POINT BREAK

How a Thriving Beach Community Handled a Coastal Sewer Force Main Failure

Presented by:

Jennifer Hale, P.E.
Michael Curry, P.E.

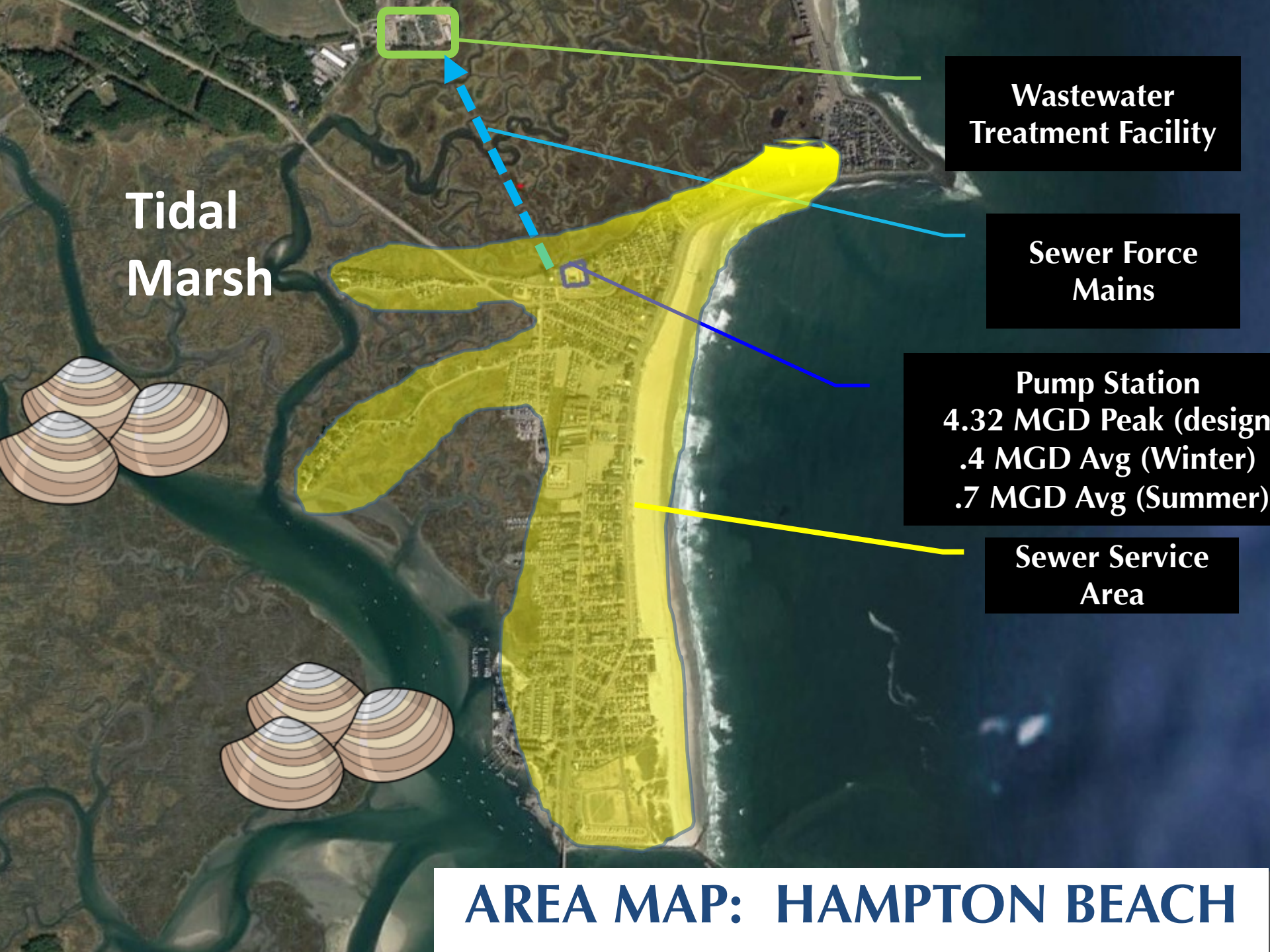
WRIGHT-PIERCE
Engineering a Better Environment

SETTING: Hampton Beach, NH

- Critical tourist destination to Town
- Summer/winter population swing
- Holiday surge (Memorial, Labor, July 4th)
- Seafood Festival (150,000 people annually)

Just a few PEOPLE at the beach…

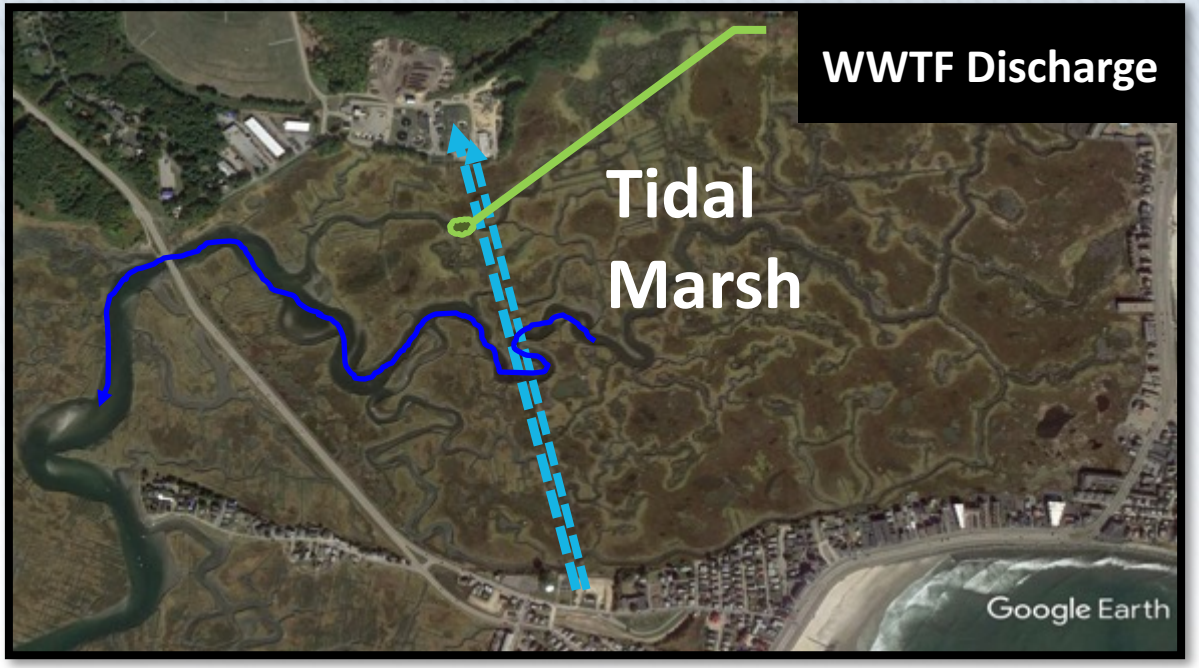
Photo: Facebook- Hampton Beach August 2015



AREA MAP: HAMPTON BEACH

EVENT TIMELINE

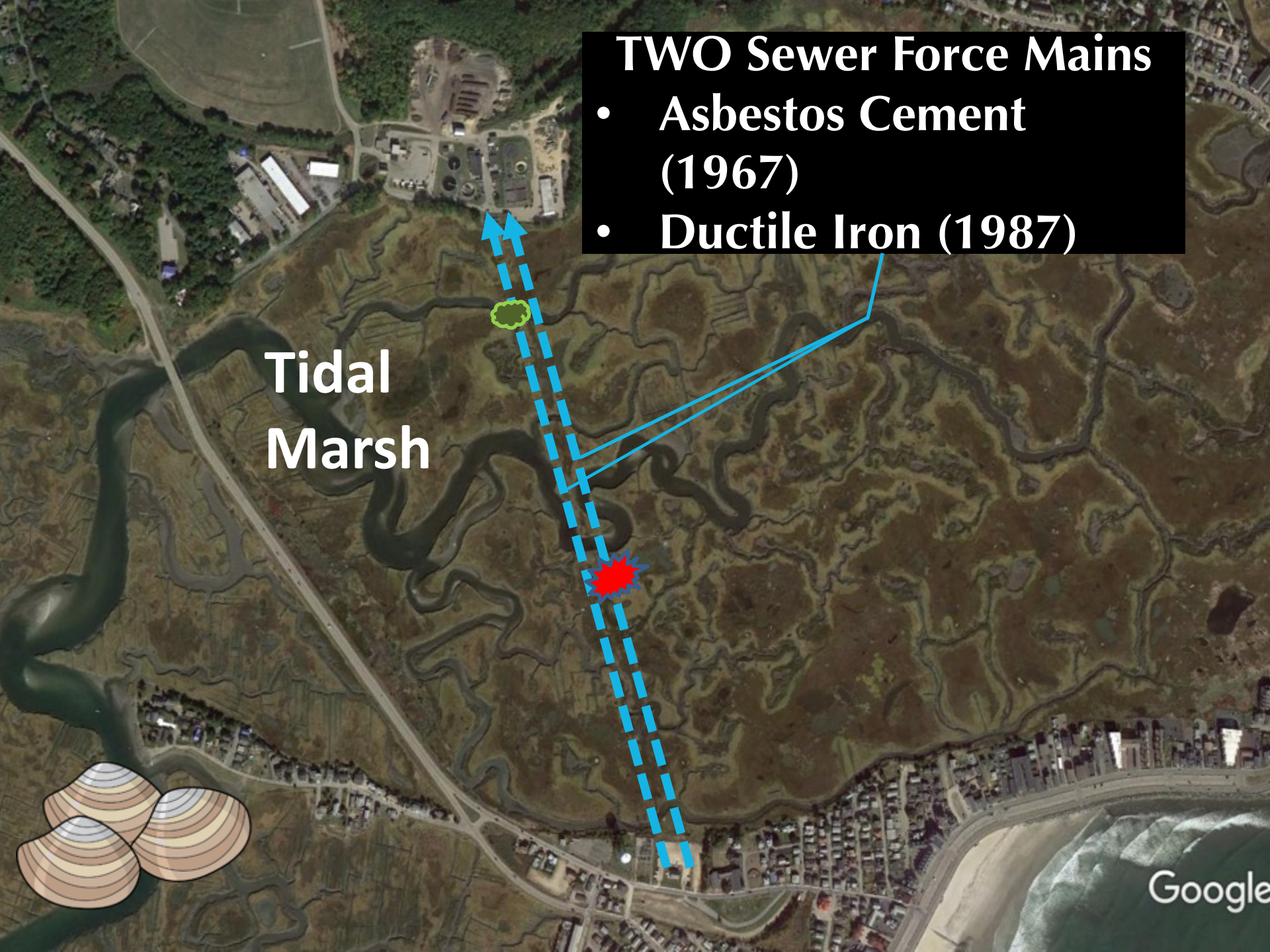
- Dec. 2015: High fecal coliform levels downstream
- Jan. 2016: Agency/Town review of possible sources
- Jan. 2016: Increased fecal sampling points
- Feb. 2016: Tidal marsh visual observations



WHERE ARE WE?

LET'S GO FOR A WALK

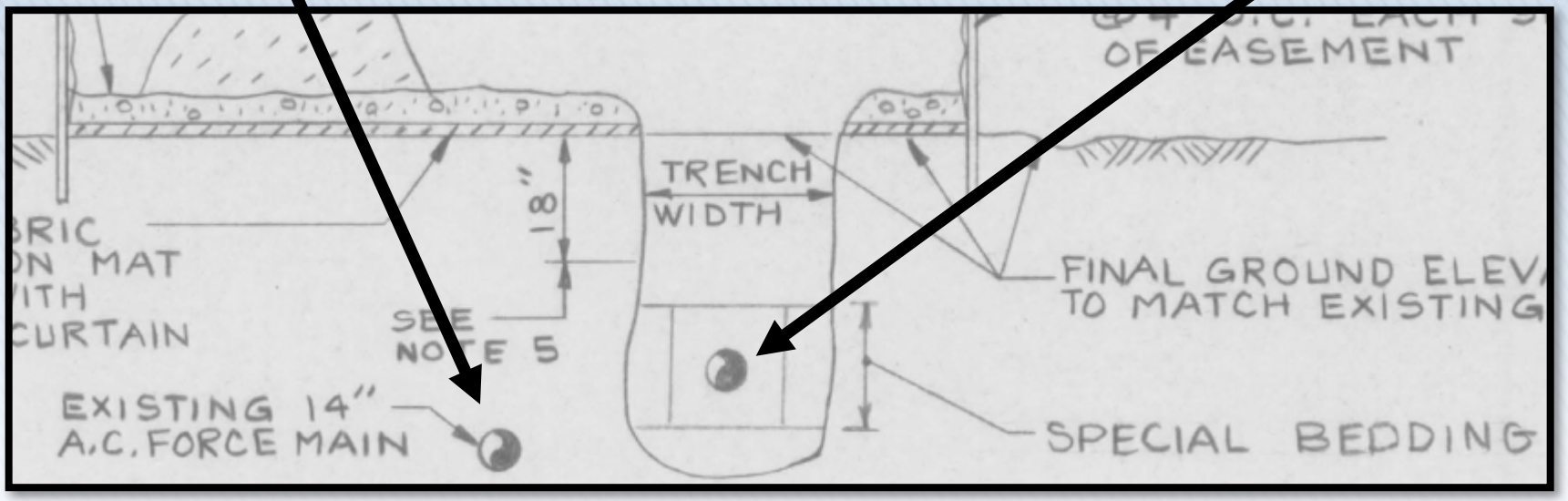
THE DISCOVERY


TWO Sewer Force Mains
• Asbestos Cement (1967)
• Ductile Iron (1987)
Tidal Marsh
Google

PIPE CONSTRUCTION

Asbestos Cement
1967

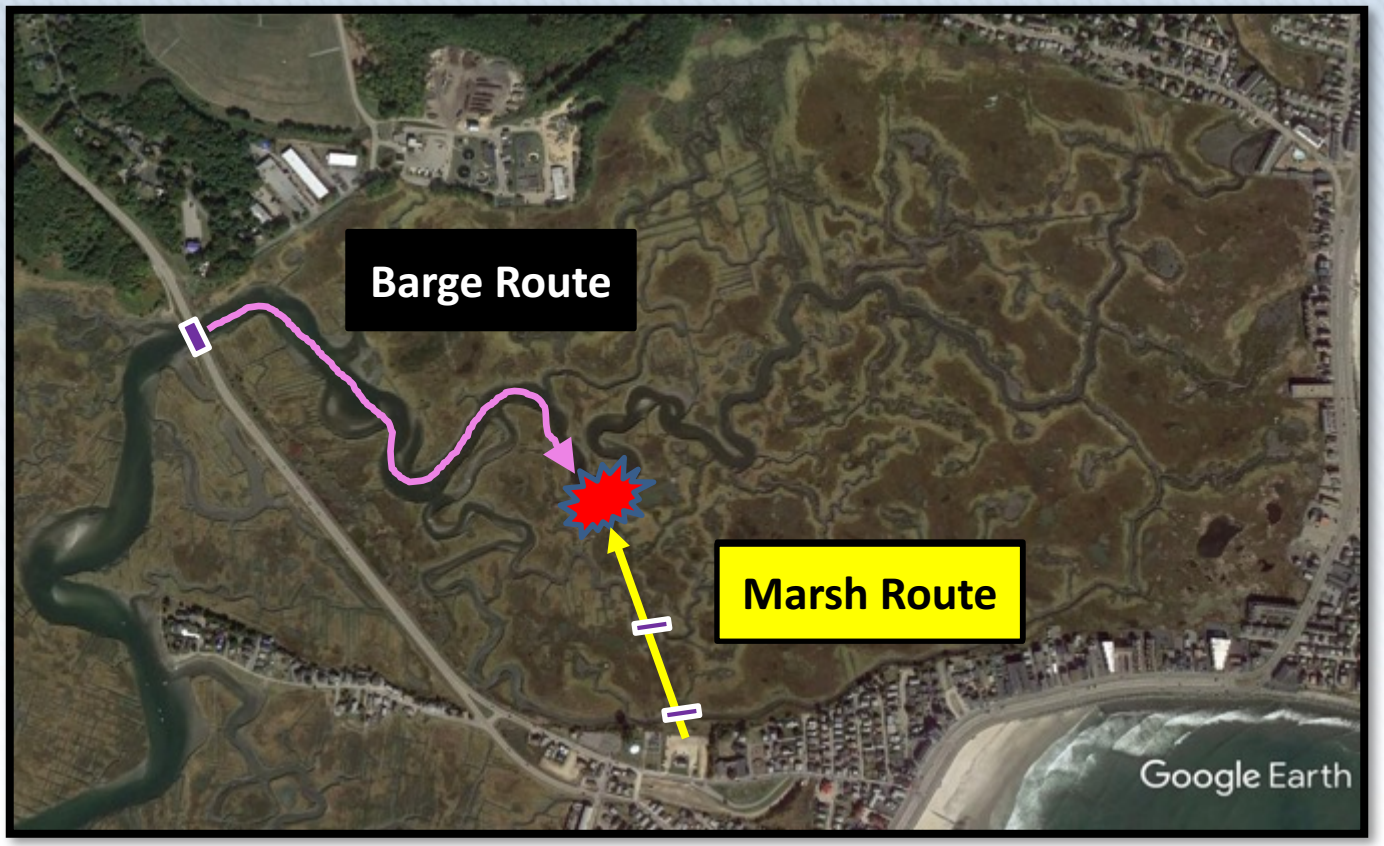
Ductile Iron
Installed in 1987



- 7.5 foot pipe separation
- 8 foot pipe depth

EMERGENCY ACTION APPROACH

- Temporary force main vs. Pipe repair
- Force main access (barge vs. marsh)



ACCESS LIMITATIONS

ACCESS LIMITATIONS

Emergency Excavation Logistics

- Sole force main: Asbestos cement line (1967)
  - Risk of disturbing single remaining force main
- Pump Station Bypass/Temporary force main

Wetlands Considerations

- Hydric soil pressure capacity
- Prime wetlands excavation
- Tide cycles
- Trench dewatering
- Trench sloughing concerns

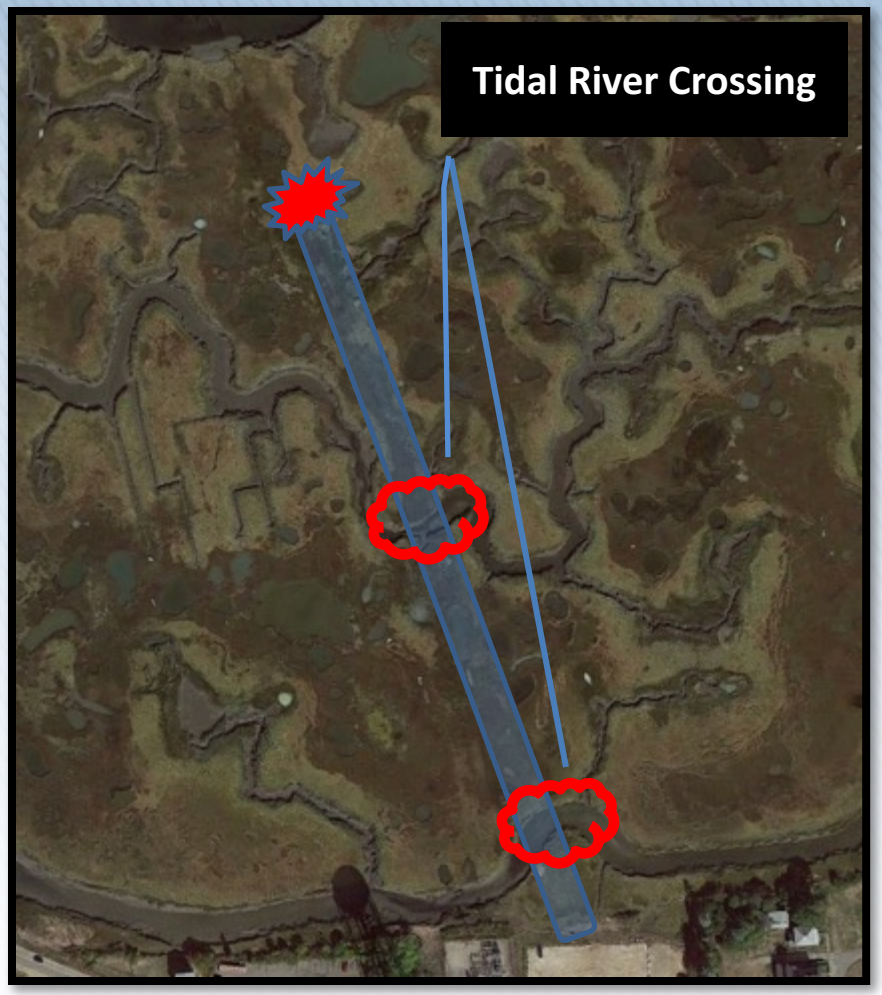
PLANNING EFFORTS

- What do we need?
  - Excavator
  - Dump Truck
  - Septic Truck
  - Loader
  - Trench Boxes
  - Gravel bedding
  - Dewatering Pumps
  - Generator
  - Temporary Bridges

IMPLEMENTATION

MARSH MAT INSTALLATION

TIDAL CREEK CROSSINGS



- Two crossings
- 30-50 ft wide
- Dictated equipment

TIDAL CREEK APPROACH

BRIDGE SUPPORT

BRIDGE CONSTRUCTION

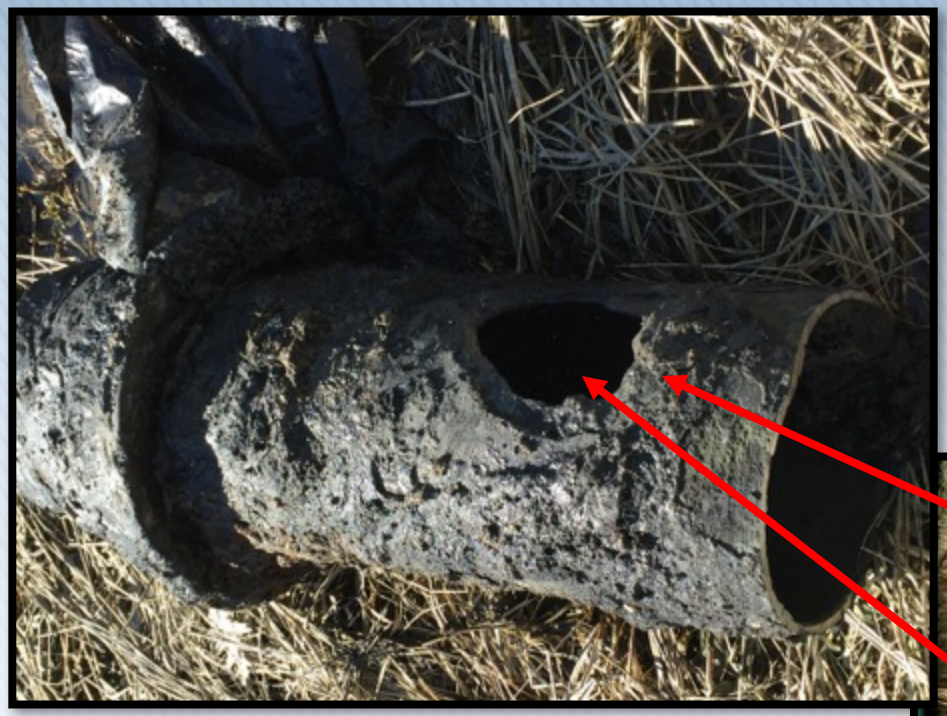
FINISHED BRIDGE

PIPE ACCESS

- 3 days construction “access” road prep
- On the fourth day…

DI Pipe Locating and Excavation

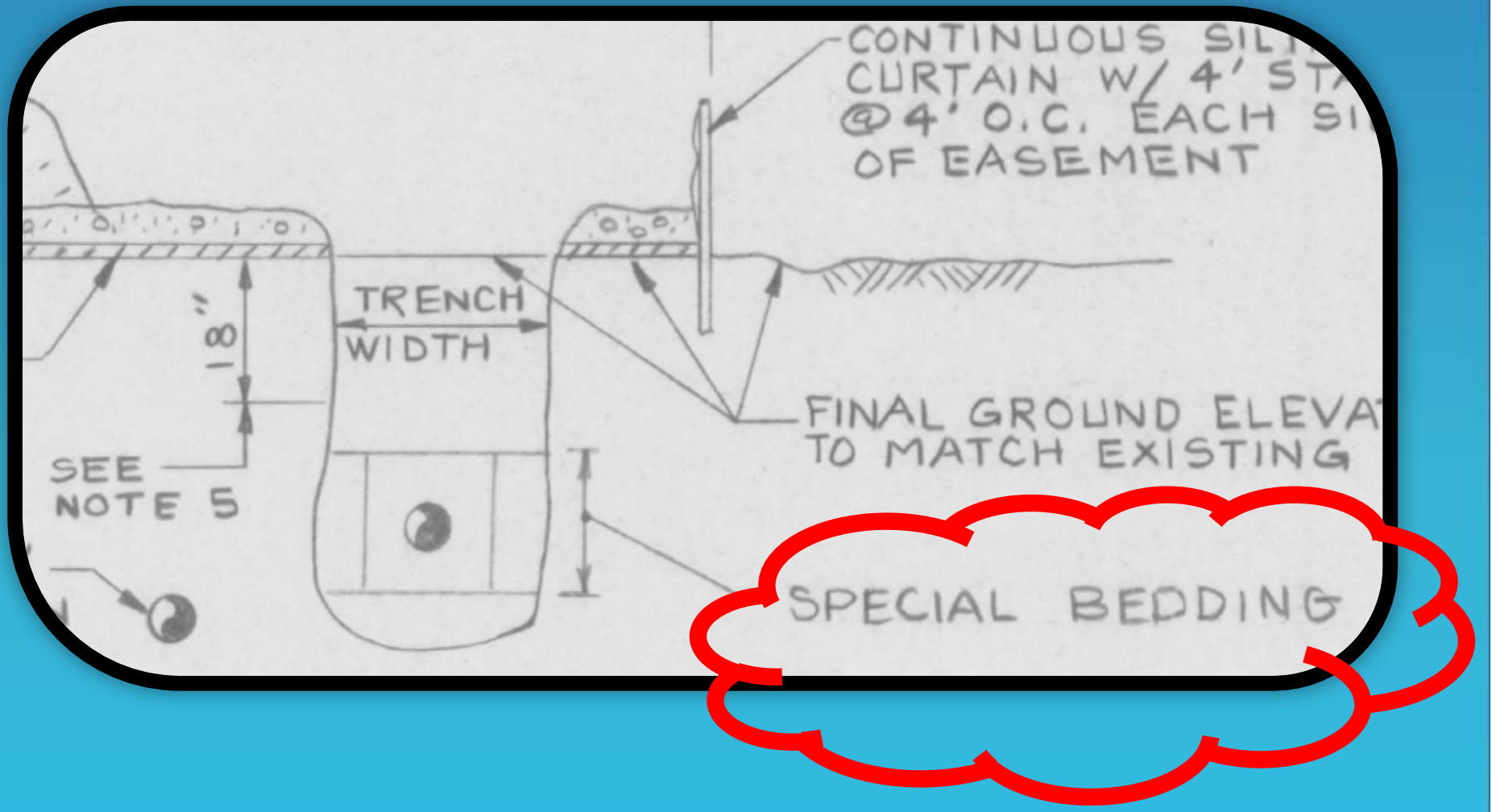
DISCOVERY



CONDITION ASSESSMENT

- **Interior (abrasion)**
- **Exterior condition (abrasion)**

PIPE CONSTRUCTION DETAILS



PIPE SECTION REPAIR

PIPE SECTION REPAIR

PIPE FAILURE EVALUATION

- Cause of failure: Improper pipe bedding
- Potential for similar future failure in marsh?
  - 3,500-ft of ductile iron force main (1987)
  - 3,500-ft of asbestos cement force main (1967)
- Consequence of failure
  - Hampton Beach restrictions
  - Shellfish/Fishing
  - Bypass pumping

WHAT NEXT?

Hampton Church Street Pump Station Scope and Schedule Matrix
Sheet 1 of 3
April 18, 2016

General Information:

- 3,500 ft of 14" Asbestos Concrete (AC) & 14" Ductile Iron (DI) Force Main (FM) existing between the Church Street Pump Station and the valve pit at the Waste Water Treatment Facility (WWTP) – Under the marsh
- 14" AC Pipe constructed in 1967 (49 years old), constructed on timber piles and the 14" DI Pipe constructed in 1987 (29 years old), direct bury, wrapped in polyethelene wrap
- During high flows (i.e. summer conditions) ***2 Working Force Mains are required to meet the demand*** without an overflow condition

	Continued Investigation	In Marsh Replacement	In Marsh Replacement	In Marsh Replacement	Route 101 Replacement
Scope	A. Identify Pipe Characteristics	B. Slip Line 14" DI	C. Pipe Burst 14" AC	D. Directional Drilling	E. Force Main Replacement
Steps	• Wetland Identification & Permitting • Specifications & Bidding • Bid Award • **Clean Pipe (AC and DI)** • **Video Inspection (AC)** • **Ultrasonic Pipe Inspection (DI only)**	• Wetland Identification, Geotechnical Investigation & Permitting • Specifications & Bidding • Bid Award • **Clean Pipe (DI)** • **Video Inspection (DI)** • **Slip Line 14" DI with 12" equivalent**	• Wetland Identification, Geotechnical Investigation & Permitting • Specifications & Bidding • Bid Award • **Clean Pipe (AC)** • **Video Inspection (ACI)** • Burst 14" AC with larger PVC pipe	• Wetland Identification, Geotechnical Investigation, Survey & Permitting • Specifications & Bidding • Bid Award • Directional Drill 2 new FM and abandon existing 2 FM	• Wetland Identification, Geotechnical Investigation, Survey & Permitting • Design, Specifications & Bidding • Bid Award • Construct 2 new FM within Route 101 then through a Town Right of Way and continue with the reconstruction of the sewer main on Tide Mill Road.
Pros:	• Results may indicate there is additional time to plan for replacement or reconstruction	• Lower initial cost	• Replaces the AC FM with larger capacity composed of marsh tolerant pipe material	• Replaces the DI and AC FM with two new marsh tolerant pipe material • Ability to increase diameter for future capacity	• Replaces the DI and AC FM out of the Marsh • Ability to increase diameter for future capacity • **Both FM would have access for monitoring and maintenance decreasing future operation costs.** • Improvements to material and capacity for Tide Mill Road Sewer.
Cons:	• **May pay cost in addition to Repair/Replacement** • To clean and inspect pipe will require DI FM to be "broken and repaired" in a total of 3 pit locations along the DI FM • Excavation near adjacent FM risks damage and possible need for Emergency Plan Implementation • Investigation can only be used on DI FM • Leaves FM in marsh with continued monitoring and maintenance issues-including access, failure impact and additional costs • Would not account for future capacity need	• To clean and slip line pipe will require DI FM to be "broken and repaired" in a total of 3 pit locations along the DI FM • Excavation near adjacent FM risks damage and possible need for Emergency Plan Implementation • Reduces the capacity of the DI FM that is required. **Must be done in combination with Pipe Burst or Directional Drilling to add capacity** • Leaves FM in marsh with continued monitoring and maintenance issues-including access, failure impact and additional costs • No improvements to Tide Mill Road Sewer	• **Unable to burst the DI FM and due to the AC pipe on piles with steel bands used for attachment, the feasibility is not confirmed. Specialty equipment and operators required.** • Existing AC line is located on piles and encased in concrete at creek crossings. There is confidence that this line can still be burst but significant additional costs and risks are unknown if unforeseen issues occur • Leaves FM in marsh with continued monitoring and maintenance issues-including access, failure impact and additional costs • No improvements to Tide Mill Road Sewer	• **Highest cost as you pay per Foot for each FM** • Leaves FM in marsh with continued monitoring and maintenance issues-including access, failure impact and additional costs • No improvements to Tide Mill Road Sewer	• Higher initial cost
Cost	Design & Bid: $ 38,755 Construction: $ 538,545 Total +/- $ 520,000	Design & Bid: $ 114,080 Construction: $ 1,870,418 Total +/- $ 1,985,000		Design & Bid: $ 152,950 Construction: $ 3,943,695 Total +/- $ 4,100,000	Design & Bid: $ 172,040 Construction: $ 2,926,376 Total +/- $ 3,100,000
Schedule	See Schedule Matrix	See Schedule Matrix	See Schedule Matrix	See Schedule Matrix	See Schedule Matrix

Clean Pipe: The maximum distance that can be cleaned is 1500 ft. To clean the entire line which is required will require that both pipes be excavated, cut – with section removed & repaired for the jet equipment to have access to the middle (Pit 1). This will require mat access and 2 bridge installations.

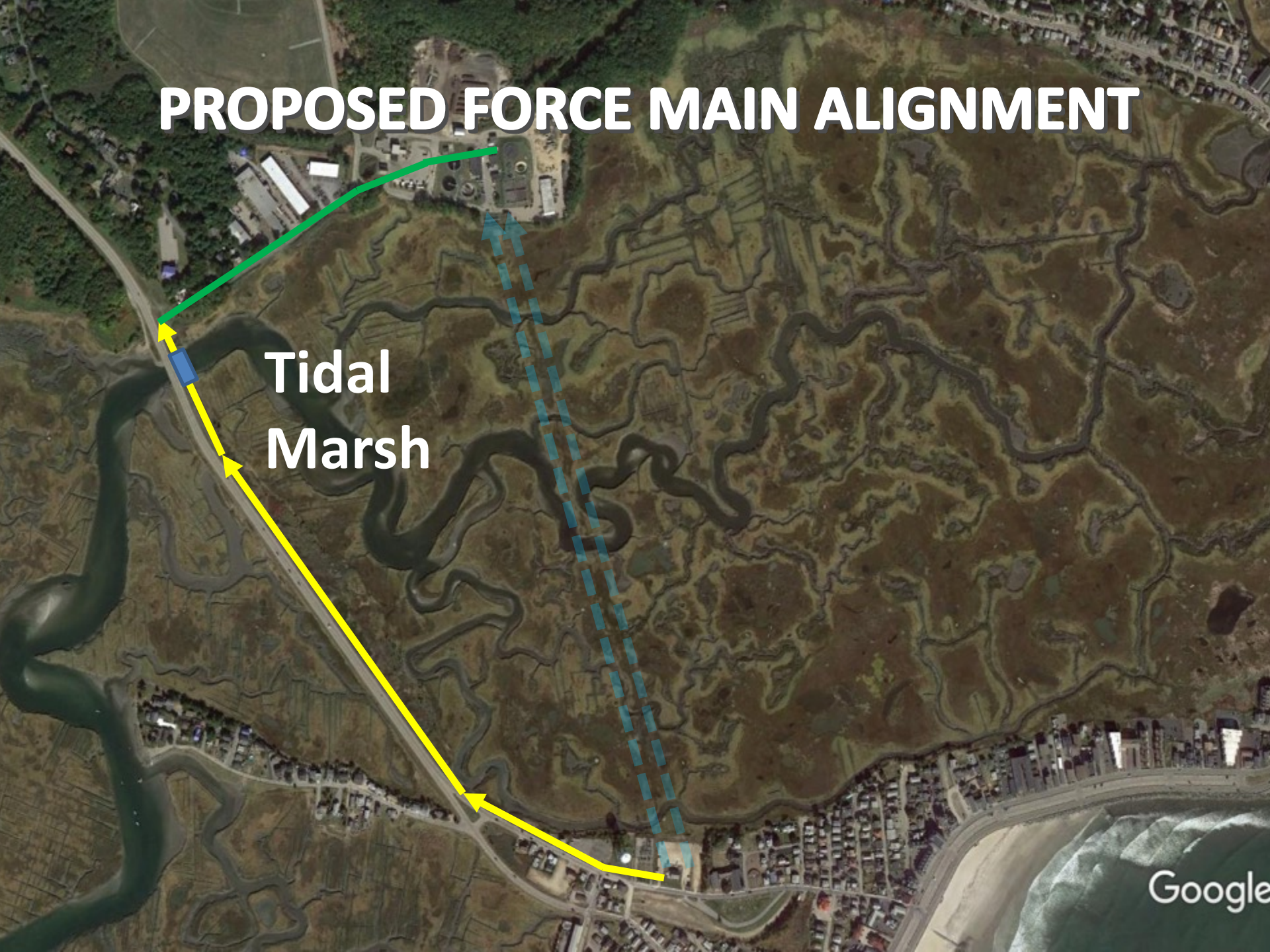
Video Inspection: For Investigation, video inspection can be used on the AC main as Ultrasonic cannot. For Slip line and burst option, both lines will require video inspection

Ultrasonic Pipe Inspection and Slip Line Steps: These methods cannot maneuver through bends. In the location of bends this method will require that the DI line be excavated in the area of the bends, cut - with section removed & repaired (Pit 2 & Pit 3). This will require the mat access and 2 bridge installations that were installed **to clean the pipe.**

LONG TERM SOLUTION

- **Objectives:**
  - **Reduce risk of failures in extreme environment**
  - **Reduce risk to environmentally sensitive area**
  - **Enable maintenance access**
  - **Redundant force mains**

- **Where are we now? 1 year after**


PROPOSED FORCE MAIN ALIGNMENT
Tidal
Marsh
Google

ACKNOWLEDGEMENTS

- Town of Hampton, NH Board of Selectman and Public Works Staff
- NHDES Wetlands and Shellfish Division
- Severino Trucking Co. Inc.
- Mabey Inc. (Ground mats/Bridges)
- Wetland Consulting Services Inc.

Questions?

WRIGHT-PIERCE
Engineering a Better Environment