Stormwater Retro-Fits

Concept to Construction Strategies

Carlton Spirio, P.E.
GHD, Inc.

Today's Focus

General Strategy

- Planning Opportunities
- Constraints
- Funding
- Partnerships
- Design Strategies
- Maintenance

Successful Examples

So What and WHY?

Planning Opportunities

- Specific Project Outcome
  - Flood Control
  - Treatment
  - Rehabilitate Existing Stormwater Ponds
  - MS4s
  - Correct Re-occurring Maintenance
  - Estuary Restoration

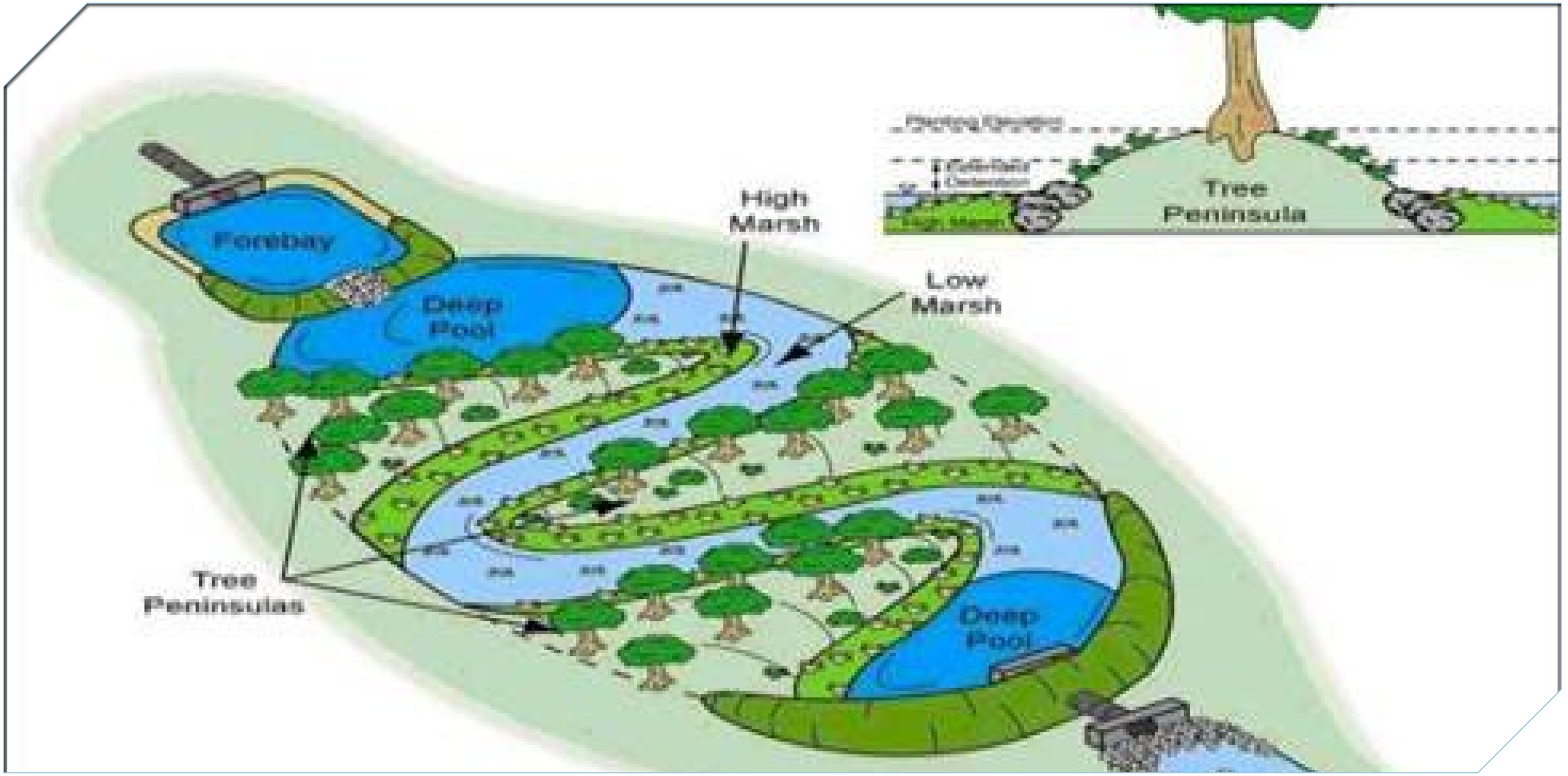
Water Quality and Flood Protection

Stormwater Pond Rehabilitation

Stream and Channel Stabilization

Planning Opportunities

- Existing Areas Without Controls
  - Commercial Centers Built Before Permitting
  - Agricultural Land
  - Residential Developments
- Available Public Lands
  - Parks
  - Surplus Land



Multi-Purpose Recreational Parks

Planning Opportunities

- Infra-Structure Upgrades
  - Water/Waterwaster Facilities
  - Sidewalk and Trails
  - Roadway Improvements
- Coastal Improvements
  - Beach Re-nourishment
  - Shoreline Protection

Complete Street Retro-Fits

Planning Opportunities

- Future Development
  - Low Impact Designs (LIDs)
  - Regional Watershed Facilities
- Cooperative Initiatives
  - Public-Private-Partnerships
  - State and Federal Projects

Regional Stormwater Facilities

Constraints

- Limited Right-of-Way
  - Urbanized Areas
  - Residential Communities
  - Commercial
- Environmental Permitting
  - Realistic Volumes

Bulb-Out Treatment Area

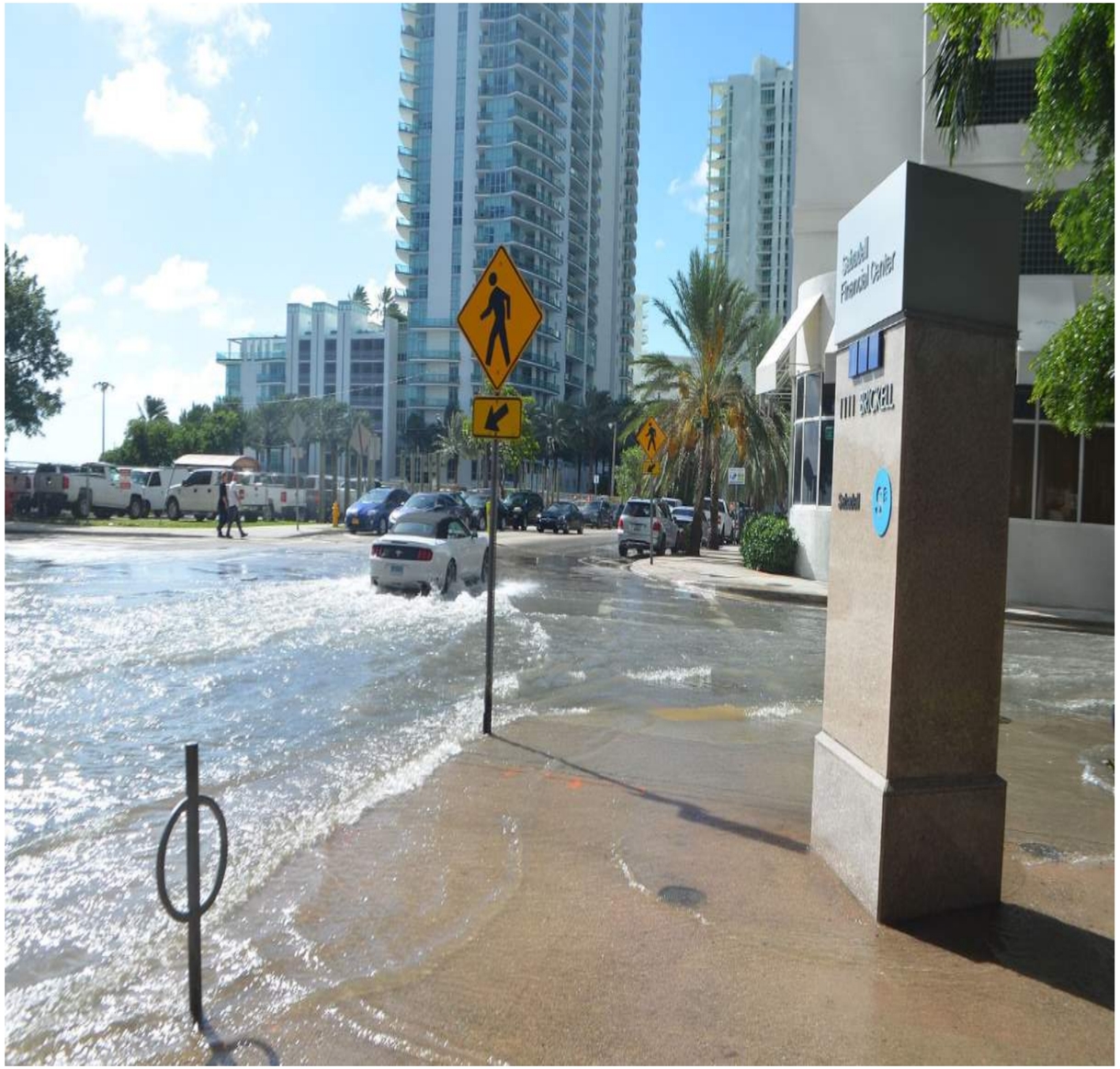
Constraints

- Hydraulic Limitations
  - Depth to Seasonal Highwater Table
  - Downstream Stage/Rate Limitations
  - Mechanical Needs
- Incentives
  - Tax Relief
  - Permitting Requirements

Recurring Flooding

Constraints

- Existing Utilities
  - Sub-surface - Water and Wastewater Lines
  - At-grade - Poles and Control Boxes
- Safety
  - Pedestrians and Bicyclists
  - Motorists



Utility and Pedestrain Safety Concerns

Funding

- Stormwater Management Fees
  - Property Taxes
- Special Taxing
  - Community
  - Watershed

Funding

- Water Management Districts
  - Cooperative Funding Initiatives
  - Water Quality Grants
- Florida Department of Environmental Protection (FDEP)
  - Cooperative Funding Grants

Funding

- Florida Department of Transportation (FDOT)
  - Local Agency Program (LAP) Agreements
  - Joint Participation Agreements (JPAs)
  - Infra-Structure/Stormwater Improvements
  - BMAP Coordination
- Florida Department of Agriculture and Consumer Services (FDACS)

Partnerships

- Public-Private-Partnerships (PPP)
- FDOT/FDACS
- WMDs/FDEP
- Other Municipalities

Design Strategies

International Stormwater BMP Database
http://www.bmpdatabase.org/

- Supporting Agencies:
- Water Environment Research Foundation (WERF)
- Federal Highway Administration (FHWA)
- Environment and Water Resource Institute (ASCE)
- U.S. EPA
- American Public Works Association (APWA)

Design Strategies

- Water Quality Practices
  - Detention Areas
  - Rain Gardens
  - Underground Vaults
  - Underdrain/Filtration Systems
  - Vegetated Swales

Detention Swales/Ponds

Underground Vaults

Design Strategies

- Sediment and Debris Collection
  - Baffle Boxes
  - Sediment Basins
  - Continuous Deflective Separation (CDS Structures)
  - Drainage Inlets with Sump Bottoms
  - Trash Grates and Skimmers

Sediment and Debris Structure

Design Strategies

- Flood Control
  - Underground Vaults
  - Modify Existing Pond Storage
  - Slotted Pipe and Underdrain Systems
  - Berms/Dykes
  - Bypass Canals

Smart Ponds

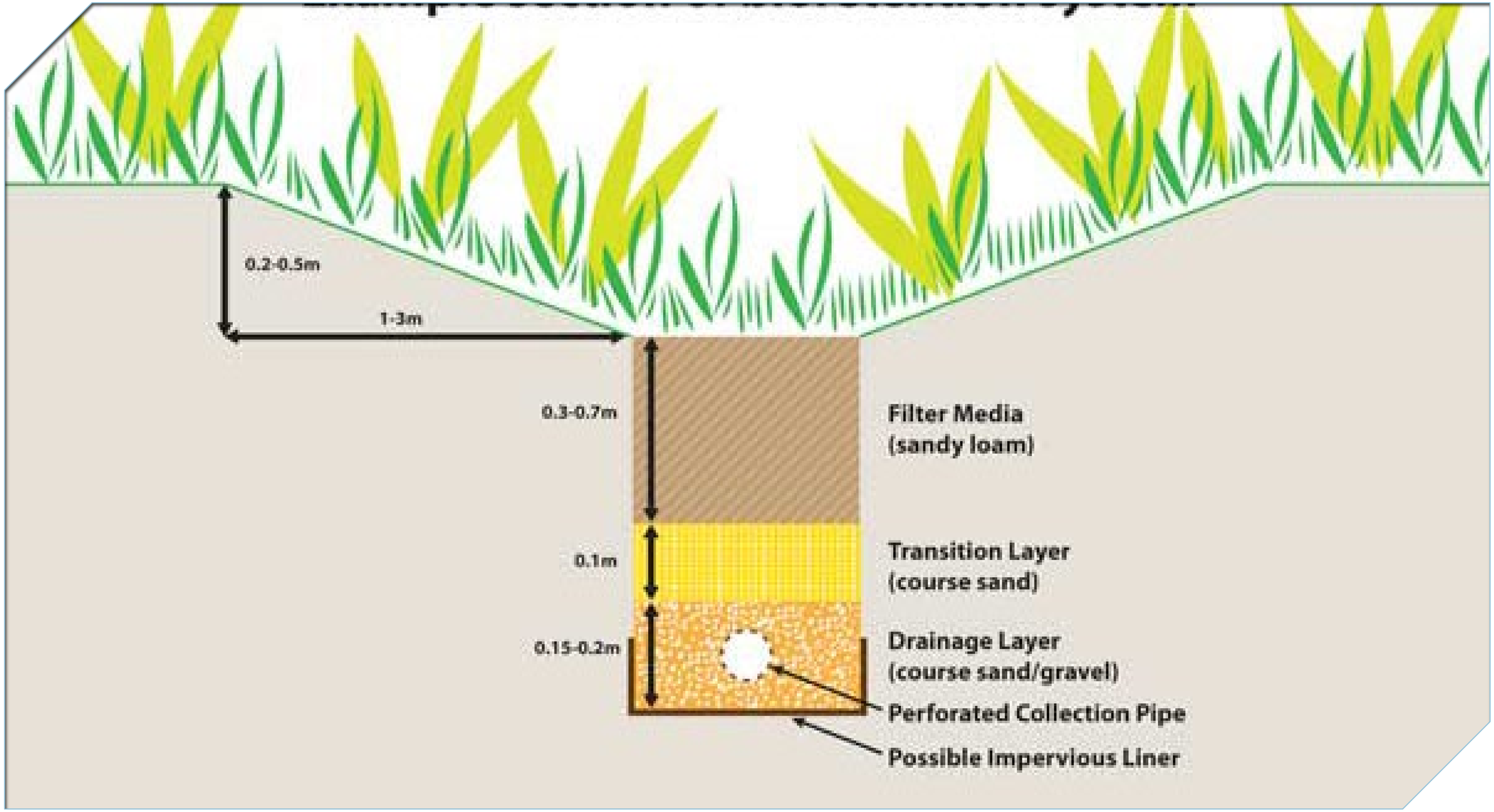
Design Strategies

- Stream Stabilization/Restoration
  - Channel Widening
  - Filter Marshes
  - Diversion Channels
  - Channel Armoring
  - Bypass Canals
  - Spurs/Weirs

Filter Marsh

Design Strategies

- Nutrient and Pollutant Controls
  - Bio-Activated Media (BAM)
  - ALUM Injection Systems
  - Embankment Stabilization
  - Mechanically Treated Stormwater Runoff



BAM Installation

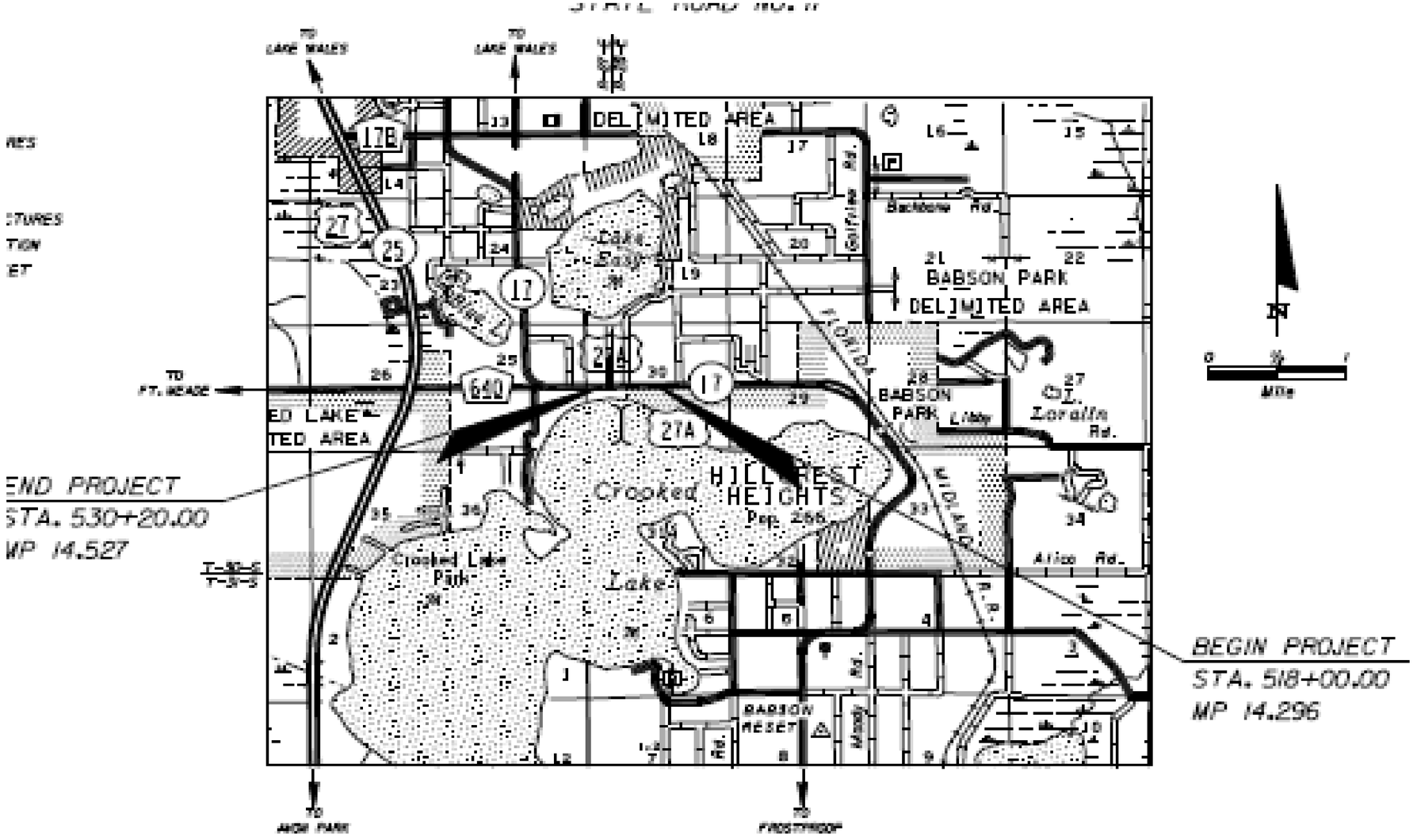
Maintenance

- Long Term Commitments
- Access
- Costs
- Storage of Specialty Materials
- Specialty Equipment
- Safety!!!!!

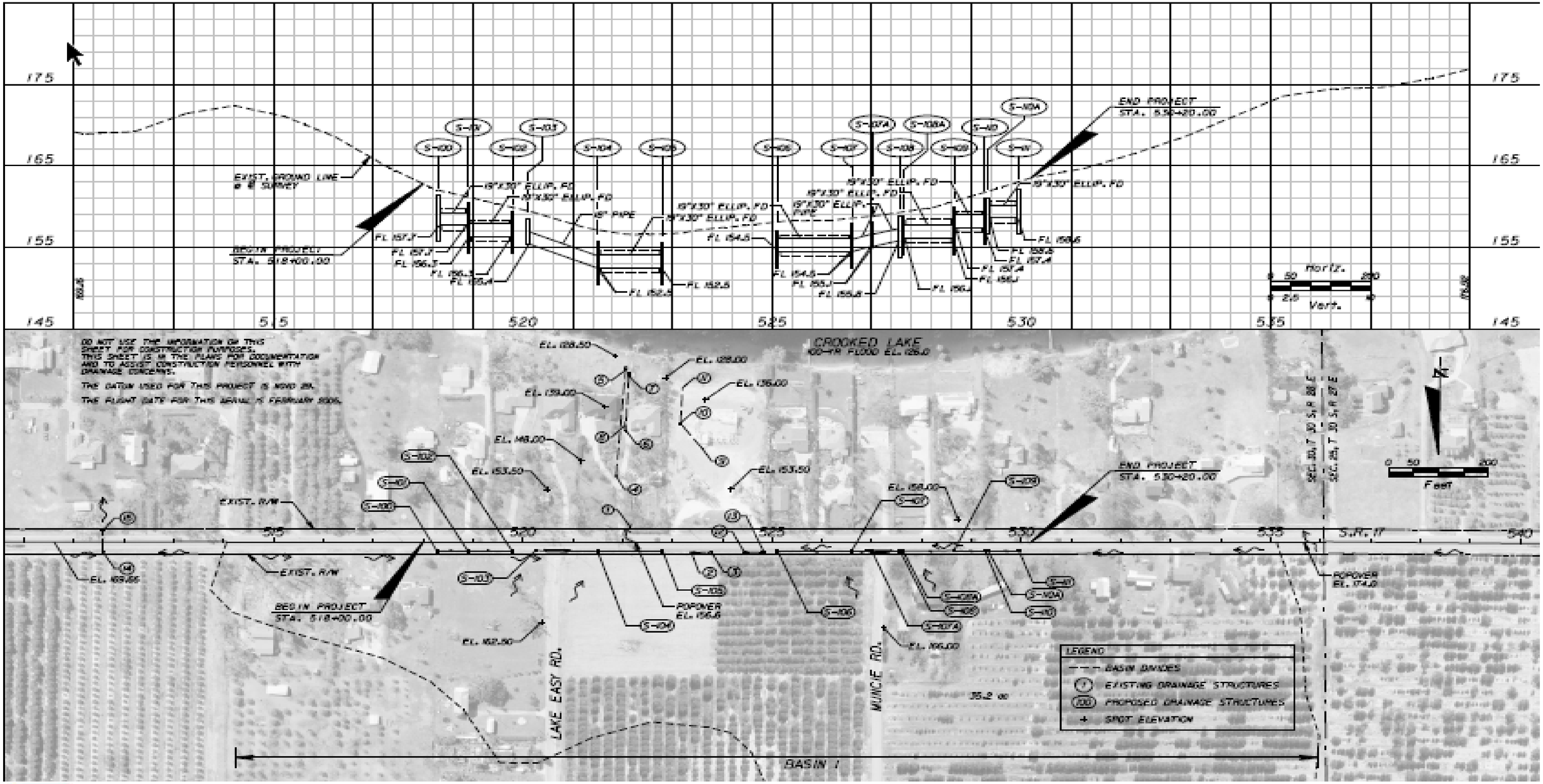
Maintenance and/or Safety Concerns?

Successful Examples

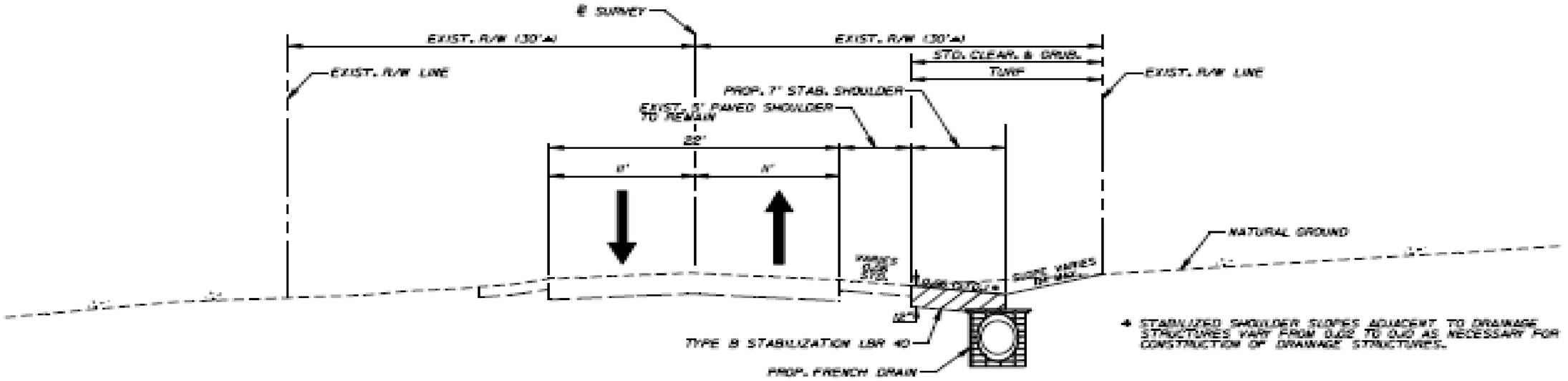
- Roadway Overtopping Retro-Fit Project
- Lake Anita (Van Buren Pond)



S.R. 17 – Babson Park, Polk County



S.R. 17 – Drainage Map



TYPICAL SECTION

S.R. 17

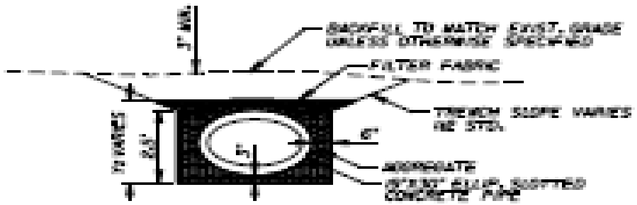
STA. 518+00.00

TO STA. 530+20.00

TRAFFIC DATA✦

CURRENT YEAR ESTIMATE = 2009 AADT = 6,900
OPENING YEAR ESTIMATE = 2010 AADT = 7,000
DESIGN YEAR ESTIMATE = 2031 AADT = 9,100
K = 9.3% D = 54.8% T = 7.8% (24 HOUR)
DESIGN HOUR T = 5.9%
DESIGN SPEED = 60

✦ TRAFFIC DATA FROM FPID 426363-1-52-01



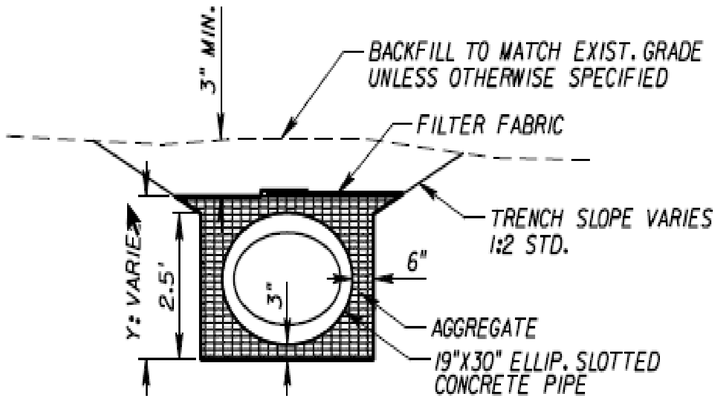
CONSTRUCT FRENCH DRAIN SYSTEM WITH THIS DETAIL AND INDEX 285. ALL NOTES AND DETAILS FROM INDEX 285 APPLY EXCEPT WHERE THEY CONFLICT WITH THIS DETAIL.

Y (FT)	AGGREGATE (CY/LF OF PD)	FILTER FABRIC (SY/LF OF PD)
2.5	0.201	1.65
3.5	0.259	1.85
4.5	0.345	1.91

FRENCH DRAIN DETAIL

N.T.S.

S.R. 17 – Typical Section



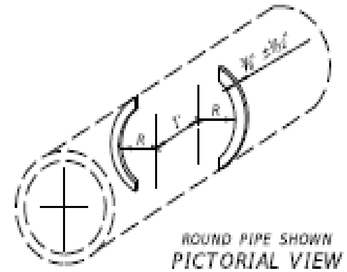
CONSTRUCT FRENCH DRAIN SYSTEM WITH THIS DETAIL AND INDEX 285. ALL NOTES AND DETAILS FROM INDEX 285 APPLY EXCEPT WHERE THEY CONFLICT WITH THIS DETAIL.

Y (FT)	AGGREGATE (CY/LF OF FD)	FILTER FABRIC (SY/LF OF FD)
2.6	0.201	1.65
2.8	0.238	1.85
2.9	0.245	1.94

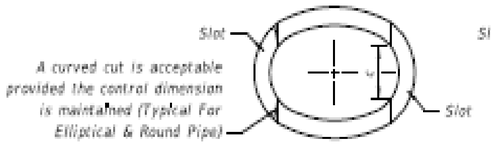
FRENCH DRAIN DETAIL
N.T.S.

ELLIPTICAL PIPE		
Pipe Size	Slot Cut Opening c	
	Min.	Max.
14"x23"	10"	12"
19"x30"	14"	16"
24"x38"	14"	16"
29"x45"	20"	22"
34"x53"	20"	22"
38"x60"	20"	22"

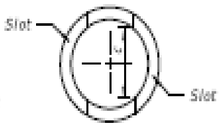
ROUND PIPE		
Pipe Size	Slot Cut Opening c	
	Min.	Max.
15"	12"	14"
18"	12"	14"
24"	16"	18"
30"	16"	18"
36"	22"	24"
42"	22"	24"
48"	22"	24"
54"	24"	26"
60"	24"	26"
66"	24"	26"
72"	24"	26"



ROUND PIPE SHOWN
PICTORIAL VIEW

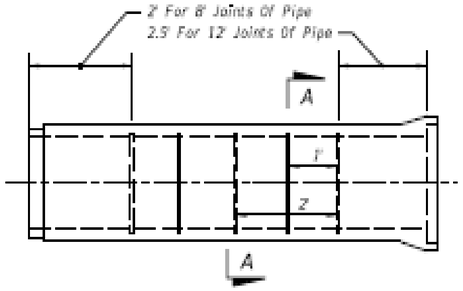


ELLIPTICAL PIPE



ROUND PIPE

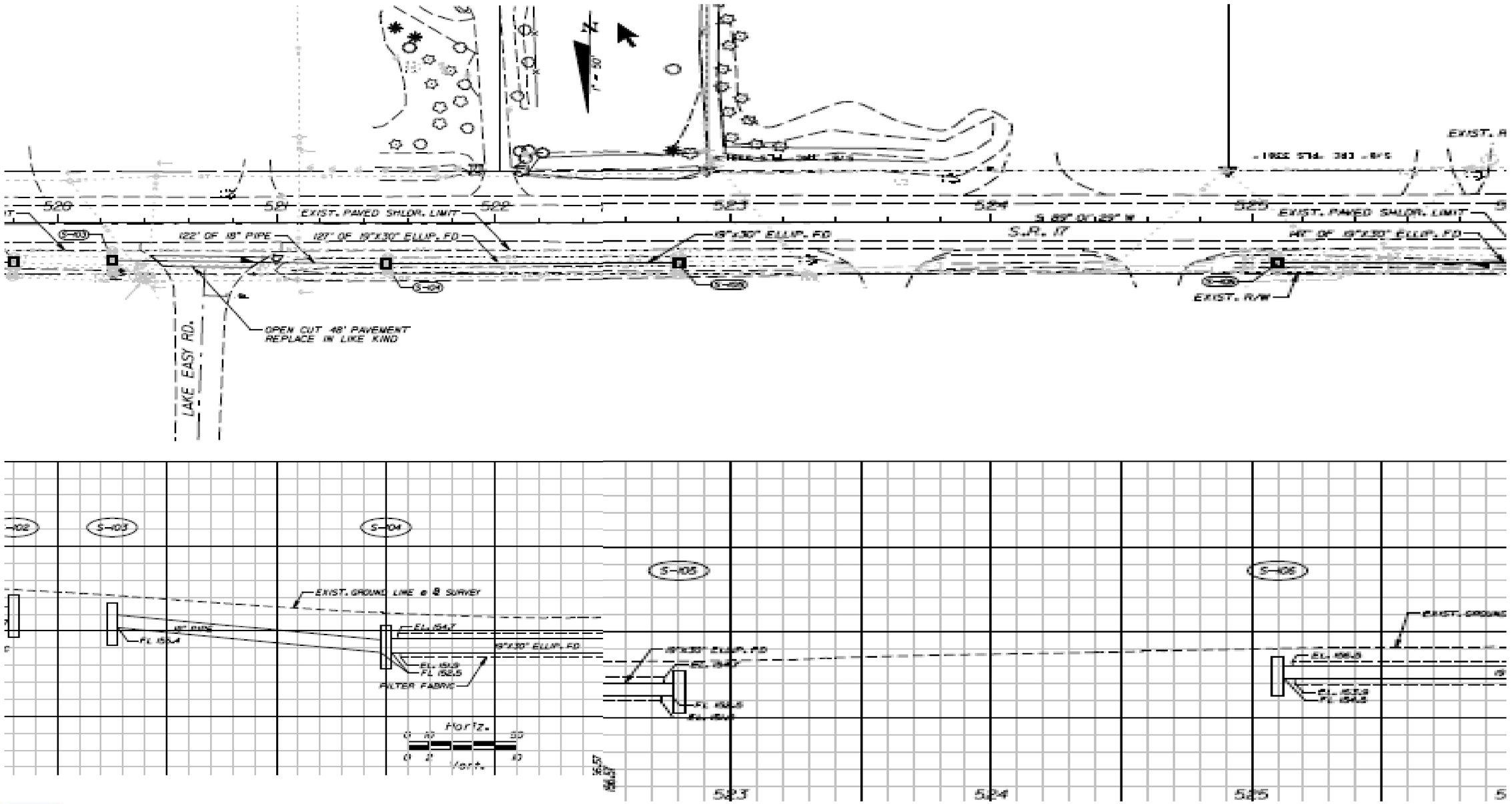
SECTION AA



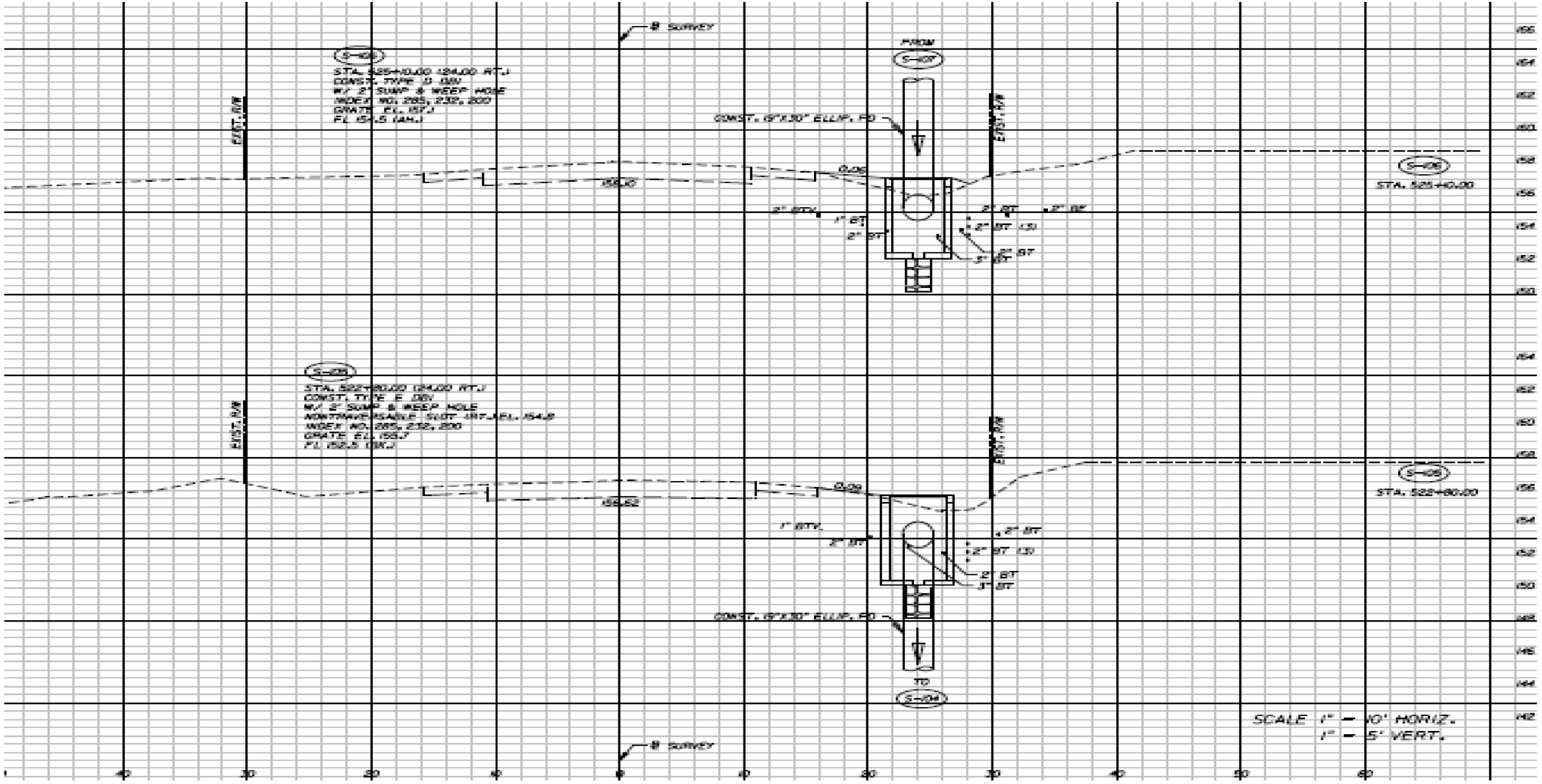
SIDE VIEW

OPTION B - ROUND OR ELLIPTICAL PIPE

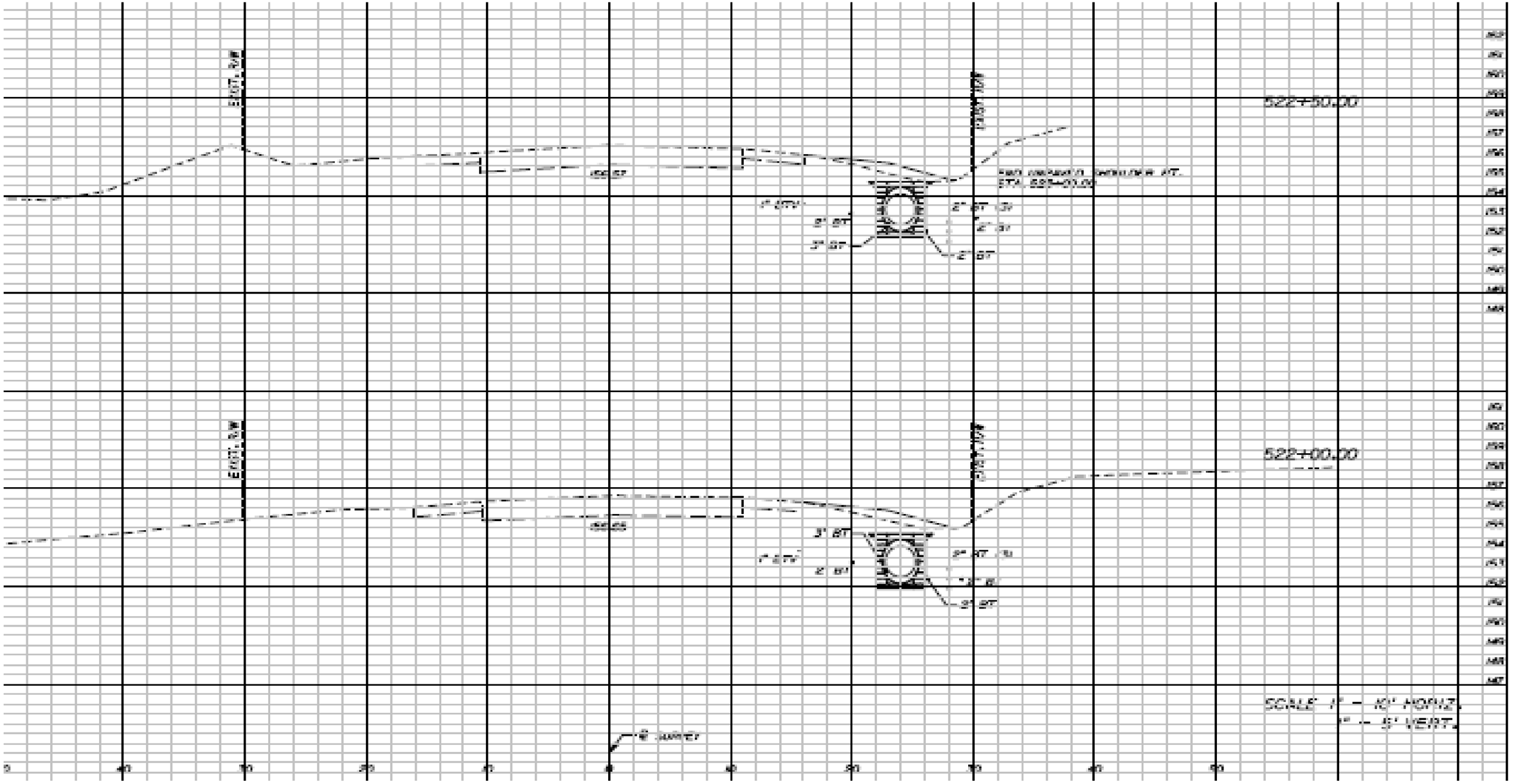
S.R. 17 – Slotted Drain Pipe



S.R. 17 – Plan & Profile



S.R. 17 – Drainage Structures



S.R. 17 – Cross Sections

Lake Anita – City of Tallahassee

Lake Anita – City of Tallahassee

Lake Anita – City of Tallahassee

Lake Anita – City of Tallahassee

Concluding Thoughts

Comprehensive Thinking

- Early and Often Coordination
- Master Planning
- Cooperative Funding
- Identify Partnerships
- Sustainable Design Strategies
- Maintenance-Friendly

Question

Carlton Spirio, P.E.
Senior Drainage Engineer
GHD
5904 Hampton Oaks Parkway
Tampa, Florida 33610
(813) 363-9429
Carlton.Spirio@ghd.com

www.ghd.com

Project Example in Collier County

Lake Trafford stormwater improvements

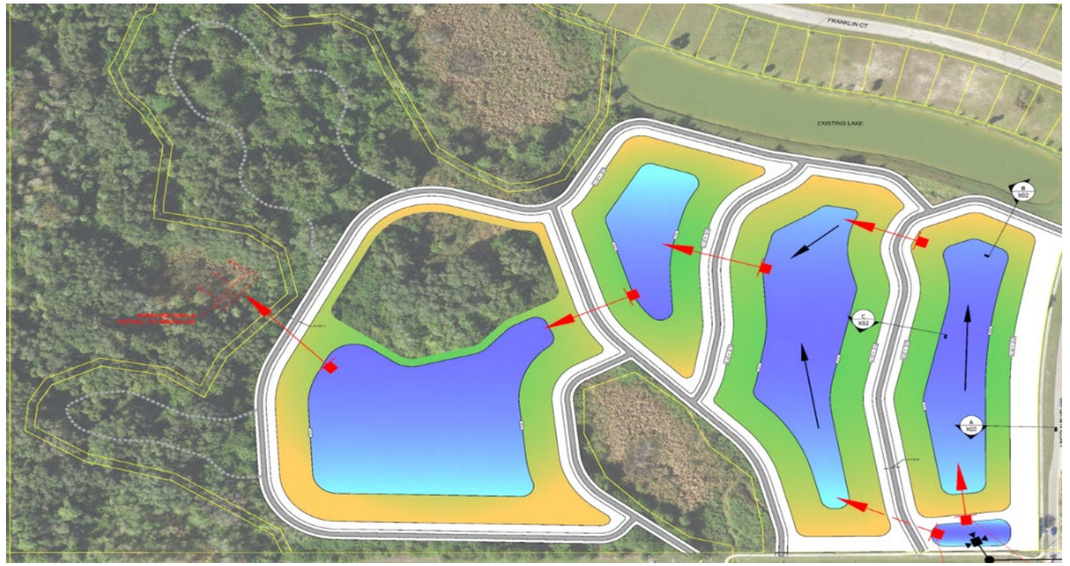
IWM approach for water quality

Lake Trafford regional stormwater pond

- Regional Approach to Improve Water Quality for Lake Trafford
- Achieve Dual Goal of Flood Relief with Restoration of Lake Trafford Basin Runoff
- Create an Environmentally Friendly Park for Education and Recreational Purposes
- Maximize Nutrient Load Reductions
- Highlight Benefits of Capturing Untreated Runoff to Slough
- Regional Pond Design to Establish Appropriate Groundwater Stages to Preserve Intended Function

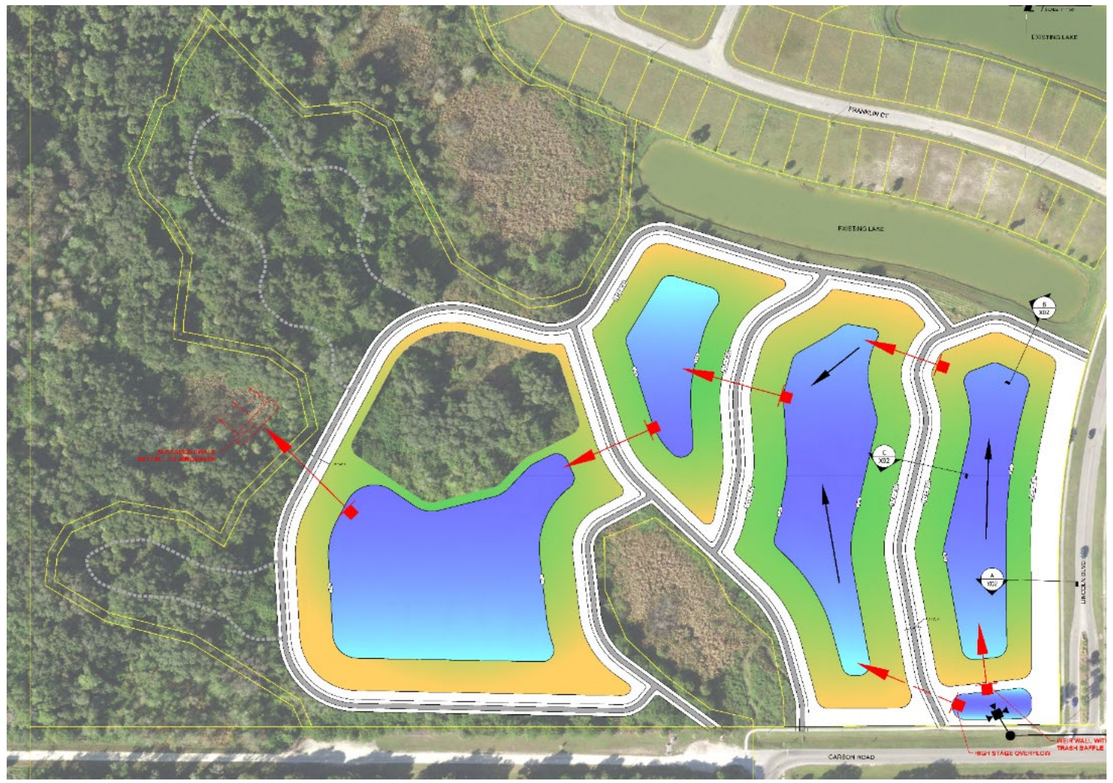
Pond design general concept

- Determination of Low Water Elevation Will Be Critical
- Shallow with Gradual Slopes for Safety, Maintenance, Plant Growth
- Pond Excavation Volume to Offset Road Filling Needs
- Design Must Consider Available County Maintenance Resources
- Set Excavation Depth for Wading Bird Foraging



Regional pond design strategy

- Separate Into Lower and Upper Bays by Receiving Area
- Extend Flow Path For Increased Settling Time in Typical Storms
- Trash Removal
- Allow Larger Storm Events to Bypass Flow Path to Maintain Tailwater



Existing residential stormwater pond

- Conservation Land to the Associated with Lake Trafford
- Minimize Impacts to Existing Wetlands
- Address Recurring Flooding to the Community

Stormwater pond retro-fit

- Expand the Existing Pond for Water Quality Improvements
- Incorporate Existing Wetlands into the Ultimate Design
- Develop Solutions that are Maintenance Friendly