



# Building Resilient Pump Stations



Tom Sgroi, PE – GNHWPCA  
Jay Sheehan, PE – Woodard & Curran  
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# Building Resilient Pump Stations

## Presentation Outline

- About GNHWPCA
- Vulnerability of Existing Pump Stations
- Preparation for Storm Sandy
- Funding opportunity & application – 75% Grant!
- Design / Construction Lessons Learned
- Doing Business with FEMA



# Background on New Haven

- New Haven trivia
  - Birthplace of the Hamburger (Louis' Lunch 1895)
  - Home to Yale University since 1701
  - Frisbee disc invented by Yale students in 1940's
  - Jim Morrison arrested in 1967
  - Best "Apizza" in the US



# About the Greater New Haven WPCA

## REGIONAL AUTHORITY CREATED IN 2005 SERVING FOUR MEMBER COMMUNITIES

### 550 MILES OF SEWERS

- INCLUDING 70 MILES OF COMBINED SEWERS (12.5%) IN NEW HAVEN

### 11 ACTIVE CSO OUTFALLS DISCHARGING TO:

- NEW HAVEN HARBOR (3)
- QUINNIPIAC RIVER (2)
- MILL RIVER (2)
- WEST RIVER (4)

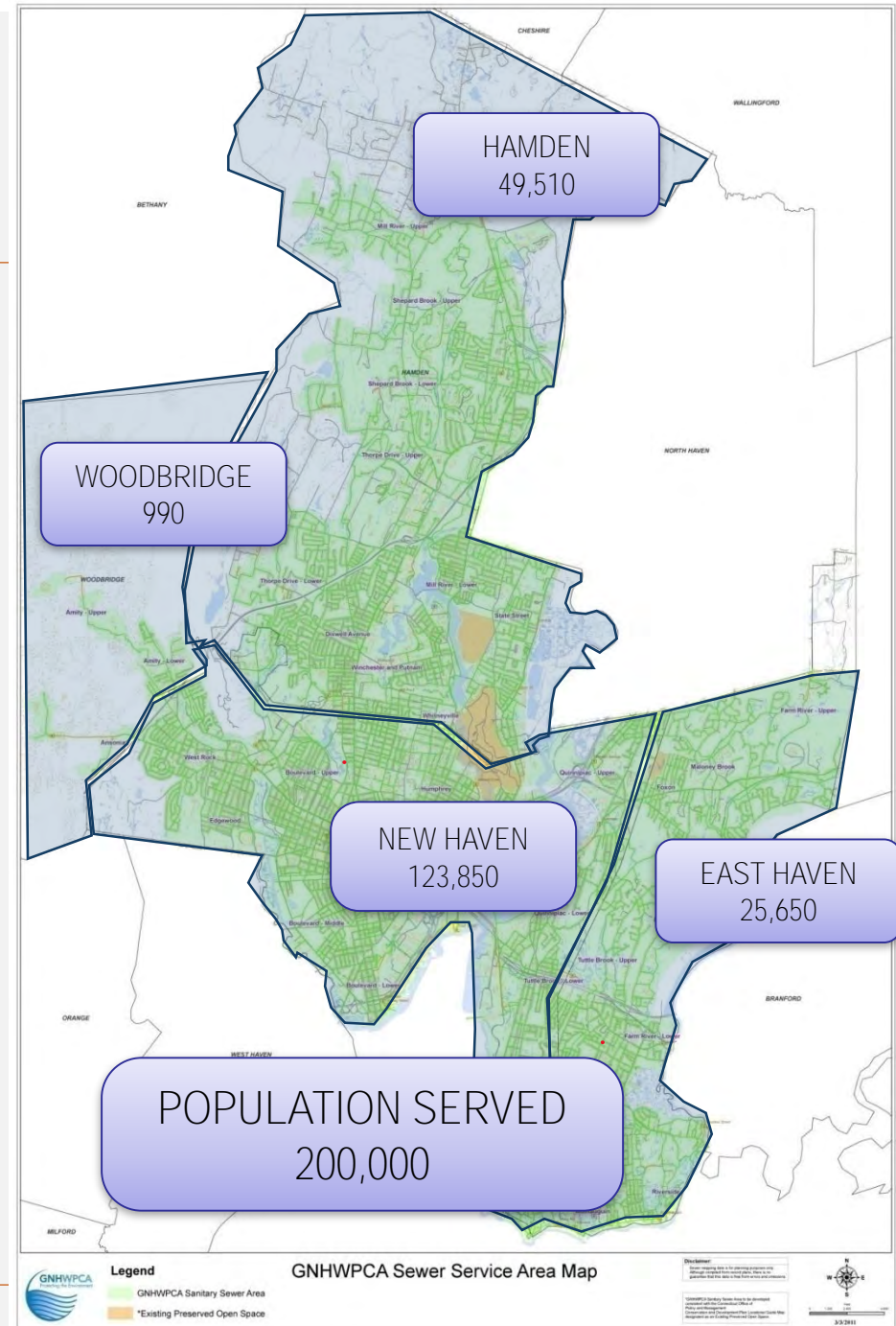
### 30 PUMP STATIONS

### 13 PUMP STATIONS EXPOSED TO COASTAL FLOODING

### EAST SHORE TREATMENT PLANT

- 30 MGD - AVERAGE DAILY FLOW
- 100 MGD - WET WEATHER FLOW

TOTAL COST OF SERVICE  
\$36M / YEAR

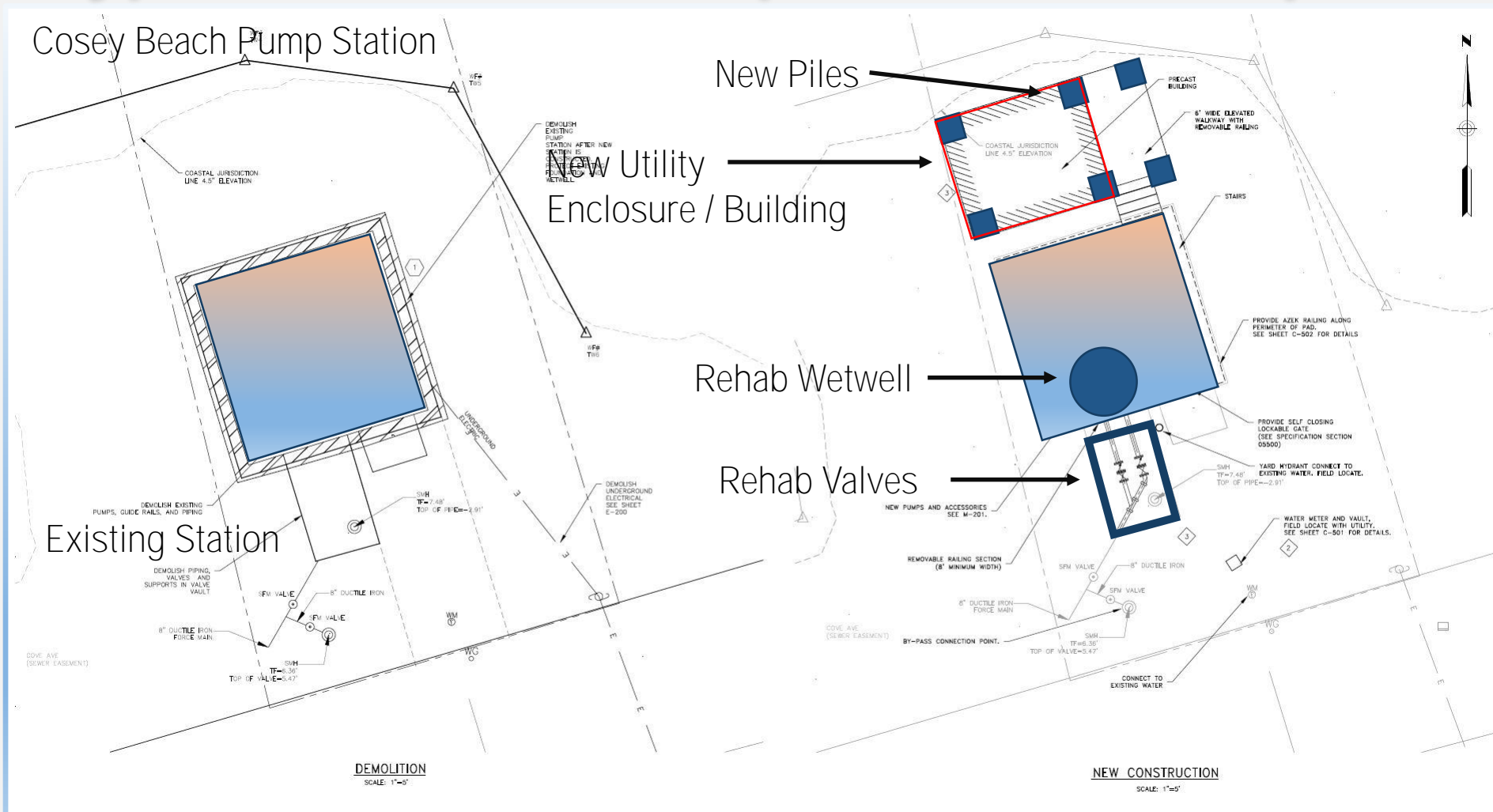


# East Haven FEMA Grant – 4 Eligible Stations

GNHWPCA has 13 coastal pump stations within our service area. This presentation highlights those approved in the FEMA Grant Application all located in the Town of East Haven, CT.

- East Haven Total Population Served by GNHWPCA – 25,650
- 4 East Haven Flood Coastal Pump Stations Population Served – 8,000
- 100 % Service by Sanitary Sewers
- Buildings are very visible / located in residential areas
- Very low-lying area
- Seasonal – Higher Flows in Summer
  - Beach Club
  - East Haven Town Beach
  - Summer eating establishments

# Typical Elevated Pump Station Concept



# Fairview (Farview) Pump Station

## Existing

- Wet well / submersible (3 centrifugal pumps) – 4.3 MGD
- Channel Grinders, 90kw Generator, non-code compliant
- Historically affected by Flooding (Irene / Sandy)
- Lunar Spring tide with coastal storms affect access



## Proposed

- New Submersible Cutter Pumps and Leads
- Elevated 125kW Generator and Electrical
- New Flow Meter
- Valve pit improvements
- Aesthetic Improvement

# Cosey Beach Pump Station

## Existing

- Wet well / submersible (2 centrifugal pumps)
- 0.4 MGD
- 60kW Generator
- Historically affected by Flooding (Irene / Sandy)
- Highest Traffic Area – Visually exposed



## Proposed

- New Submersible Pumps and Leads
- Elevated 75kW Generator and Electrical
- Valve pit improvements
- Aesthetic Improvement



# Meadow Street Pump Station

## Existing

- Wet well / submersible (2 centrifugal pumps)
- 0.8 MGD
- 30kW
- Historical Protection Deployed (Irene / Sandy)



## Proposed

- New Submersible Pumps and Leads
- Elevated 60kW Generator and Electrical
- Valve pit improvements
- Aesthetic Improvement (pedestrians)

# Minor Road Pump Station

## Existing

- Wet well / submersible (2 centrifugal pumps)
- 0.4 MGD
- 17.5kW Generator
- Historical Protection Deployed (Irene / Sandy)



## Proposed

- New Submersible Pumps and Leads
- Elevated 60kW Generator and Electrical
- Valve pit improvements
- Aesthetic improvement



# Hurricane Approaching October 27, 2012



What do you do?

- Emergency Response Plan (HOPEFULLY YOU HAVE ONE!)
- Monitor Forecasted Weather (STORM SURGE)
- **Determine Elevations of Critical Assets (DON'T WAIT FOR STORM)**
- Prepare - Deploy protection wherever possible

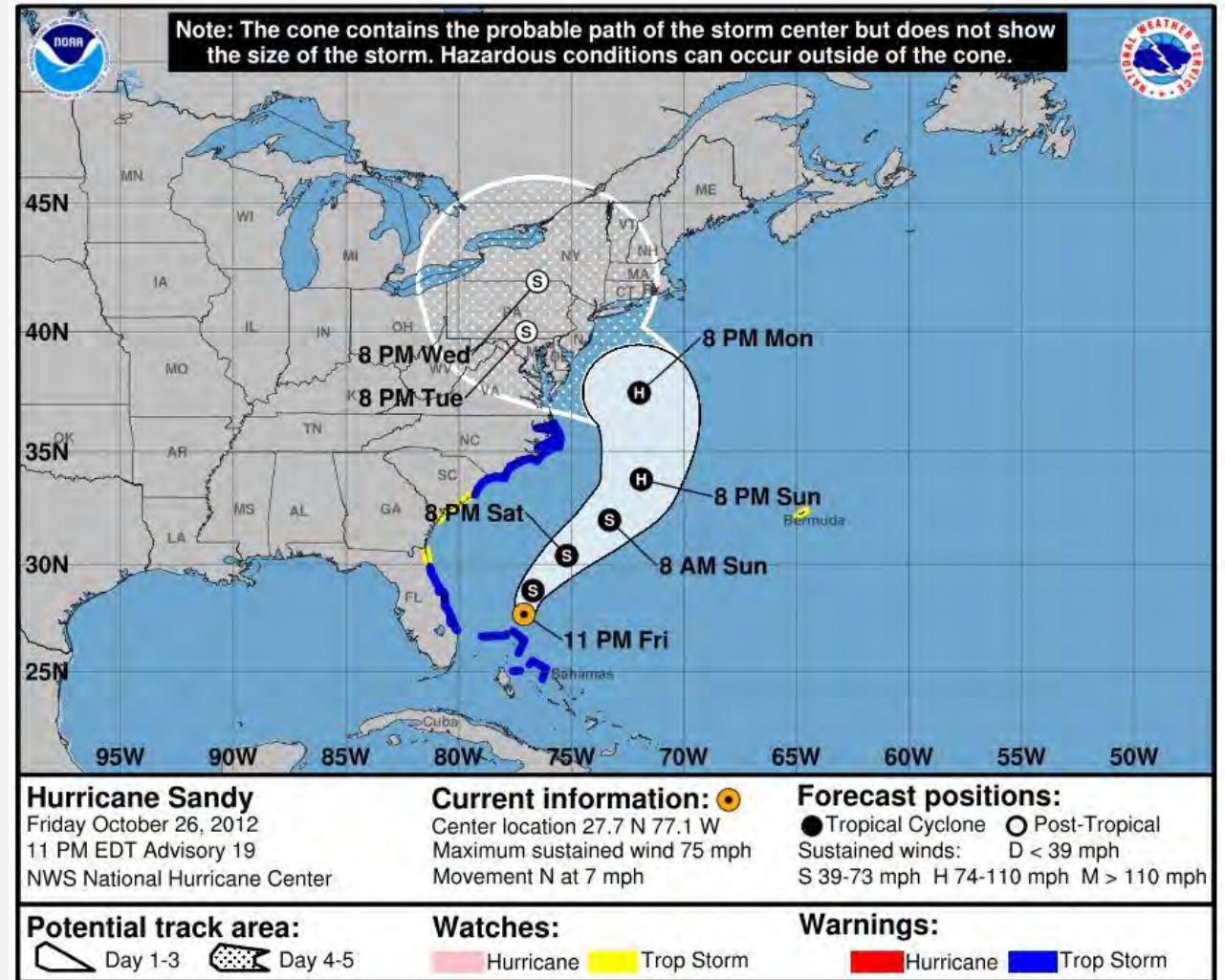
# Monitoring Forecast and Predicted Storm Surge

Information 48hours prior to CT Landfall:

- Storm Surge as much as 16 feet
- Potential Tropical Rainfall
- Likely affecting two tide cycles
- Predicted Category 1 Hurricane
- Timing of High tide will be critical

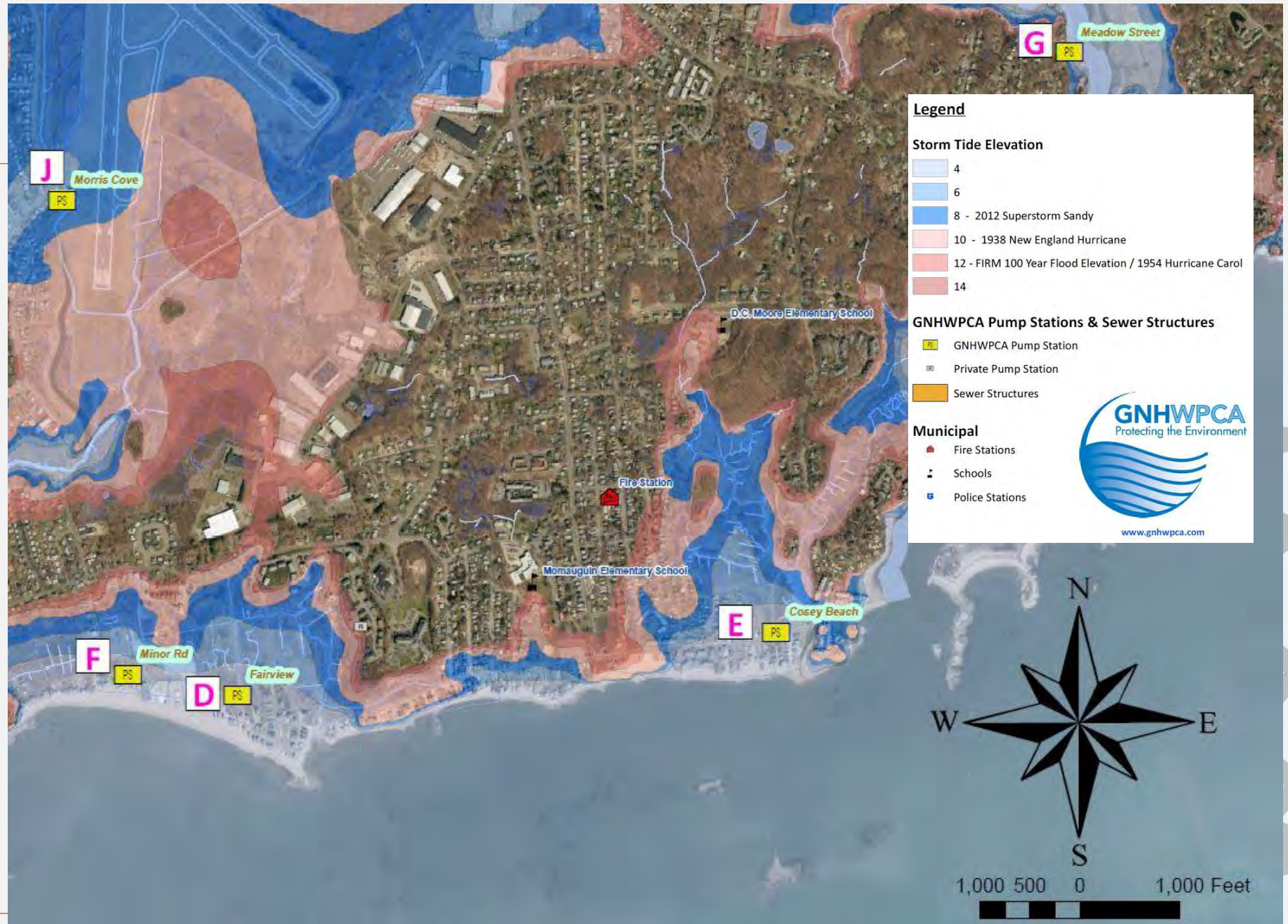
Our reality:

- Became clear that many of our Facilities could be subject to significant damage
- Recovery time would be large
- Access would be limited until tide subsides
- Immediate action required to secure/protect as much as possible.



# Predicted Storm Surge

*“We didn’t have this nice map in 2012!”*



# Determine Elevation of Critical Assets

Coastal Zone Assets - 2013 Resiliency Status Deemed Significantly Vulnerable to predicted Storm Surge

Emergency Prep – “a farmers approach”

## East Haven

- Cosey Beach - 875 gpm, Pump Station Structure – 1978, Plywood and Sandbag
- Minor Road – 360 gpm, Pump Station Structure – 1978, Plywood and Sandbag
- Meadow Street – 350 gpm, Pump Station Structure – 1978, Plywood and Sandbag
- Farview Road – 1200 gpm, Pump Station Structure – 1978, Plywood and Sandbag

## New Haven

- Boulevard Pump Station – 30,000 gpm – Design to 100yr FEMA Criterion Circa 1984, Steel Plates, Plywood and Sandbag
- East St Pump Station – 24,000 gpm – Design to 100yr FEMA Criterion Circa 1984, Steel Plates, Plywood, Sandbag, dewatering pump staged.
- Fort Hale Pump Station – 200 gpm - Last upgrade Circa 1972, Plywood and Sandbag
- Long Wharf Pump Station - 1600 gpm - Last upgrade 1998, Elevation 5.5ft NAVD88, remove critical components

# Deploy Temporary Protection Measures



Farview Pump Station, East Haven

10.29.2012 16:03

# Deploy Temporary Protection Measures





# Deploy Temporary Protection Measures



# Deploy Temporary Protection Measures



10.29.2012 16:05

# Deploy Temporary Protection Measures



# Deploy Temporary Protection Measures



Cosey Beach Pump Station, East Haven

# Deploy Temporary Protection Measures



Meadow Street Pump Station, East Haven



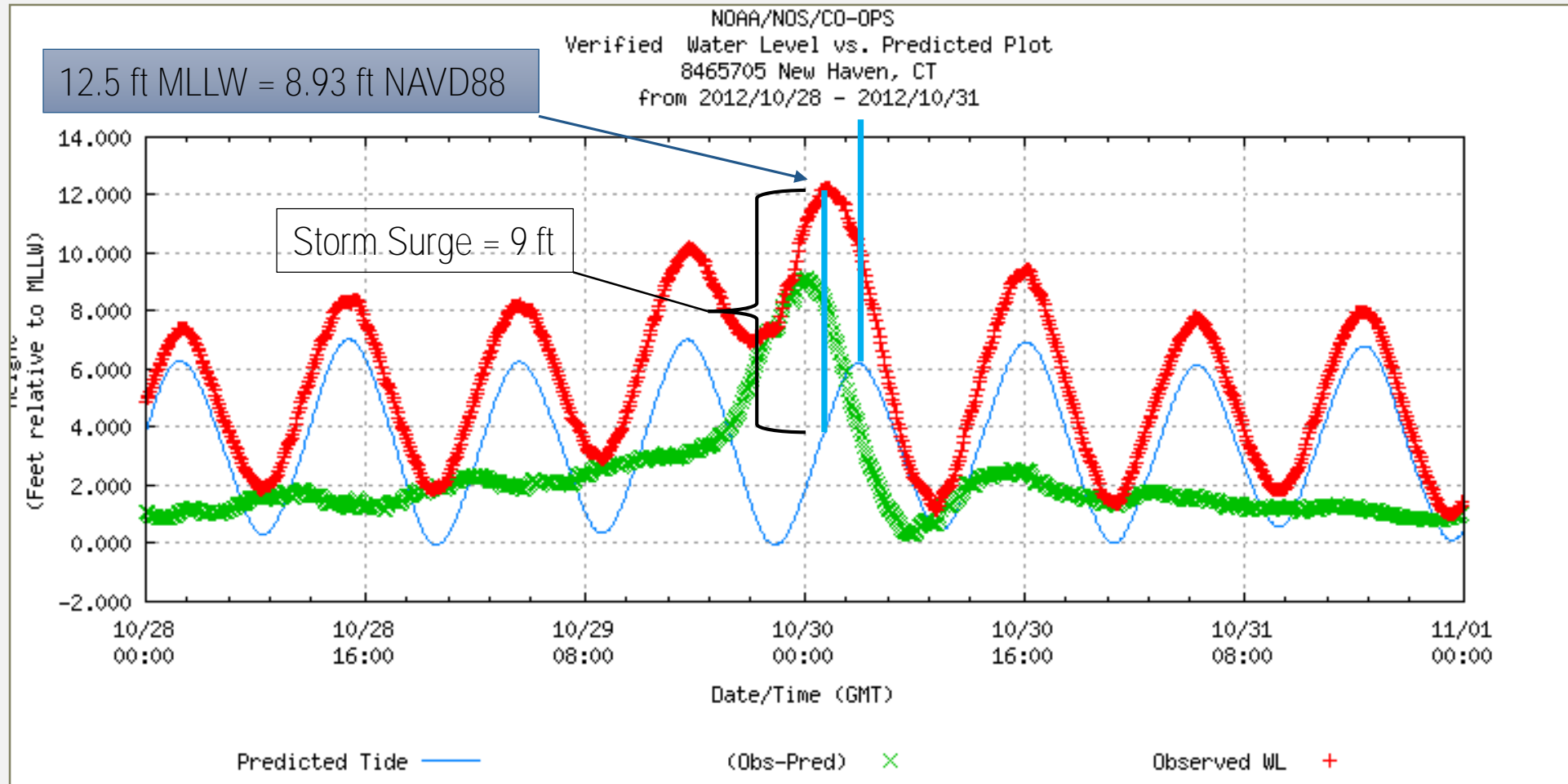
# Hurricane Sandy

## October 29-30, 2012

“Sandy devastated the Connecticut & Rhode Island coastlines, the Jersey Shore, New York City, and parts of Long Island. A total of \$71.4 billion in property damage was left in Sandy's wake after it made landfall. Sandy killed 4 people in Connecticut...”



# Monitoring Predicted Storm Surge



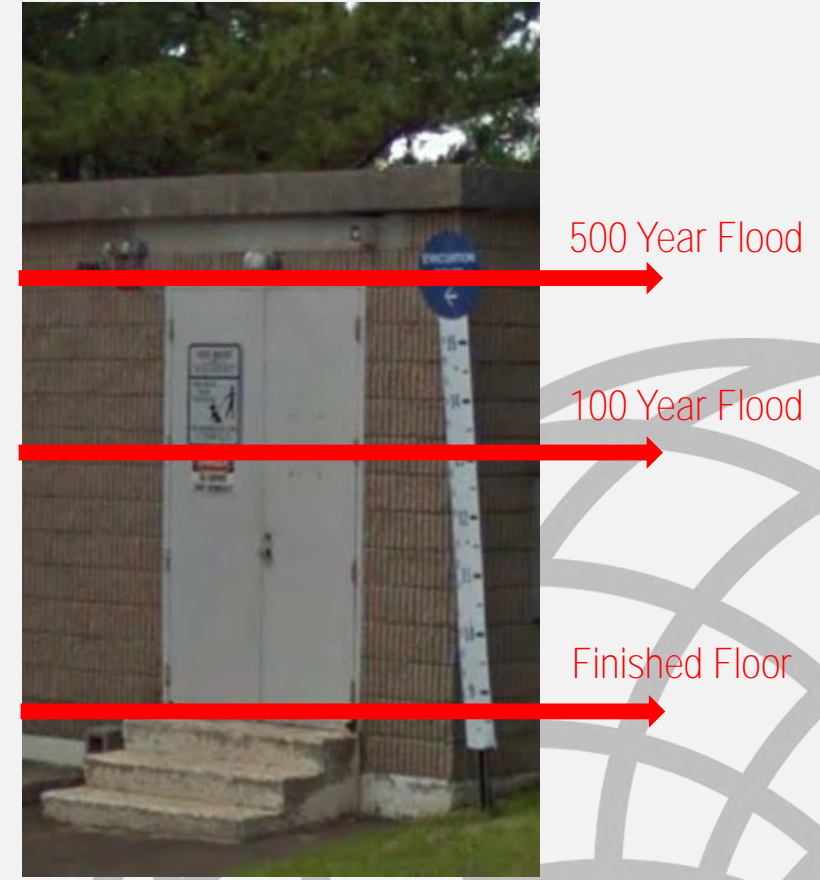
# East Haven Pump Station Flood Elevations

Storm Sandy High Water Reached 8.93 ft (9 foot surge)  
 Missed high tide by 2-3 hours



Pump Station	Existing Elev (finished floor)	100 Year Flood Elev	500 Year Flood Elev
Fairview Road	7.80 ft	12.00 ft	15.00 ft
Cosey Beach	8.68 ft	13.00 ft	16.25 ft
Meadow Street	9.27 ft	11.00 ft	13.75 ft
Minor Road	9.02 ft	12.00 ft	15.00 ft

During a 500-year storm, these stations will be under 4.5 to 7.6 feet of water!



Cosey Beach Pump Station



# Funding Opportunity & Timeline

- Hurricane Sandy (October 29-30, 2012)
  - CT Governor Malloy signs Declaration of Emergency on October 27
  - President Obama Disaster Declaration on October 30
- FEMA Actions
  - Individual Assistance Grants Notice (November 8)
  - Public Assistance Grants Notice (November 21)
  - Applications for Hazard Mitigation Grants (Application December 2013 – both New Haven and East Haven)
  - Awarded East Haven in January 2015
  - FEMA Staff changed project significantly delayed due to scope change from application to preliminary design.
  - FEMA Staff in CT left
    - *This program often has unused funds*



# FEMA Post Disaster Funding Programs

## 1. Public Assistance Funding

- Supports the cost of debris removal / cleanup in the immediate aftermath of a disaster and rebuilding (public buildings & infrastructure)

## 2. Individual Assistance Funding

- Enables people who have lost their homes to find temporary housing, food and shelter for their families

## 3. *Hazard Mitigation Grants* ←

- Provides support to fix vulnerabilities that were exposed in the most recent disaster (relocating, elevating, etc.)



# Hazard Mitigation Plan

Requires an approved Hazard Mitigation Plan

- Very prescribed public planning process
- Utilities must be mentioned as “critical infrastructure” in HMP
  - East Haven HMP was put together by Regional Planning Agency – had to get it approved & wait
- 75% grant, 25% match
  - “in-kind” services count as part of the match
  - no WBE / MBE required




ons for sanitary sewer residential structures re recently revised by


# FEMA Application

Need to clearly articulate the need

- Benefit / Cost Analysis (BCA)
  - Prescribed BCA certification
  - Computer modeling
  - Quantifiable costs needed
- Demonstrate that improvements will be lasting / preventative
- Competitive grant process
  - Originally GNHWPCA only awarded ½ of request (East Haven)
  - **Must show commitment of Funds for “Local Share”**
  - FEMA came back in July 2018 FEMA with \$1.8M additional (New Haven)
    - Boulevard PS, East Street PS, East Shore WPAF



## New BENEFIT-COST ANALYSIS Toolkit Now Available



Benefit-Cost Analysis (BCA) is the method by which the **future benefits of a hazard mitigation project are determined and compared to its costs**. FEMA requires a BCA to validate cost effectiveness of proposed hazard mitigation projects prior to funding.

**Version 6.0** of the Benefit-Cost Analysis (BCA) Toolkit is here, featuring a streamlined user interface and improved user experience.

This **Excel-based tool** is compatible with both **Windows and Macintosh** operating systems.\*

Go to: [www.fema.gov/benefit-cost-analysis](http://www.fema.gov/benefit-cost-analysis) for download instructions

If you need technical assistance, please contact the BCA Helpline at [bchelp@fema.dhs.gov](mailto:bchelp@fema.dhs.gov)

\* Excel 2013 or later is required

# Federal Grant Challenges

2 CFR Part 200 (Office of Management & Budget, 2013)

- Now Federal interpretation is: *consultants who assist municipalities with grant applications are now prohibited from participating in the design or construction work funded by that award*
- Unless:
  - **“Grant assistance and full A&E services may be linked to ensure fully formed and feasible project applications with maximum time and cost efficiency. Such linkages will not be construed to violate conflict of interest or open competitive procurement requirements set forth in 200.318 and 200.319.”**

# Project Scope & Delivery

## Scope

- Elevated Pump Stations, site improvements
- New pumps, piping, & flow meters
- New electrical, generators, HVAC, SCADA, fuel tanks

## Delivery

- Funding, permitting, design (Woodard & Curran)
- Construction (CH Nickerson / GNHWPCA)



# Design / Construction Lessons Learned

- Identify Coastal Jurisdiction Line
- Constructability - Elevated heavy structure
- Maintenance – waterproof electrical connections
- Assembly
- Aesthetics



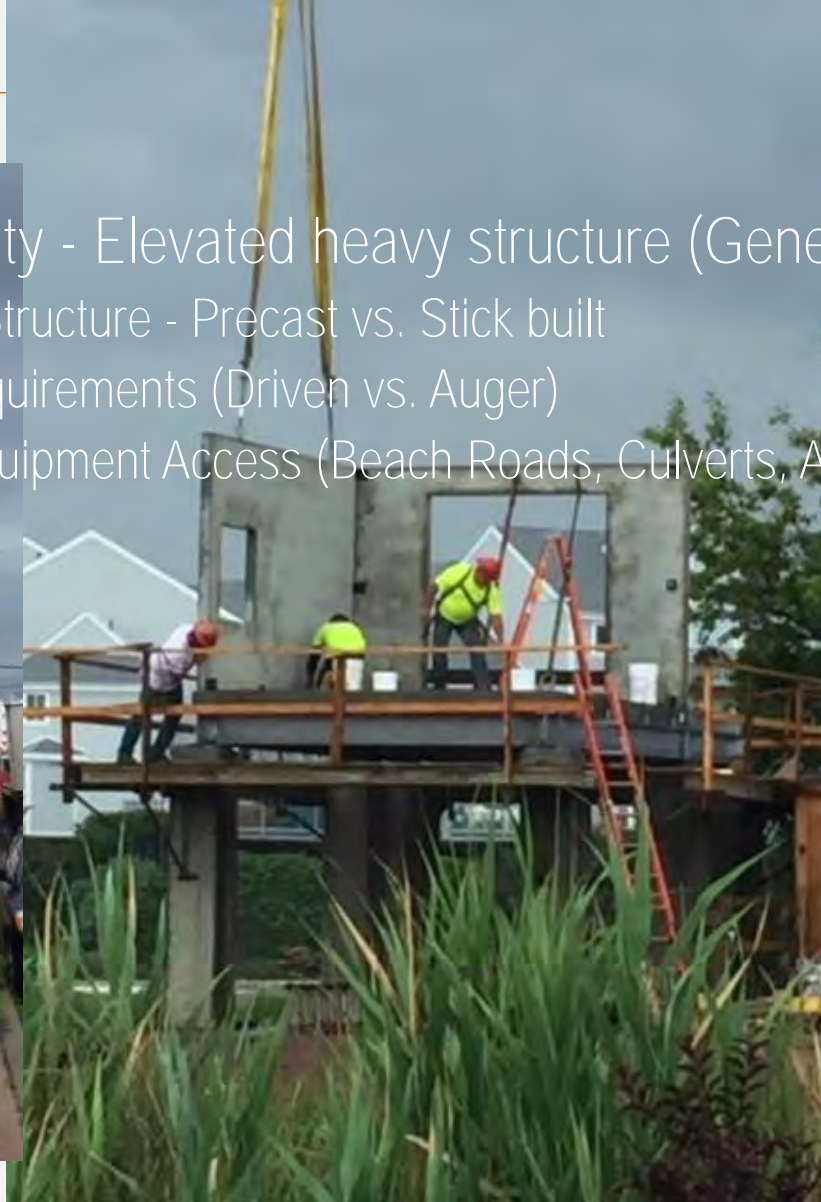
# Design / Construction Lessons Learned

- Identify Coastal Jurisdiction Line – MHW (Permitting), space for pile work



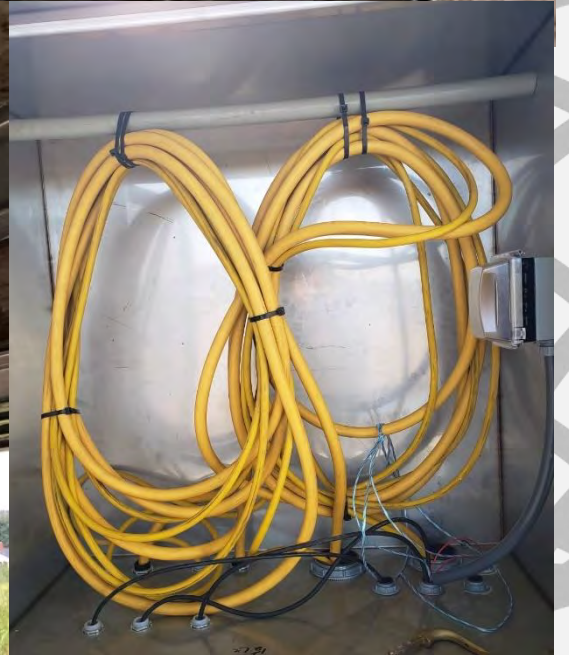


- Constructability - Elevated heavy structure (Generator, Fuel, Electrical, Building)
  - Building Structure - Precast vs. Stick built
  - Piling Requirements (Driven vs. Auger)
  - Heavy Equipment Access (Beach Roads, Culverts, Aerial Obstructions)



# Design / Construction Lessons Learned

Maintaining waterproof electrical connections



# Design / Construction Lessons Learned

Concrete Pier / Bearing Plate / Steel Assembly



# Design / Construction Lessons Learned

Aesthetics – Blending into the Residential Beach Front Neighborhood



# Design / Construction Lessons Learned

Aesthetics – Blending into the Residential Beach Front Neighborhood



# Doing Business with FEMA

- Scope changes can call SIGNIFICANT DELAYS - Application vs Design Scope should match
- Conservative estimates will avoid delays in contract award – avoid revisiting BCA
- Terminology – New Building vs. Utility Enclosure; Demolition
- Remediation – generally not covered (house raising logic)
- Multiple contracts cannot be going on at the same time
- Will not pay for upgrades or replacements ( Work around – ex. pumps and leads)
- New generator needs to be larger (will not participate in straight replacement)
- Large staff turnover – on both State and FEMA level
- Time Extensions are reasonable
- Have local share funds available for change orders, may get funds but will need to revisit BCA.
- Close out inspection required – State and FEMA Reps Attend – Generator was as specified

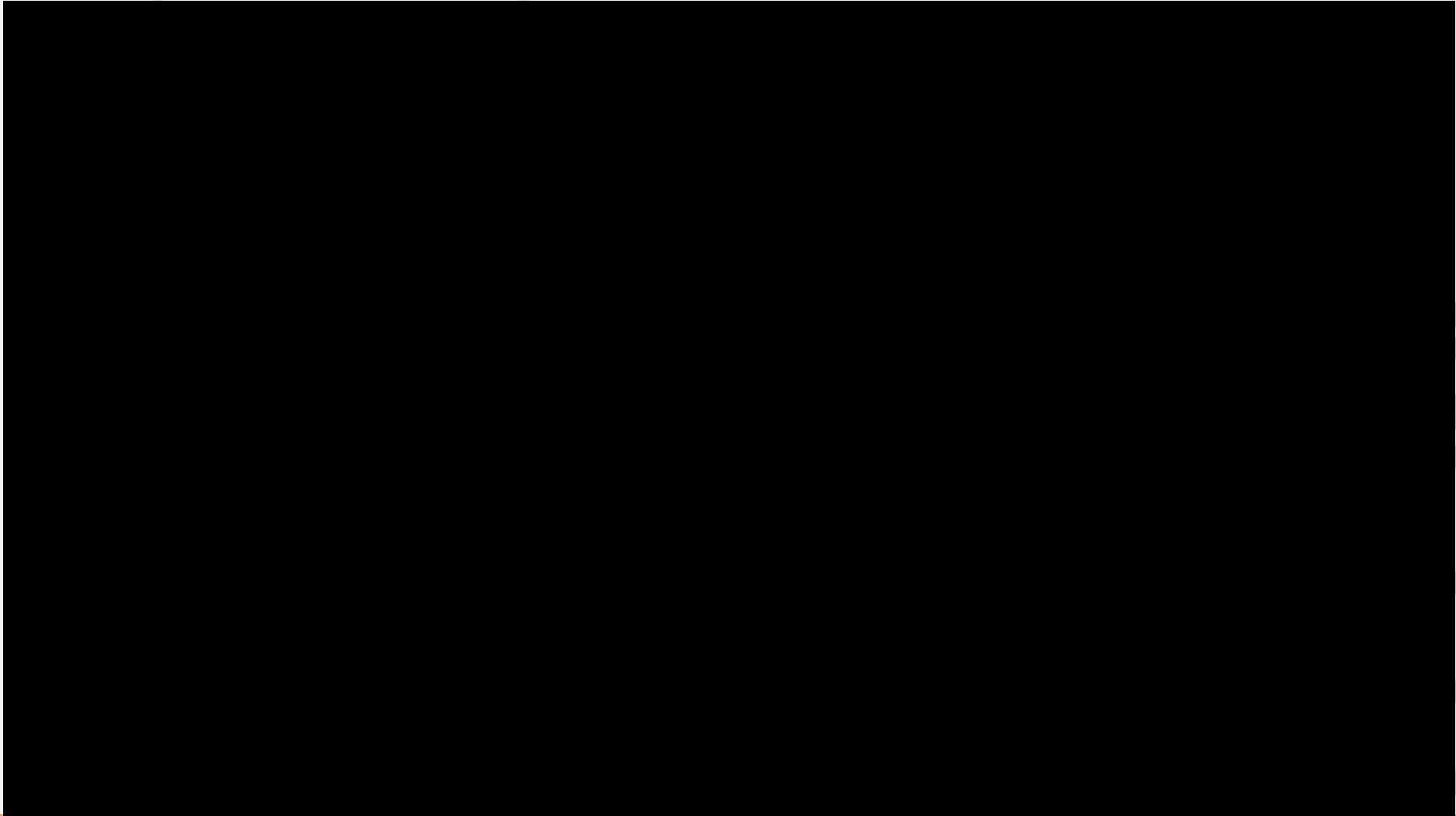
# Pump Station Funding Breakdown

	Total Project Costs	FEMA Approved Costs	FEMA Grant (75%)	GNHWPCA Match (25%)	FEMA Ineligible Costs	Final GNHWPCA % Share
Final Budget	\$4,222,737	\$3,872,105	\$2,904,079	\$968,026	\$350,632	31%

GNHWPCA did not try to recoup all project costs

- BCA needed to be re-run
- **FEMA sees GNHWPCA as a “good investment” & has come back with more money for more stations!**

# Completed Pump Stations





# Fairview Pump Station



# Inside Station (Typical)



# Fairview Pump Station



# Cosey Beach Pump Station



BEFORE



AFTER

# Meadow Street Pump Station



# Minor Road Pump Station





# Questions / Comments



Tom Sgroi, PE  
*Director of Engineering*  
[tsgroi@gnhwpc.org](mailto:tsgroi@gnhwpc.org)



Jay Sheehan, PE  
*Sr. Vice President*  
[jsheehan@woodardcurran.com](mailto:jsheehan@woodardcurran.com)

