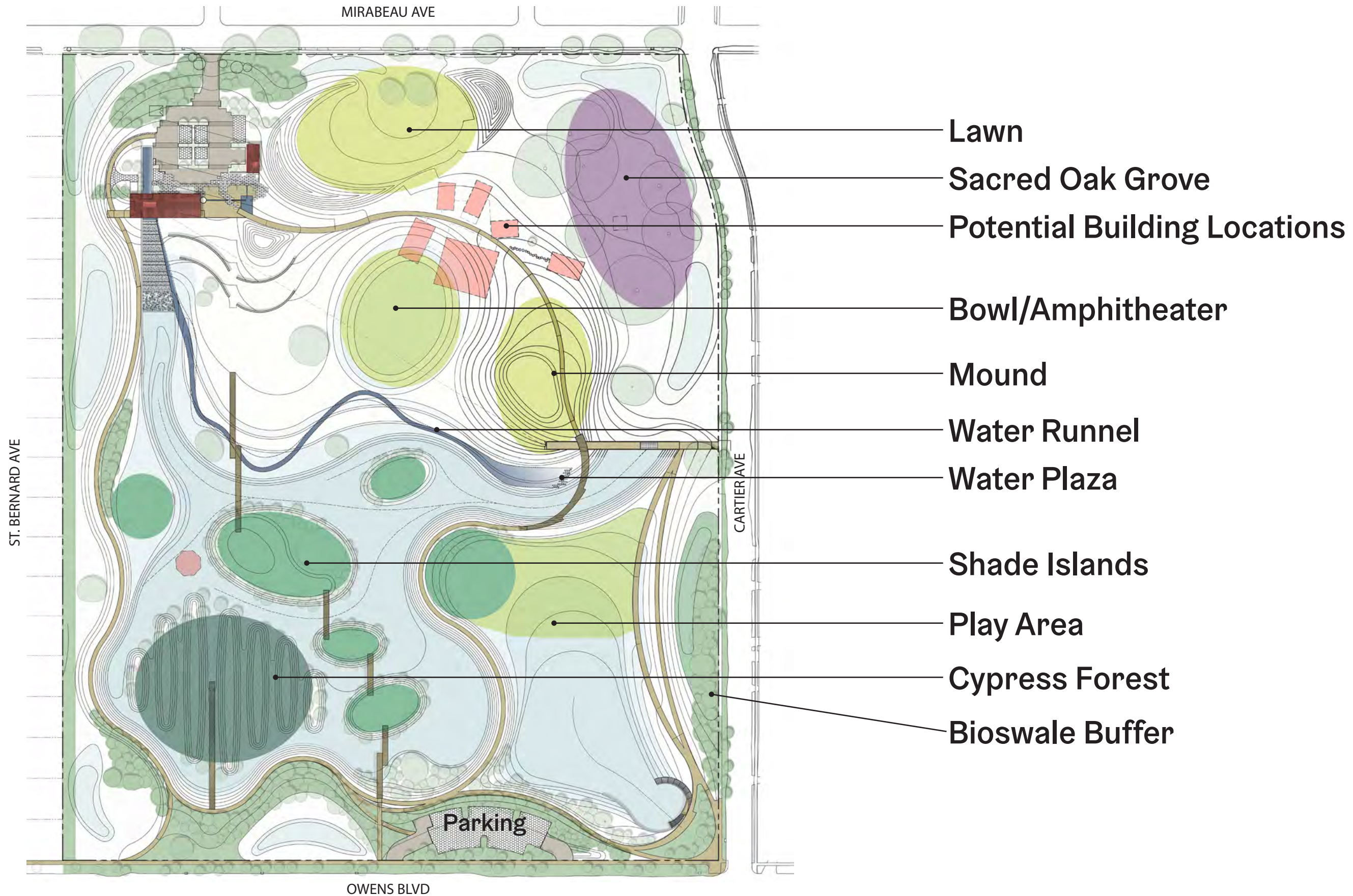
### Public Parking





# PROGRAM

Overall Diagram





## GOALS & PRIORITIES

- Flood reduction - monitor & measure performance to ensure functionality over time
- Safety - fenced perimeter or natural but secure barriers; security cameras; site lighting
- Maintenance and cleanliness - garbage containers; park rules (including dog clean-up) and enforcement against illegal dumping
- Improved street edges - close coordination with public works street projects
- Natural vs. regimented landscape
- Park amenities for families and youth:
  - Visitor's center and pavilions for environmental education, community events, meeting space, and exercise classes
  - Bike racks, walking paths, distance markers
  - Community garden to learn how to grow food; sculpture garden; butterfly garden



## **ADDITIONAL QUESTIONS/CONCERNS**

- How will trees be affected from a 10-year storm inundation?
- Schedule - community anticipated construction to start this summer
- How is community input going to affect design after 90% completion?
- How is polluted water entering site being handled?
- Who will be responsible for maintenance beyond contractor's 3-year responsibility, where does funding come from, and how will it be better than street maintenance today?
- Street repairs should be integral part of this project
- Ensure local businesses participate in the redevelopment of the site
- Fear that project funding may get re-allocated with new project administration
- Parking and entry point locations - concern about traffic, noise, and security



# DRY CONDITION

Aerial Perspective Looking South





# DRY CONDITION

Aerial Perspective Looking North





# TYPICAL RAIN STORM

1-3 Inches





# HEAVY RAIN STORM

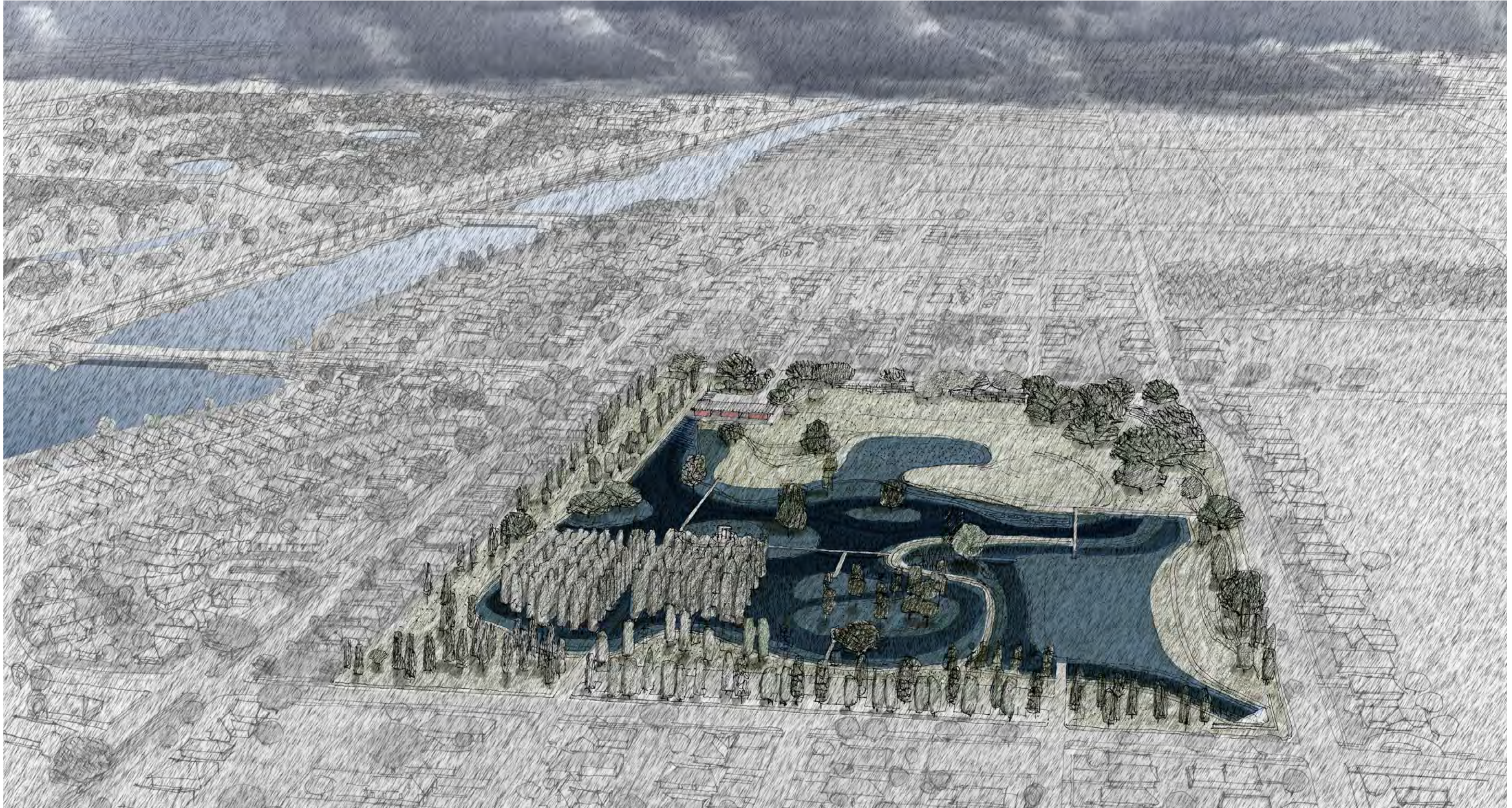
2-Year Event





# EXTREME RAIN STORM

10-Year Event





## NEXT STEPS

- Review comments from City agencies, FEMA, and Design Review Committee and Notice to Proceed
- FEMA Environmental Assessment
- Additional Geotechnical / Groundwater Investigation for final Groundwater Control System design
- Phase 2 (NDR-Funded) Program Development
- Phase 2 Schematic Design, Design Development, and Construction Documents



# PROJECT SCHEDULE

