

# Stormwater and Infrastructure Improvements for Coastal Resiliency & Beach Restoration

City of Naples, FL



February 6, 2020

Presented By:

Karyn Erickson, MS, PE, DCE

President, ECE

Christin Perkinson, PhD, PE, DCE

Vice President, ECE

Gregg Strakaluse, PE

City of Naples, Director of Streets and  
Stormwater

# Meet the Team



**Karyn Erickson**  
**Erickson Consulting**  
**Engineers, Inc**  
Project Director



**Christin Perkinson**  
**Erickson Consulting**  
**Engineers, Inc**  
Project Manager



**Gregg Strakaluse**  
**City of Naples, FL**  
Director, Streets  
& Stormwater

# The City of Naples, FL

- One of the Nation's Premier Coastal Communities
- 22,000 Full-Time + 12,000 Seasonal Residents
- 1.9M Visitors Annually
- Project is 395 Ac Urban Residential Beach Site
- Stormwater Masterplan Identified Infrastructure Improvements & Resilience at \$70M

*Naples recognizes the connection between the natural environment and quality of life, and is dedicated to providing a sustainable environment for its residents, businesses, and visitors to enjoy.*



# City of Naples, FL

## Quality of Life - Goals

Improve Communities Quality of Life

Enhance Public Health & Safety

Enhance Views & Local Character

Enhance Public Parks & Amenities

Respect Neighborhood Identities,  
Character, and History



# Project Need

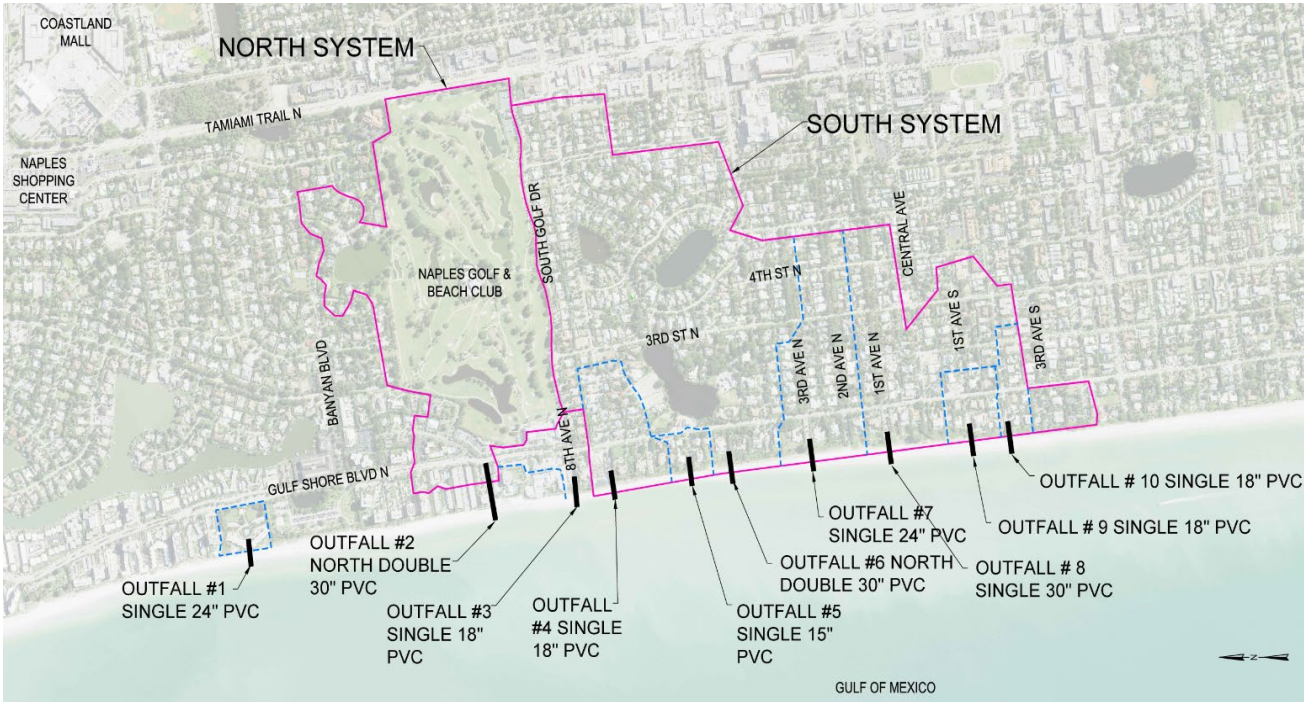
- Rising Sea Levels & Aging Infrastructure – Low Lying Coastal Area (Less 4.5 ft NAVD)
- 8 Beach Park Accesses (limited spaces) – Beach Users Benefits from Improved Pedestrian and Bike Access
- Poor WQ & No-Swim Advisories (Bacteria) due to stormwater outfalls
- Current Measures include Street Sweeping, Swales & Lakes
- Sand Losses Affecting Beach Nourishment \$\$
- Adverse Impacts to Marine Resources and Beach Users – Lateral Impacts



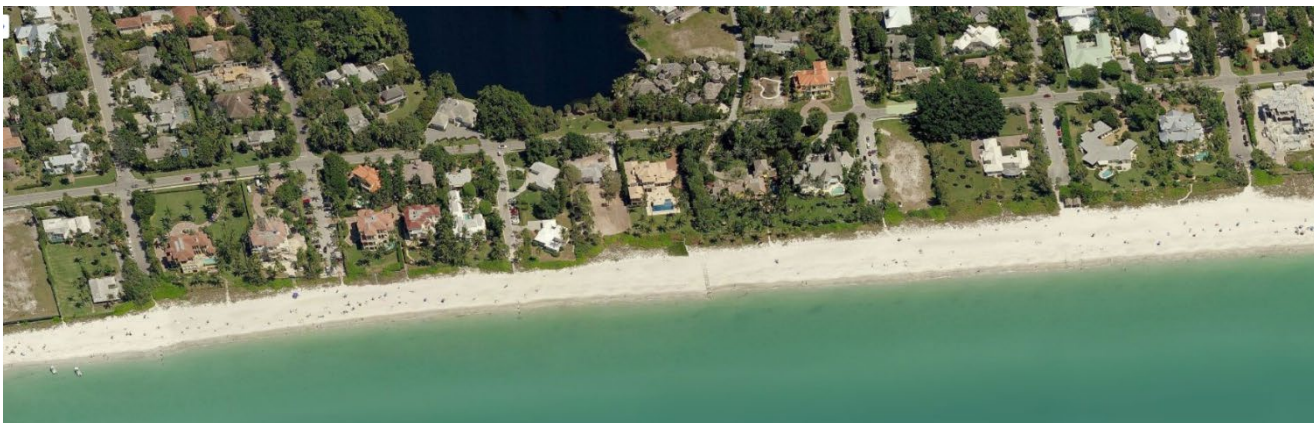
# Goals & Objectives

1. Reduces Flooding (Sea Level Rise) and Improve Level of Service using pump system and lake storage (25-YR/3-Day Rain Event)
2. Improve Water Quality (Pre-Treatment)
3. Reduce Adverse Impacts to Beach Users (e.g. Swimming)
4. Complete Streets (bike lanes, pedestrian safety/access)
5. Reduce Impacts to Environmental Resources (e.g. Hardbottom)
6. Eliminate Beach Erosion from Outfall Induced Scour
7. Improve Beach for Sea Turtles & Beach Users (Remove Outfalls)

# Site Characteristics & Existing Conditions



- 395 Acre Drainage Basin, 4,600 ft
- Stormwater Discharge through 10 Beach Outfalls (18-48") & Upstream Flooding
- Road Elevations <4 ft MSL, No Bike Lanes
- 3 Outfalls Carry 60% of Total Outflow
- 3-Lake Storage System
- Beach Nourishment Program



# Flood Management

Improve Level of Service to 5-yr to 25-yr Rainfall Event

Overflow System for Extreme Events

Increase Wet Detention for 3-Lake System (2ft, 2.5 MG)

## Historic “Legacy” Rainfall Events Exceeding 3 Inches

Date	Max 24-Hr (Inches)
June 21, 2003	3.15
Aug 15, 2003	3.38
Oct 23, 2005 (H. Wilma)	6.14
July 14, 2013	3.41
Aug 4, 2014	6.73
Jan 27, 2016	3.50
June 6, 2017**	4.13
Sept 9-10 (H-Irma)*	13+*

*In last 15 years, Hurricane Wilma (2005, 6” event) and Similar Events did not Exceed Peak Capacity of the System*

*Only Hurricane Irma (2017, 13” event) would have resulted in the opening of the Overflow.*

\*No Record Available at Peak of Storm



# Design Peak Flows

Storm Event	Peak Flow (cfs)
5-YR/1-HR	70
5-YR/1-Day	89
25-Yr/1-Day	Flooding contained w/in pipes and swales
25-Yr/3-Day	152

**Pump Station Flow Discharged to Gulf: 98 cfs**

**North System Overflow (Basins 5&6): 54 cfs**

**Total System Capacity: 152 cfs**

# Coastal Resiliency

- Dune Height: +5 ft NAVD
- Existing Road Elevations: +3.5 to +4.0 ft NAVD
- 5-YR Surge Elev: +4.4 ft NAVD
- SLR: +0.9 ft over 40 years
- PS Design: +5.3 ft NAVD
- Raise Road: 0.8 ft Average (+4.2 to +5.6 ft NAVD)

## IRMA Storm Surge

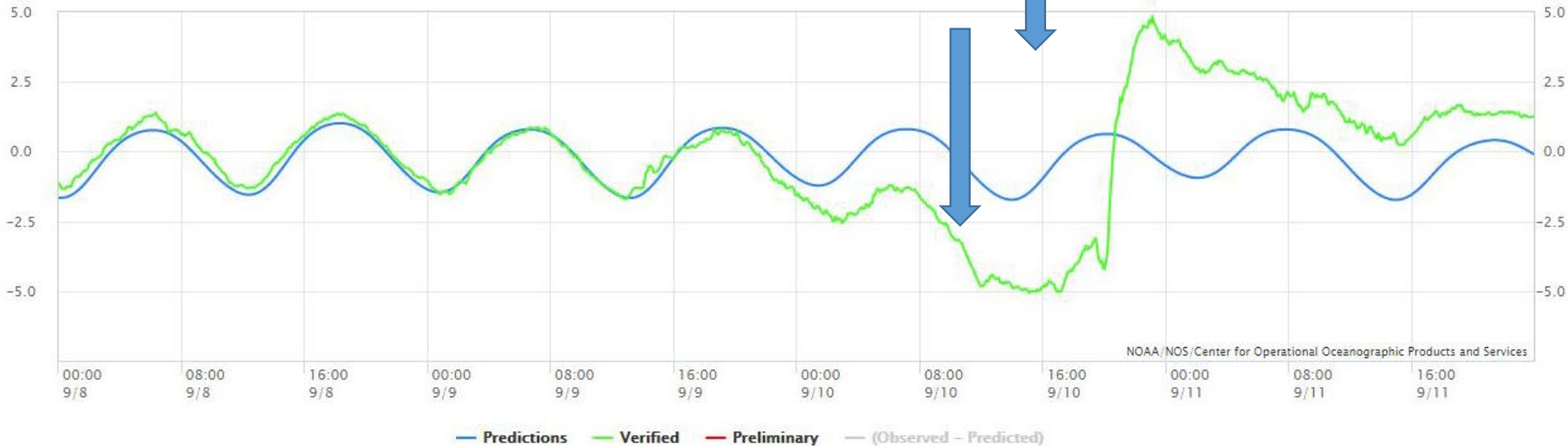
NOAA/NOS/CO-OPS  
Observed Water Levels at 8725110, Naples, Gulf of Mexico FL  
From 2017/09/08 00:00 GMT to 2017/09/11 23:59 GMT

ROAD ELEV +3.5 TO +4.0'

Datums  
(NAVD)

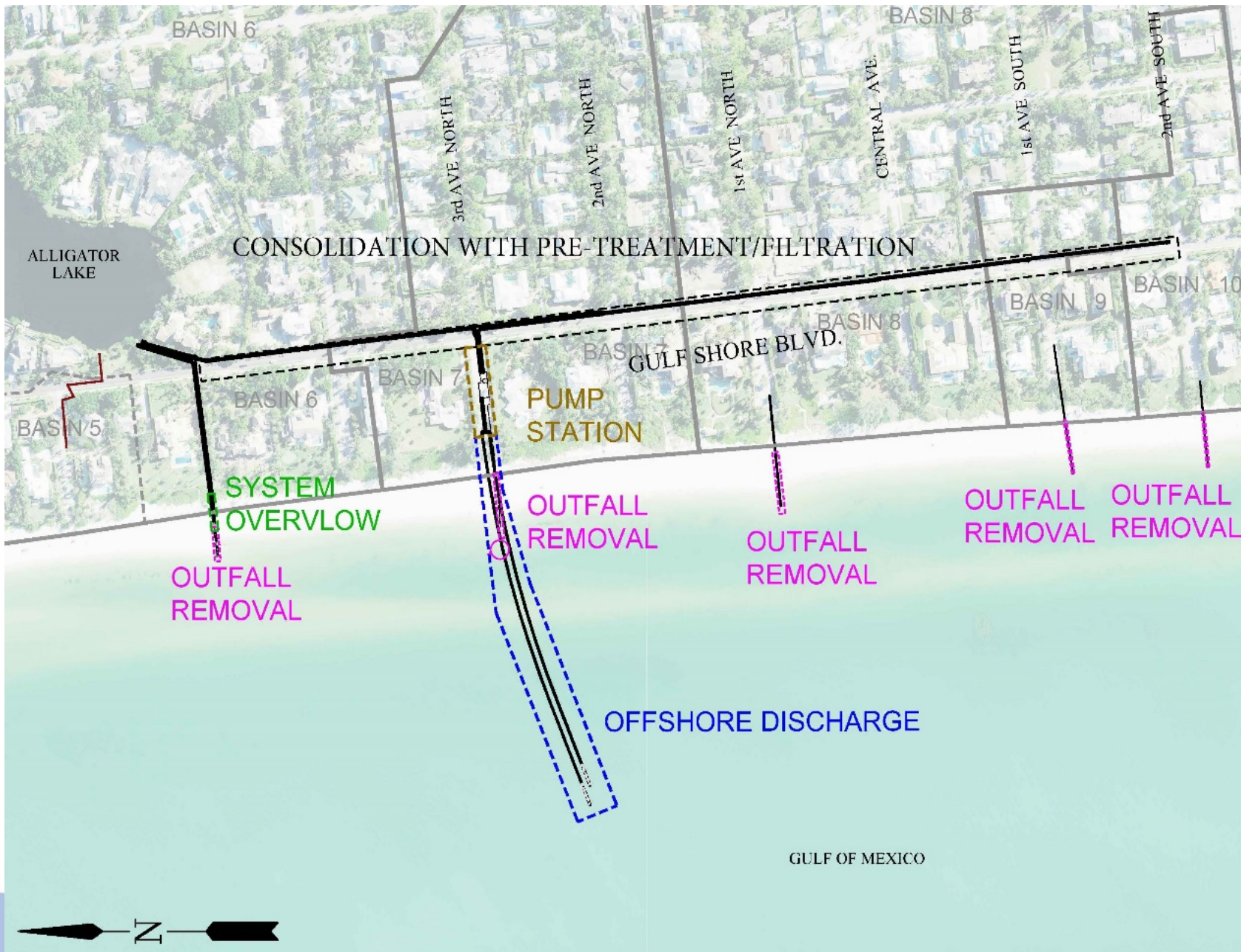
MHHW  
MSL  
MLW

MHW NAVD8:  
MTL  
MLLW

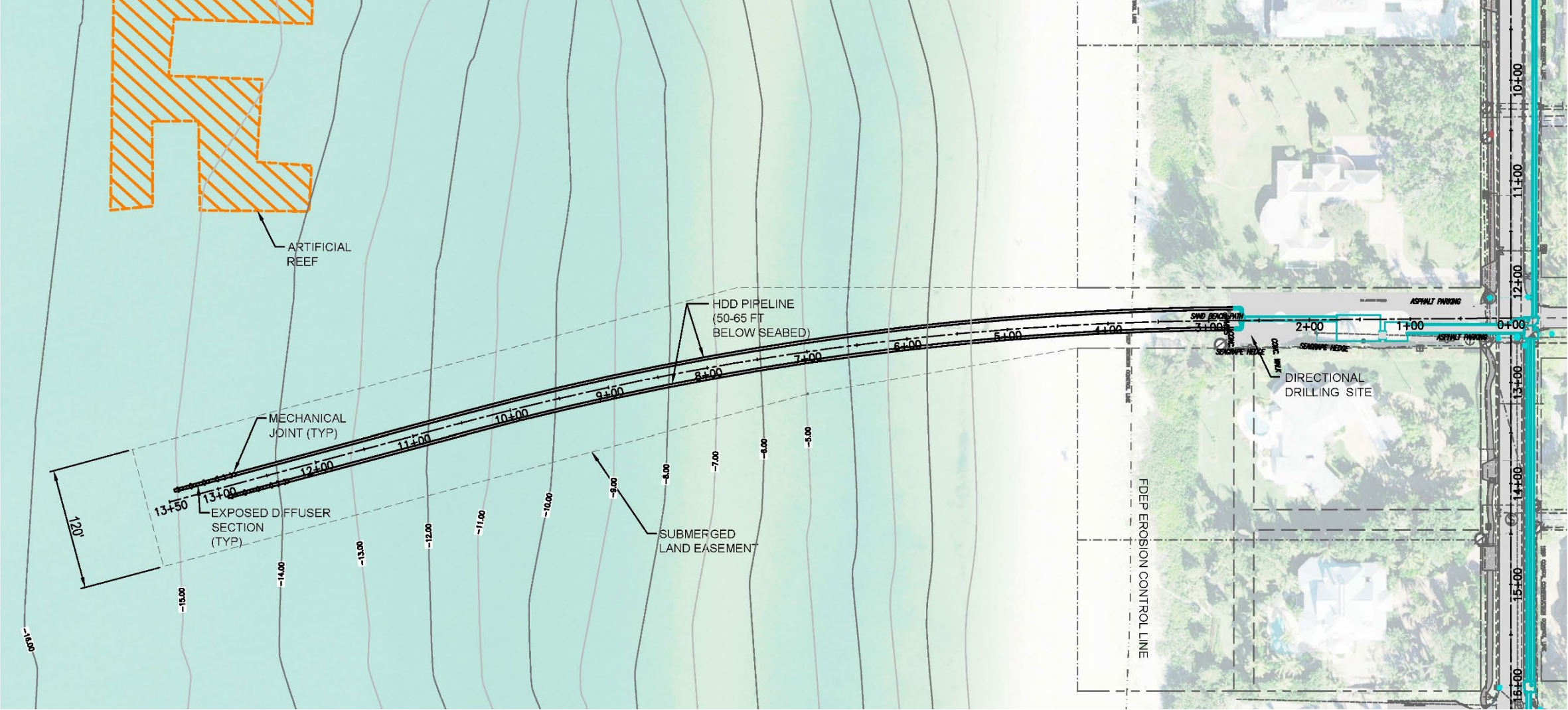


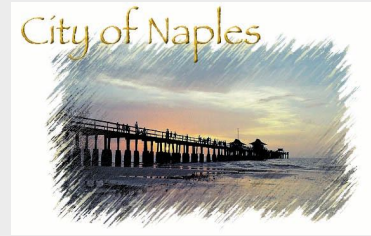
# Project Components

- Stormwater Consolidation & Conveyance to Pump Stations
- Water Quality Pre-Treatment
- 2 Pump Stations with Backup Generators
- Directionally Drill Pipelines for Offshore Discharge
- System Overflow for Extreme Events (25-Yr/3-Day)
- Complete Streets & Raise Roadway



# Project Overview: Offshore Discharge

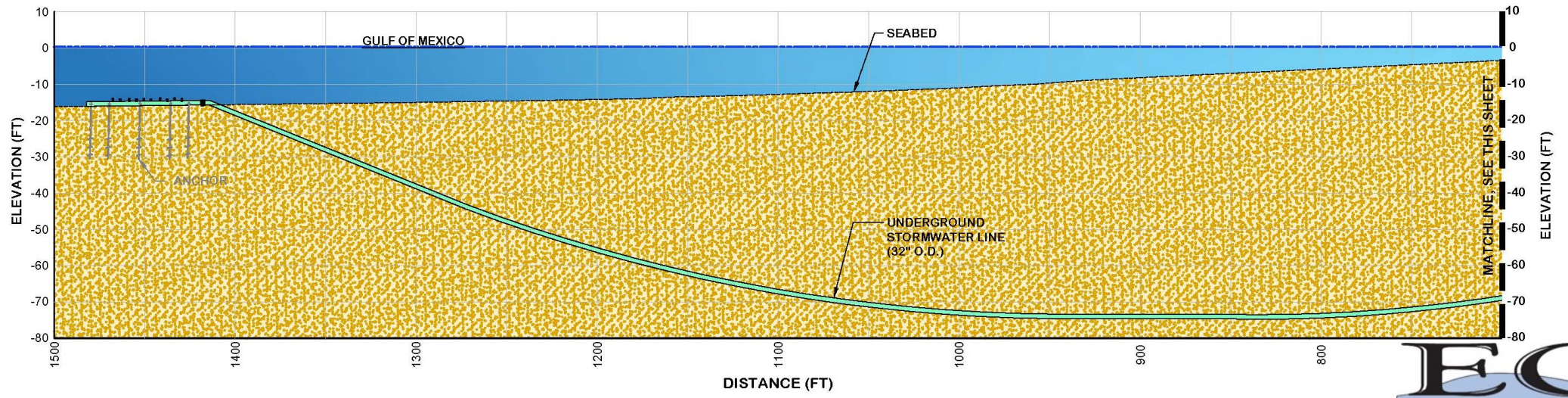
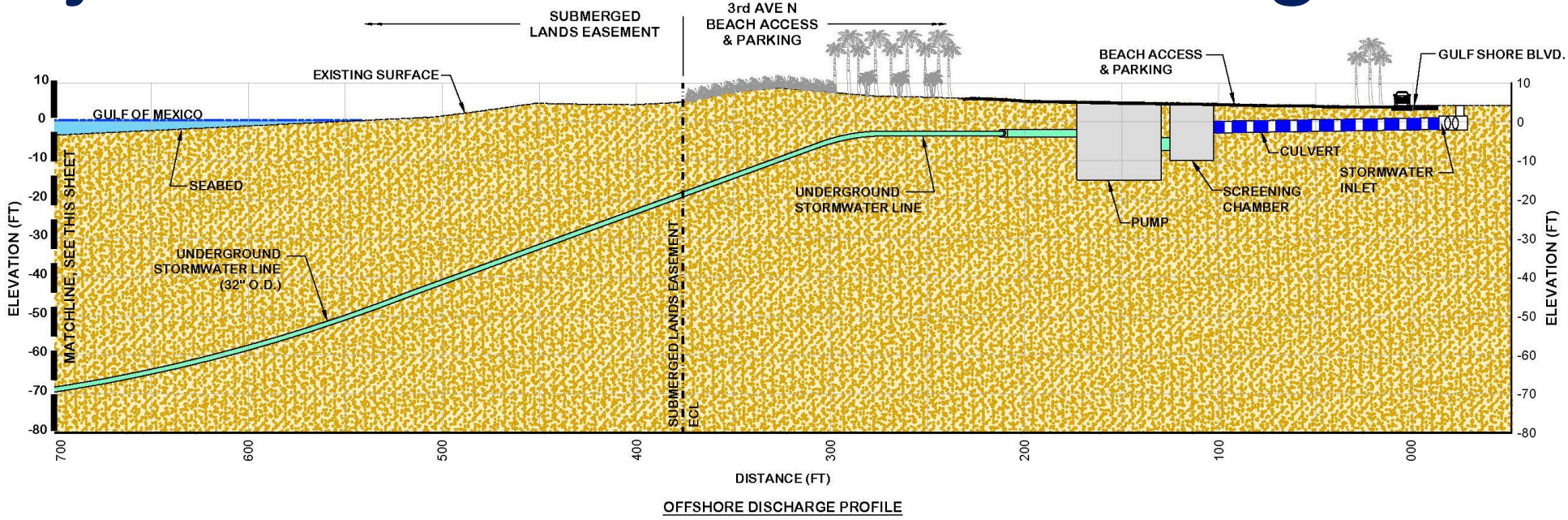




# Offshore Subsurface Pipe & Discharge Design Factors

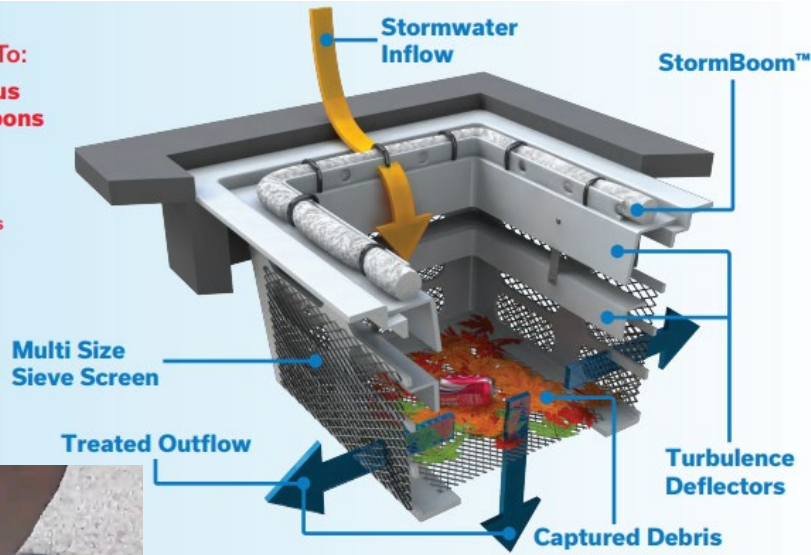
- ❖ **Pipeline Sizing**
  - Discharge Normal, Seasonal (LOS)
  - Low Relief from Seafloor using HDD
- ❖ **Pipeline Placement**
  - To Depth of Closure (-15 ft NAVD88)
  - Prevent Impacts to Nearshore Resources
- ❖ **Diffuser Section**
  - Mixing Zone (8-10 fps Velocity - <250 ft)
  - Durability and Low Maintenance
- ❖ **Anchoring System**
  - Capacity (+/- 10,000 lbs force per anchor)
  - Strapping (316 Stainless Steel)

# Project Overview: Offshore Discharge



# Project Overview: Pre-Treatment Inlet Inserts

GISB™ Removal Efficiencies Up To:  
**71% Phosphorus**  
**51% Hydrocarbons**  
**60% Nitrogen**  
**90% TSS**  
 \*Varies Based on Size + Site Conditions



Source: Andy Holland, City of Naples  
 10 Filters @ GSB & Park Shore Dr  
 ~1 CY (1,000 lbs) Annual Cleanout



Source: Suntree Technologies, Inc.



Source: Andy Holland, City of Naples  
 Inlet Baskets Installed Near Lake  
 Manor (6<sup>th</sup> Ave Near 10<sup>th</sup> St N)



Pollutant	Estimated Load Reduction
TSS	70%
TP	50%
TN	29%
Enterococci	92%

## Water Quality

### Reduce Bacteria

Replace Aging (>50yrs) Infrastructure, Pump Station for Continuous Flushing & Potential UV Treatment

### Reduce Debris, TSS, TP, & TN

Catch Basin Inserts, Trash Traps, In-Line Hydrodynamic Separators, Swale Improvements, Bioswales

### Improvements to 3-Lake System

Increase Wet Detention, Floating Islands and Aquatic Vegetation Harvesting



# Complete Streets for an Urban Residential Beach Site

Safe, Accessible & Comfortable Travel for All Users  
 Motorists, Bicyclists, Pedestrians and Beach Users

Motorists / Traffic Calming  
 10 ft Travel Lanes, Curb Radii, Signage and Stripping

Interface w/Beach Accesses  
 Pedestrian Crossings

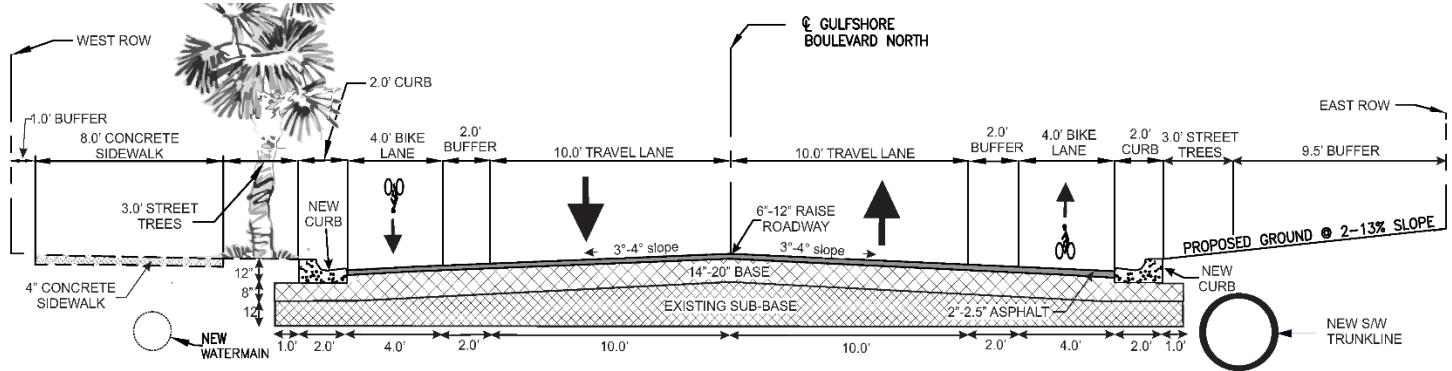
Bicyclists  
 Buffered v. Non-Buffered

Pedestrians  
 (Wide) Sidewalks, Cross-Walks, Accessible Pedestrian Signals, ADA

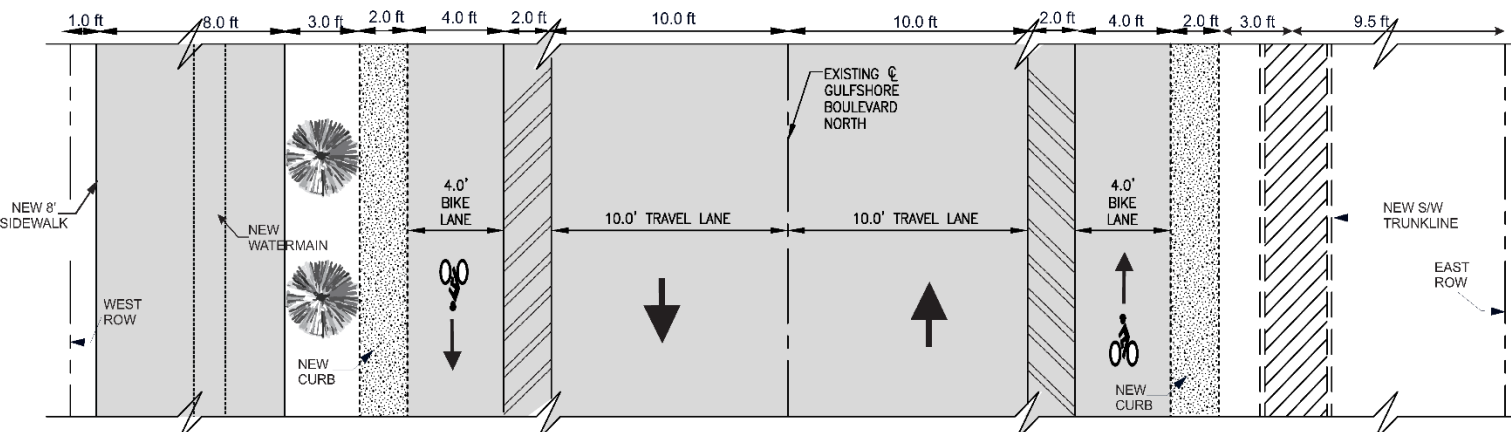
Design Standards  
 NACTO, AASHTO, FDOT, MUTCD

Resiliency  
 Raise Roadway

Landscaping & Lighting



TYPICAL SECTION



PLAN VIEW



Local Collector Roads with Access to Beach

# Connected and Multimodal Mobility

## Encourages Non-Automotive Travel

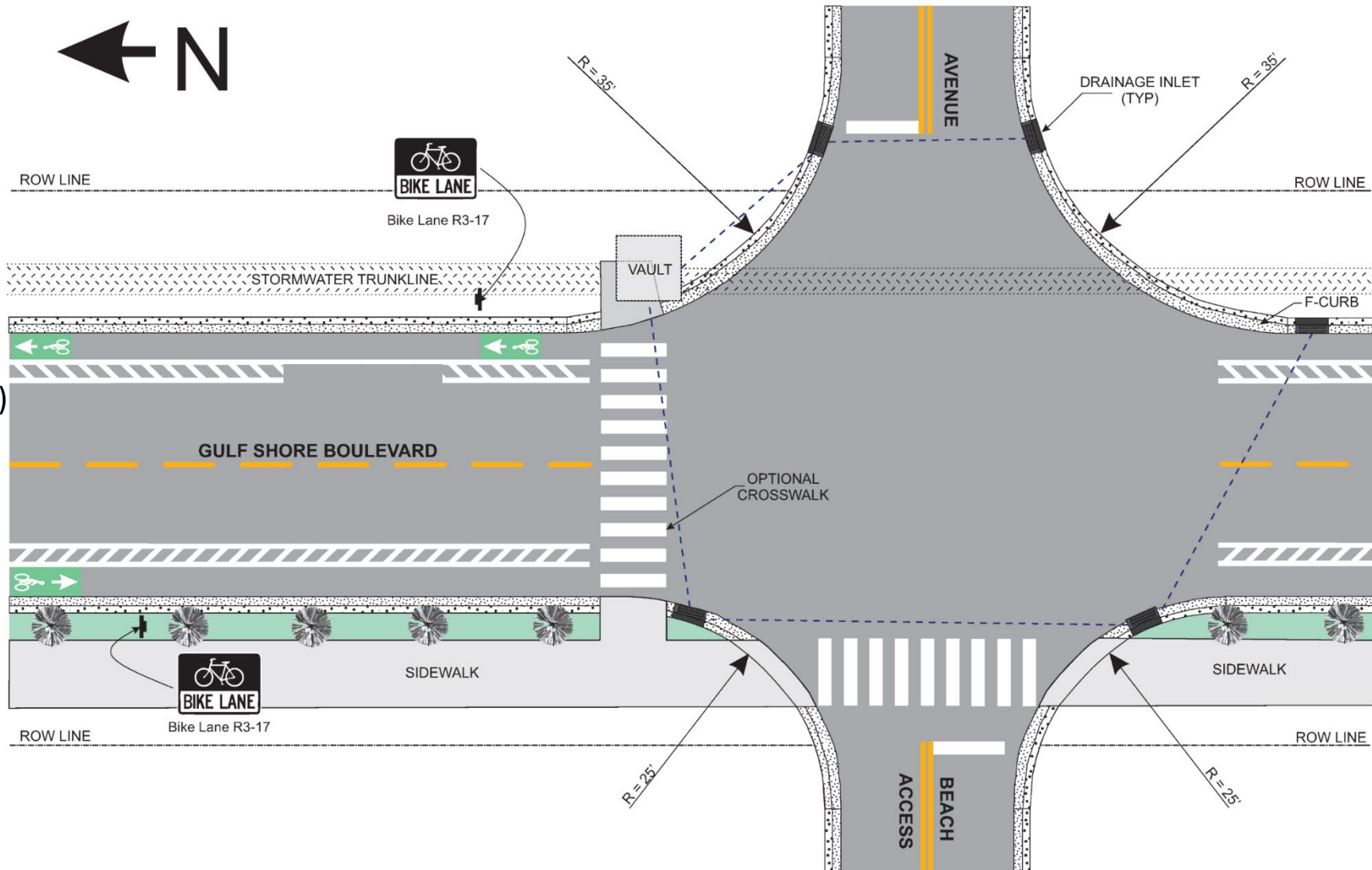
- 6 ft Buffered Bike Lanes
- Pedestrian Access
- Reduces Carbon Footprint & Pollution

## Motorist/Traffic Calming

- 35 ft East – Ease of Turning for Larger Vehicles
- 25 ft Beach Access - Pedestrian Scale Intersections, Slow Vehicle Turning Speeds
- Narrow Vehicle Travel Lanes (12 to 10 ft)

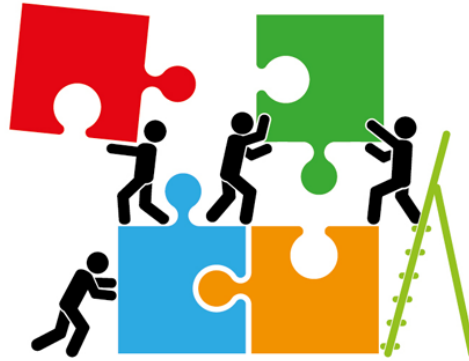
## Pedestrian Improvements

- 8 ft wide Sidewalk (from 5 ft)
- Sidewalks Buffered from Travel Lanes
- Add Crosswalks at 8 Beach Access
- Pedestrian Warning Signs & Signals at Central Ave (Main Access)
- ADA Compliance



## Economic

Protect \$5 Billion in Taxable Property  
Stimulate Economic Prosperity & Development  
Tourism (Swim Advisories and Beach Closures)  
Beach Sand Placement Events – Improve Resilience



## Leadership

Stakeholder Involvement (Mtgs & Survey)

\* WQ Pre-Treatment, Attenuation/Flood Protection, Buffered Bike Lanes, Pedestrian Crossings, Widen Sidewalks

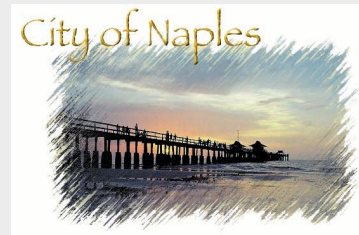
Resilience for Climate Change and Sustainability  
Long-Term Monitoring & Maintenance Planning

## Environmental

Restores 0.3+ Acres of Beach (removing outfalls)  
Improves Water Quality  
Protection of Endangered Species & Nesting Habitats  
Adds Resilience to City Infrastructure & Protects Community



[\\*HTTPS://WWW.SURVEYMONKEY.COM/R/HNVJGYP.](https://www.surveymonkey.com/r/hnvjgyp)



Questions?