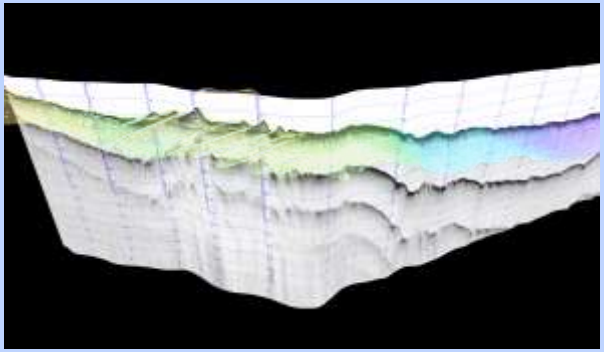
Martha's Vineyard
Hybrid Submarine Cable Project
Comcast & NSTAR



Prepared by:

Epsilon Associates Inc.

In Association with:

CR www.crenvironmental.com

Outline

- Project Overview
- Environmental Data Gathering & Analysis, and Permitting
- Construction
- Post-Construction Marine Survey & Report
- Covering Exposed Cable
- Summary & Conclusions

PROJECT OVERVIEW

Project Team

Co-applicants: Comcast & NSTAR (Eversource)

Engineer: Power Engineers

Marine Contracting: J.F. White

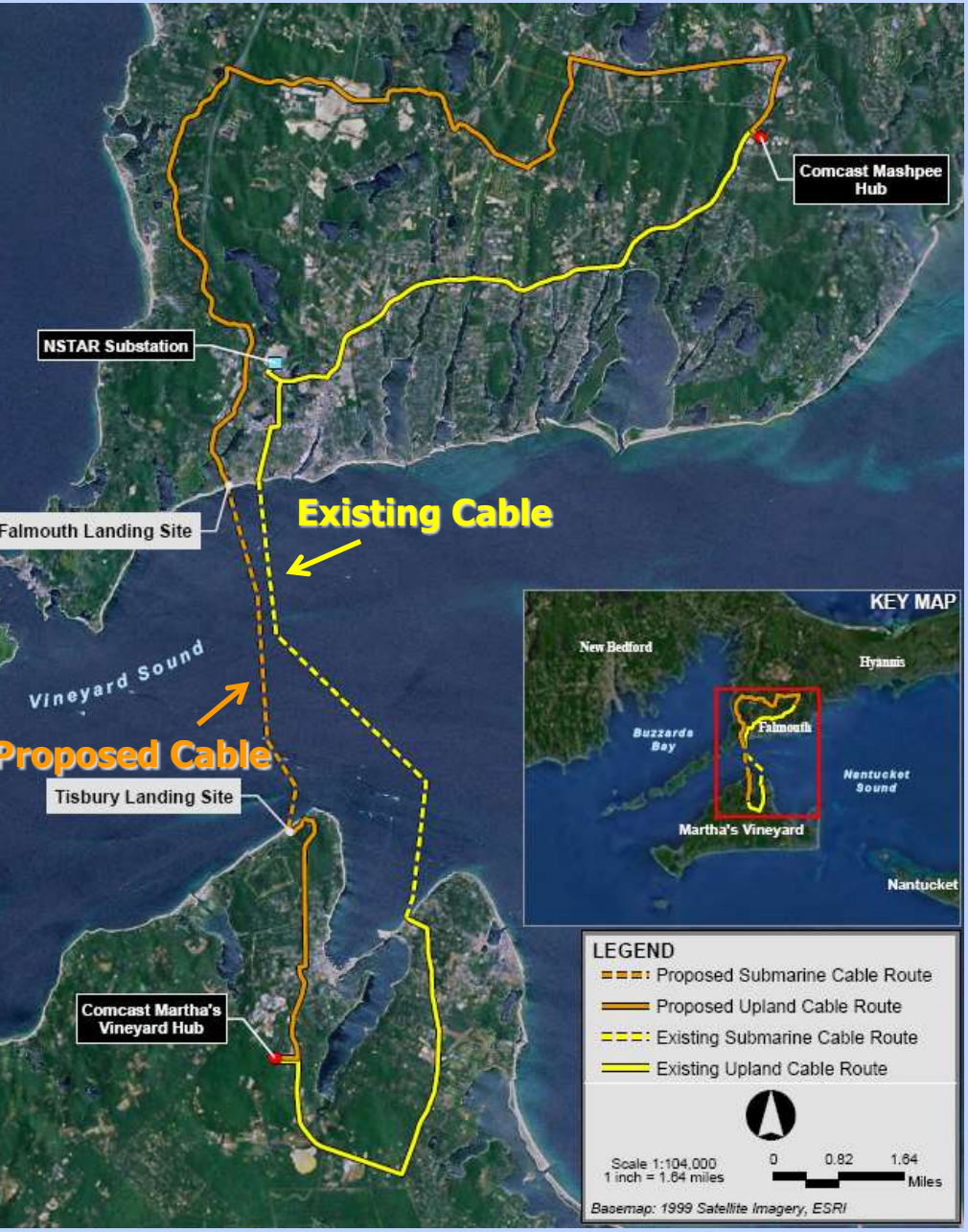
Marine Environmental Surveys: CR Environmental

Marine Archaeology: Fathom Research

Environmental Permitting: Epsilon Associates

Introductory Meetings with Agencies

- **Ocean Team – Mar 2011**
  - **CZM**
  - **MassDEP**
  - **DMF**
  - **MEPA**
- **Cape Cod Commission – Feb 2011**
- **Martha's Vineyard Commission – Feb 2011**
- **Army Corps of Engineers – Mar 2011**



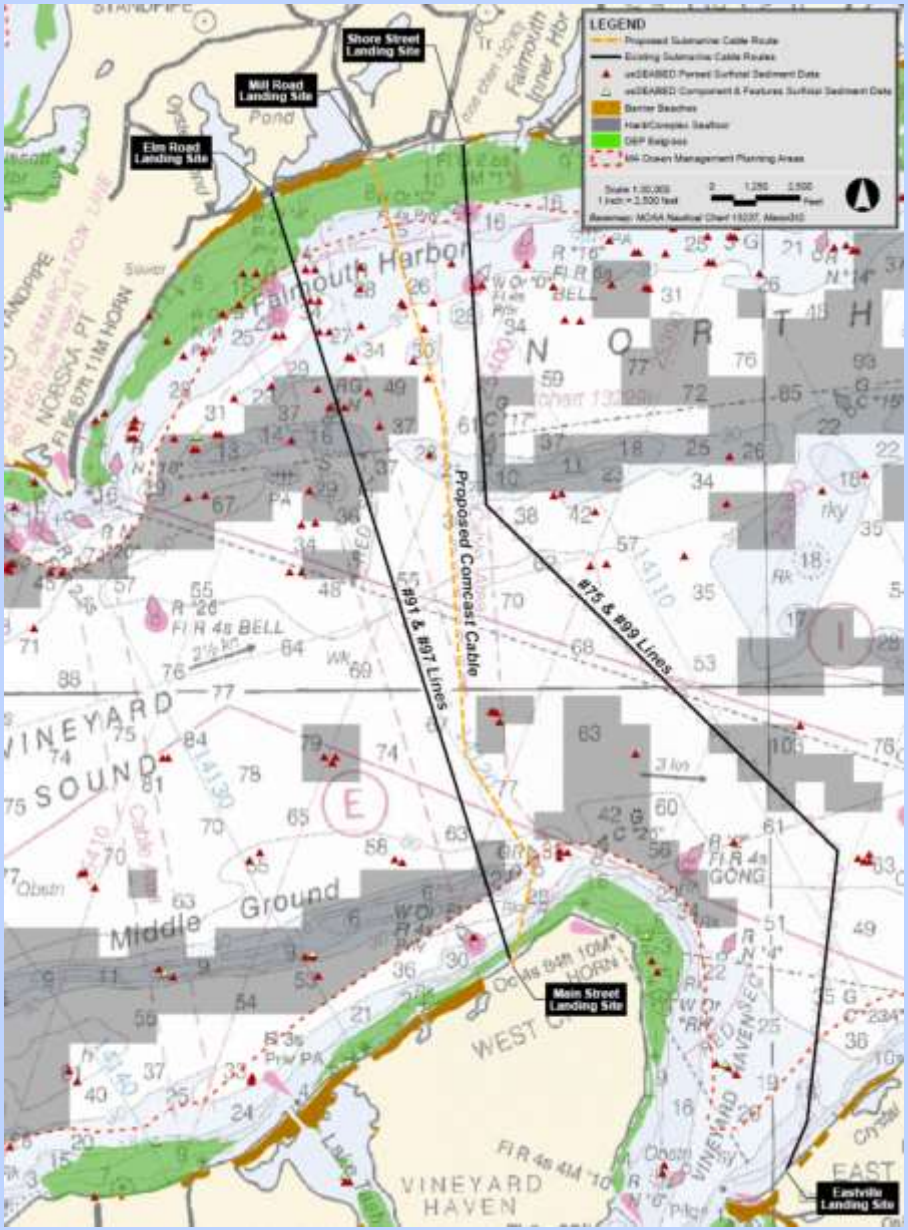
Project Purpose

Provide redundant Submarine Fiber Optic Cable to Martha's Vineyard

Initial Project
Upgrade Existing Comcast Fiber Optic Service to MV

- **Customers: ~ 10,000 (vast majority of homes and businesses on MV)**
- **Comcast Service: video, high-speed internet and phone**

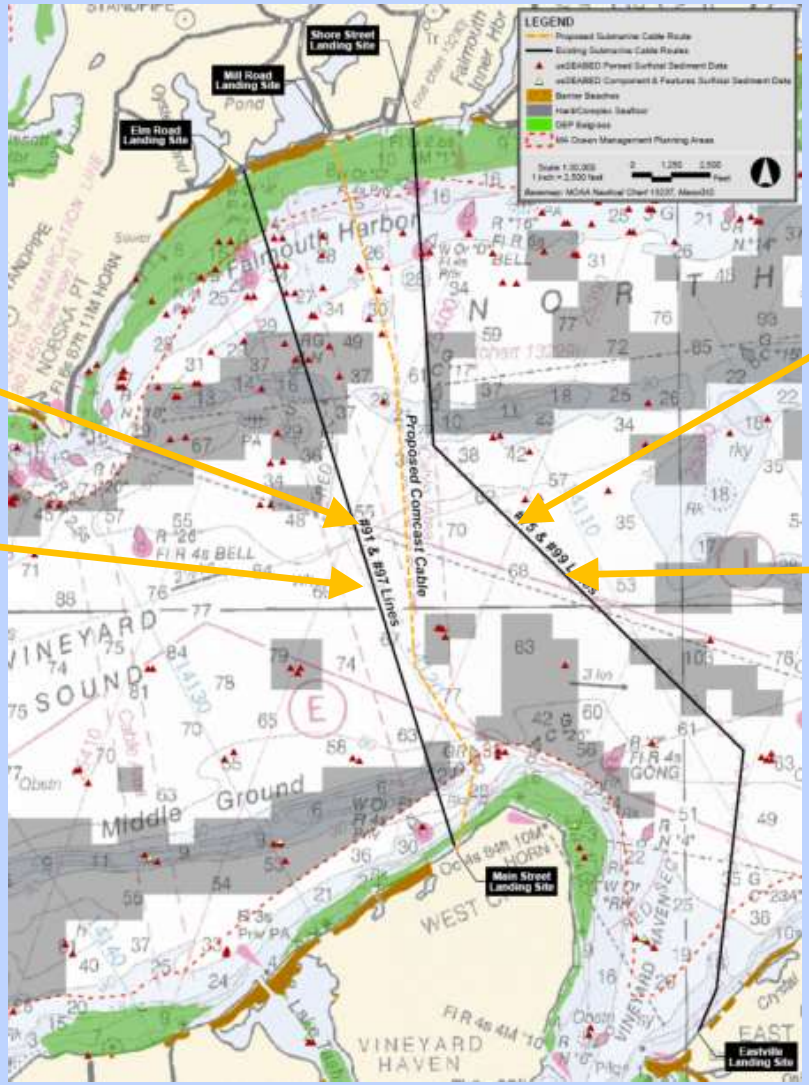
Existing Submarine Cables



- 4 existing NSTAR cables
- All installed with short HDD (~80’) at shoreline, with remainder on seafloor
- Comcast leased bandwidth from NSTAR on fiber optic cable within Cable #99

Cable History & Project Need

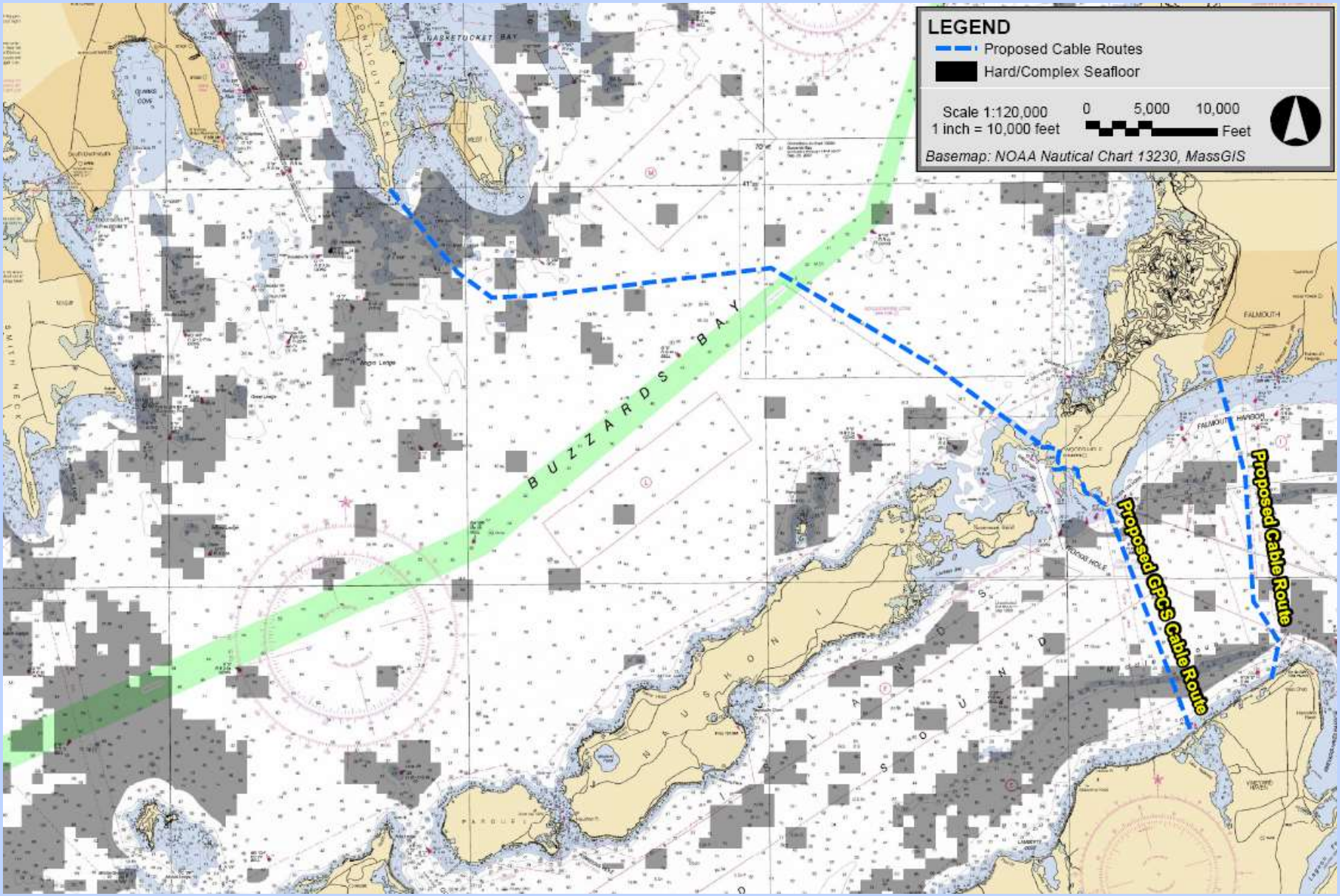
- **Cable #91: failed 6 times**
- **Cable#97: only cable that has not failed since 1990**



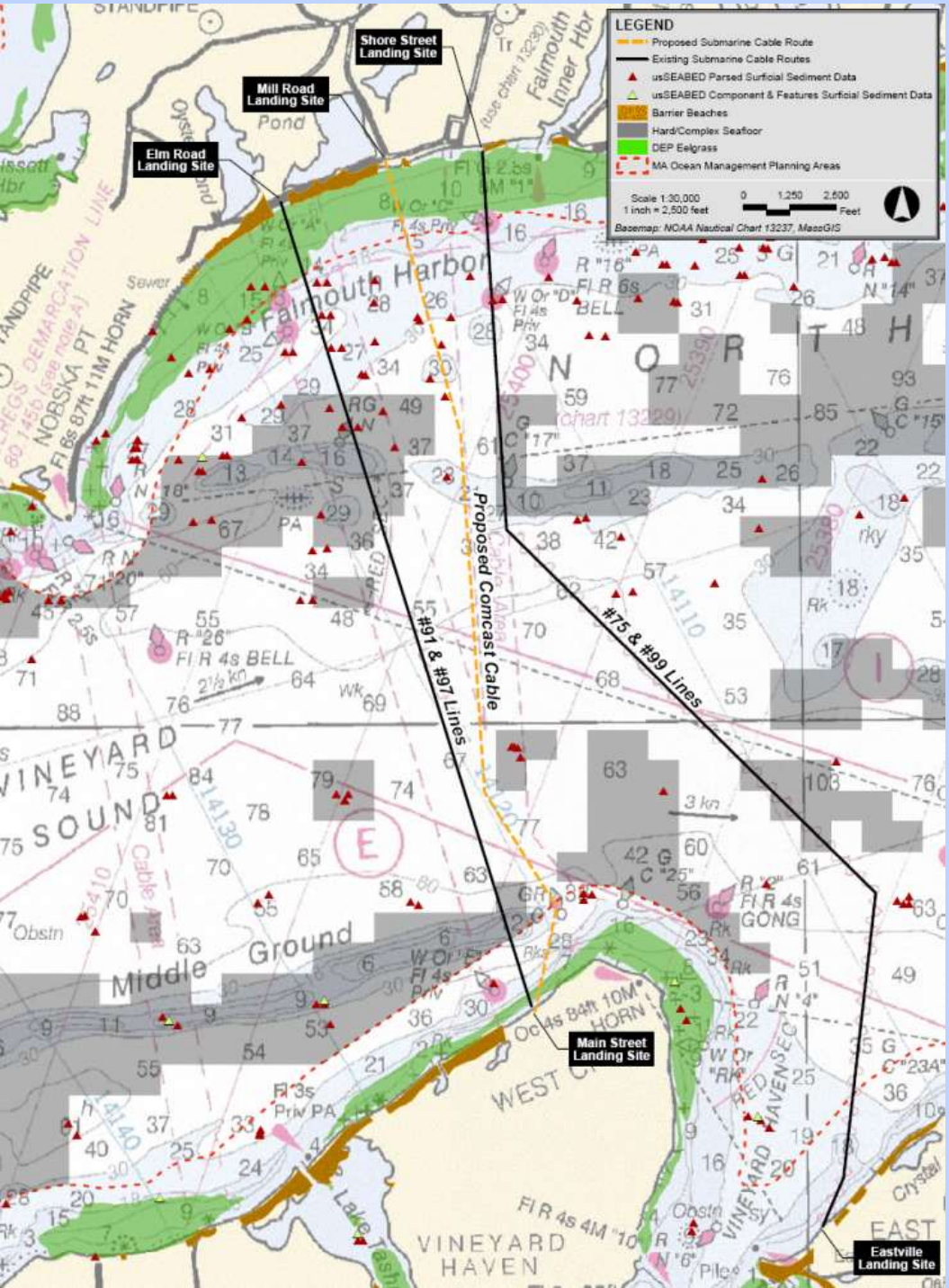
- **Cable #75: failed and not operational**
- **Cable #99: failed 4 times over a span of 15 years**

- **Comcast proposed this new fiber optic cable to ensure future service.**

Project Alternatives



Submarine Route



Avoids Impacts to Special, Sensitive, or Unique (SSU) Resources Protected under the state's Ocean Management Plan

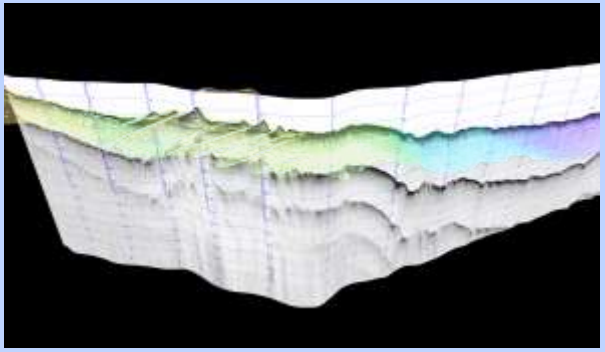
For Submarine Cables protected SSU Resources include:

- **Intertidal Flats**
- **Eelgrass**
- **Hard/Complex Bottom**
- **N. Atlantic Right Whale Core Habitat**
- **Fin & Humpback Whale Core Habitat**

Hard/Complex Bottom

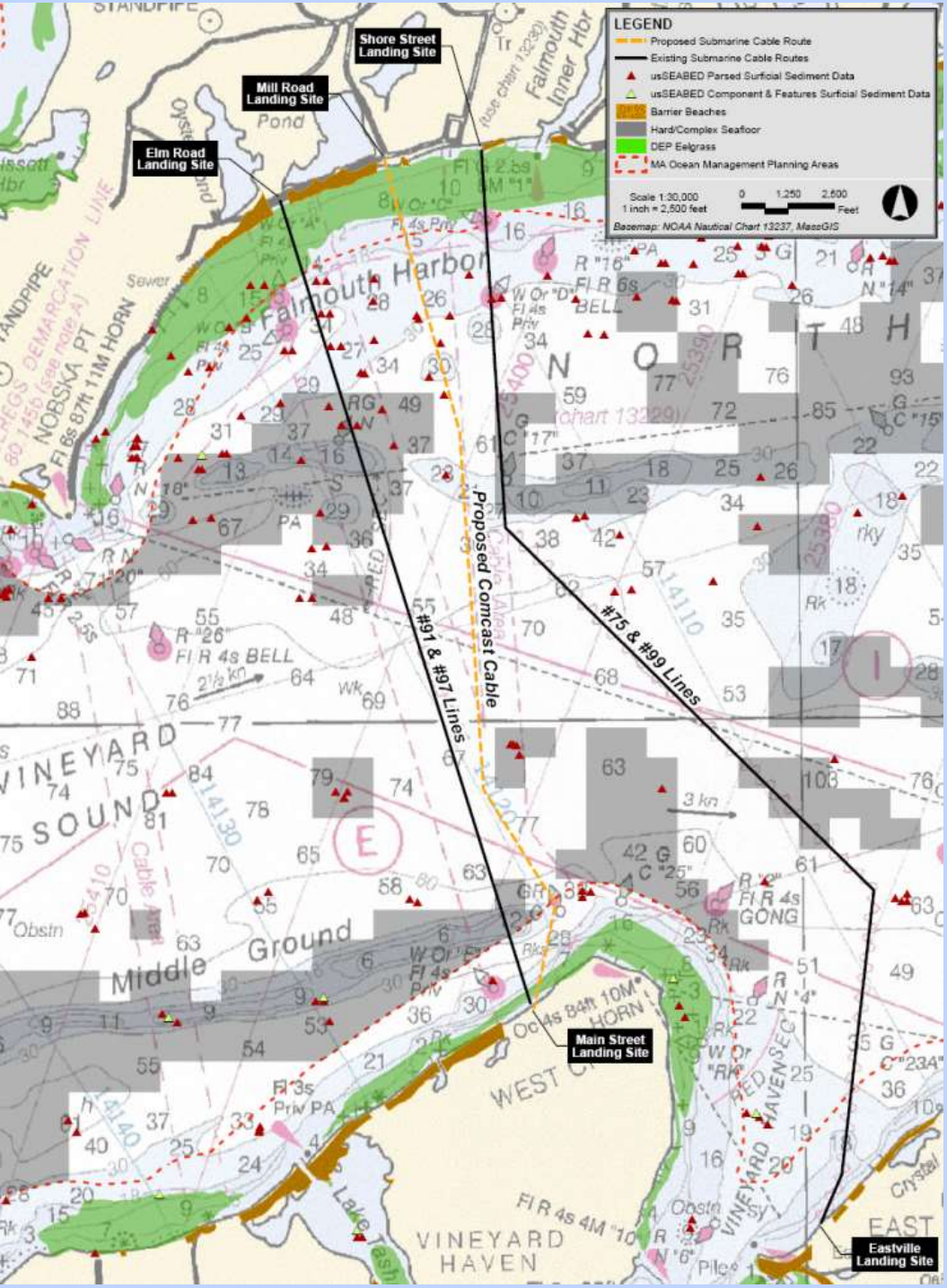
- Exposed bedrock or concentrations of boulder, cobble, or similar hardbottom
- Morphologically rugged seafloor with highly variable bathymetry
- Man-made structures with hard bottom biological communities (artificial reefs, wrecks)

NOAA Photo Lab



Middle Ground

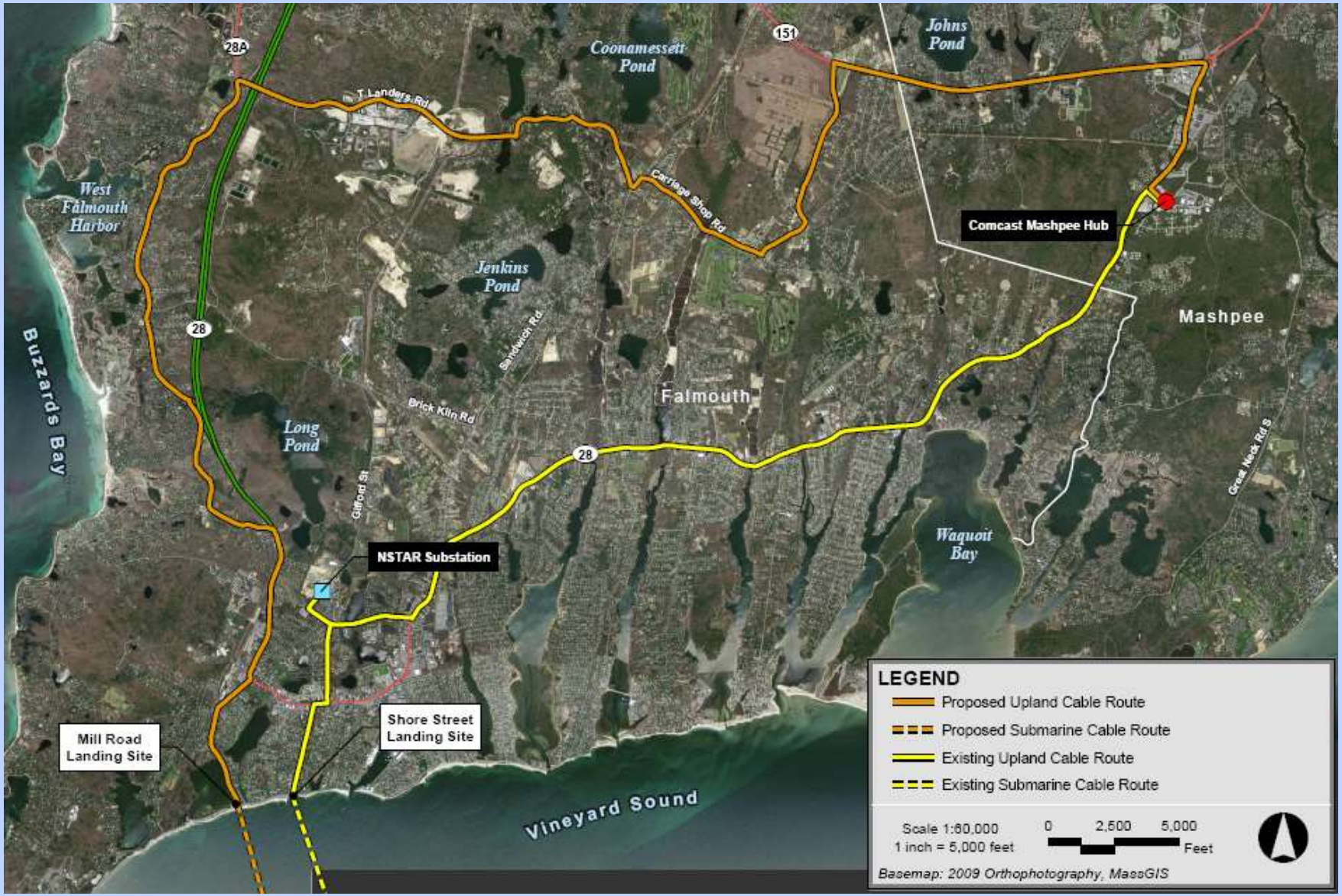
NOAA Photo Lab



Alternative Landings & Preferred Cable Route

Preferred Cable Route

Cape Cod Onshore Routing

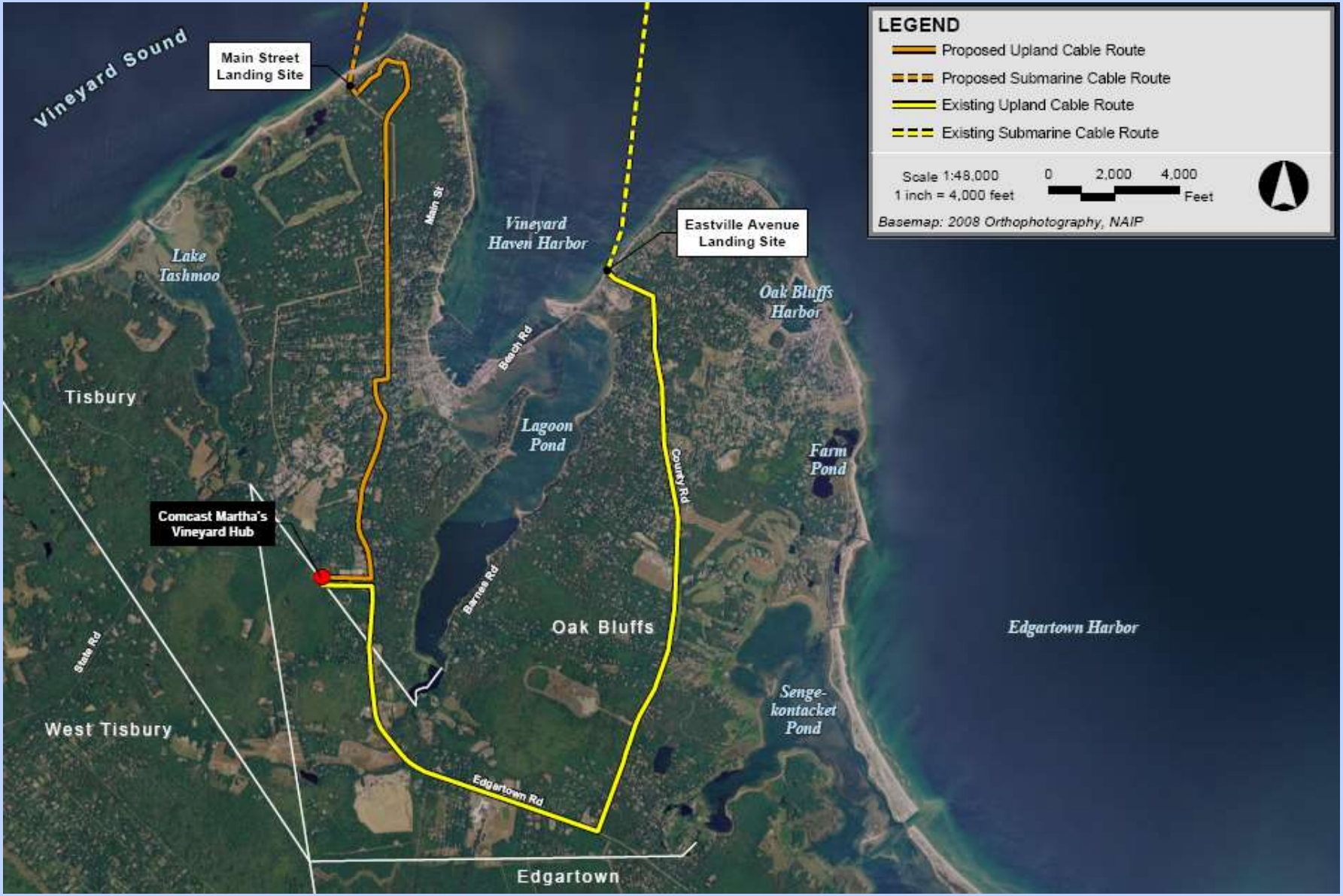


Falmouth Landing Site (Mill Road)

Falmouth Landing Site
Test Boring

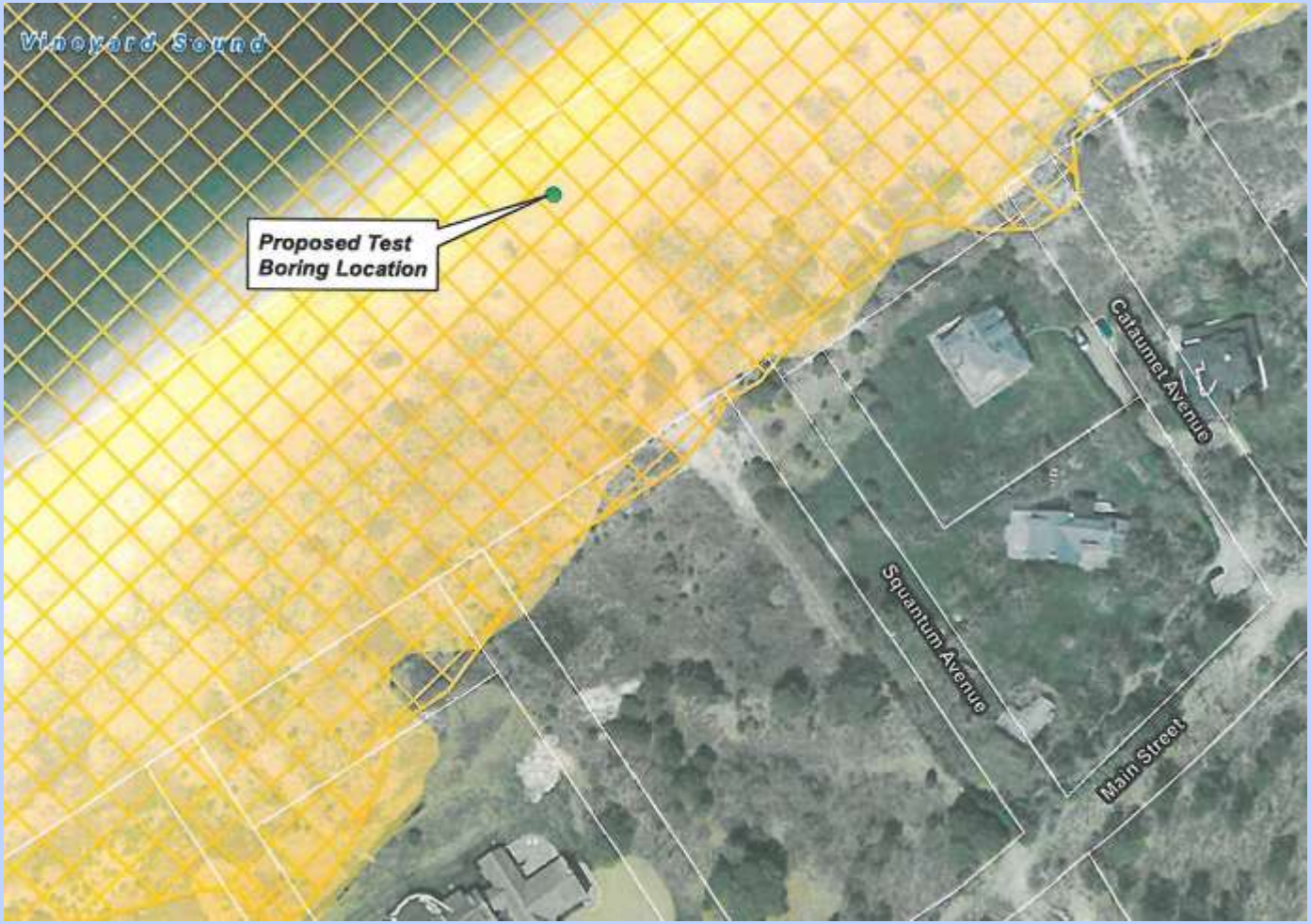
- **Mostly sand to a depth of 40 feet**
- **Good for HDD operation**

Martha's Vineyard Onshore Routing



Tisbury Landing Site (Squantum Ave.)

Tisbury Landing Site (Squantum Ave.) Test Boring

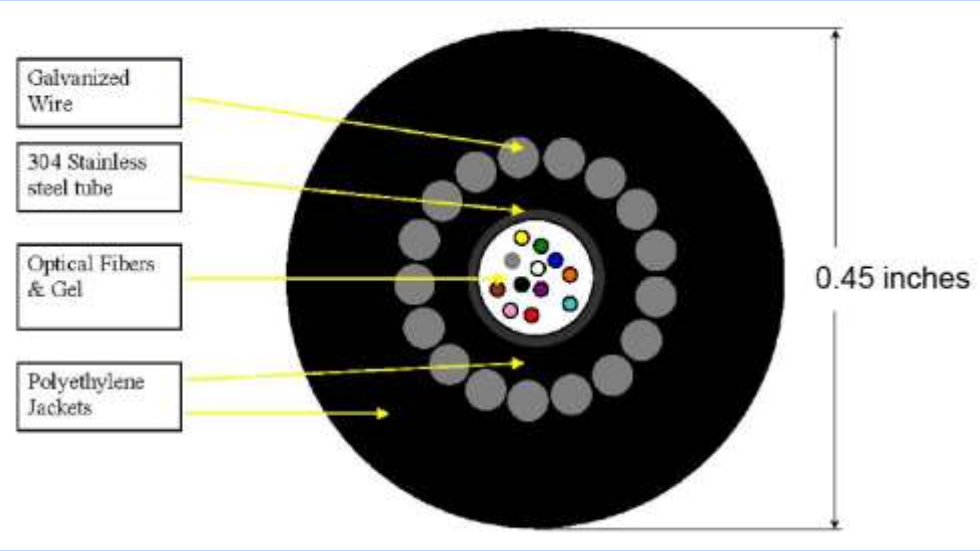


- **Received approval from Tisbury ConCom to conduct boring**

Tisbury Landing Site (Squantum Ave.) Test Boring

- Used tractor drill rig to minimize impacts to coastal beach & dune.
- 20 feet of sand with gravel – good for HDD

Fiber Optic Cable Characteristics



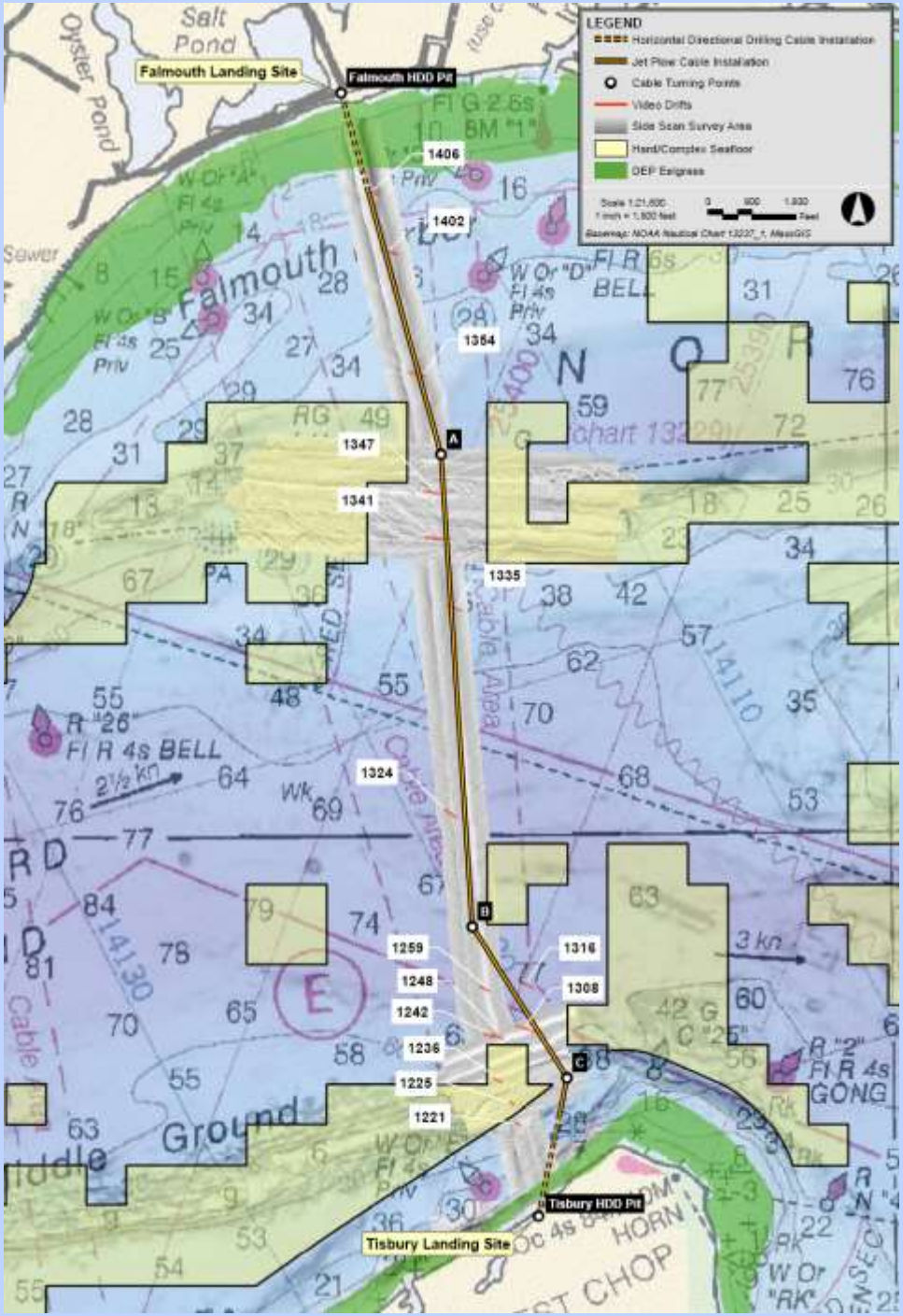
Cable Cross-Section

Range of Cables

ENVIRONMENTAL DATA GATHERING & ANALYSIS

AND

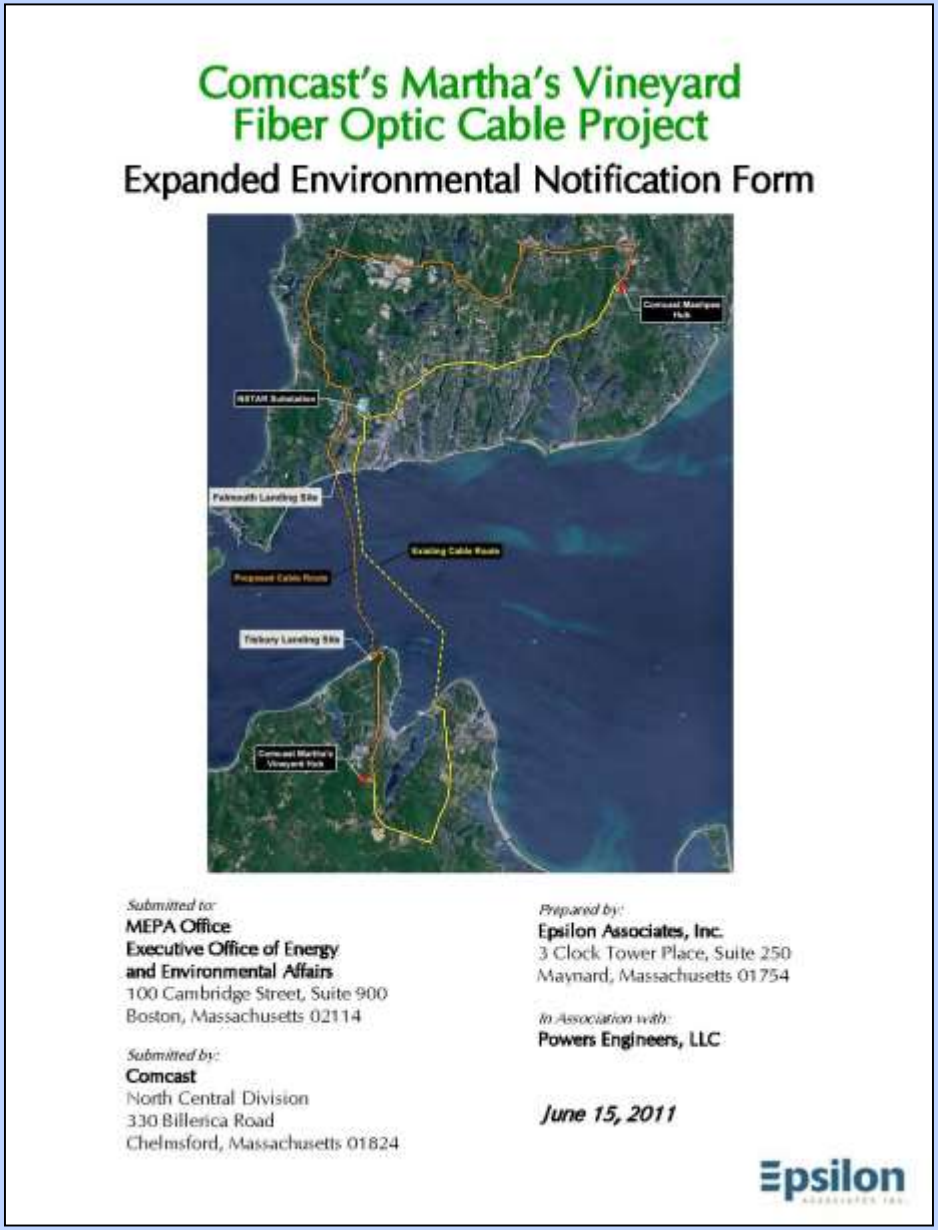
PERMITTING



Reconnaissance Survey May 2011

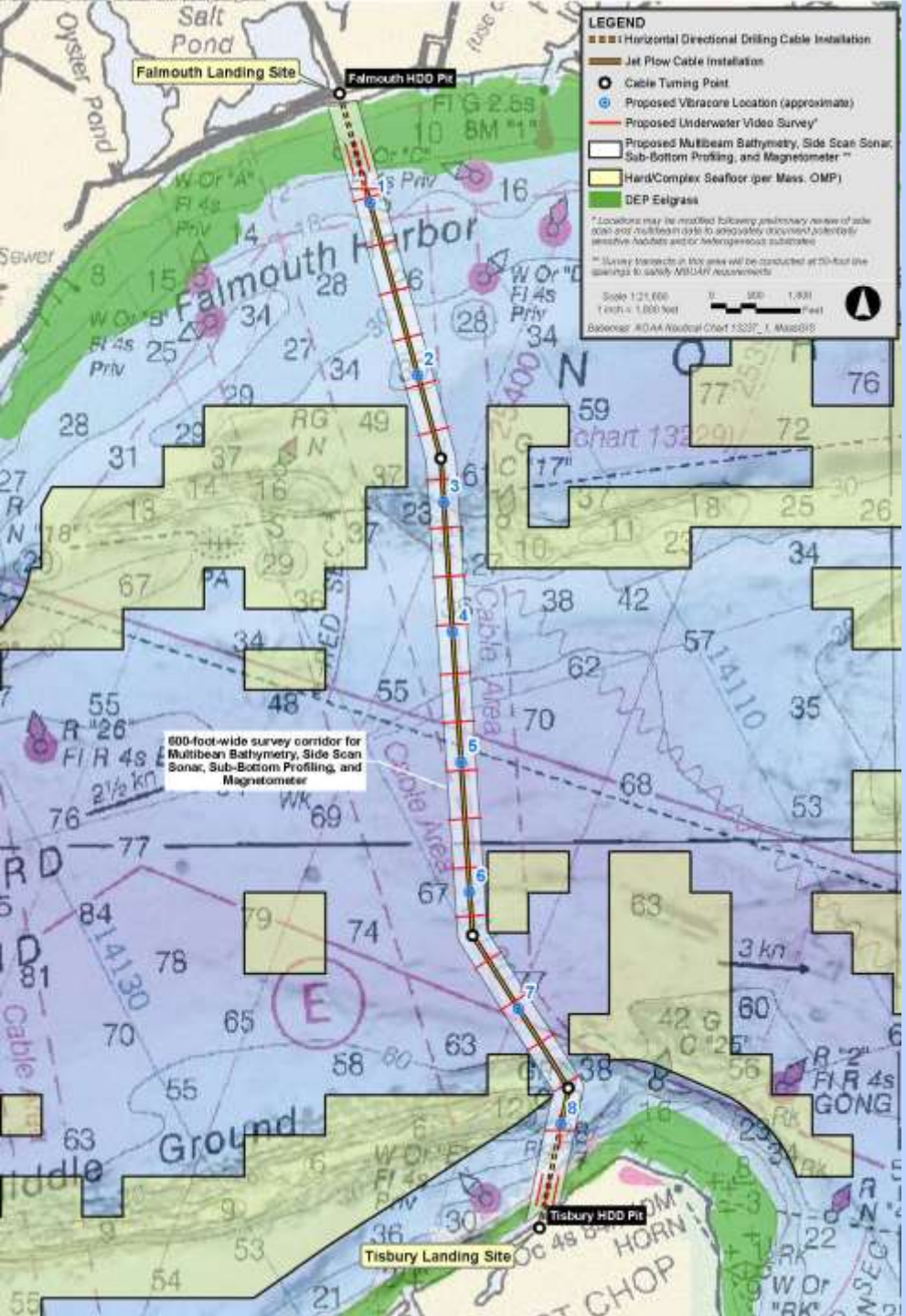
- **Conducted:**
  - **Bathymetry**
  - **Sidescan Sonar**
  - **Video Transects**
- **Evaluated route for SSU resources:**
  - **Hard/complex bottom**
  - **Eelgrass**
- **Confirmed:**
  - **route avoids SSU resources**

MEPA – Expanded ENF



- **Public Hearing - Falmouth Town Hall: July 14, 2011**
- **Certificate issued: July 29, 2011**
- **Agreed with request for Single EIR**
- **Requested continued coordination with Ocean Team on marine data collection and analysis**

Detailed Survey & Sampling Sept 2011



600-ft wide survey corridor:

- **Multibeam Bathymetry**
- **Multibeam Side Scan Sonar**
- **Sub-bottom Profiling**
- **Magnetometer**
- **U/W Video**

Survey Vessel

42-ft research vessel

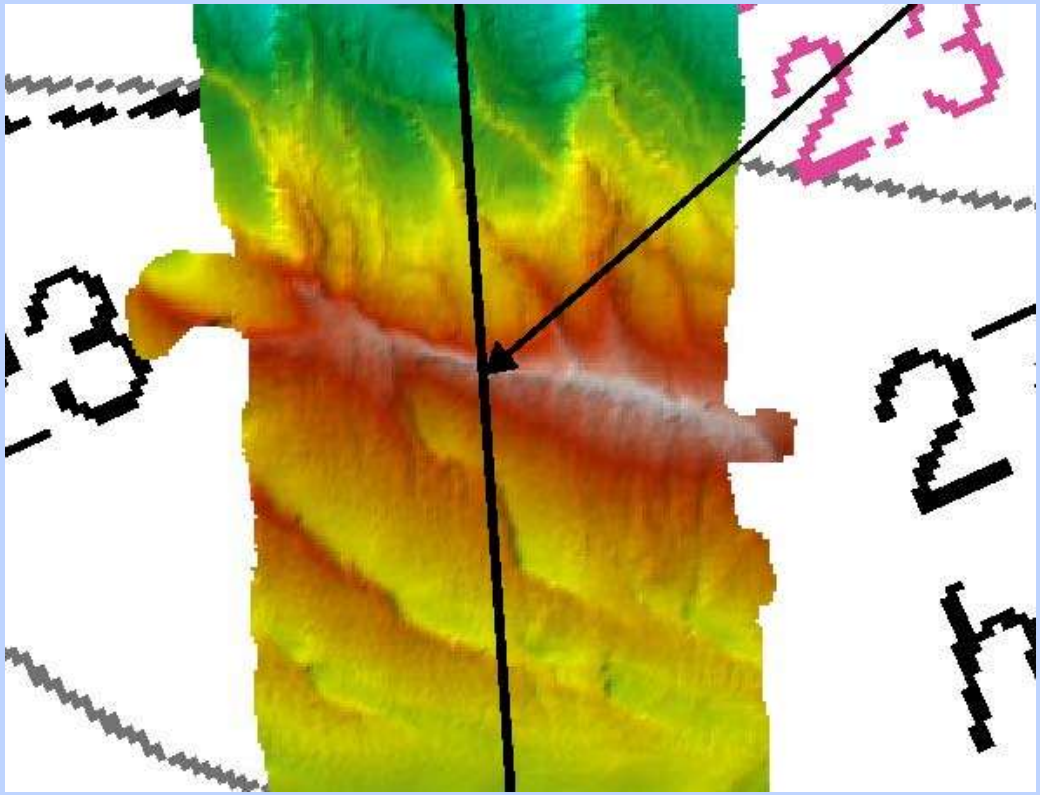
First Light, Hull, MA

Crew

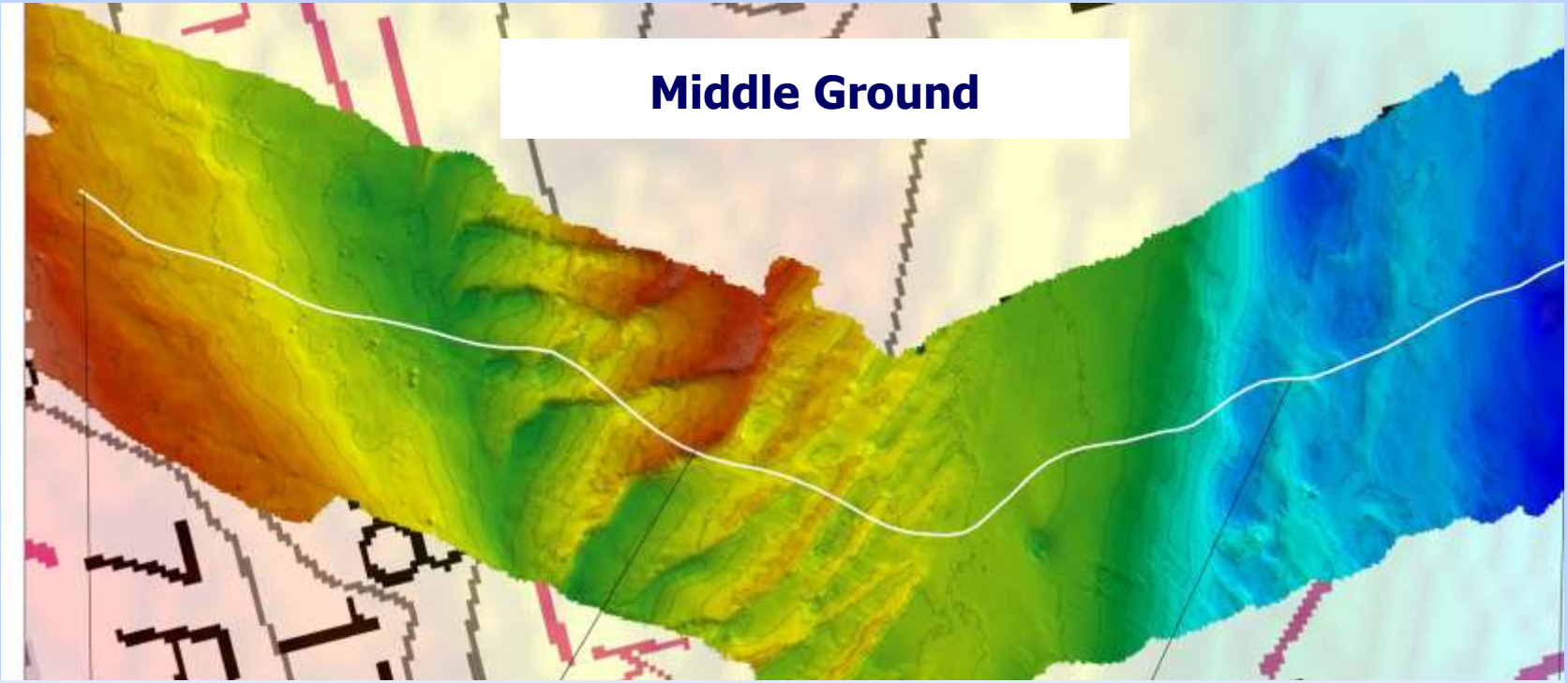
- **Licensed Captain & Mate**
- **Senior Hydrographer & Survey technician**
- **Marine Geologist**
- **Marine Biologist**
- **Marine Archaeologist**

Multibeam Bathymetry

- **Samples wide swath of bottom providing 3D-view rather than single track.**
- **Computer receives/processes data to render bathymetric map.**

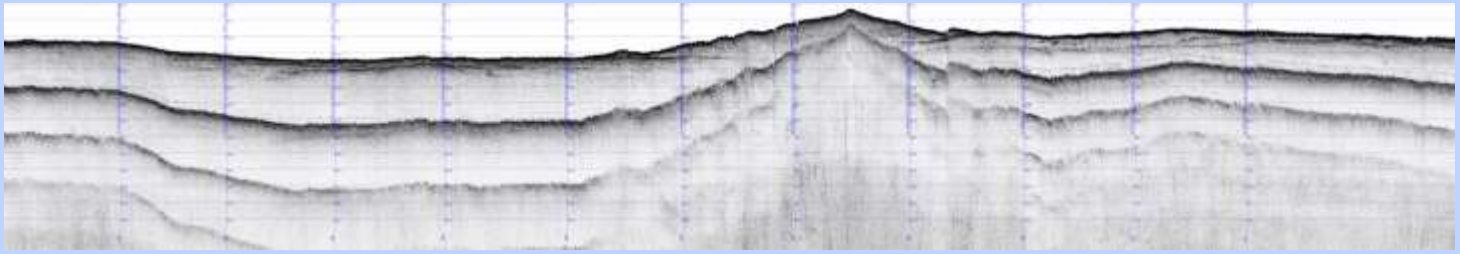


MultiBeam Bathymetry

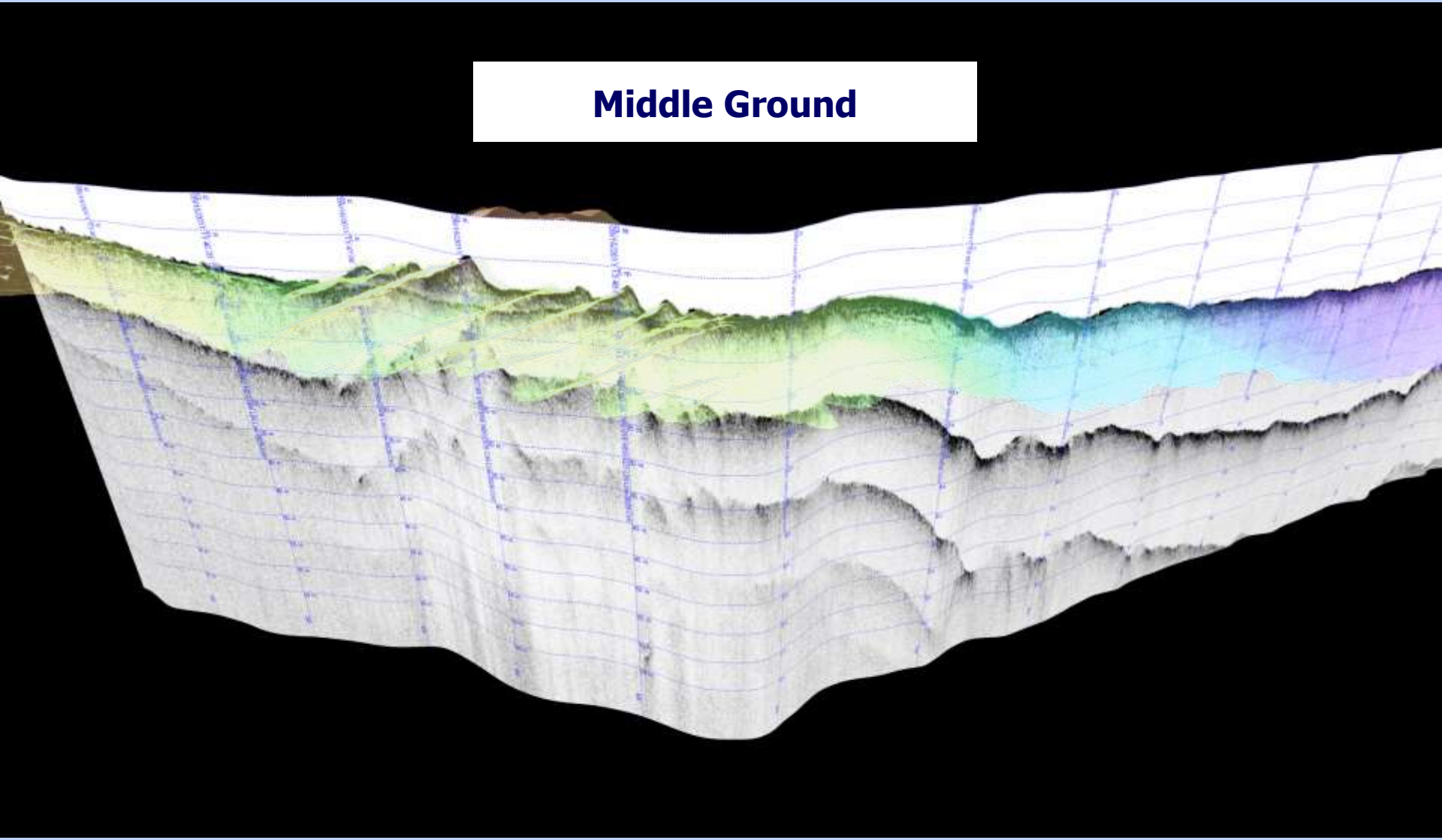


Sub-bottom Profiles

- Geological stratification
- Hard bottom evidence
- Sand wave thickness
- Buried archaeological features

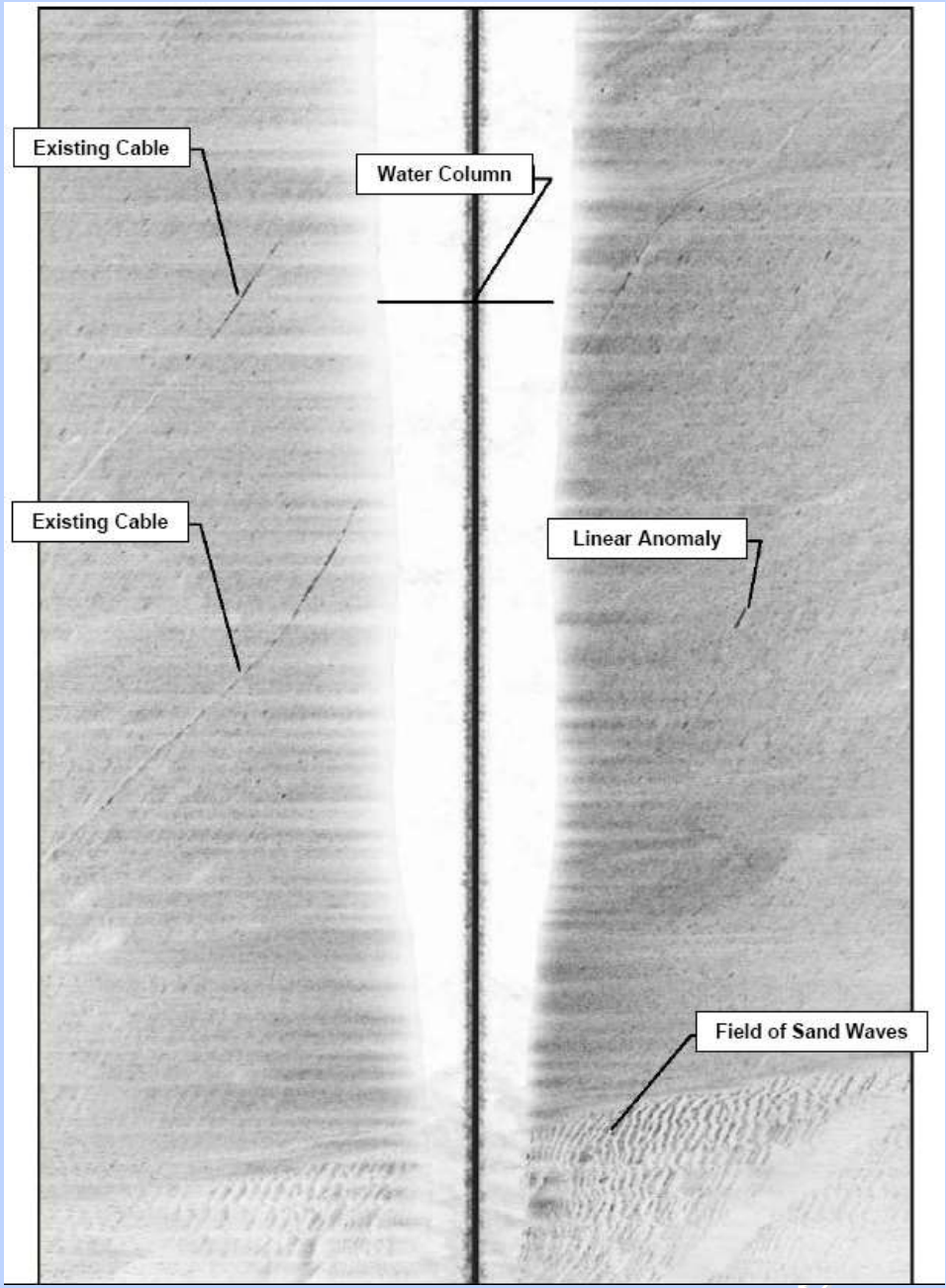


Sub-bottom Profile



Side Scan Sonar (multibeam)

- High resolution images of targets for archaeological analysis
- Provides good resolution of sand waves and other bottom features

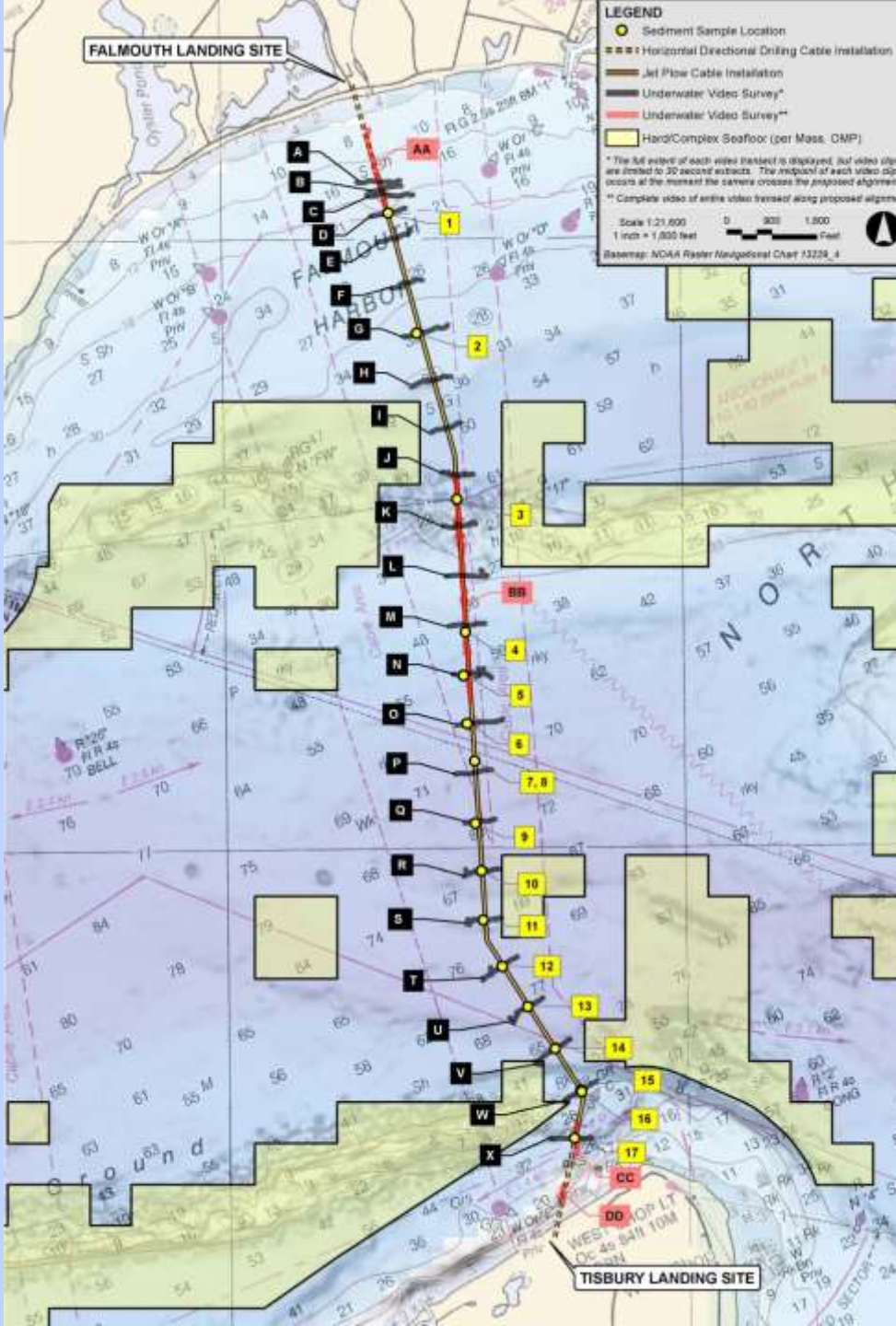


Magnetometer Survey

- **Identify metal objects in the subsurface.**
- **Used to determine if marine archaeological resources are present.**

Sediment Samples

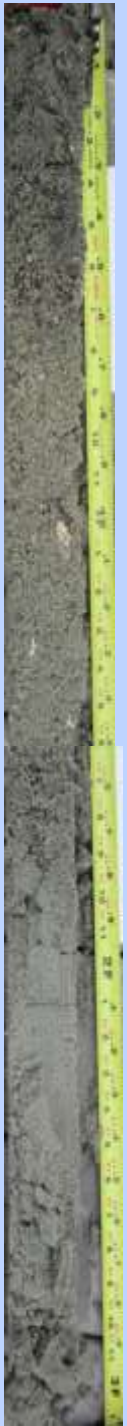
- **17 sediment sampling locations**



Sediment Sampling

Vibracore

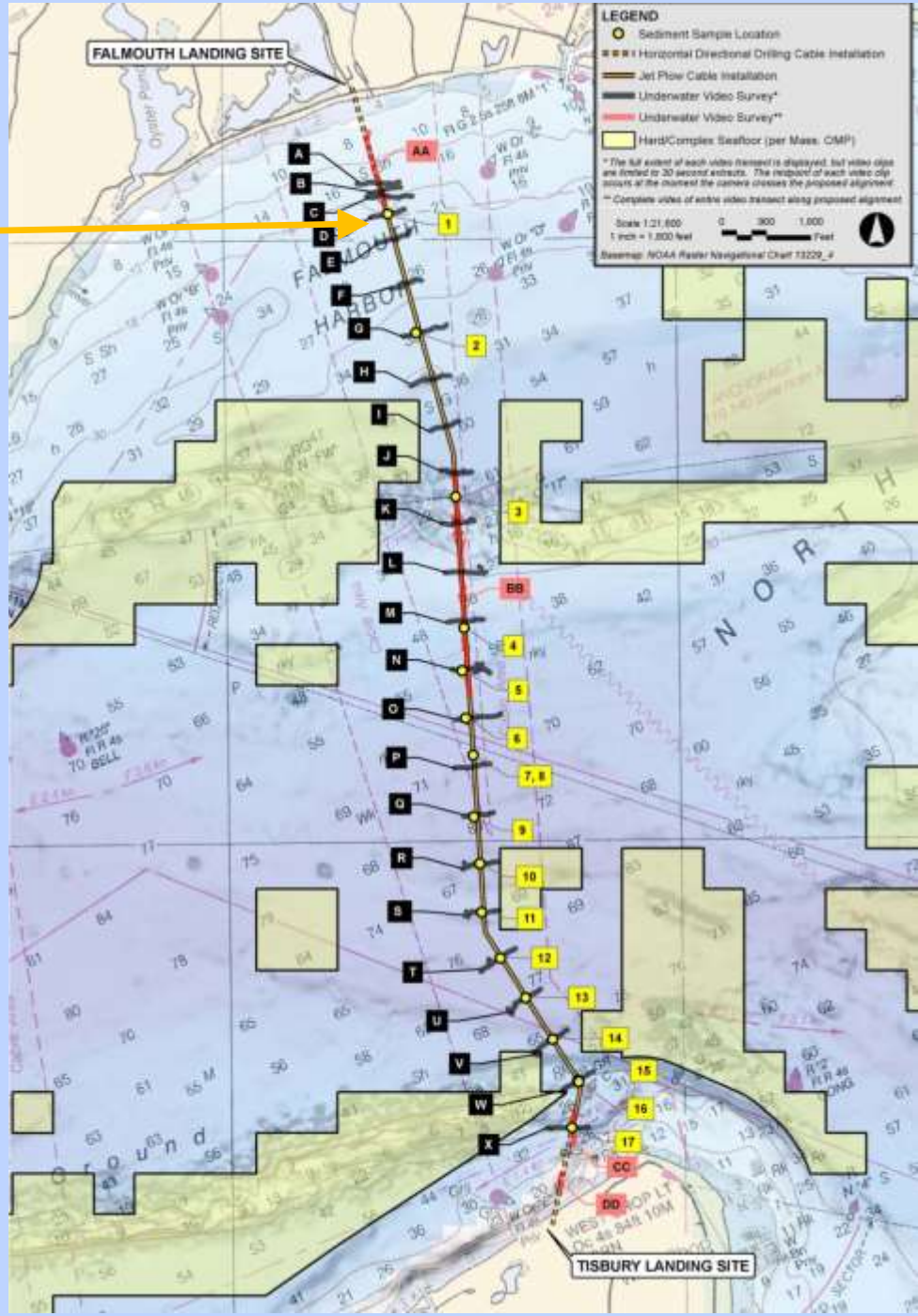
Grab Sampler



Sediment Sample 1

Moderately well sorted

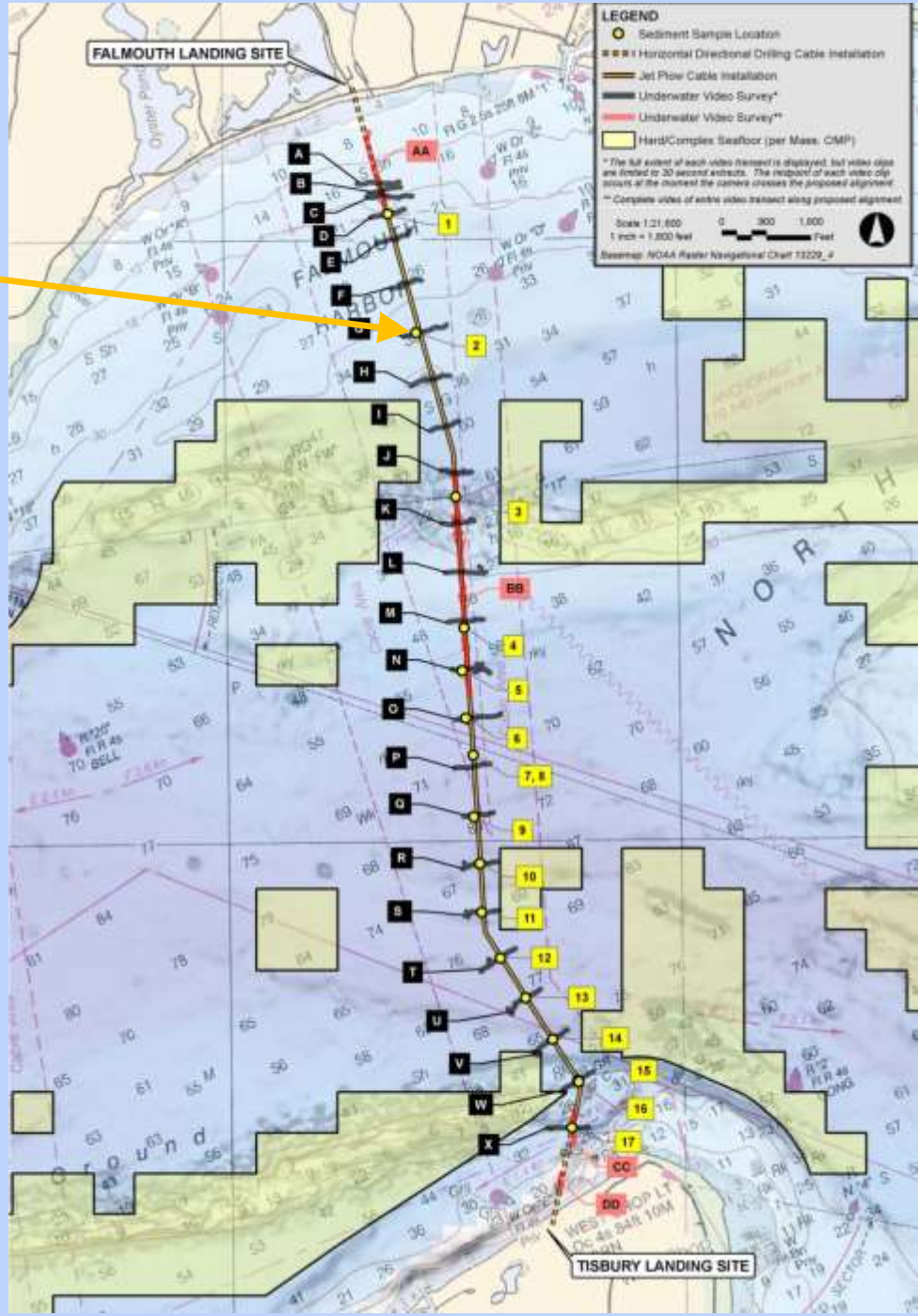
coarse sand



Sediment Sample 2

Very well sorted

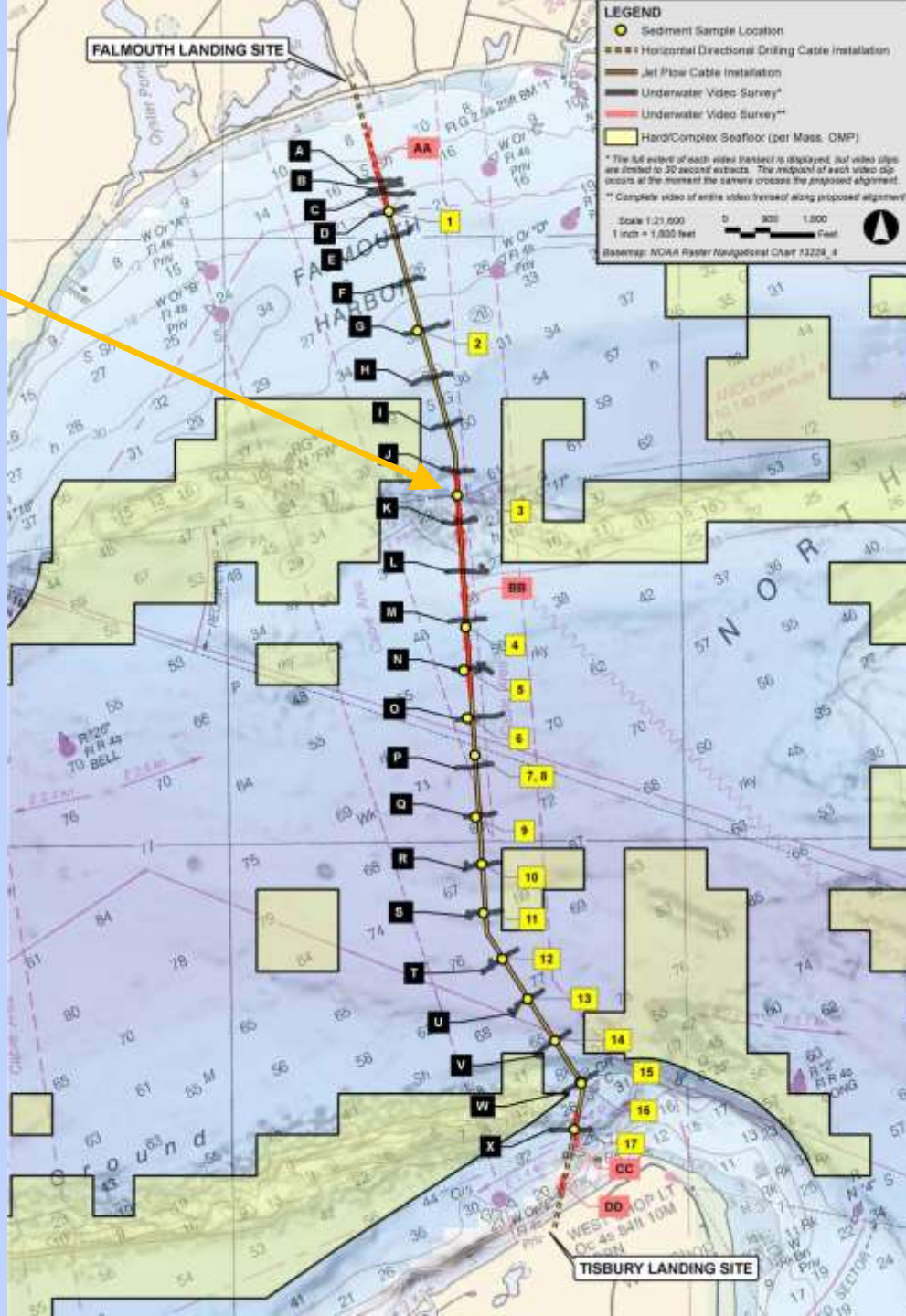
gravelly coarse sand



Sediment Sample 3

Moderately sorted

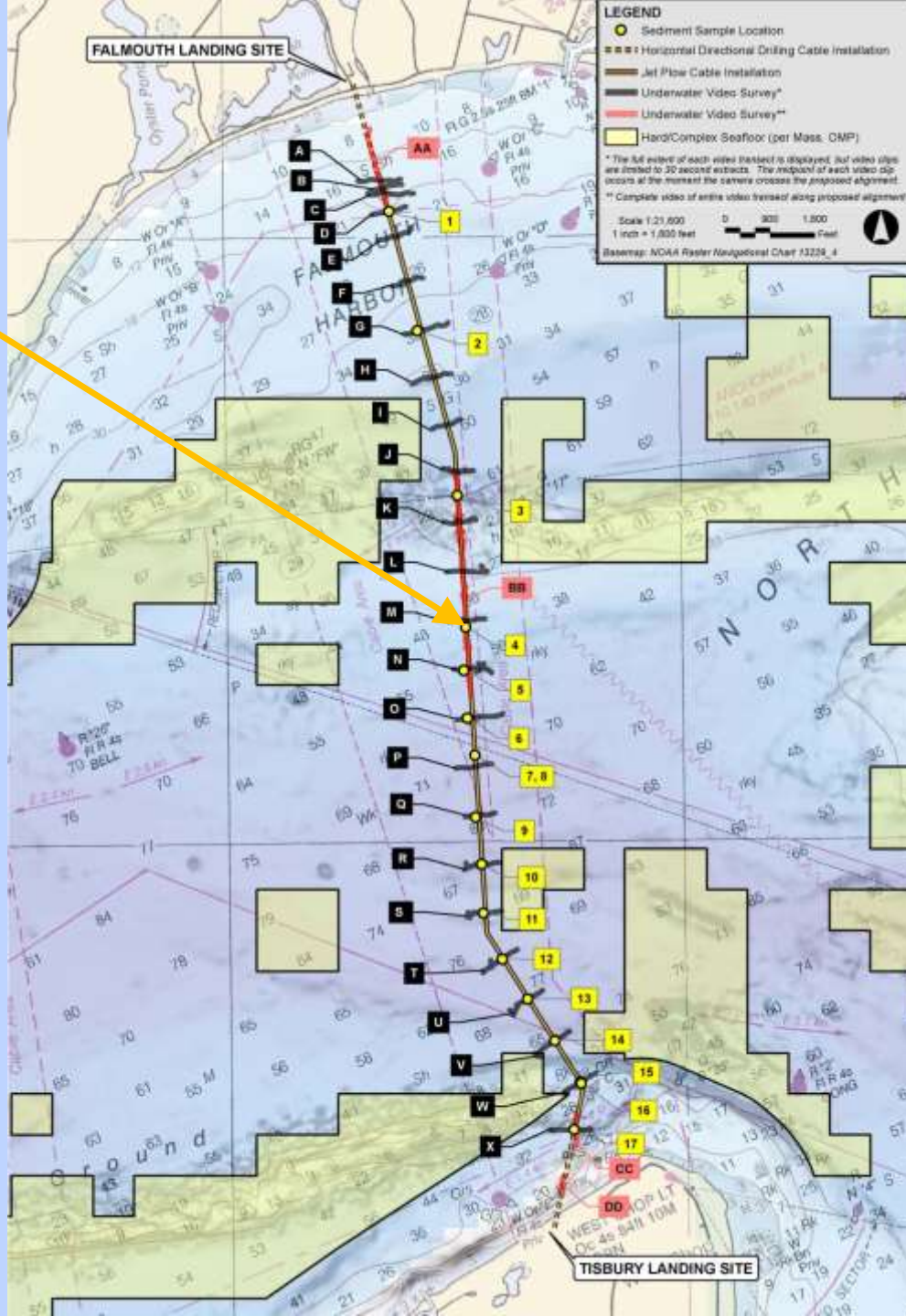
coarse to very coarse sand



Sediment Sample 4

Very well sorted

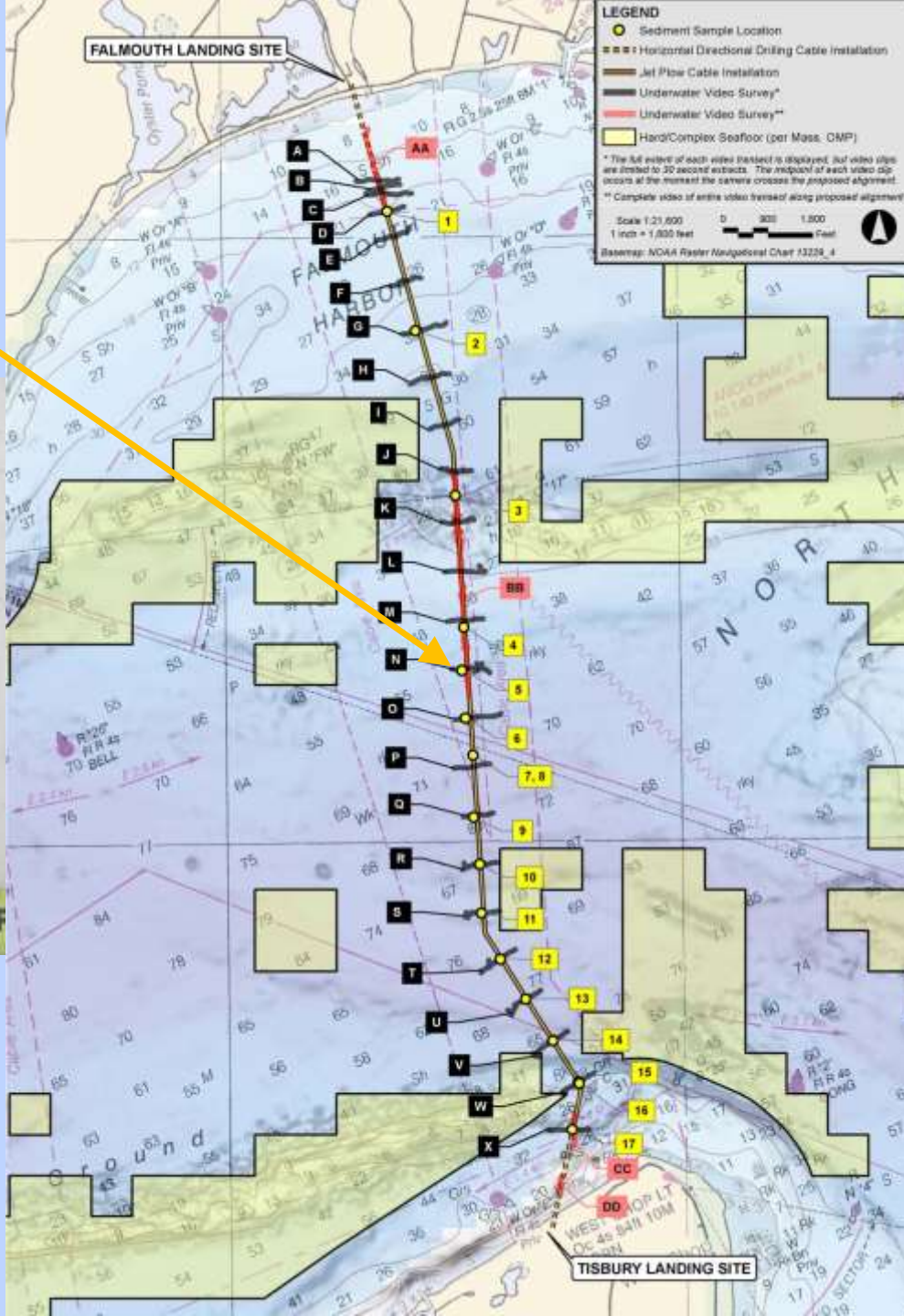
gravelly very coarse sand



Sediment Sample 5

Very well sorted gravel;

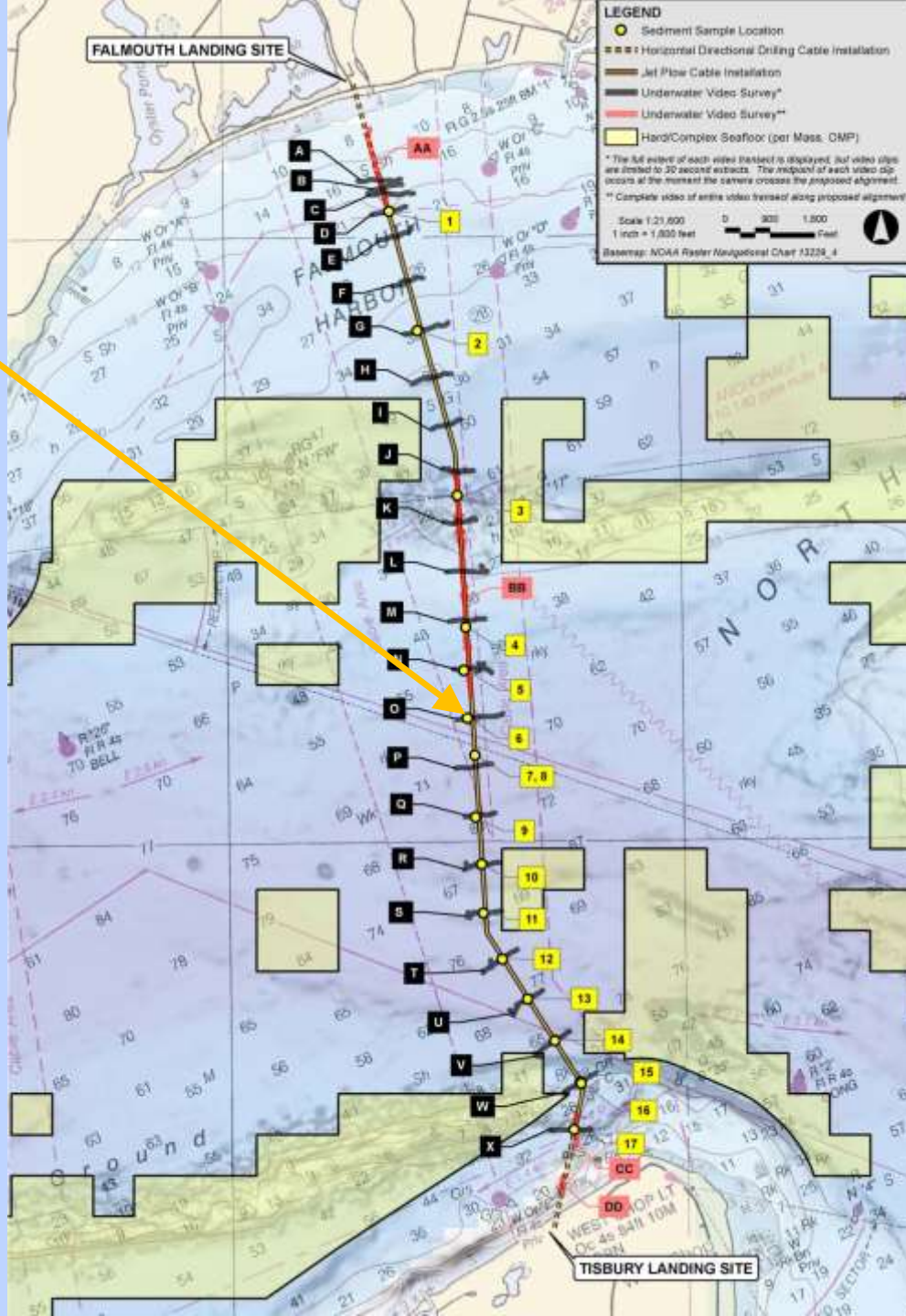
scattered cobbles



Sediment Sample 6

Moderately well sorted

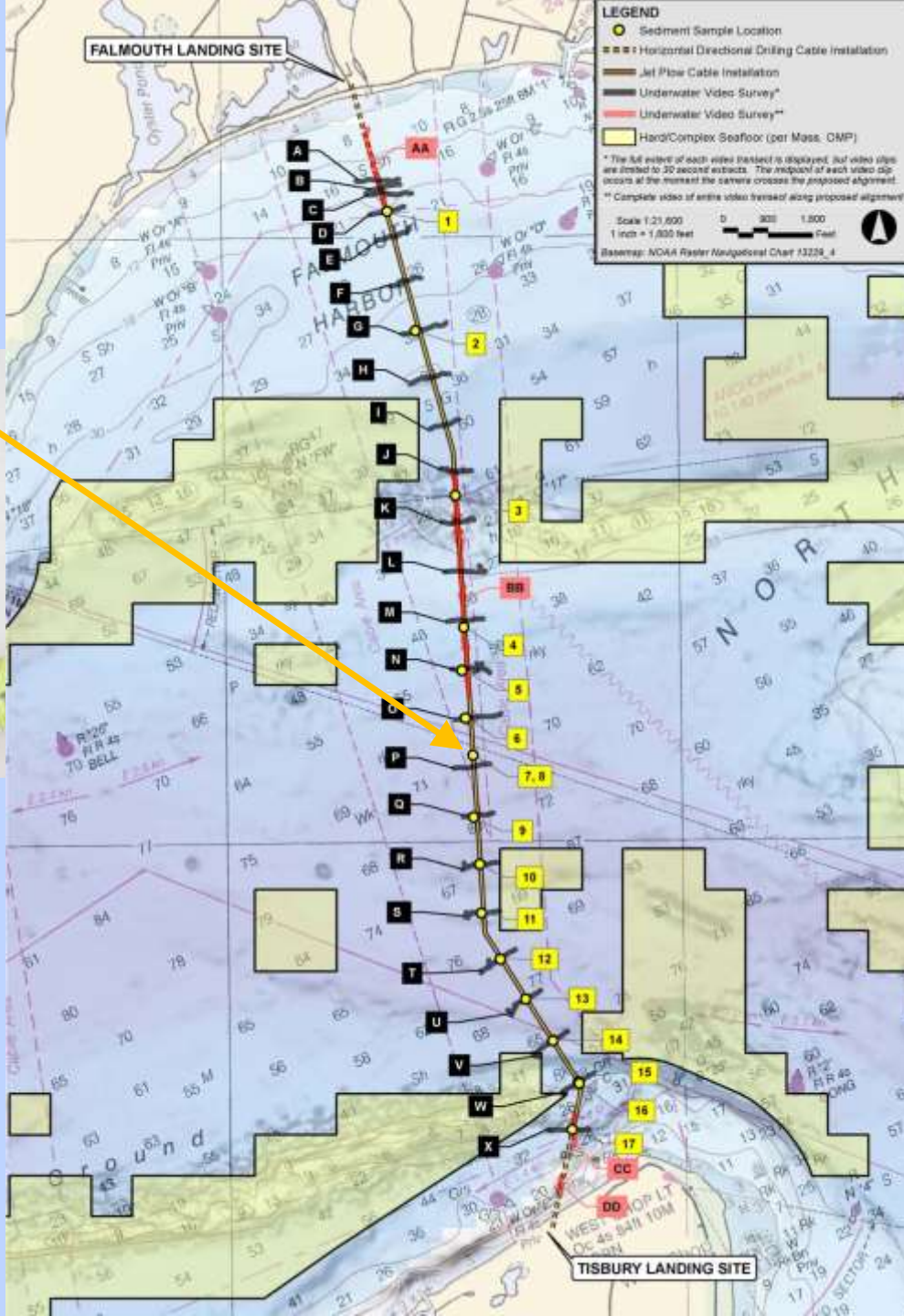
gravelly sand



Sediment Sample 7

Very well sorted

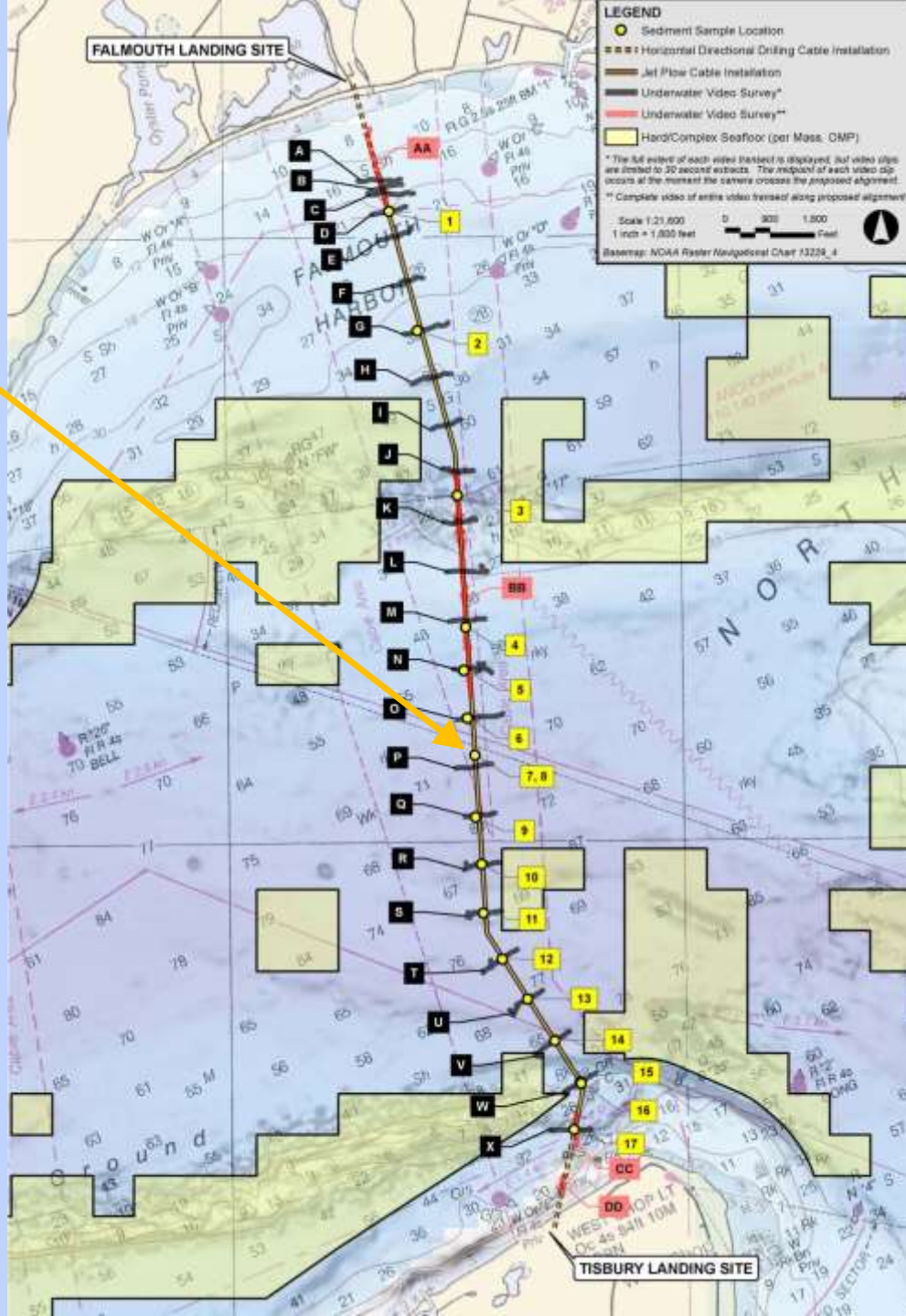
gravelly very coarse sand



Sediment Sample 8

Very well sorted

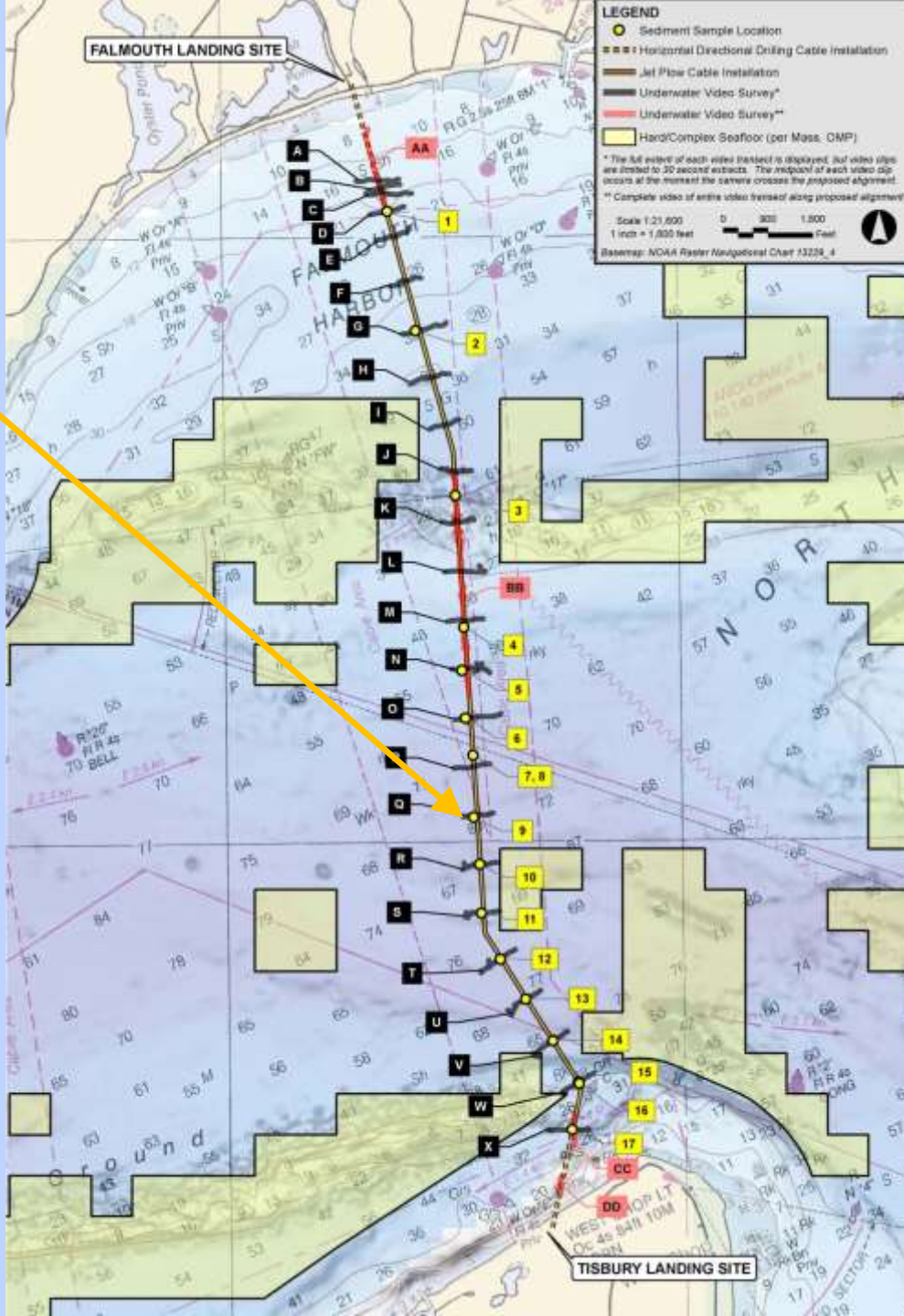
gravelly very coarse sand



Sediment Sample 9

Very well sorted gravel;

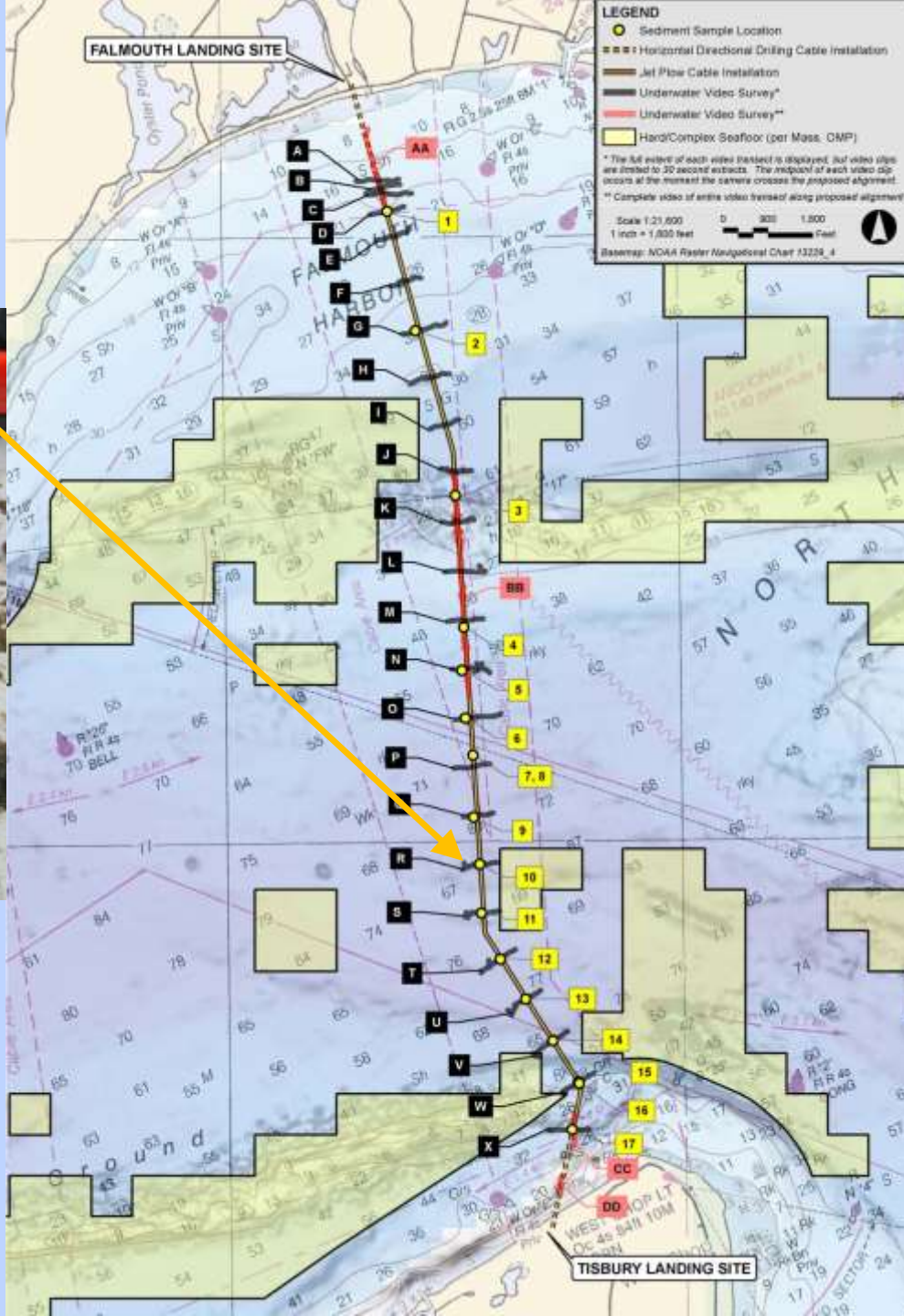
scattered cobbles



Sediment Sample 10

Very well sorted gravel;

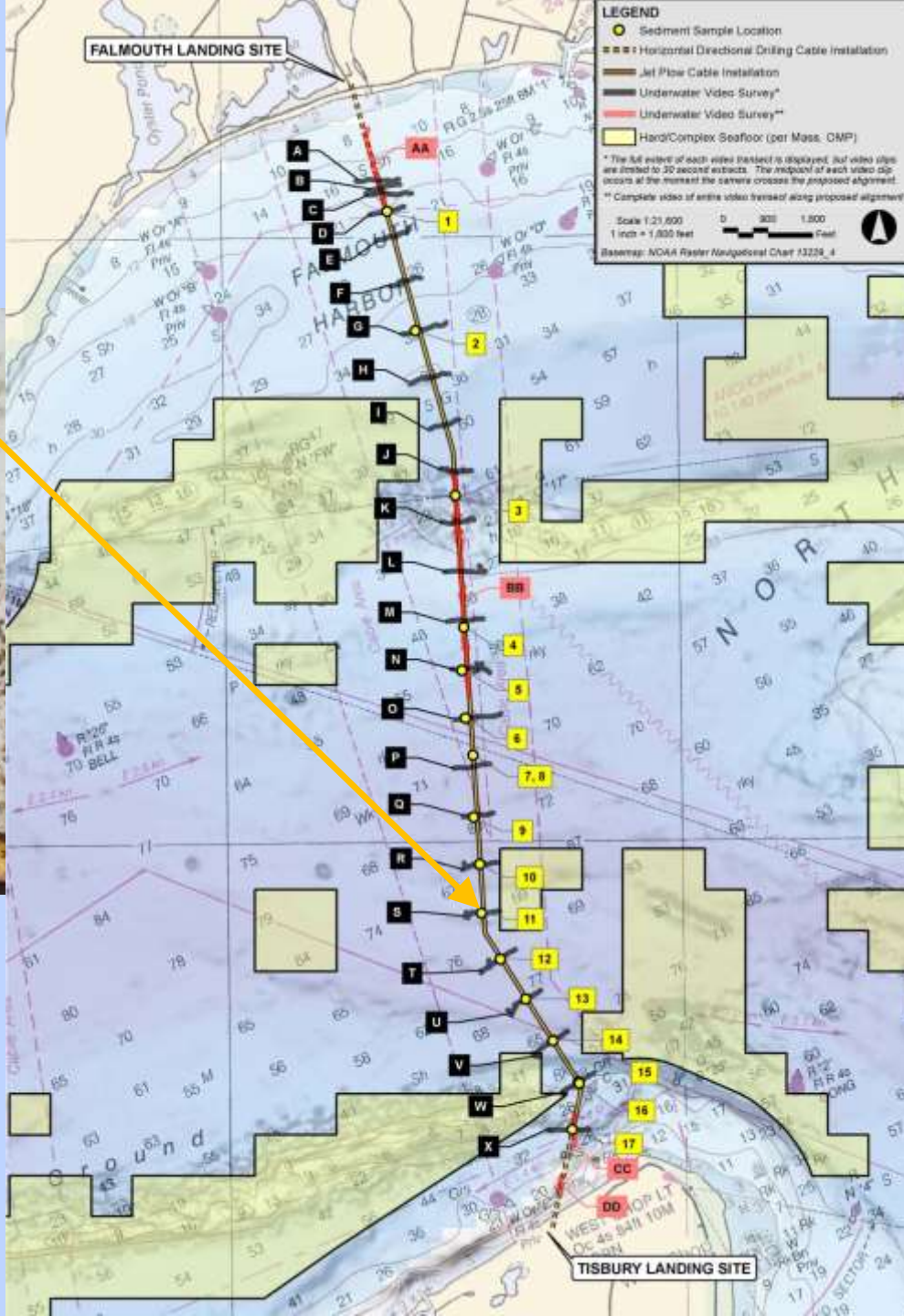
scattered cobbles



Sediment Sample 11

Very well sorted gravelly sand;

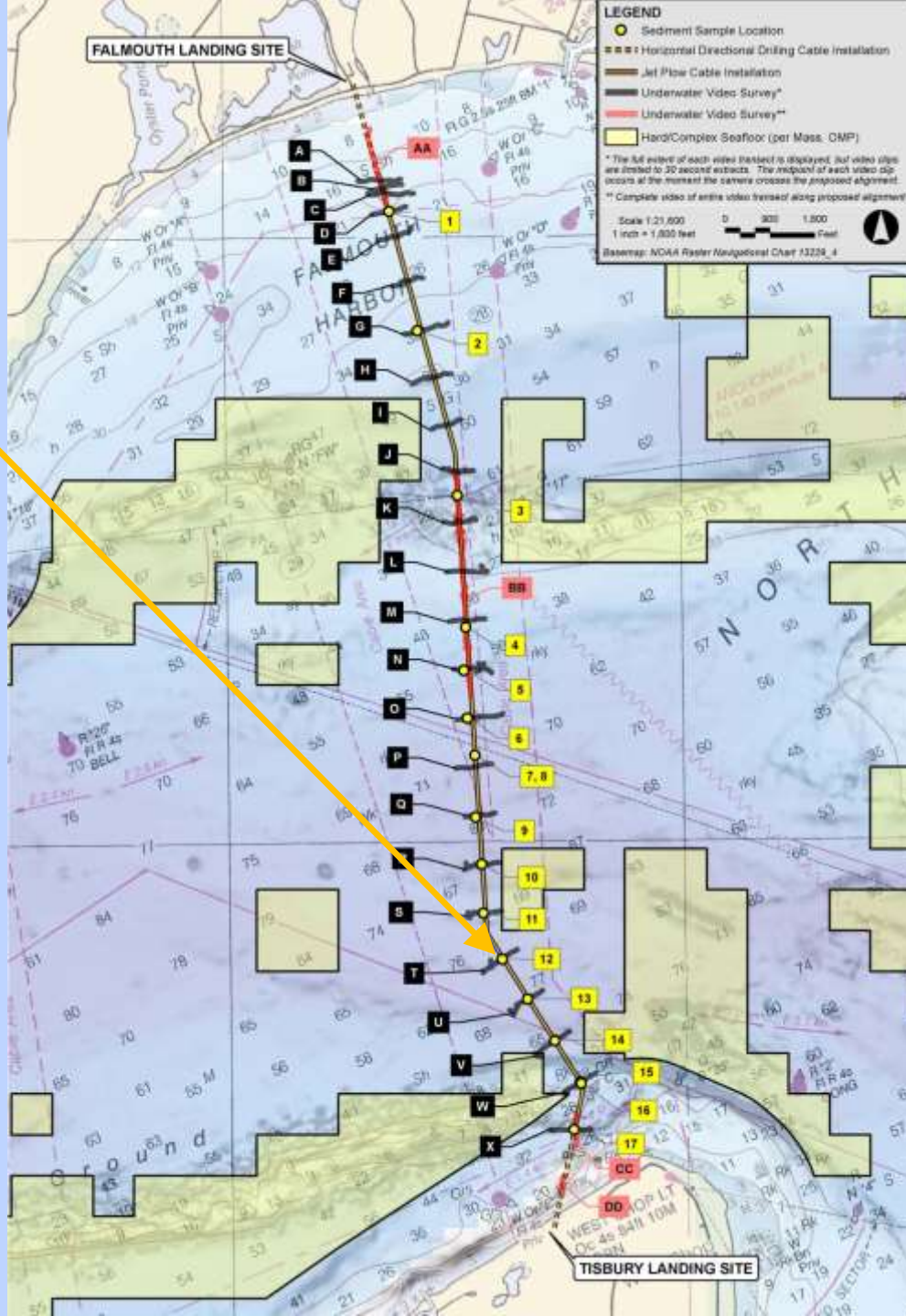
scattered cobbles



Sediment Sample 12

Very well sorted gravel;

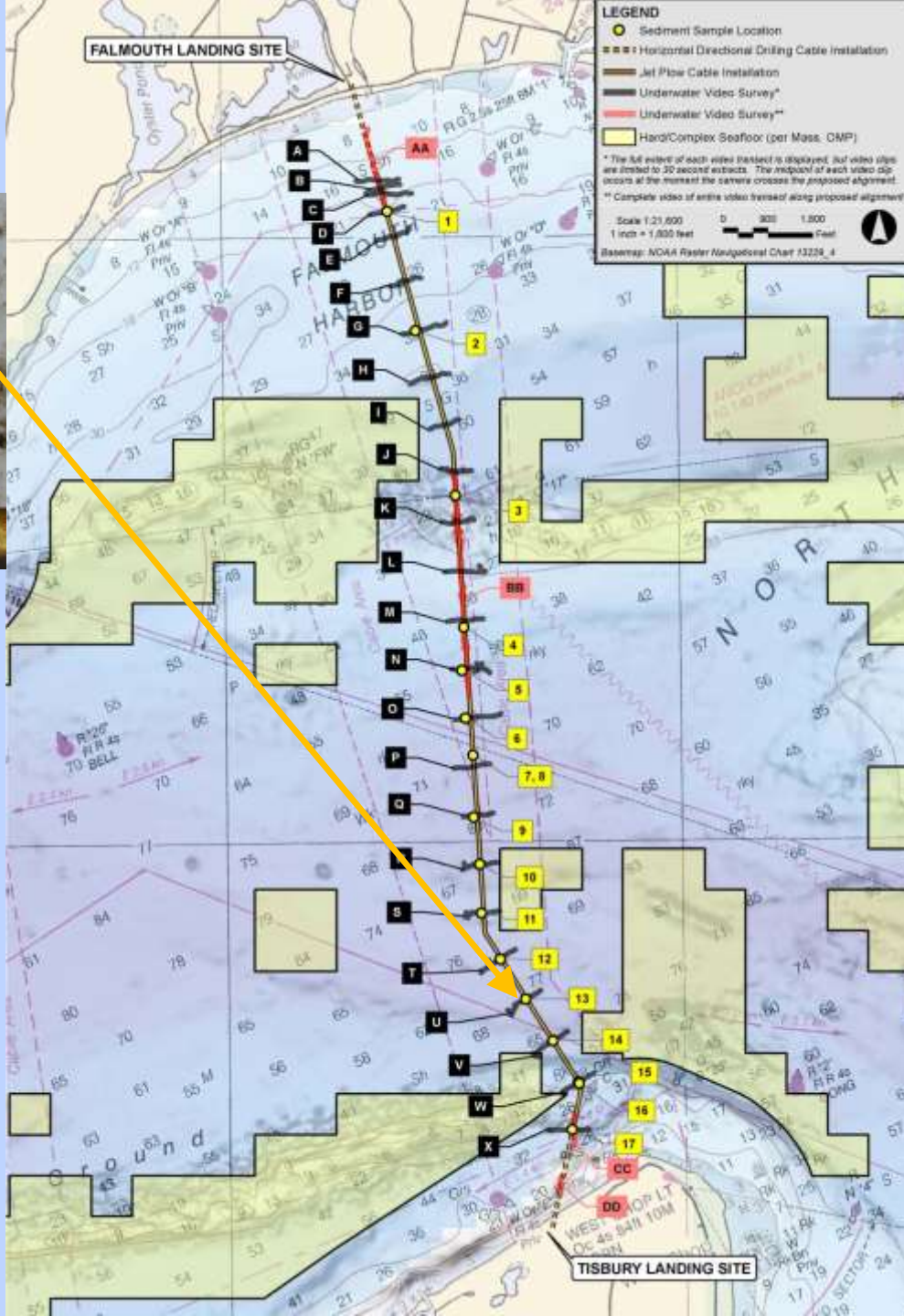
scattered cobbles



Sediment Sample 13

Very well sorted gravel;

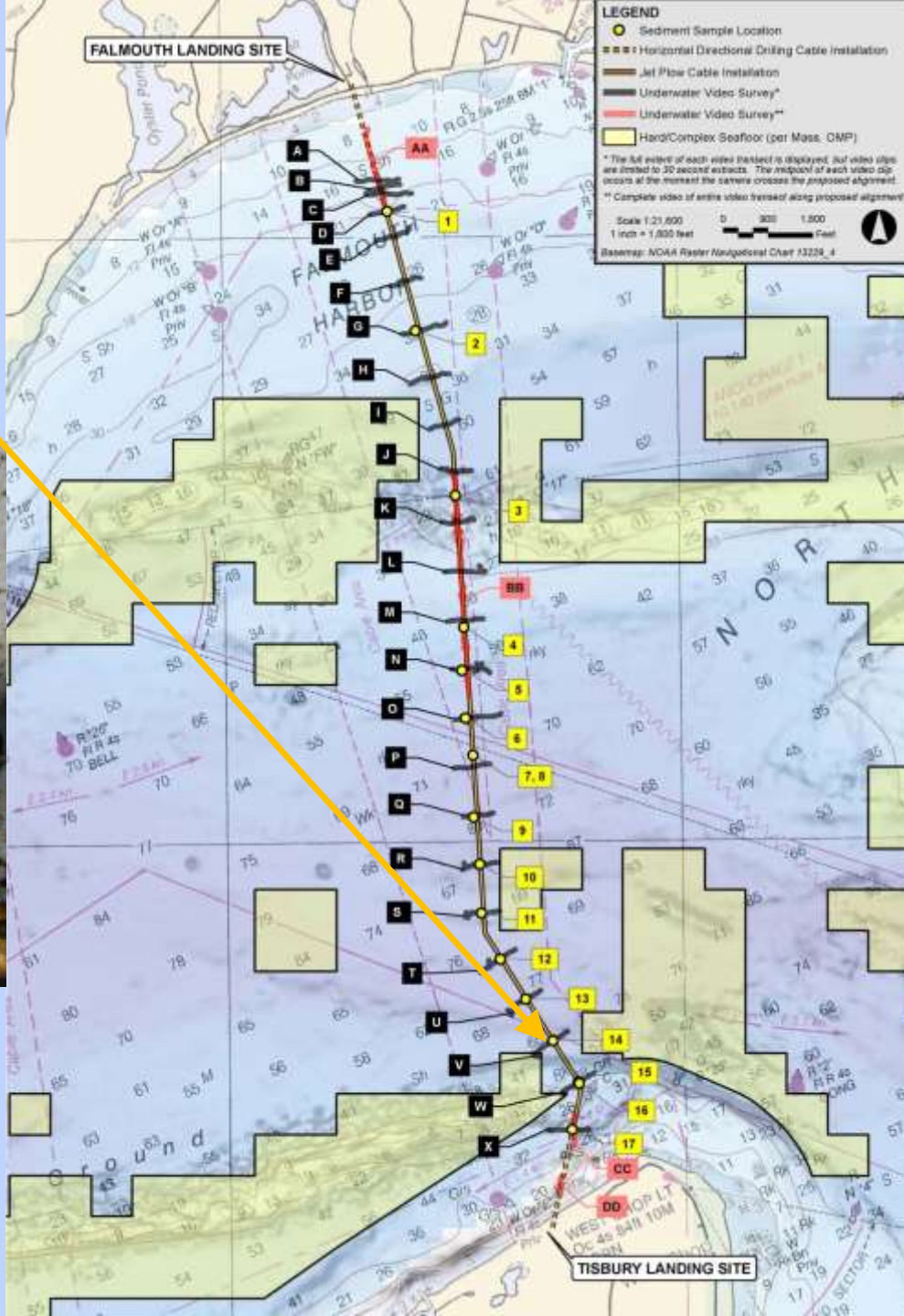
scattered cobbles and boulders



Sediment Sample 14

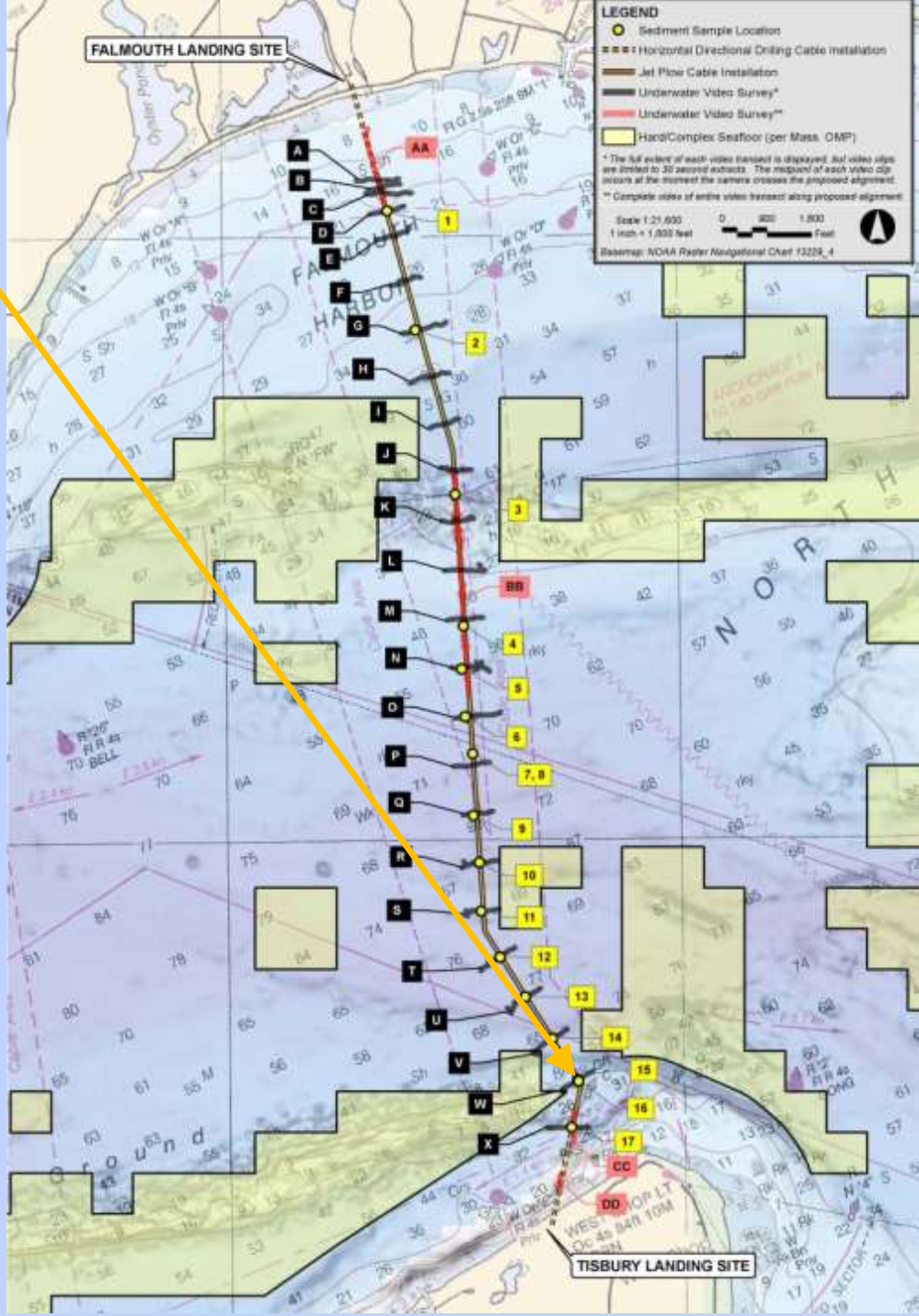
Very well sorted gravel;

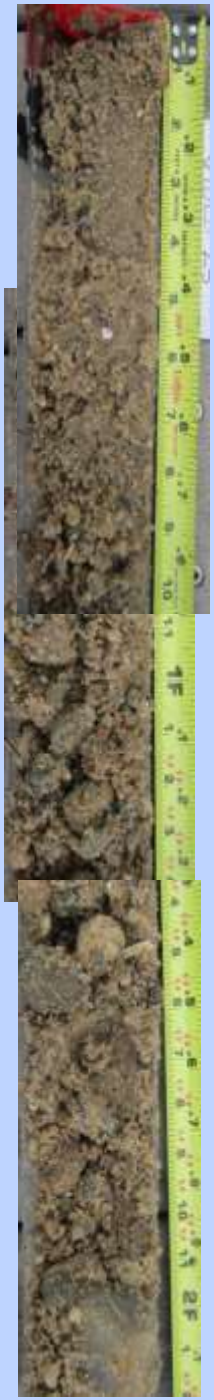
scattered cobbles



Sediment Sample 15

Moderately well sorted coarse sand

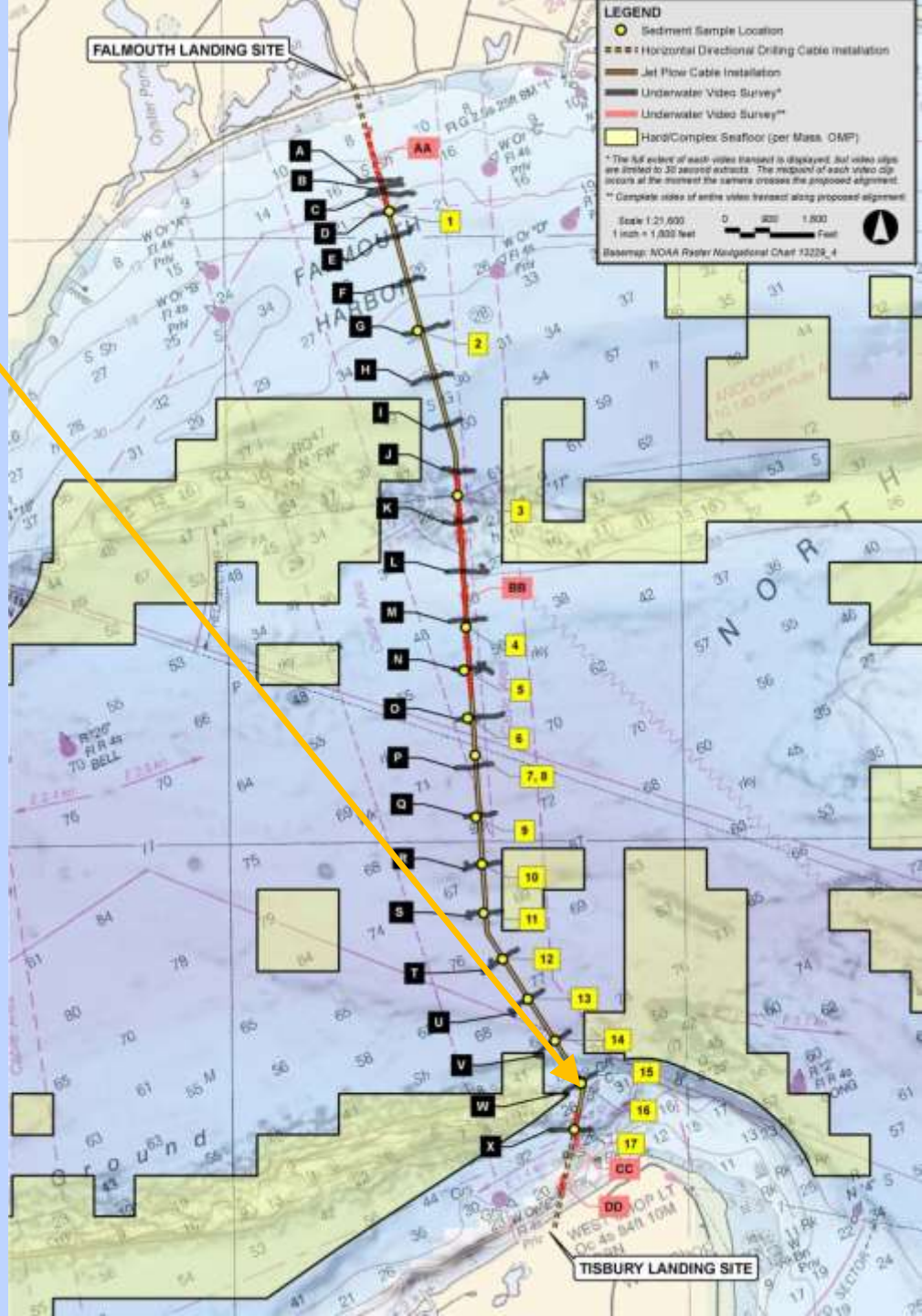




Sediment Sample 16

Moderately sorted

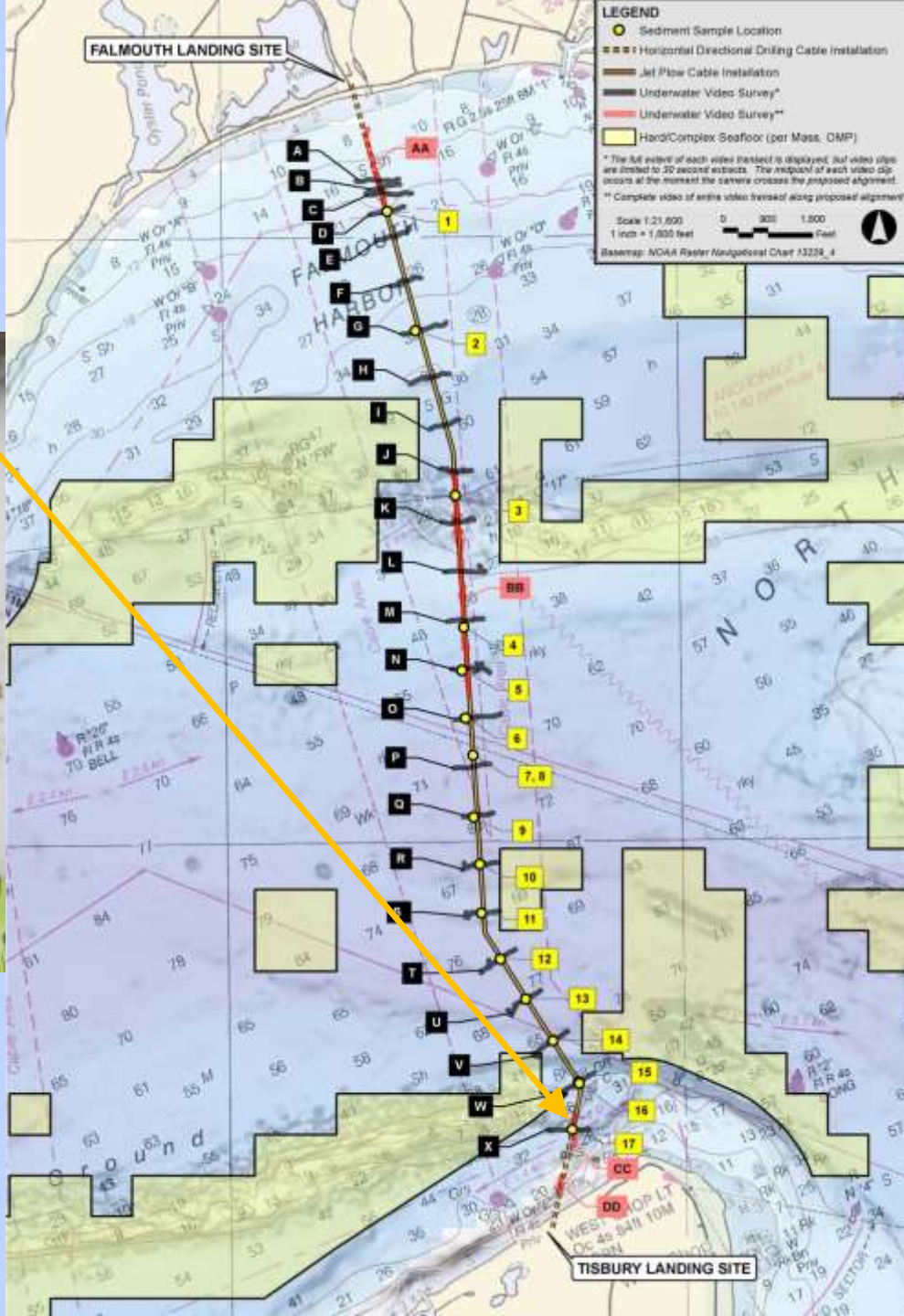
gravelly very coarse sand



Sediment Sample 17

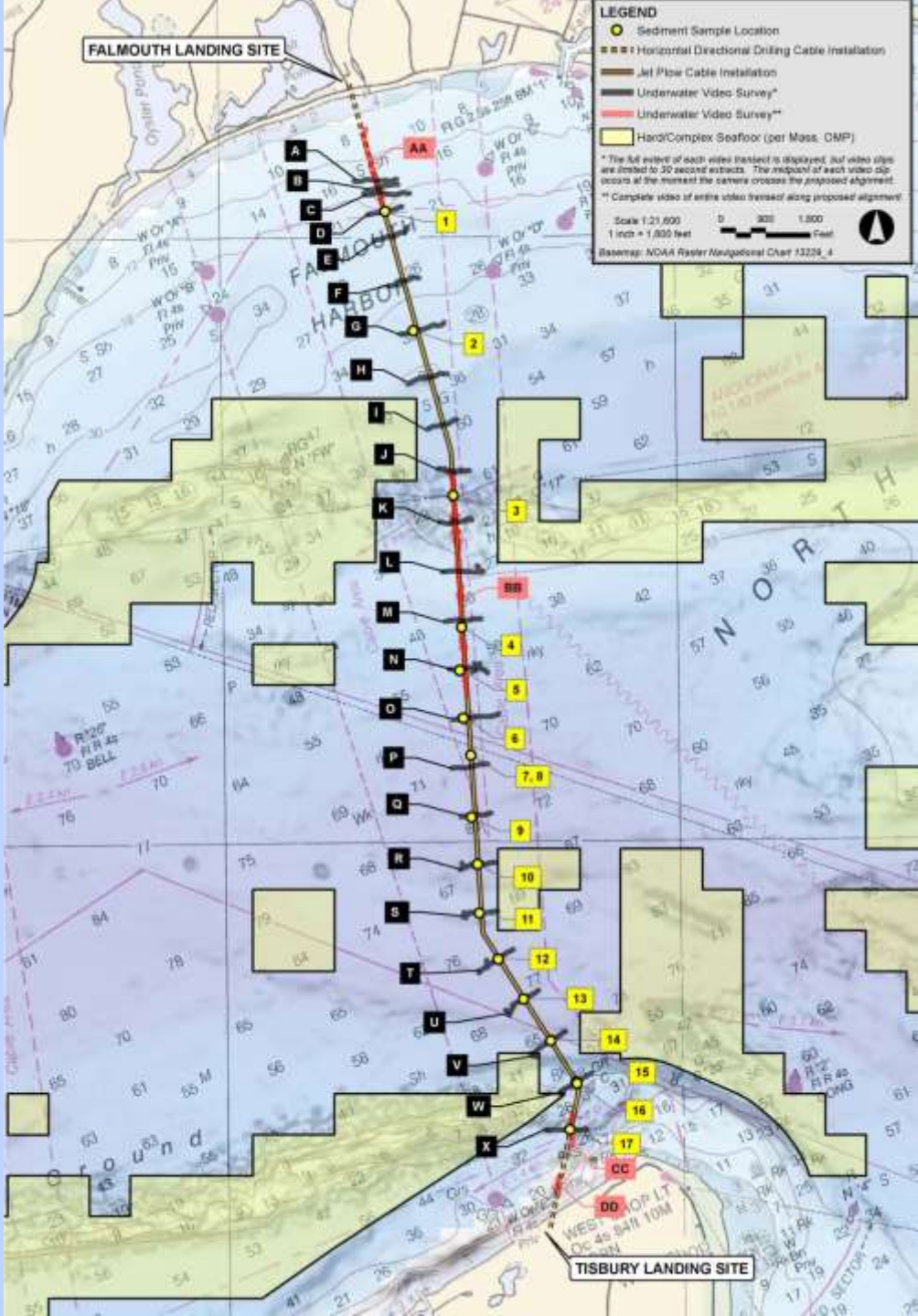
Very well sorted

very coarse sand



Underwater Videos

- **24 video transects (A – X)**
  - ***(300 m spacing)***



Underwater Video

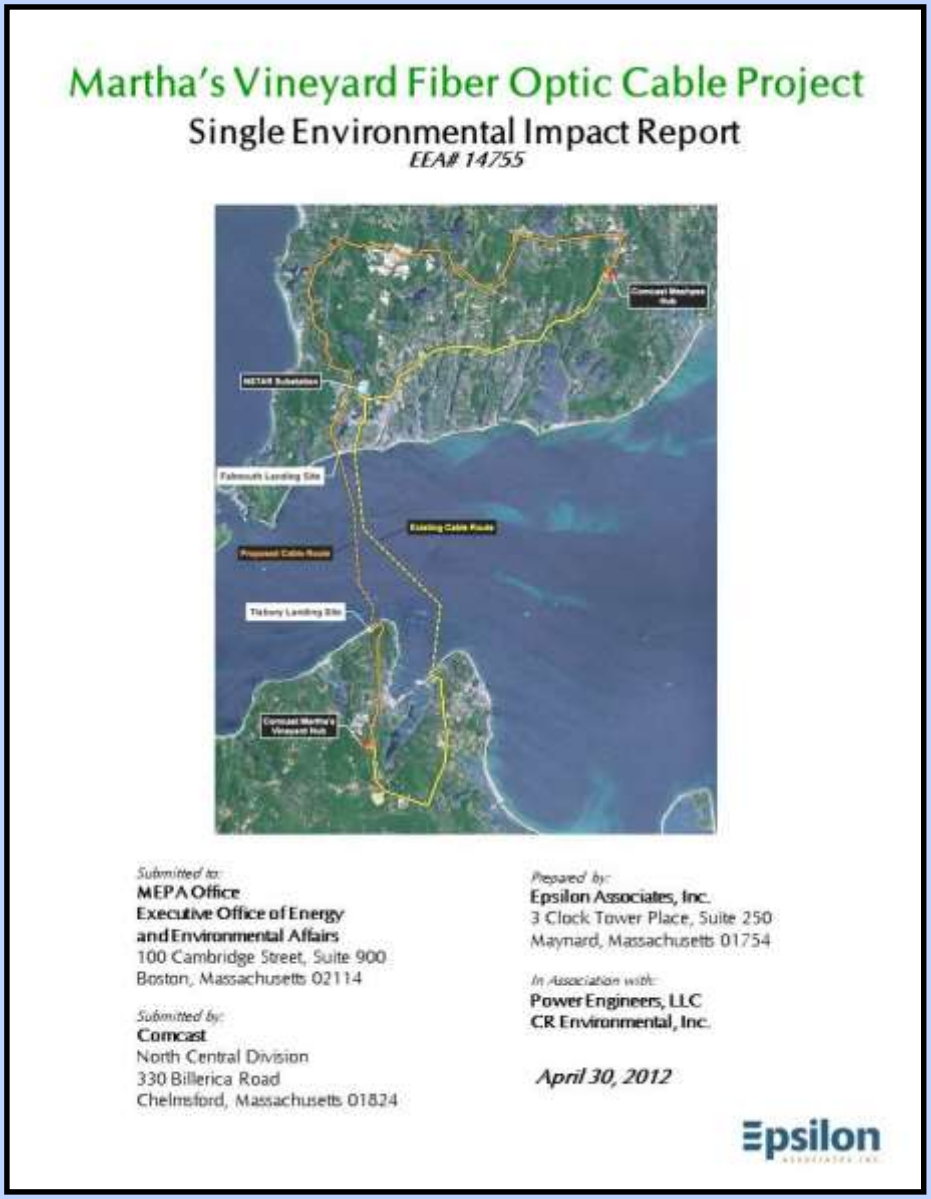
- Eelgrass mapping
- Marine biota mapping
- Sediment characteristics

Eelgrass & red algae

Sand ripples
No marine biota

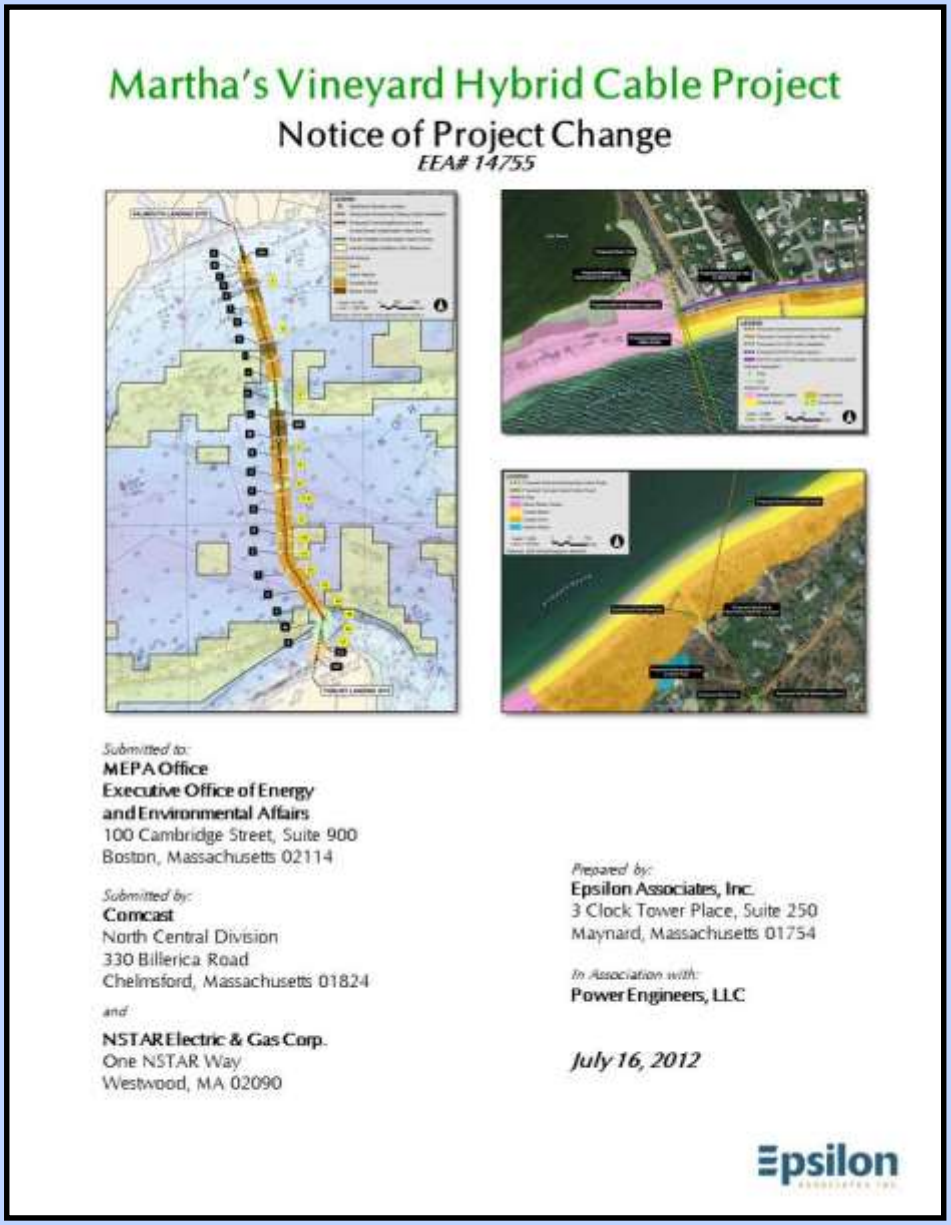
Gravel bottom
Encrusting ascidian

MEPA – Single EIR



- **Certificate issued June 15, 2012**
- **Adequately and properly complies with MEPA**
- **DMF - no Time-of-Year restrictions required - HDD extends beyond eelgrass beds**
- **NHESP - Piping Plover and Least Tern Habitat on MV - HDD avoids impact to habitat.**

MEPA – NPC



- **Comcast and NSTAR - bundle fiber optic and electric in single 5.5" diameter hybrid cable**
- **Certificate on NPC issued: August 24, 2012**
- **MEPA:**
  - **Change does not require a Supplemental EIR**
  - **Installation methods/ equipment remain unchanged**

MEPA Public Benefit Determination

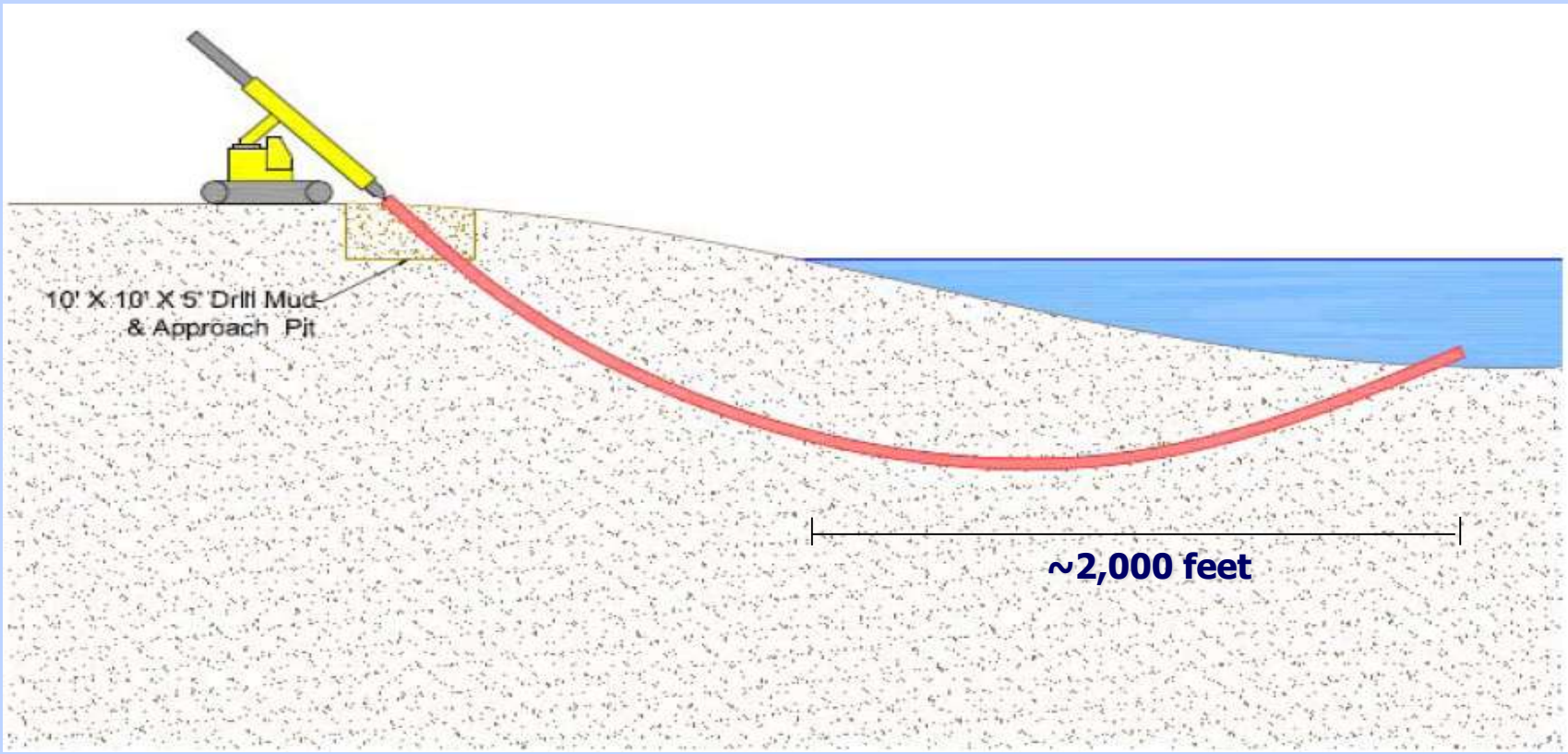
- **Certificate issued: September 28, 2012**
- **Secretary's findings:**
  - **Project will have public benefit**
  - **Positive effect - redundant communication service**
  - **Route selection/proposed construction mitigation measures avoids adverse impacts to SSU resources**
  - **No adverse impacts to public health, safety, or welfare**

CONSTRUCTION

Falmouth HDD Staging

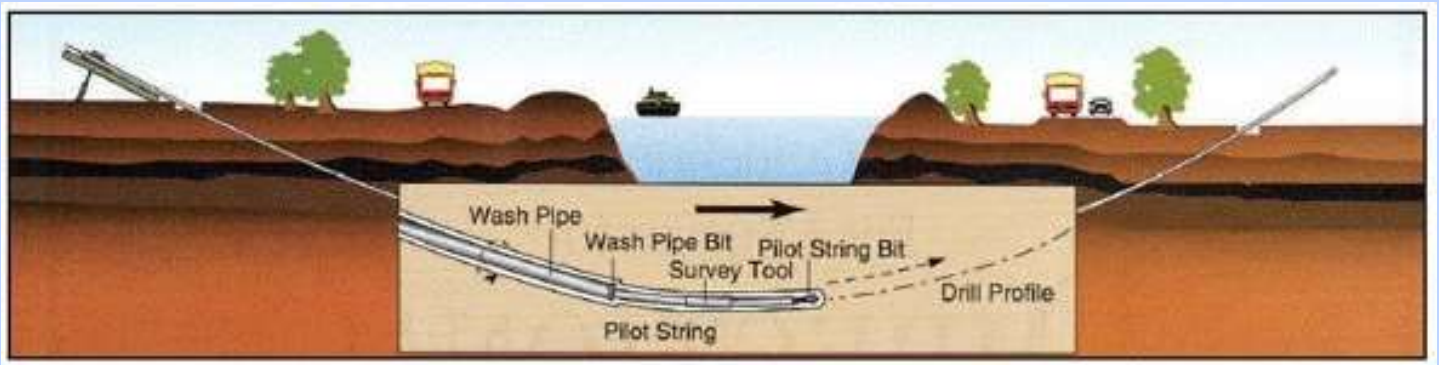
Horizontal Directional Drilling (HDD)

- HDD eliminates need for open excavation through the sensitive shore and nearshore zone
- avoids eelgrass beds

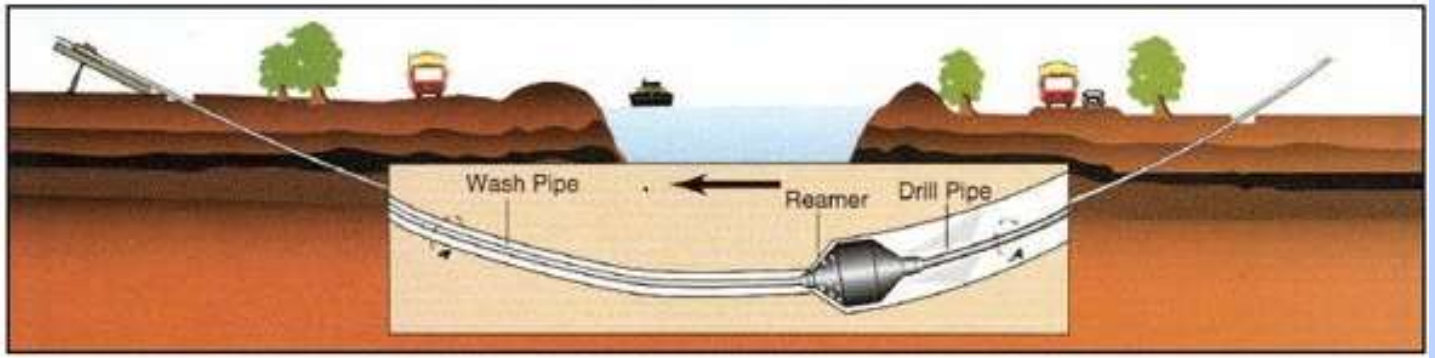


Horizontal Directional Drilling (HDD)

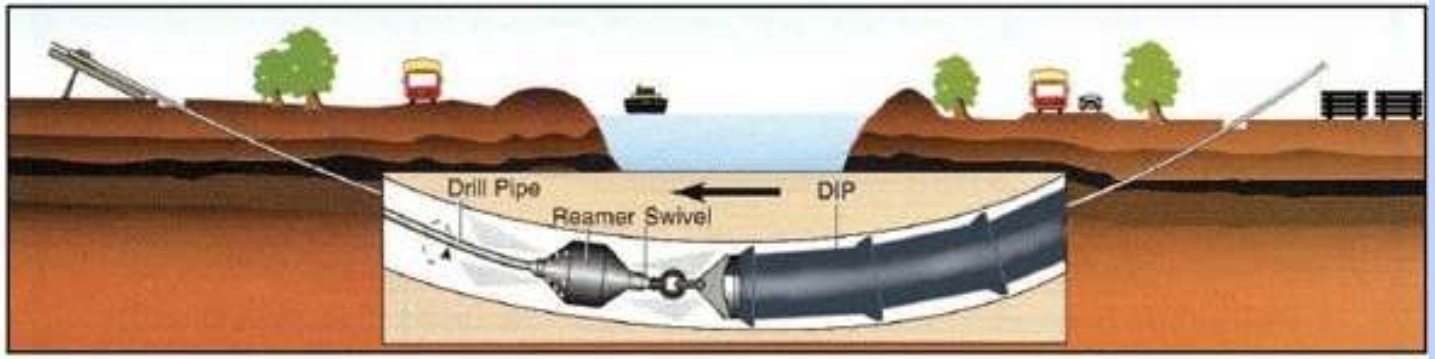
HDD Process



PILOT HOLE

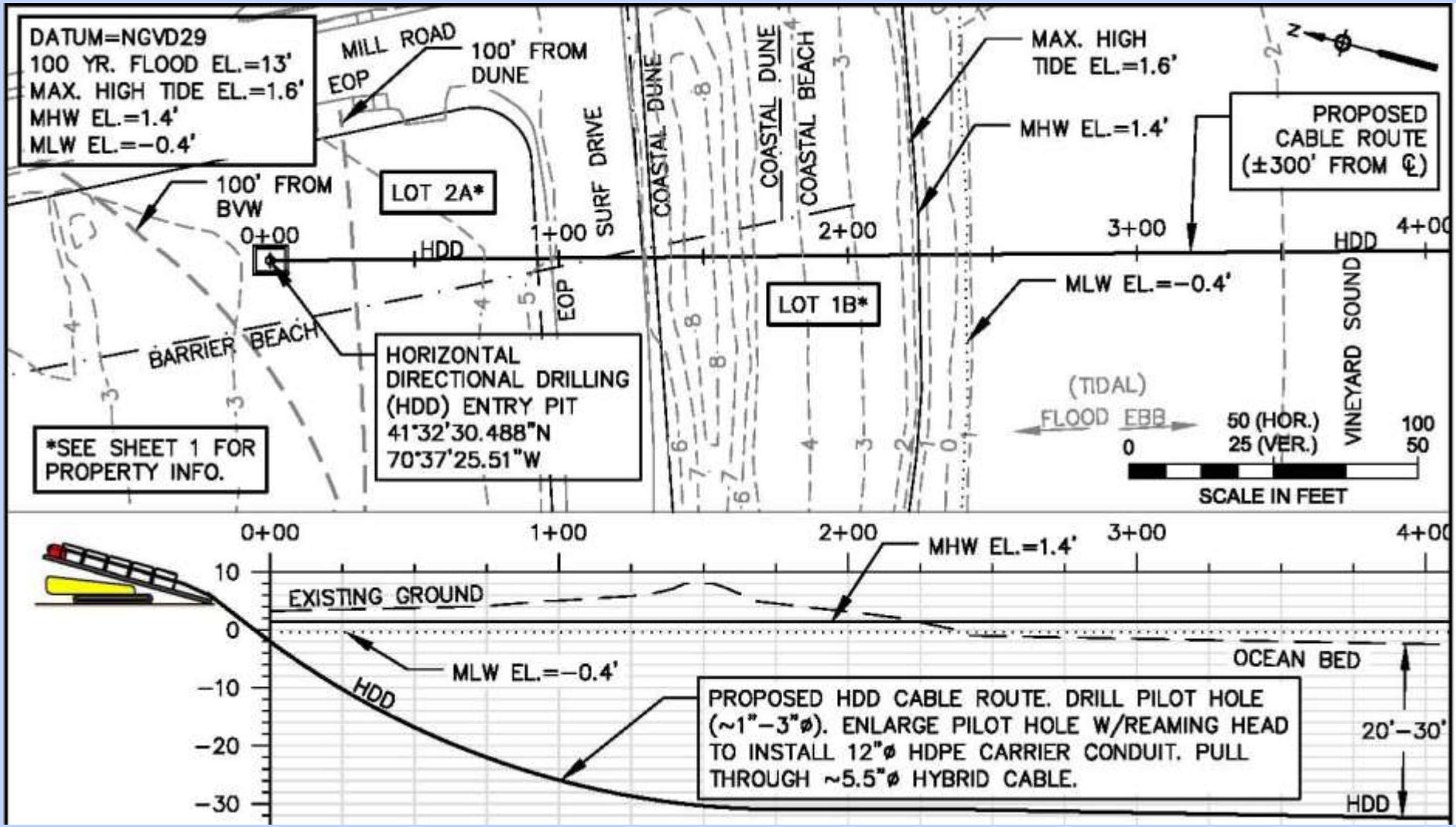


PRE-REAMING



PULL-BACK

Falmouth HDD



Drill Mud

Purpose of Mud:

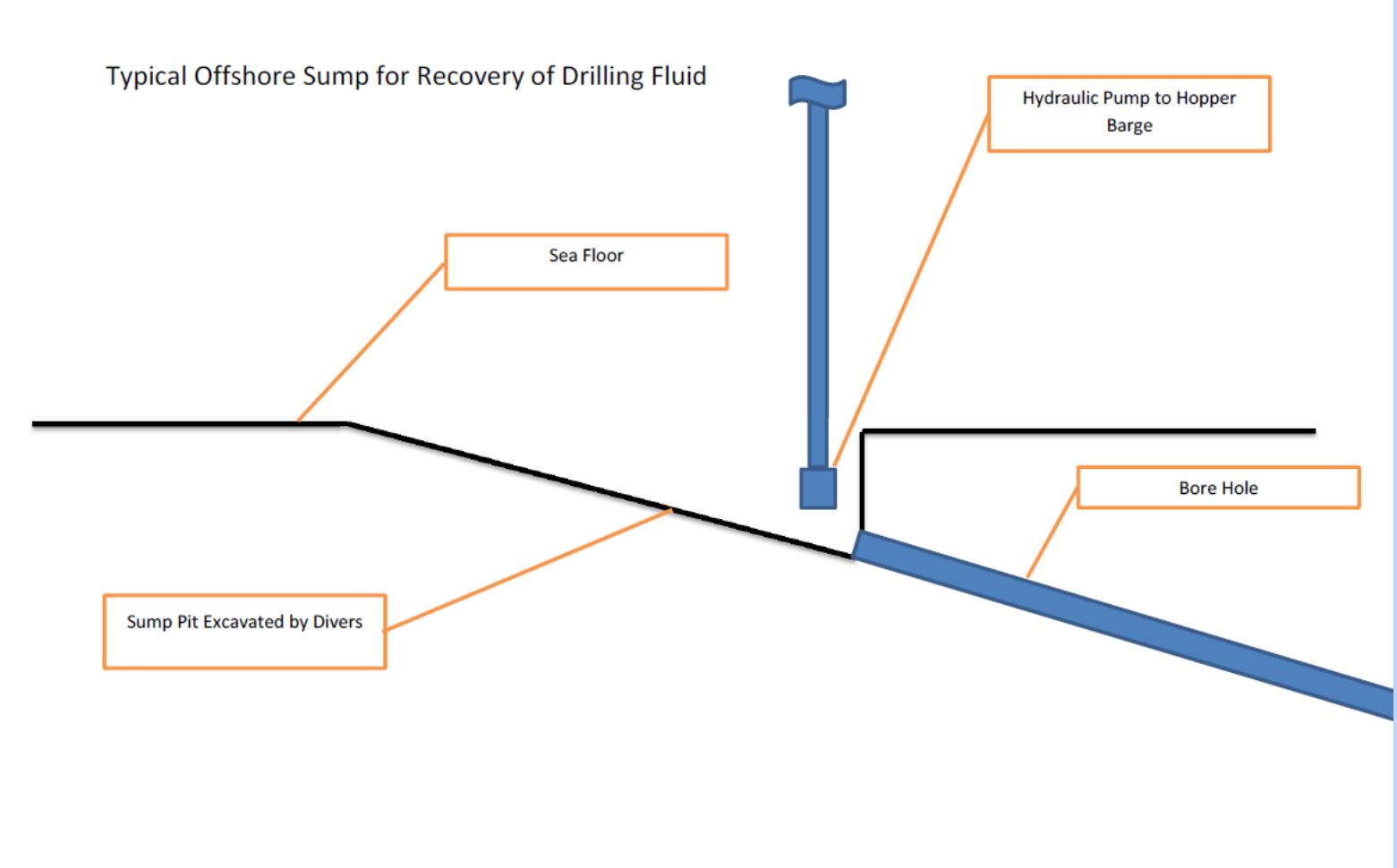
- **Bring back cuttings**
- **Cools & lubricates drill head**
- **Seals & maintains hole stability**

Mud Composition:

- **Bentonite - Montmorillonite clay mineral**
  - ***expands greatly (15 times in volume) when water is added***
- **Polymers**
  - ***Chemical compound - adds viscosity & lubricity to mud – Polymers are used in ice cream, starches, and cellulose.***
- **Water**

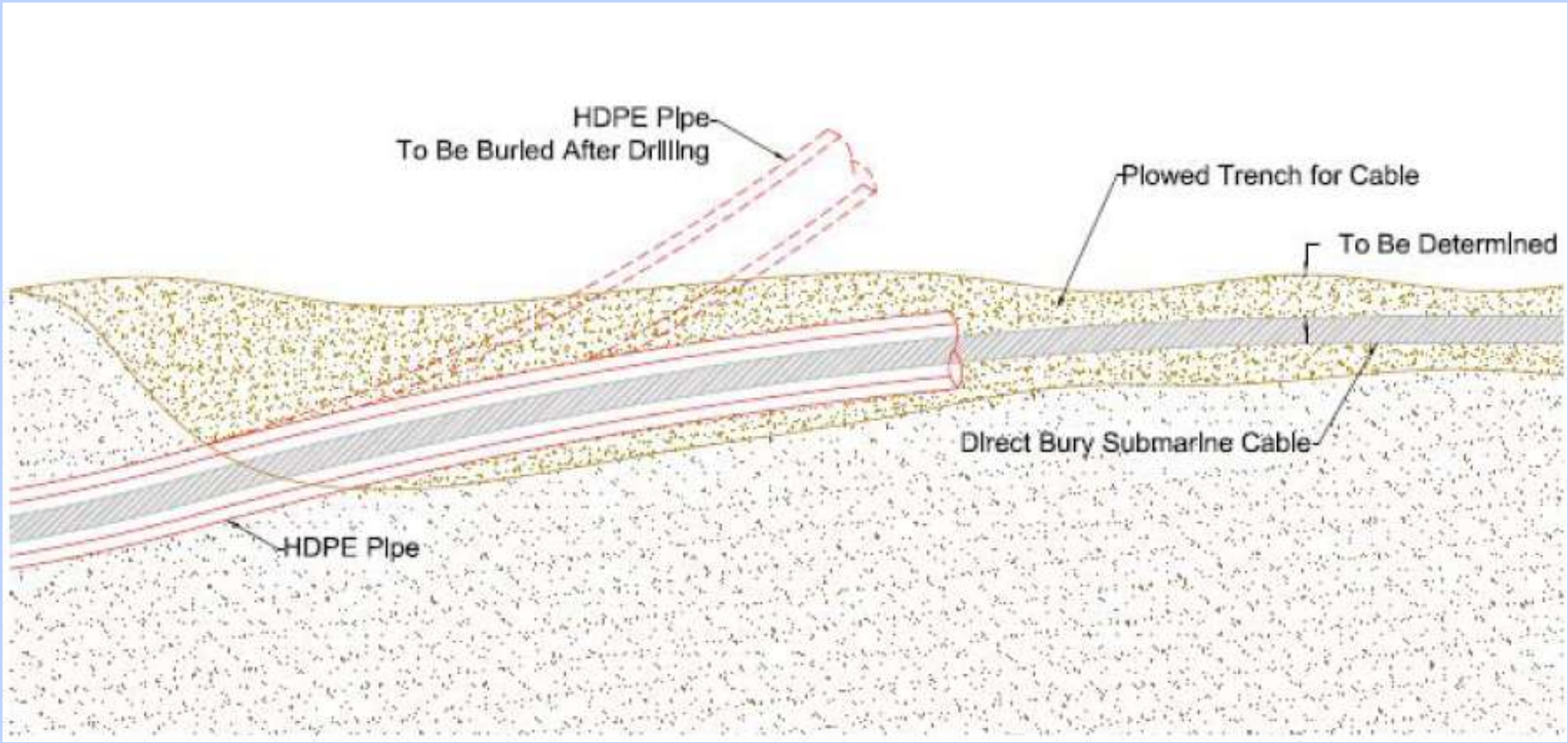
Drill Fluid Recovery

- **Divers create a sump pit at bore hole exit using venturi pump.**
- **Hydraulic pump removes drilling fluid from sump pit and delivers it to a surface barge where it is stored in frac tanks.**

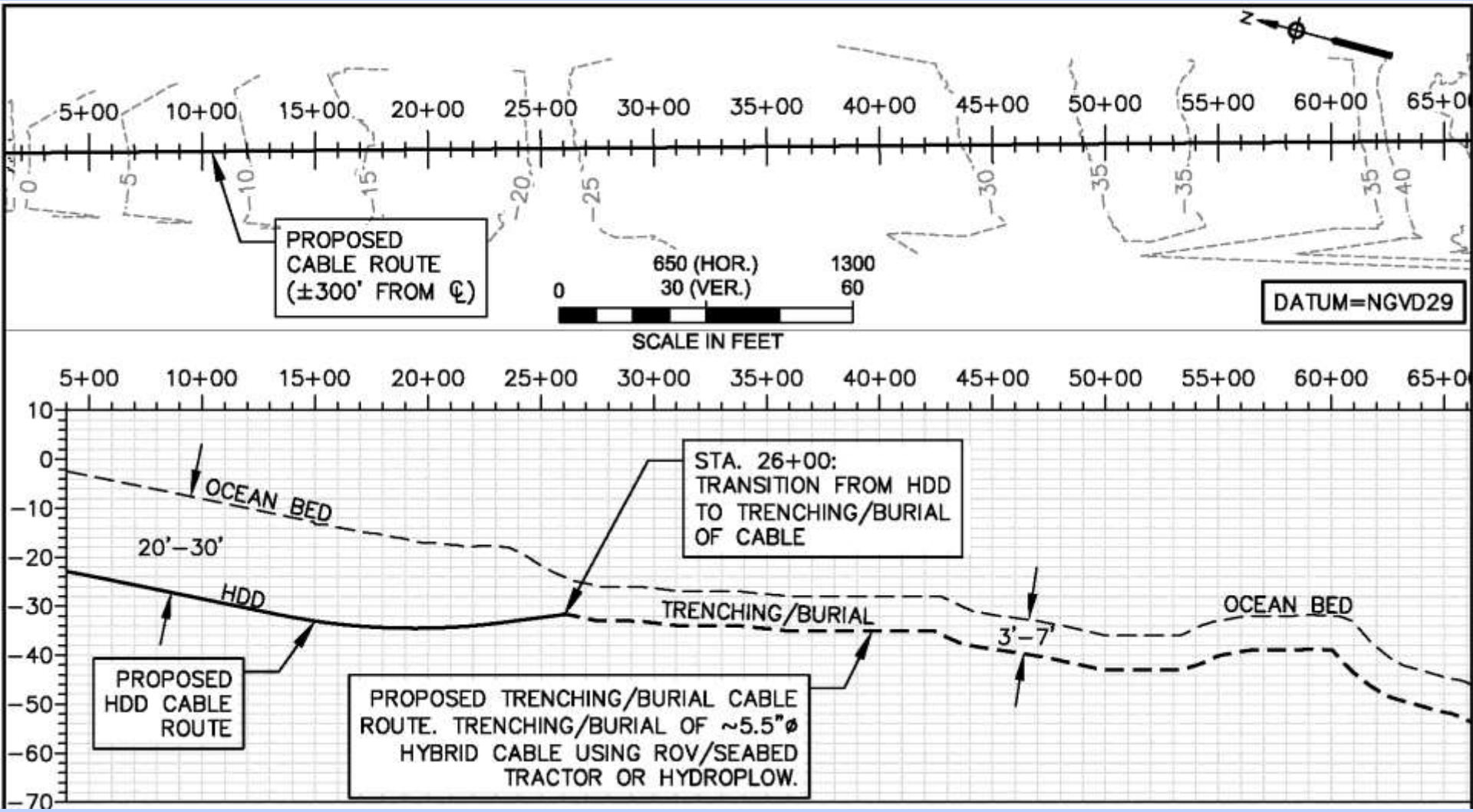


Transition from HDD to Plow

- **Divers bury seaward end of HDD conduit by hand-jetting.**



Falmouth
Transition from HDD / Plow



Offshore Barge – HDD Cable Install

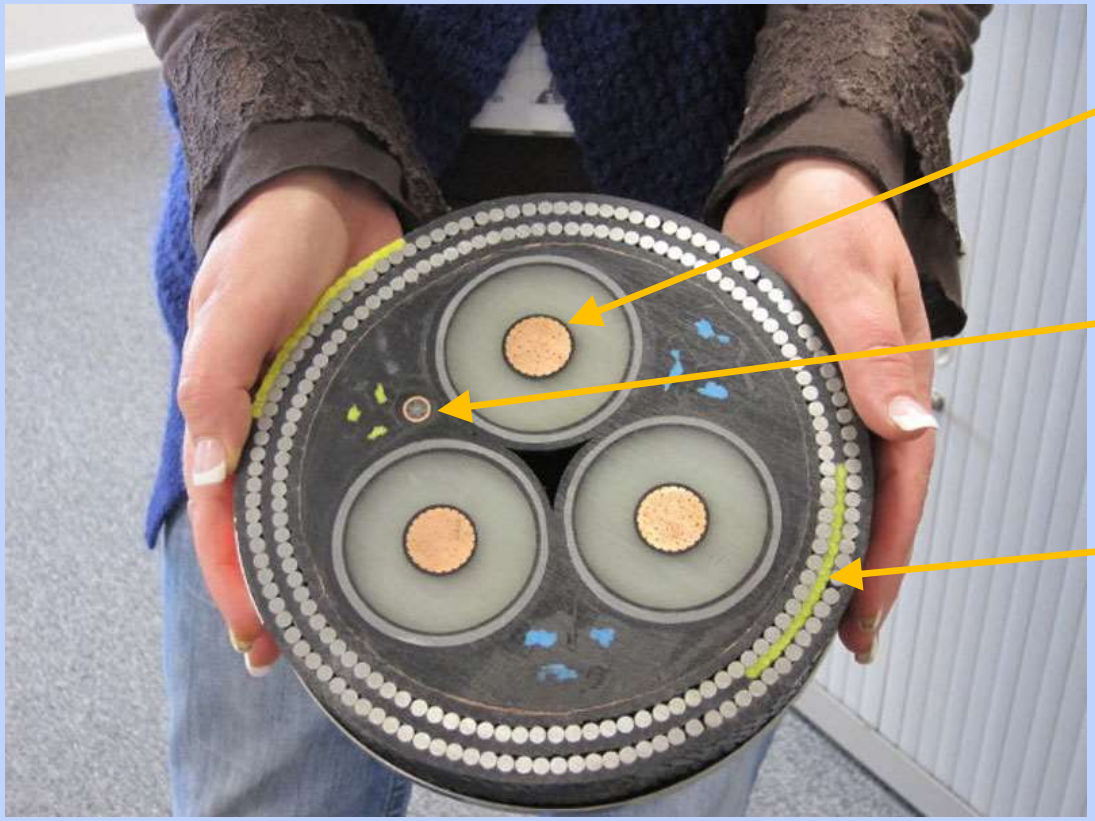
HydroPlow

HydroPlow – Ship Operations

- Entire Cable Length spooled.

- Cable removed from spool and delivered to HydroPlow.

Hybrid Cable Cross Section

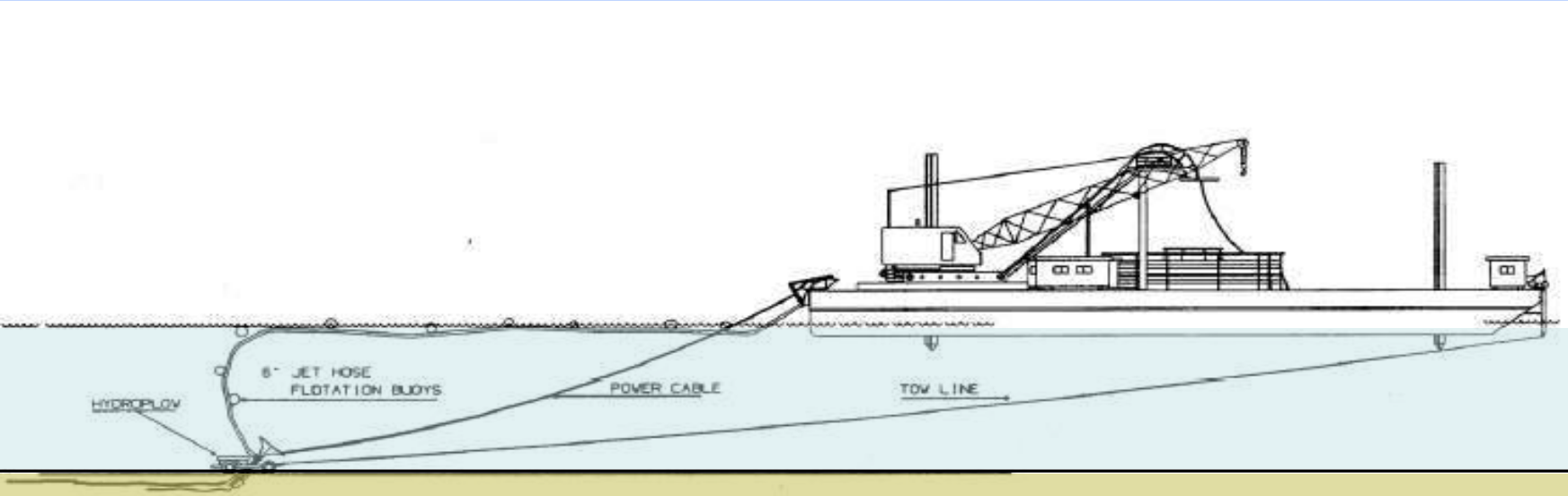


Copper – *electric power transmission*

Fiber Optics

Steel Cables – *provide strength & flexibility*

HydroPlow – Installation



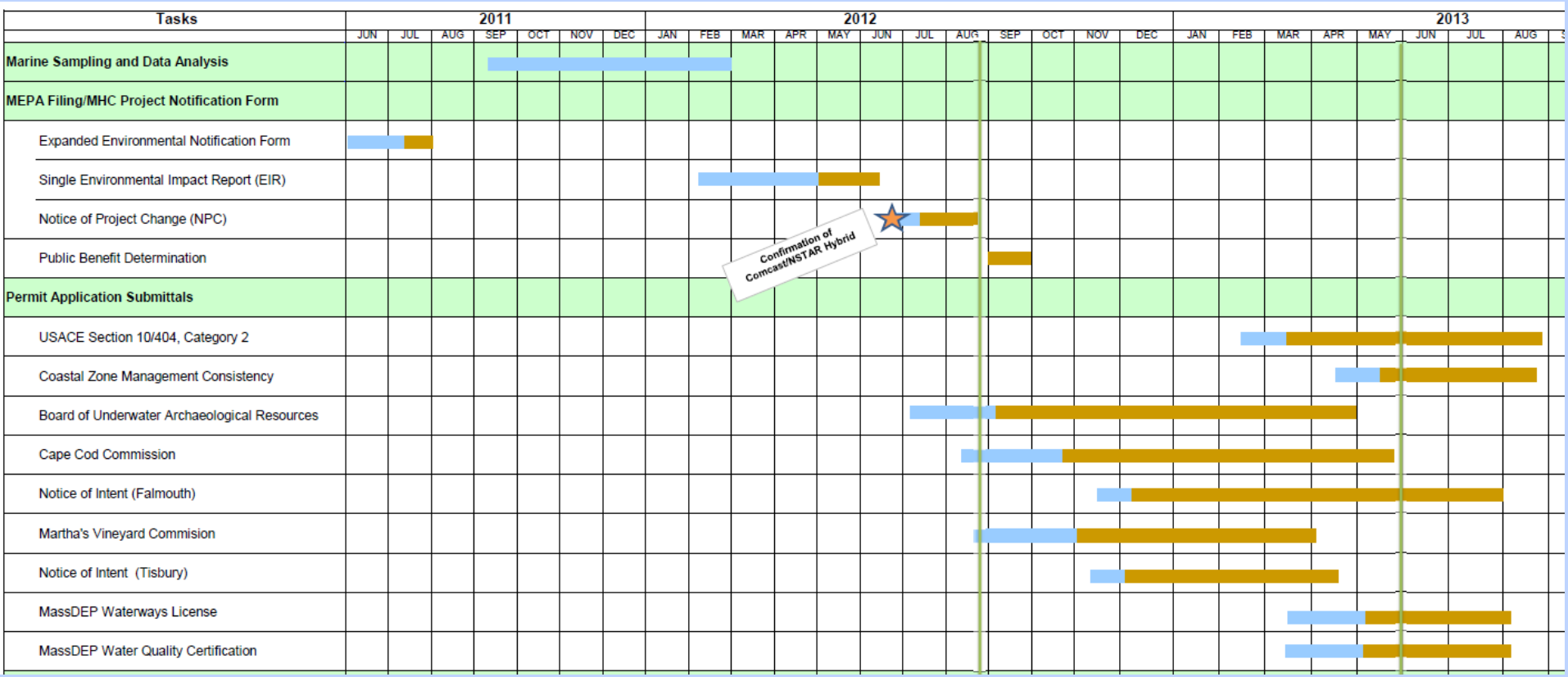
- HydroPlow is pulled by the surface vessel.
- Stinger jets fluidize the sediment allowing cable to sink into the trench with the sediment settling on top.

Tisbury HDD – Aerial View

Swamp Mats – Tisbury HDD Site

- *Provide road for equipment access to HDD.*

Permitting Schedule
Hybrid Cable - Comcast & NSTAR



Permit Conditions

- Total of 92 permit conditions including:
  - Prior to Work
    - Payment of Fees –
      - $20K – Mass Ocean Resources & Waterways Trust Fund
      - $156K – Occupation Fee – Waterways License
    - Coordination – Coast Guard, Harbormasters, Steamship Authority, ConComs
    - Submit to MassDEP - Post-Construction Monitoring & Mitigation Plan, and notification of any changes to project or plans
    - Hold Meetings with – ConCom agents, town police
    - Submit – Contact info to agencies, communications plan to West Chop Assoc and abutters
    - Install – construction fences around work areas, MassDEP wetland sign
    - Employ – Independent Environmental Monitor to ensure conditions are complied with (Monitor must be approved by MVC Land Use Committee & Tisbury ConCom). Monitor provides daily guidance to contractors.

Permit Conditions (continued)

- During Work
  - BMPs – erosion & sedimentation – must be maintained
  - Construction Hours – Upland work must comply with local bylaws
  - Noise Ordinance – must comply with
  - No damage to tree canopy along approach road in MV
  - Prohibit fill that may contain seeds of invasives or weeds
  - Cuttings Disposal on MV – must be approved by MVC
  - Water dry soils to prevent dust
  - Environmental Inspector – stop work authority
  - Matting – to be used to protect wetlands, and road

Permit Conditions (continued)

- Post Construction
  - Post Construction As-built Survey – to document compliance
  - Certificate of Compliance – ConComs
  - Monitor Vegetation regrowth
  - Post–Construction Marine Survey and Report – to CZM & DEP for review and approval

Marine Construction Costs

HDD – Tisbury = $8.7 million

HDD – Falmouth = $5.7 million

Total HDD = $14.4 million

Cable Vessel Install - $3 million

Construction Noise & Light

Noise & Light - typically the biggest concerns for neighbors

Noise Sources:

- **HDD equipment, Generators, Excavators, Trucks**

Noise Mitigation:

- **Work offseason in Fall/Winter**
- **Employ stringent noise standards**
- **Monitor noise levels**
- **Mufflers on all equipment**
- **Self-adjusting backup alarms on mobile equipment**
- **Shields and enclosures around stationary equipment**

Light Mitigation:

- **Employ stringent light standards**
- **Require - aiming lighting away from nearby homes; use light shields**

Post Construction Marine Survey

Post Construction Marine Survey Report

Reviewed Cable Install & Compliance with Conditions

Survey consisted: Bathymetry and Side-Scan Sonar which provided data on:

- **Bottom sediment characteristics**
- **Biota**
- **Areas of disturbance**
- **Eelgrass**

Post Construction Marine Survey Report (cont)

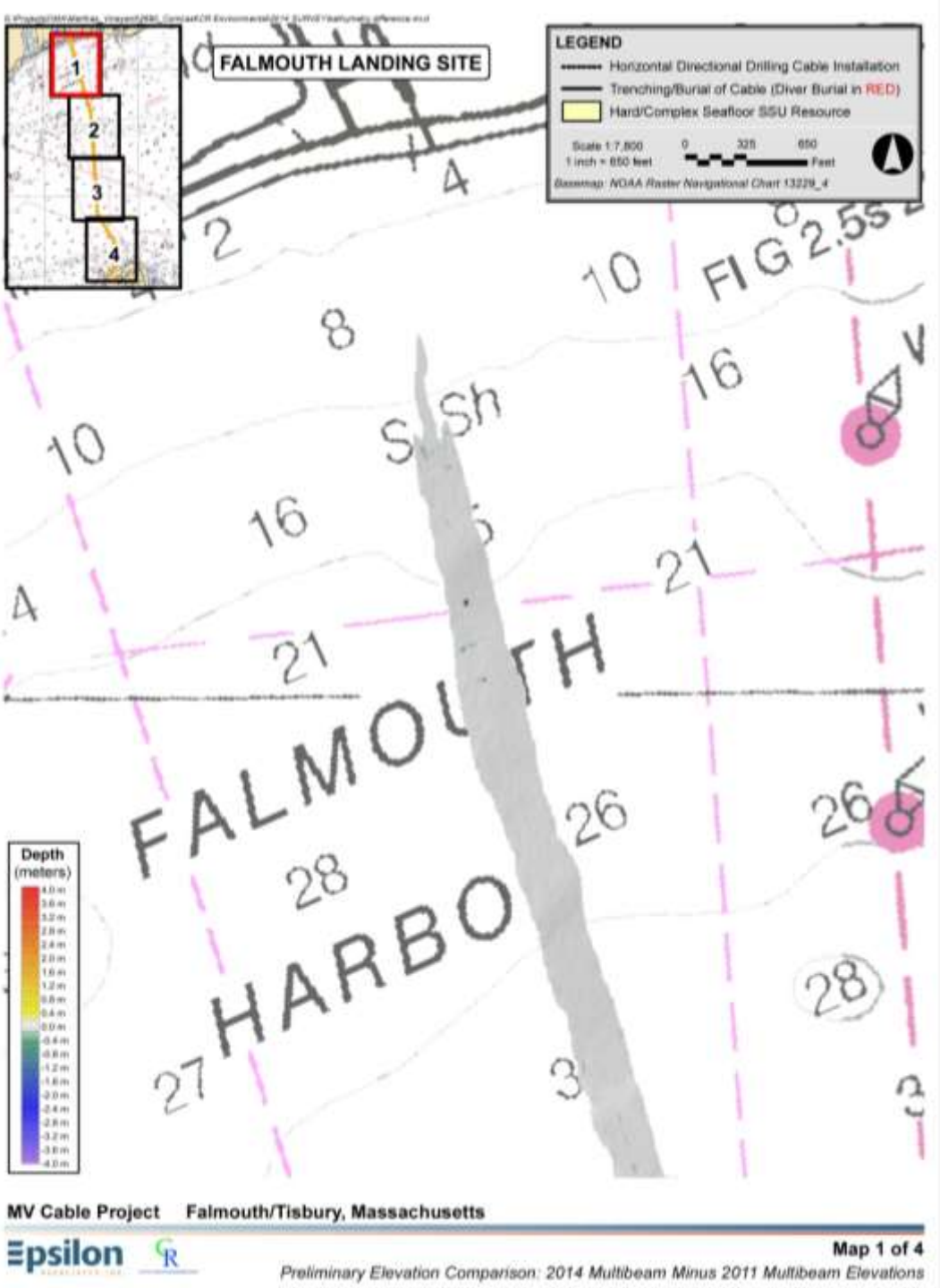
Conclusions

- No evidence of damage to SSUs
- Only disturbance was presence of a narrow sand furrow resulting from cable plowing (multiple observations of Black Sea Bass – probably due to slightly higher relief – created new fish habitat)
- 10-12 ft section of cable exposed

Multibeam Bathymetry

Map 1

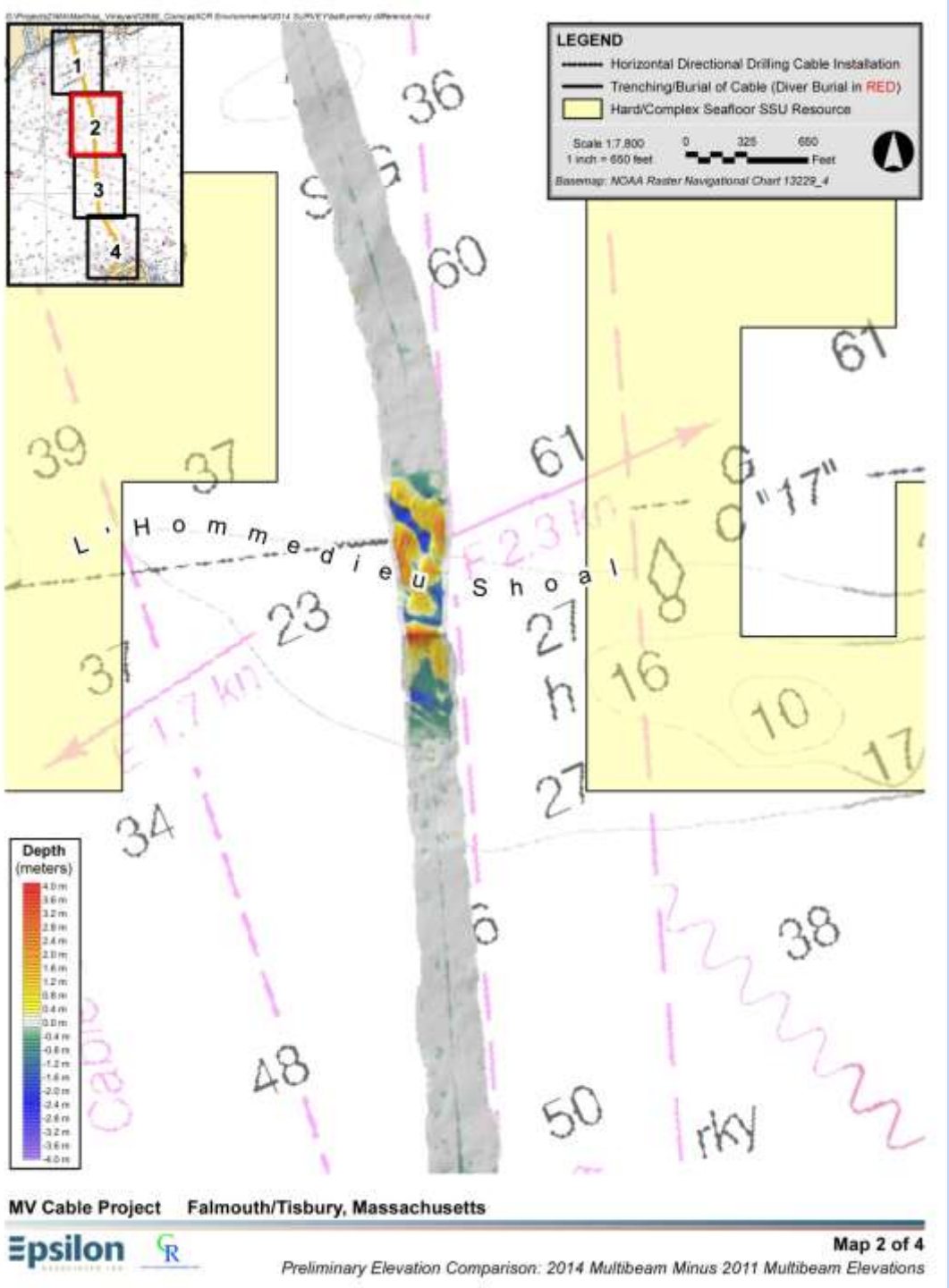
Comparison of 2014 Elevations with 2011



Multibeam Bathymetry

Map 2

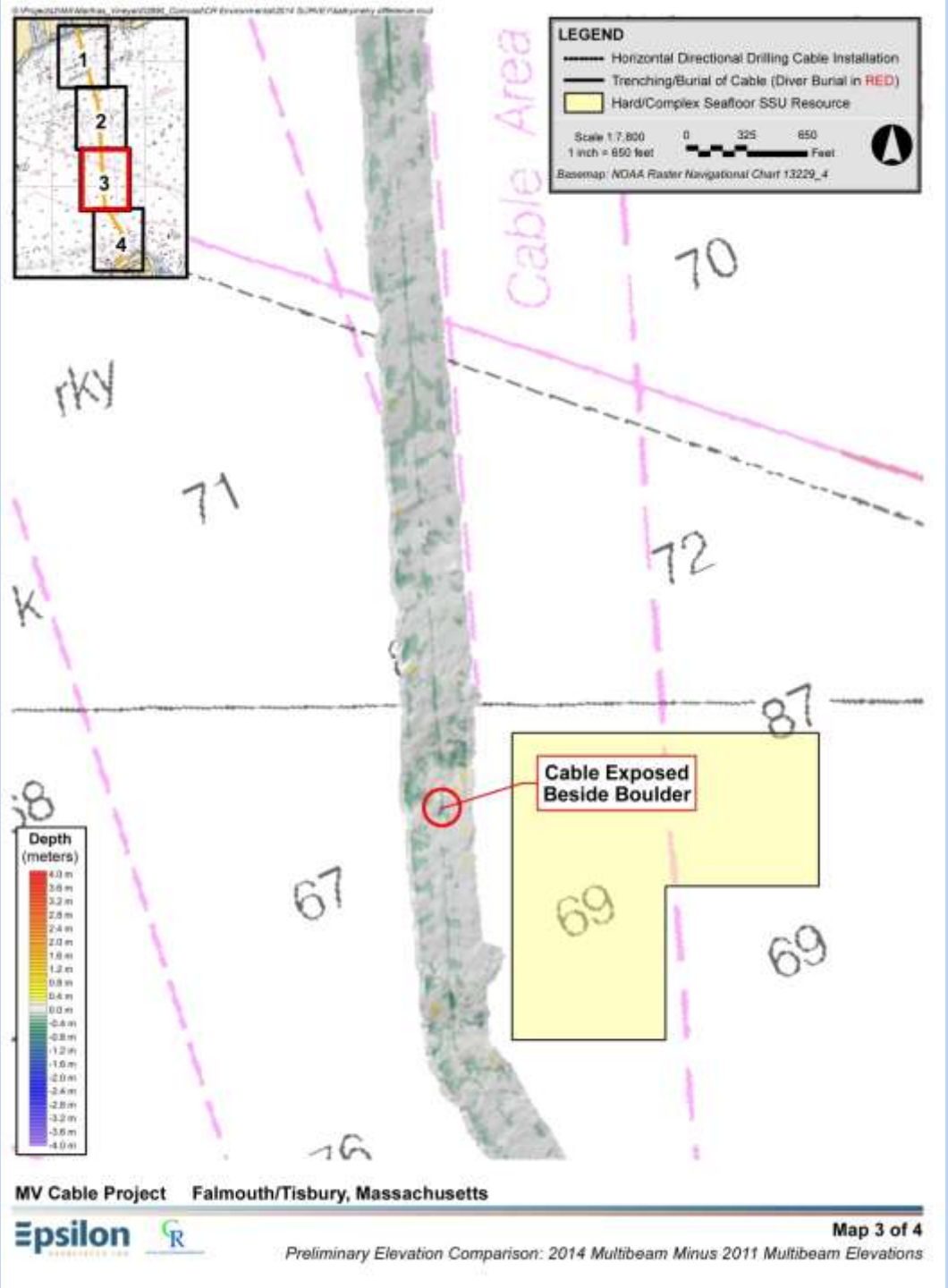
Comparison of 2014 Elevations with 2011



Multibeam Bathymetry

Map 3

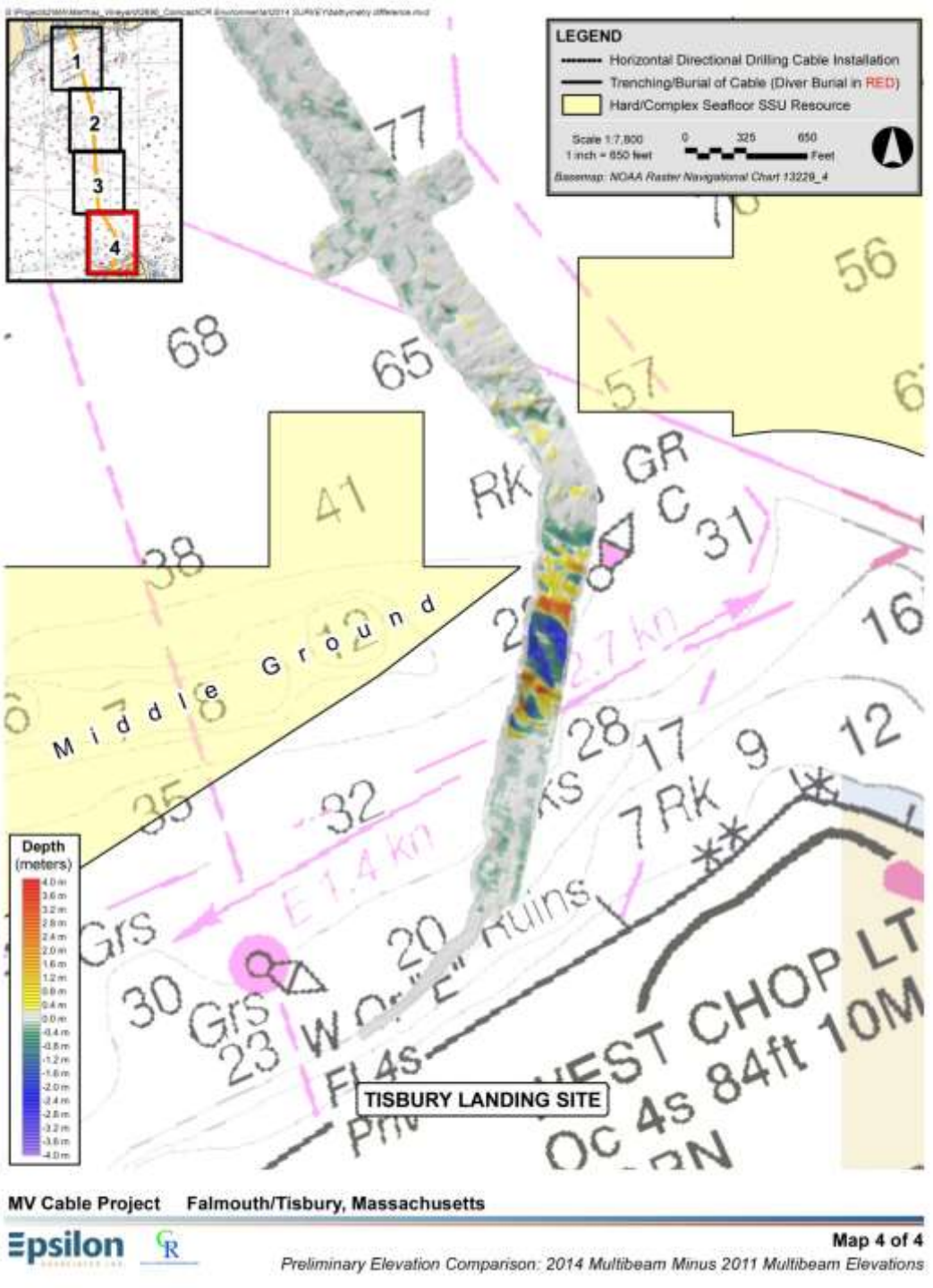
Comparison of 2014 Elevations with 2011



Multibeam Bathymetry

Map 4

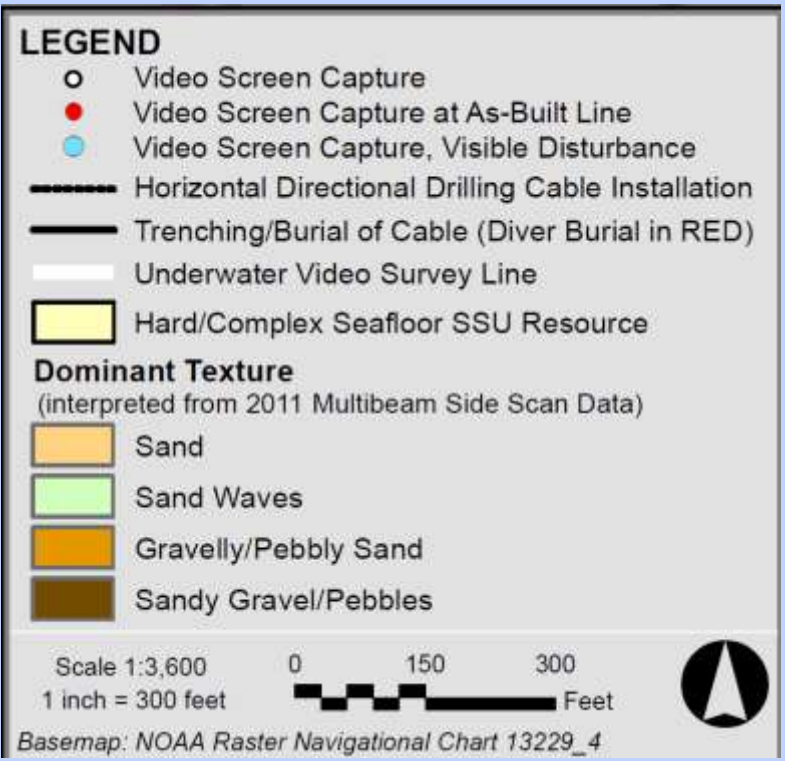
Comparison of 2014 Elevations with 2011

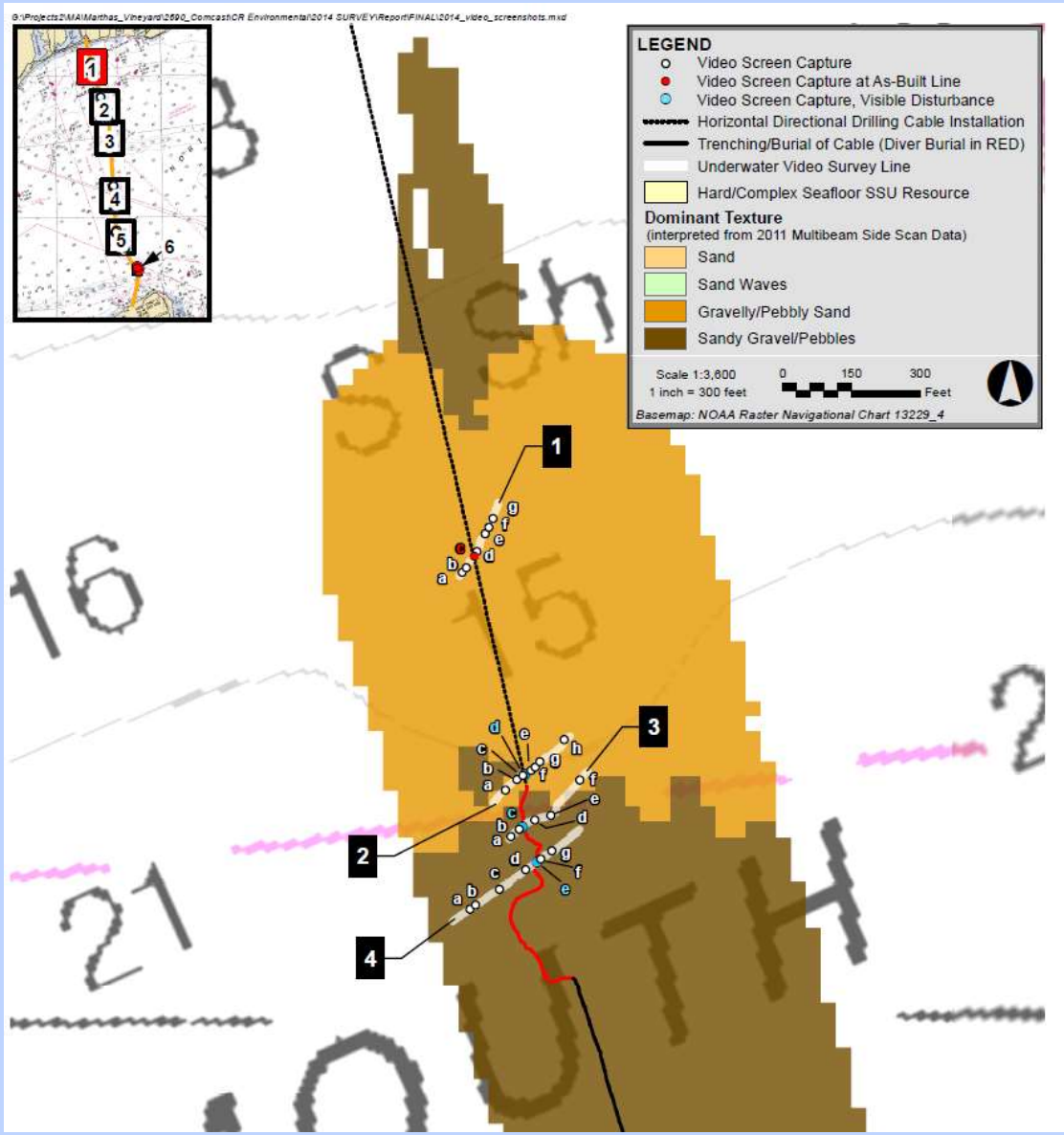


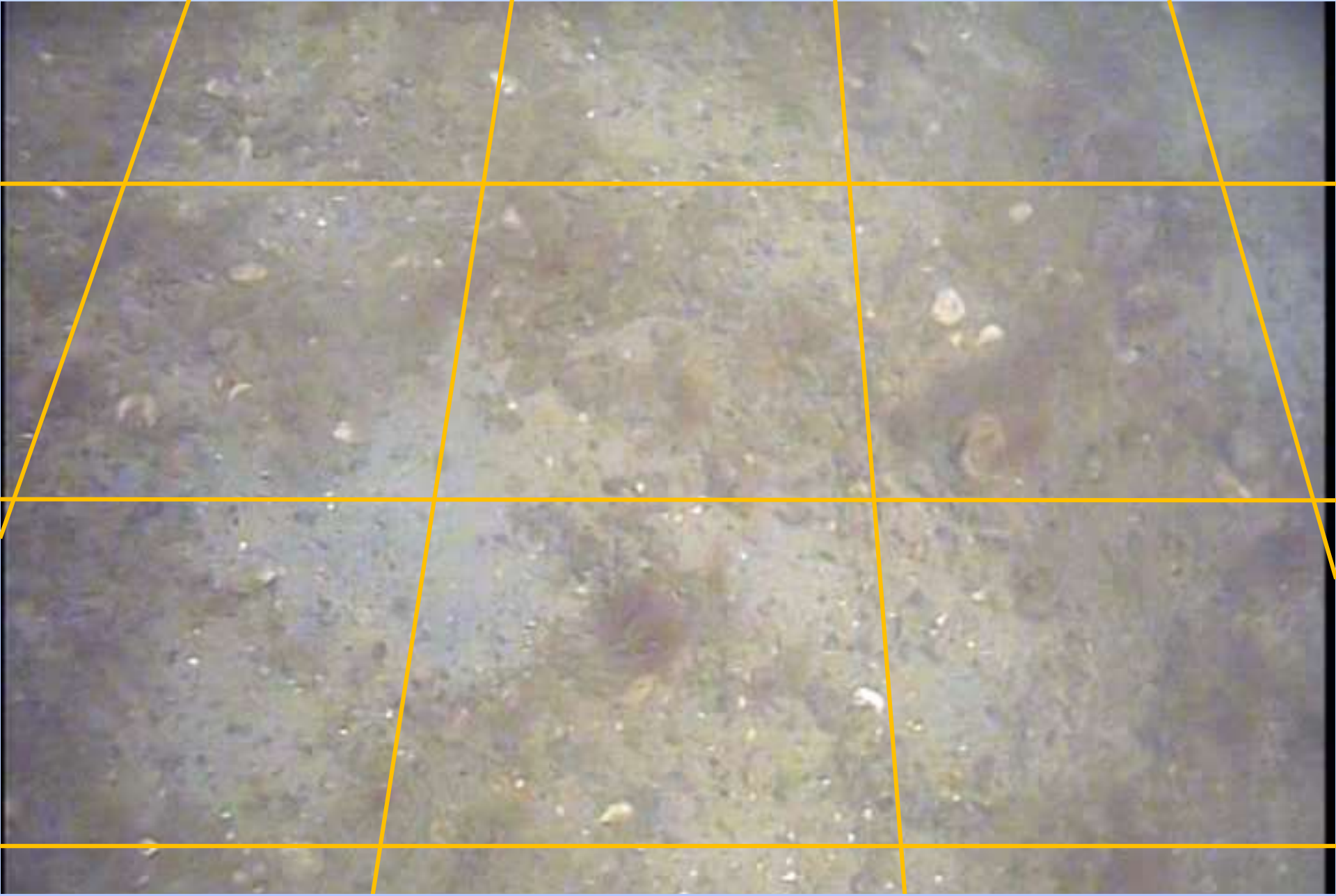
U/W Video

Transect 1

- HDD Area

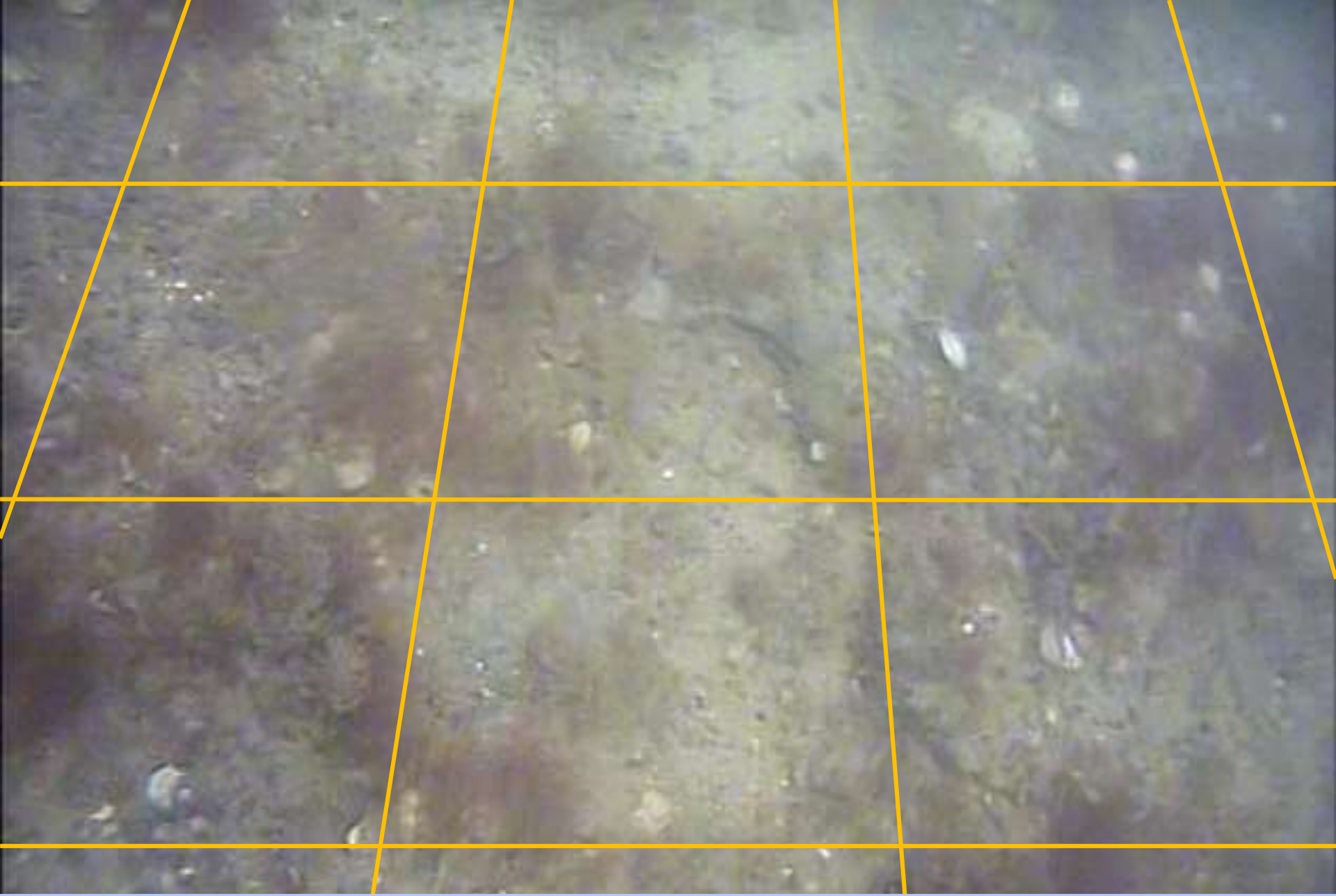






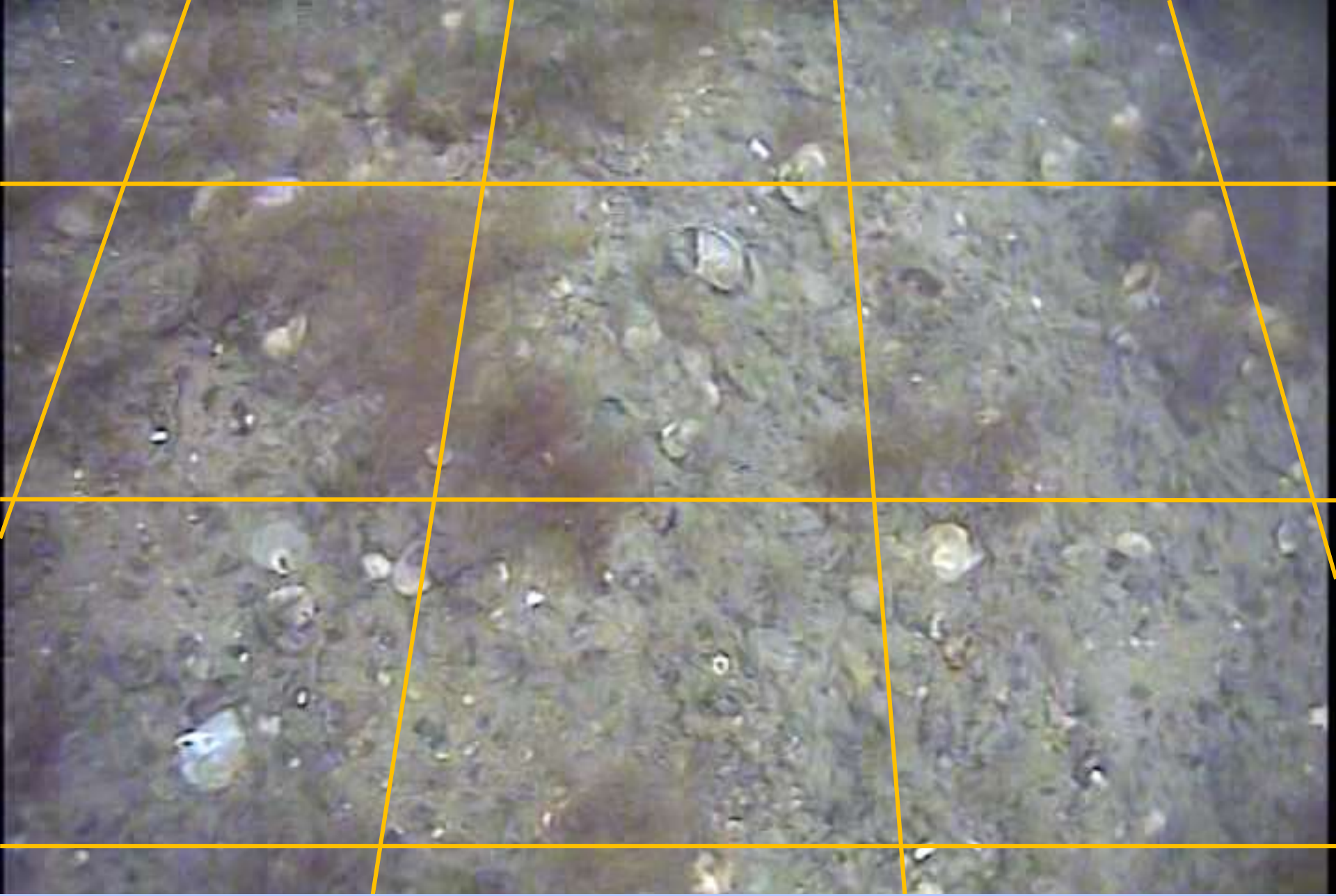
1b (Pebble 50%, Flat Sand 50%)

Branching Brown & Red Algae



1c HDD Crossing (Flat Sand 50%, Pebbles 50%)

Brown & Red Branching Algae



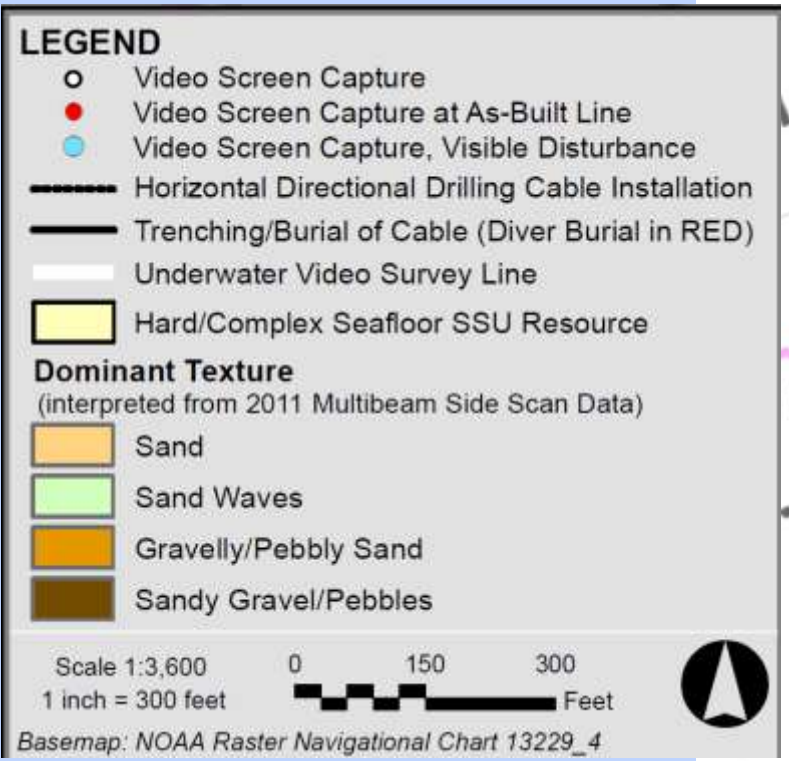
1d (Pebble 55%, Flat Sand 45%)

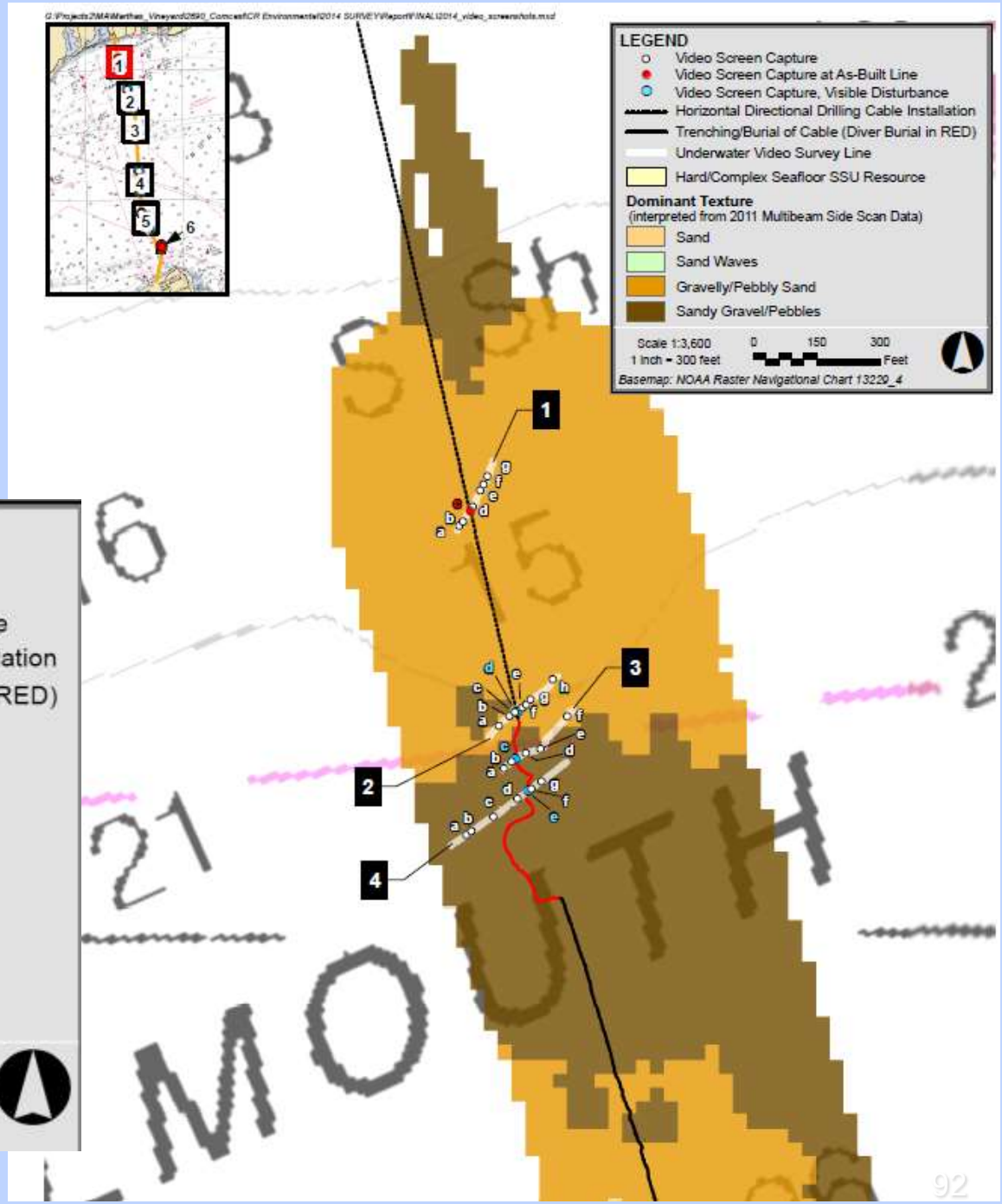
Common Slipper Shells, Brown & Red Branching Algae

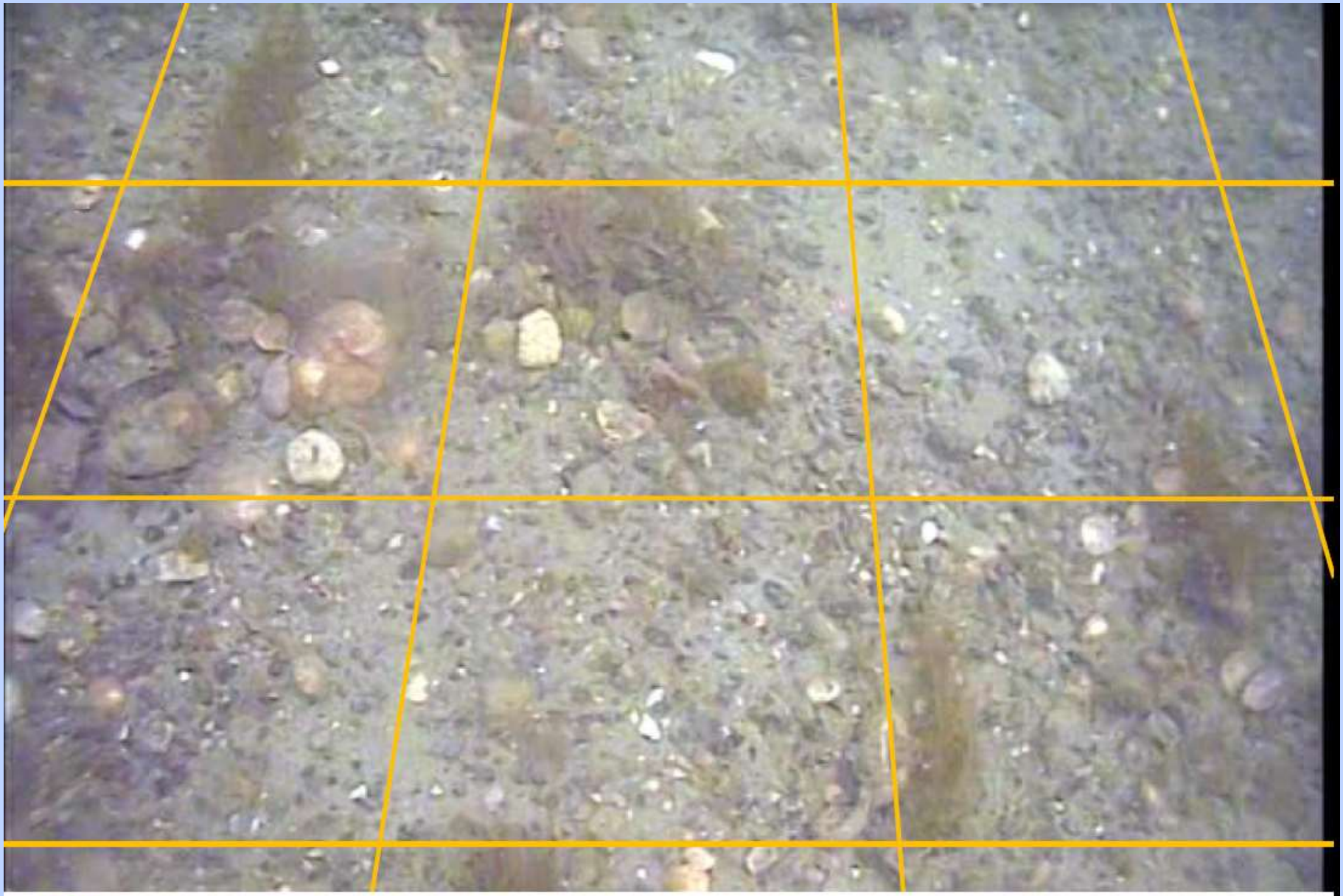
U/W Video

Transect 4

- **Diver Burial**







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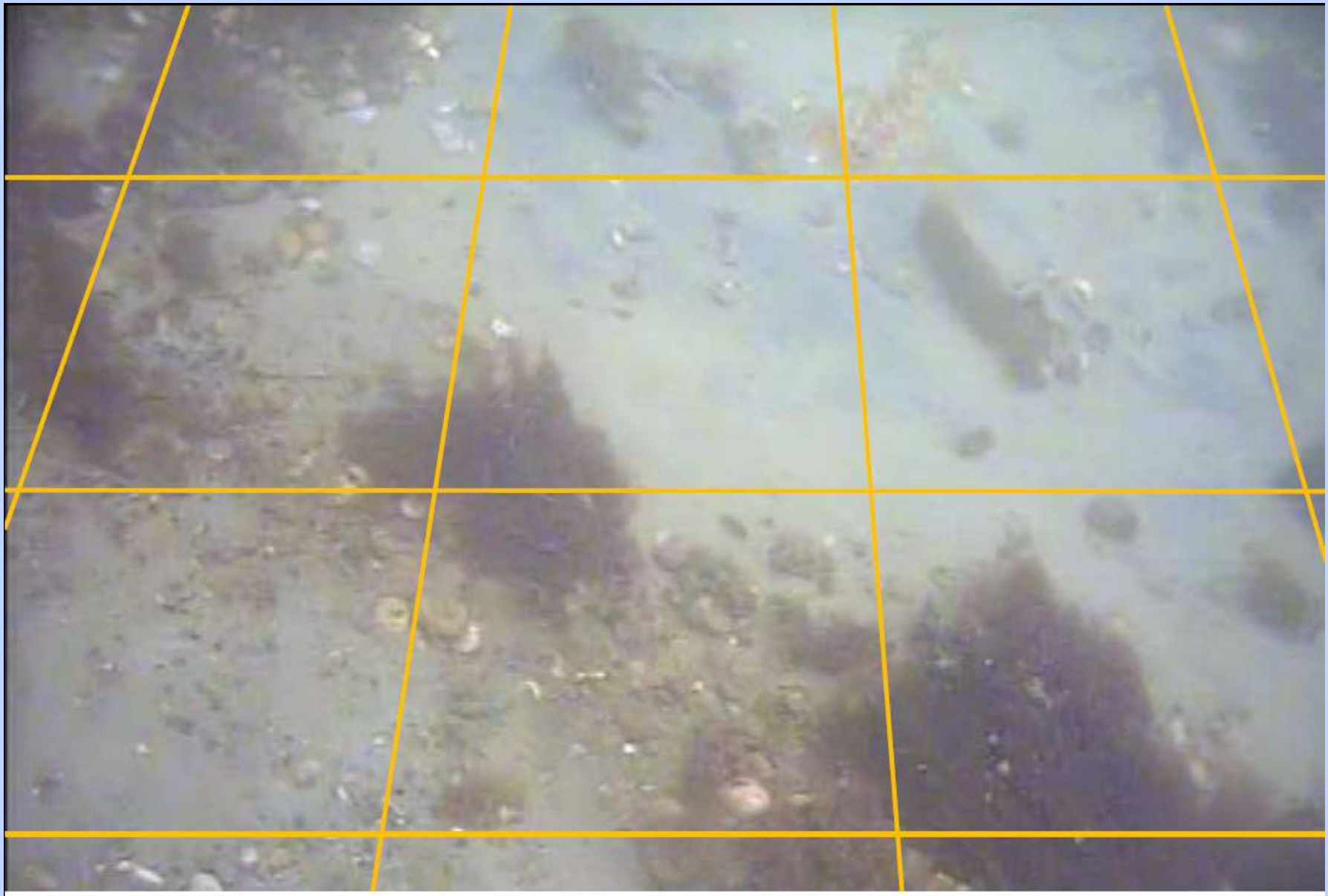
4d (Flat Sand 50%, Pebble 45%, Cobble 5%) Orange Encrusting Bryozoan, Brown Branching Algae

Epsilon Associates, Inc.



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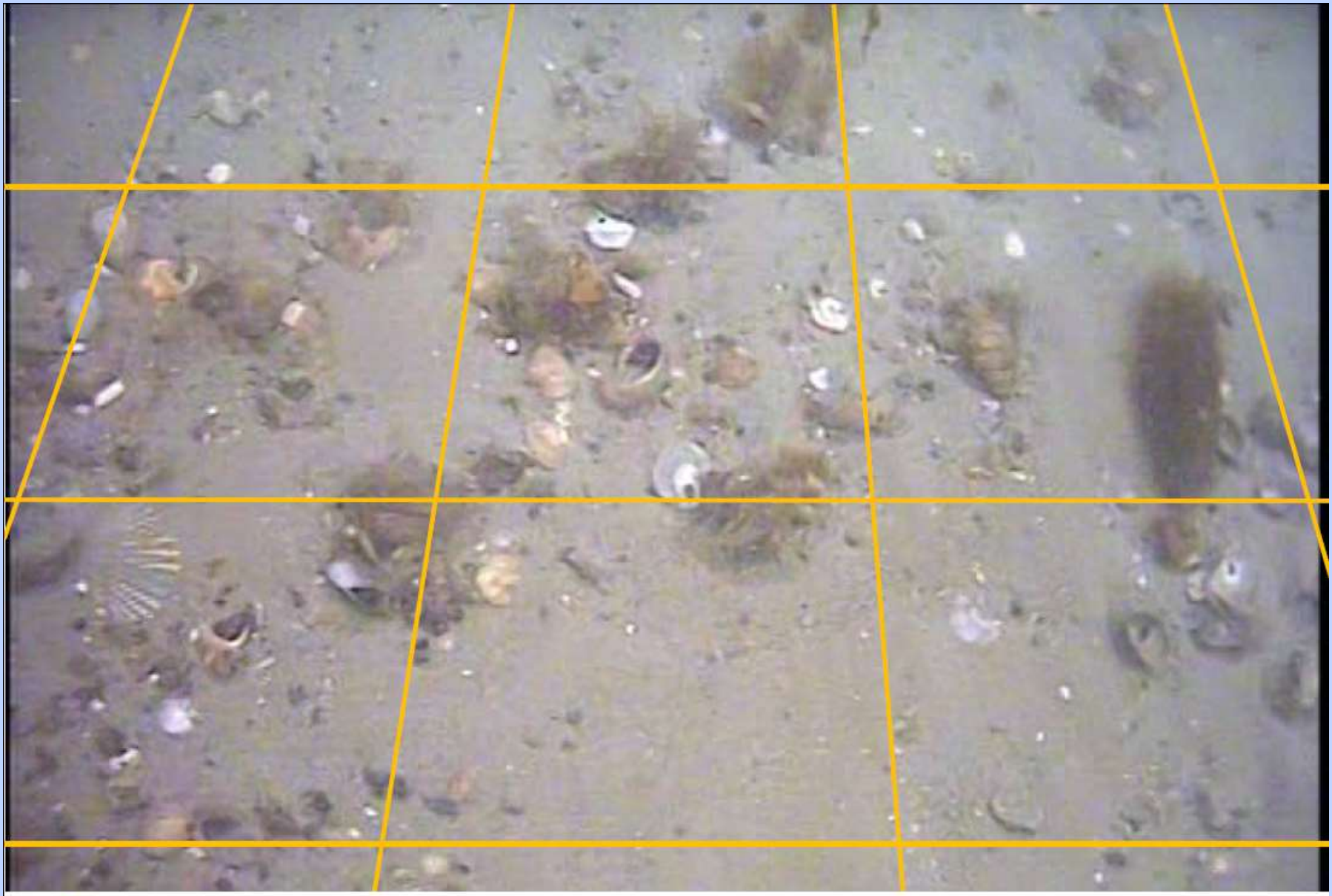
4e Diver Burial Cable Crossing (Flat Sand 60%, Pebble 40%)
Brown & Red Branching Algae

Epsilon Associates Inc.



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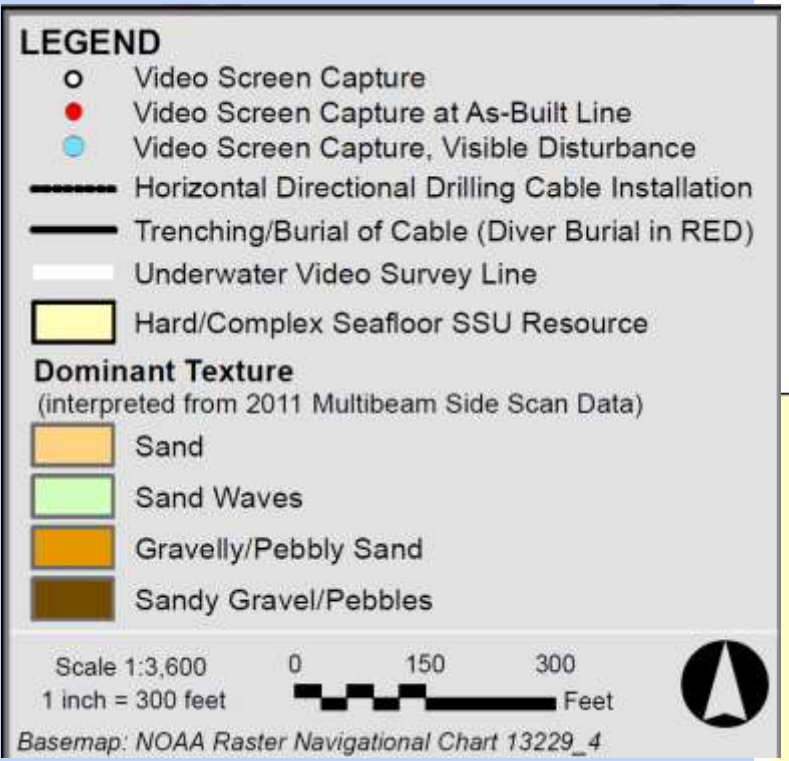
4f (Flat Sand 70%, Pebble 30%) Common Slipper Shells, Scallop Shell, Brown Branching Algae

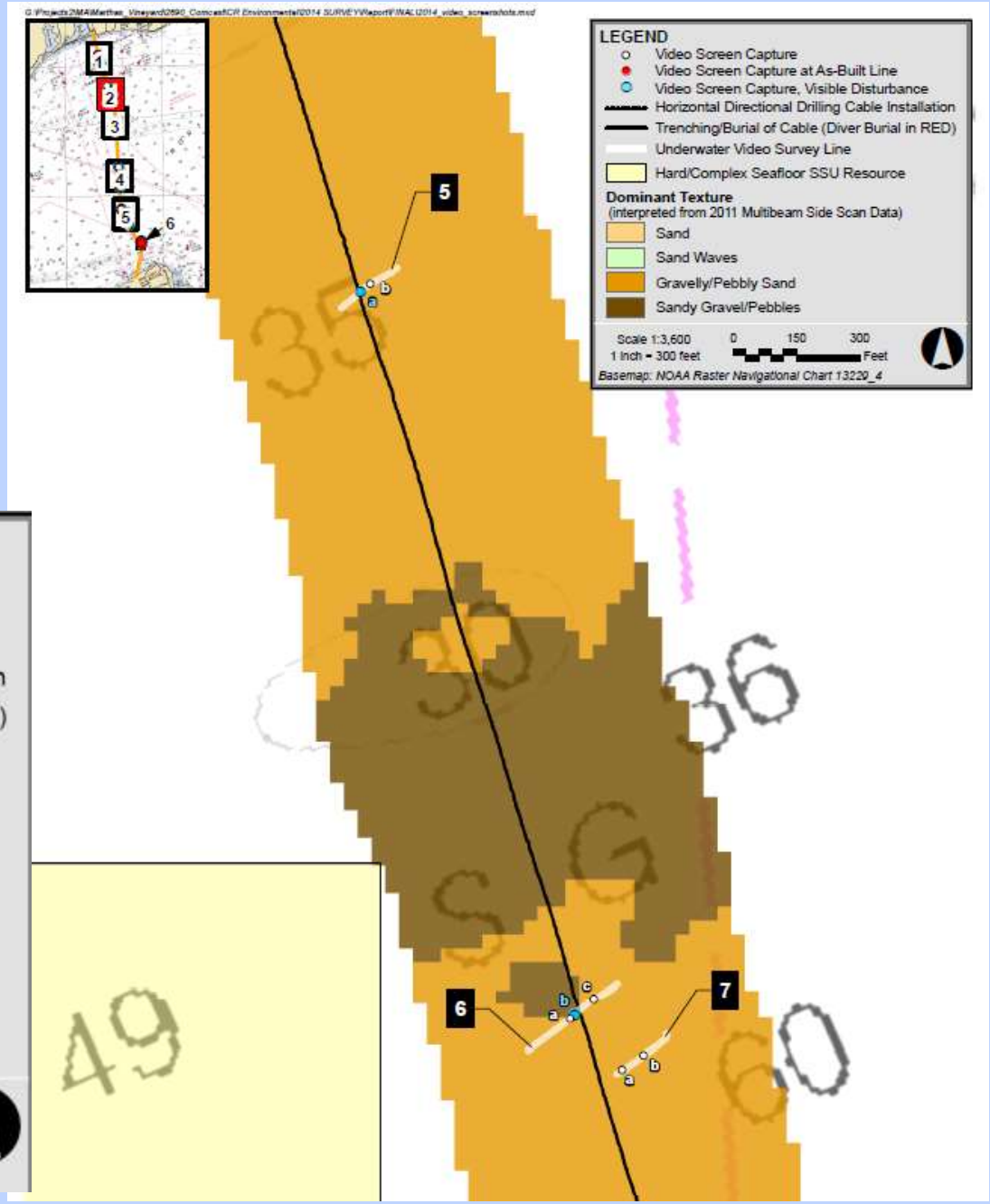
Epsilon Associates, Inc.

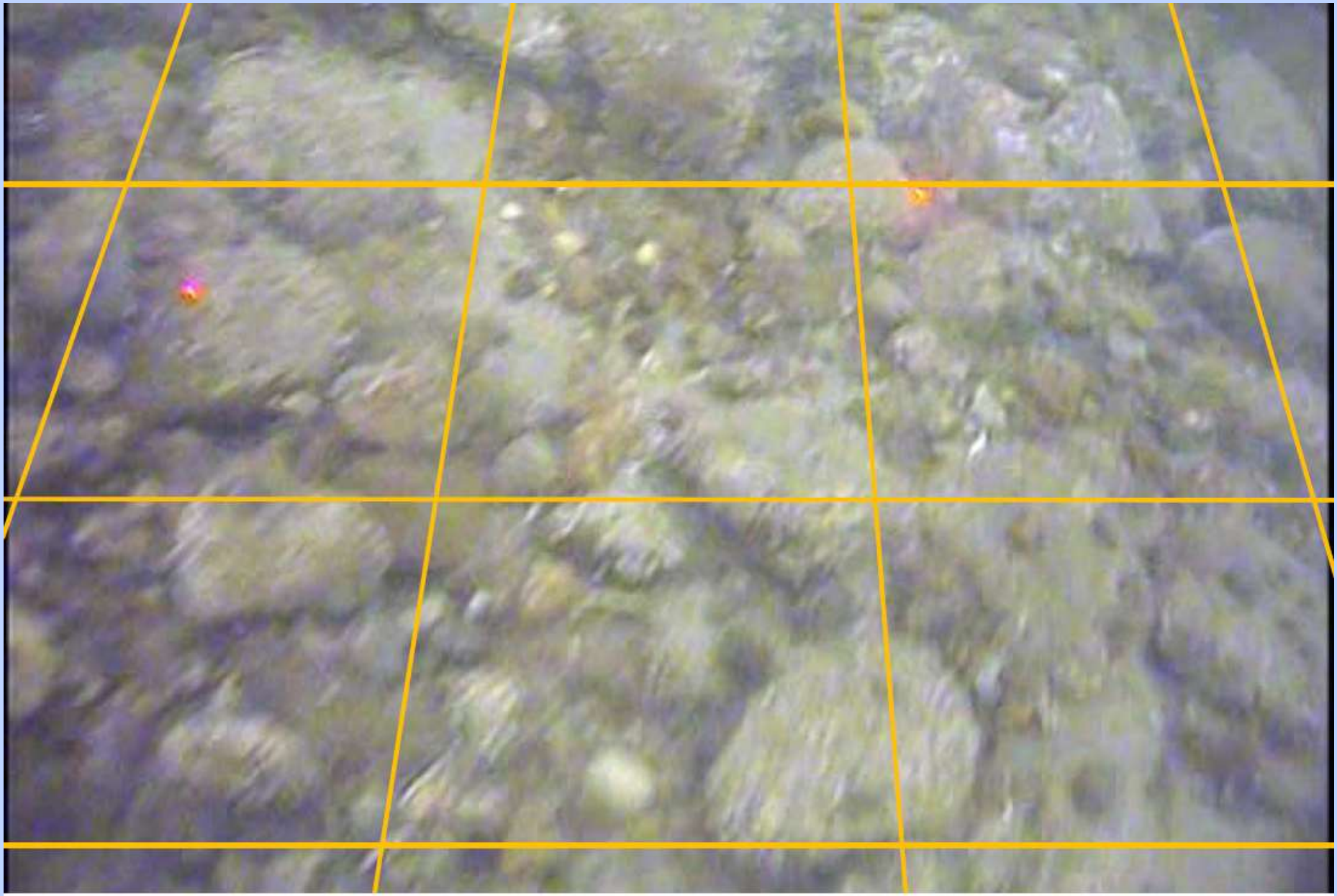
U/W Video

Transect 6

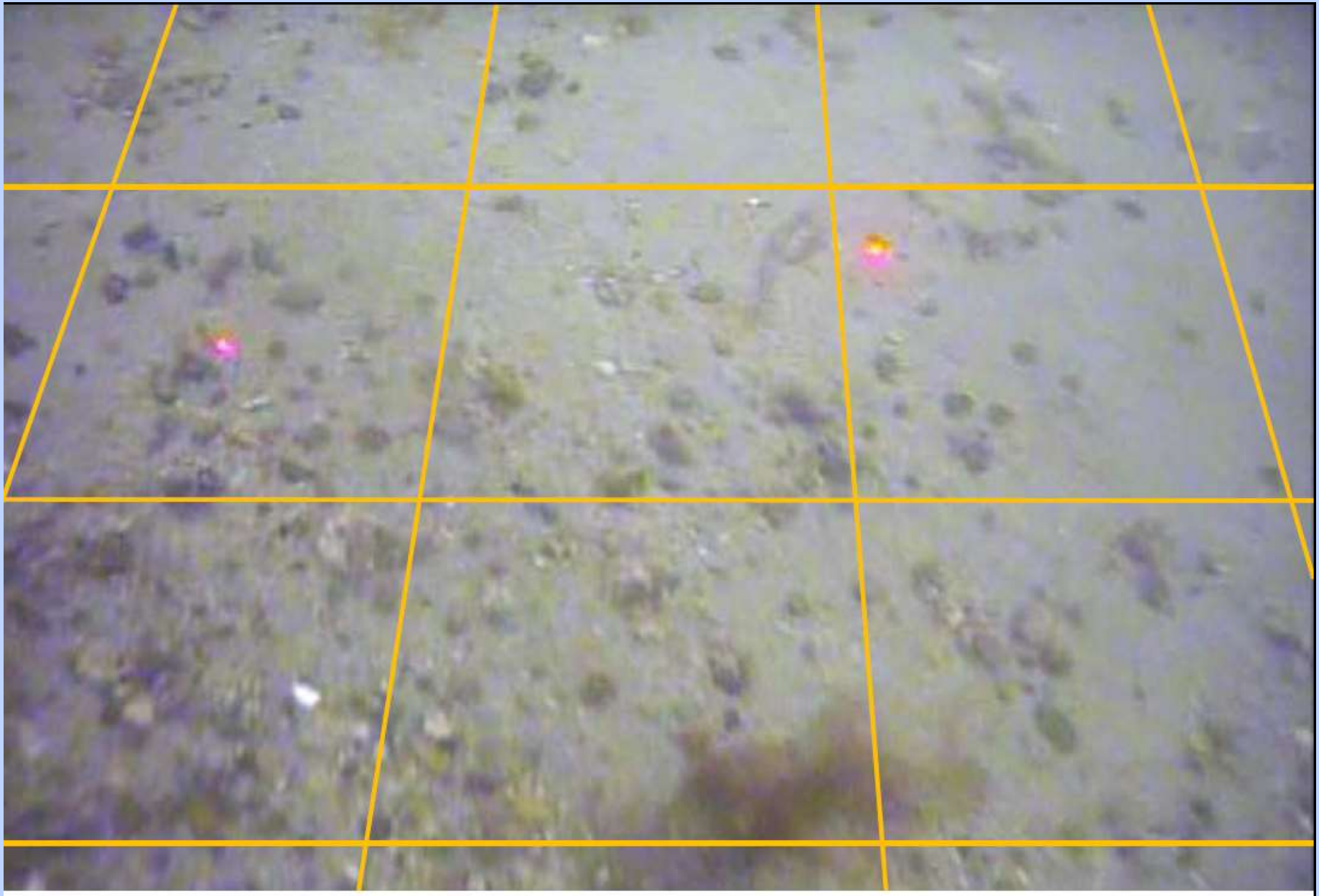
- **Plow Burial**







6a (Flat Sand 10%, Pebble 50%, Cobble 40%) Carnation Worms, Common Barnacles



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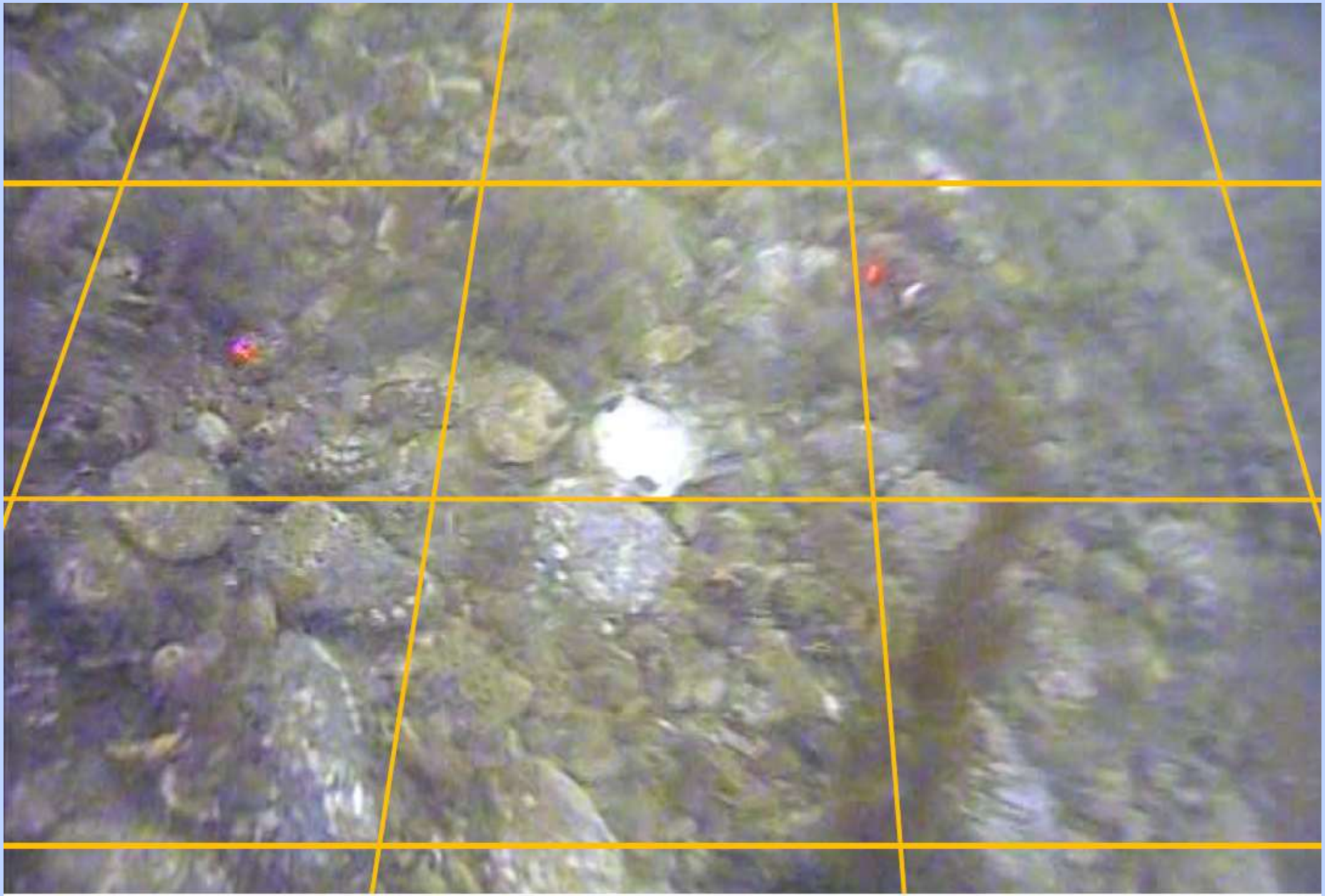
6b Plow Burial Cable Crossing (Flat Sand 70%, Pebble 30%)
Branching Brown Algae

Epsilon Associates Inc.

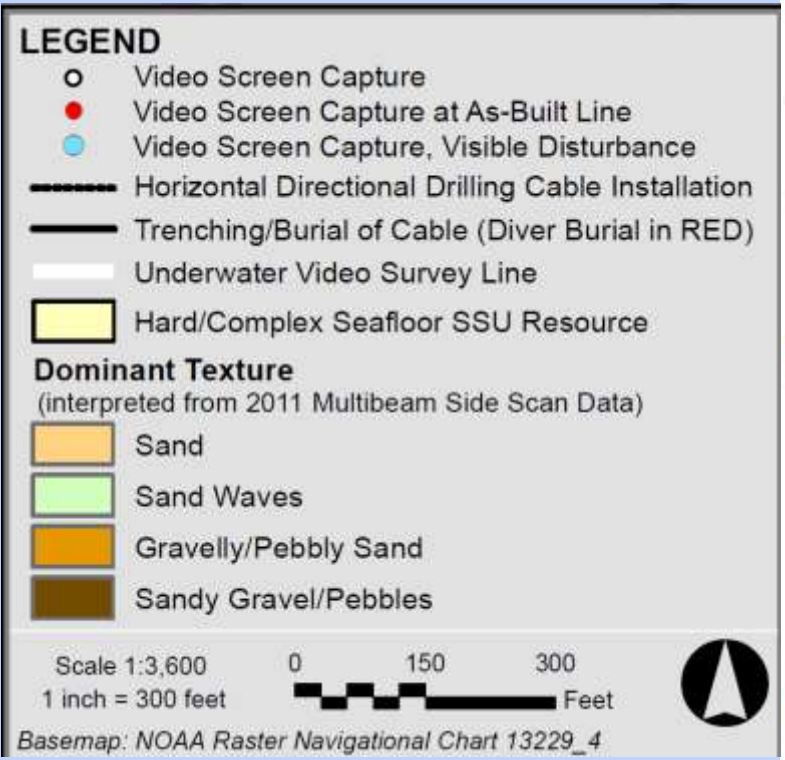


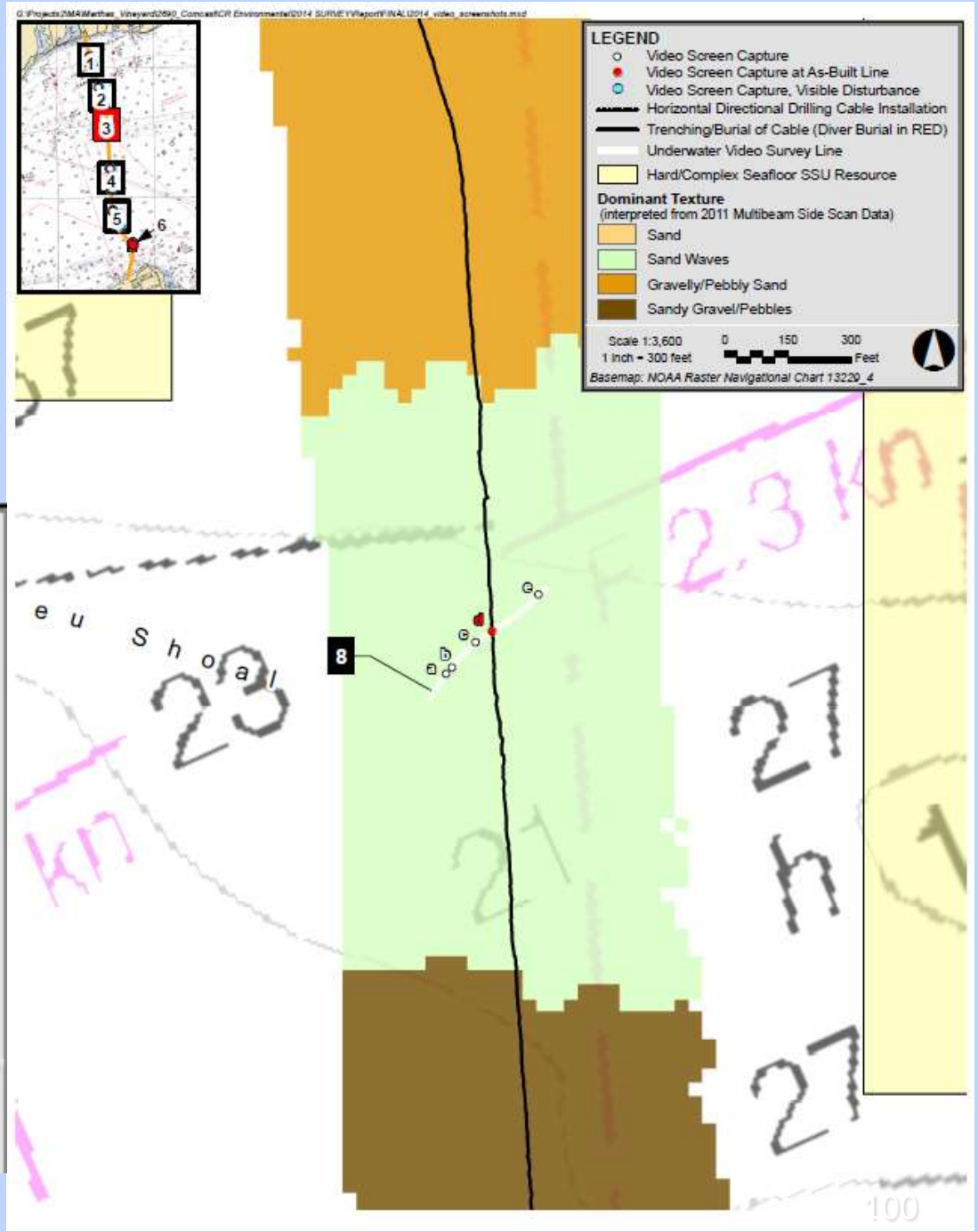
6c (Flat Sand 5%, Pebble 55%, Cobble 40%) Carnation Worms, Common Barnacles, Branching Brown Algae

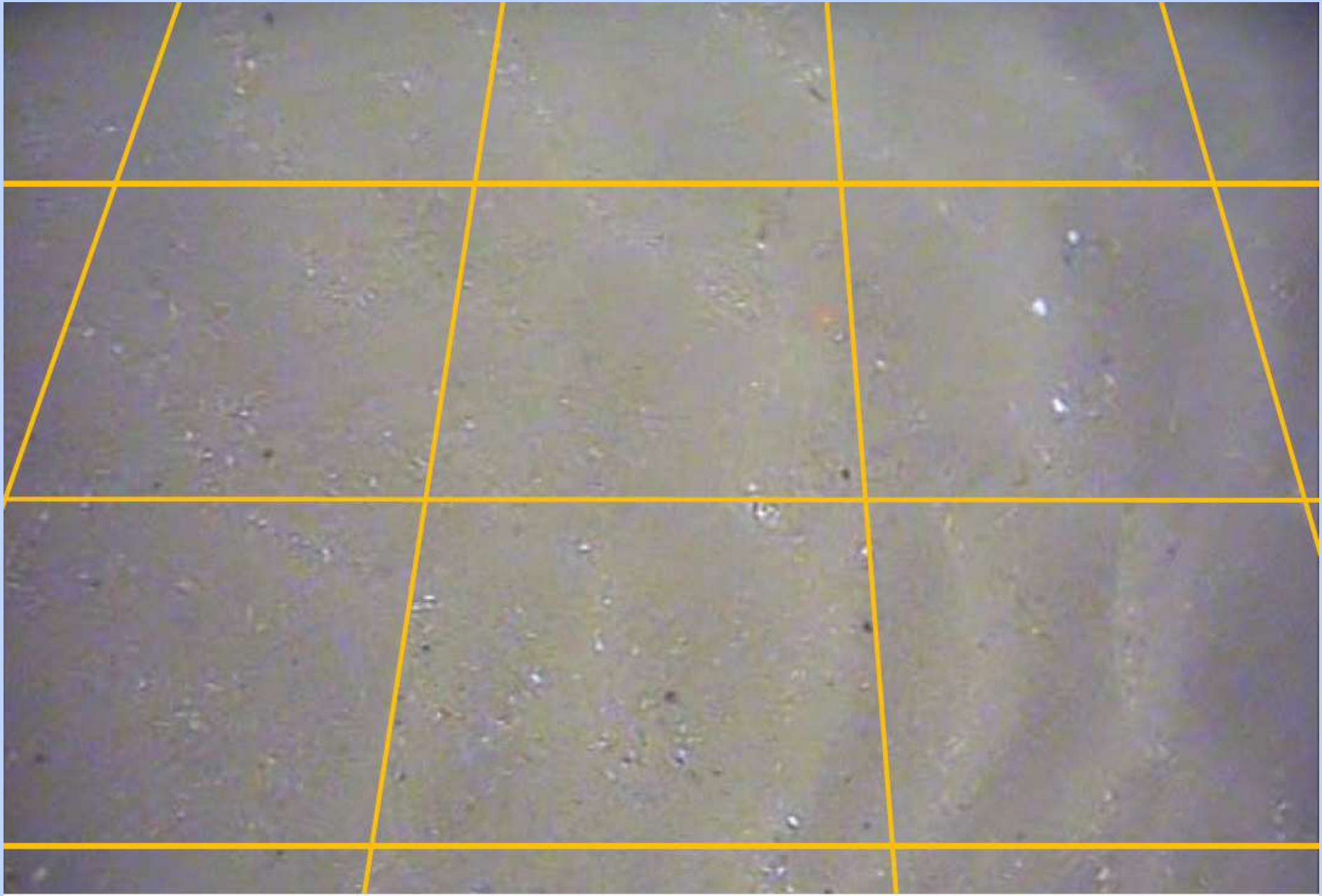
U/W Video

Transect 8

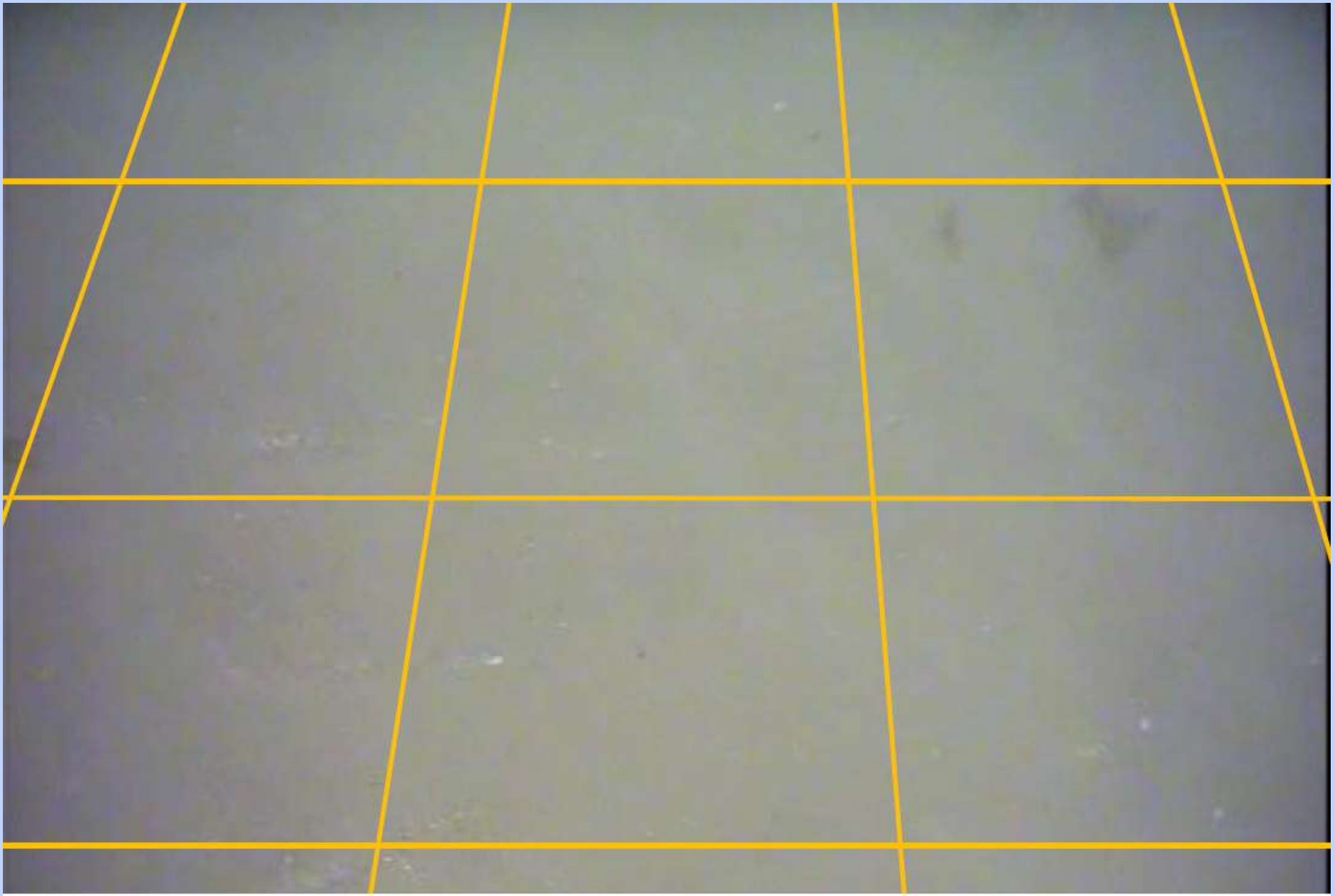
- **Plow Burial**



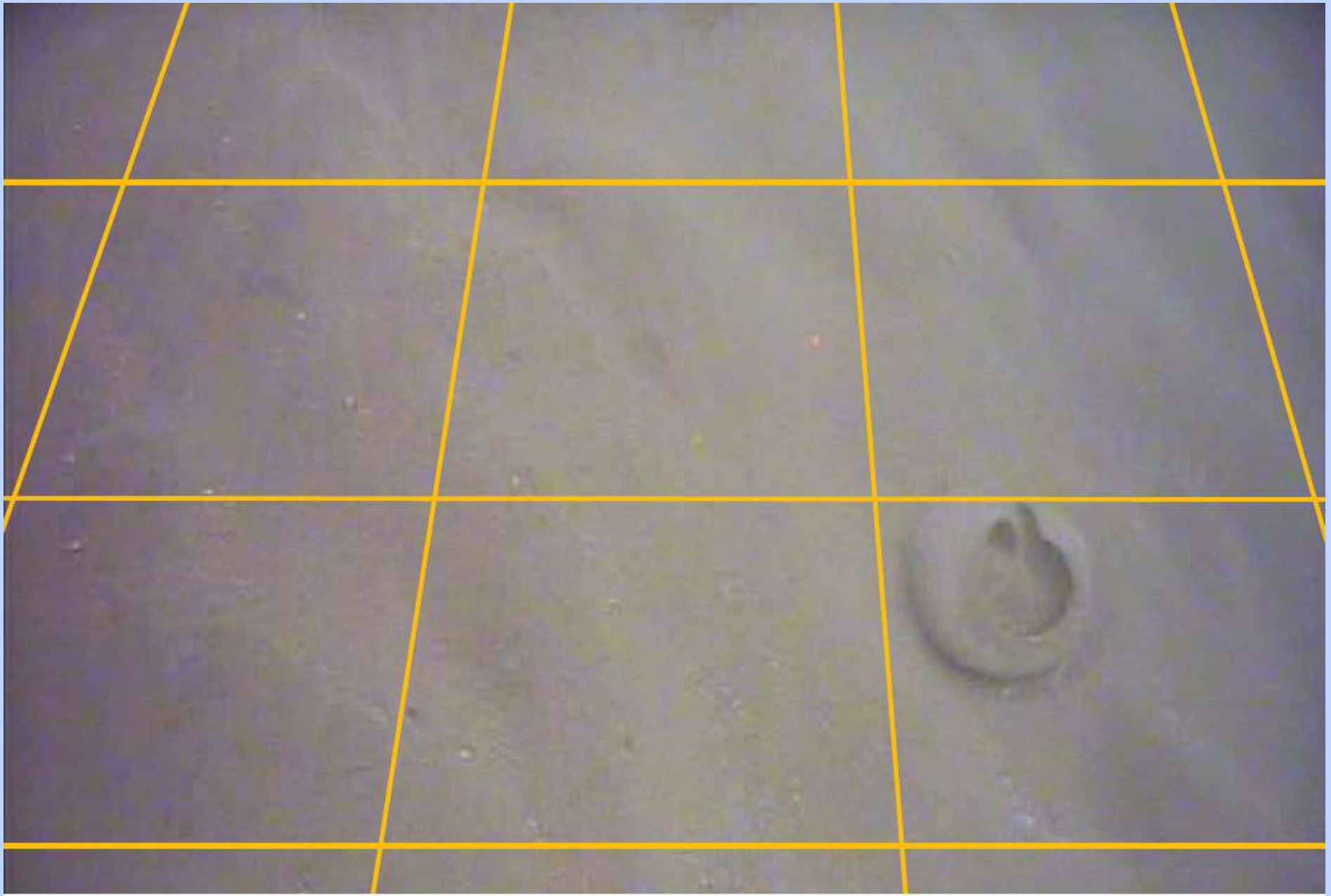




8c (Sand Waves 95%, Pebble 5%)



8d Plow Burial Cable Crossing (Sand Waves 95%, Pebble 5%)

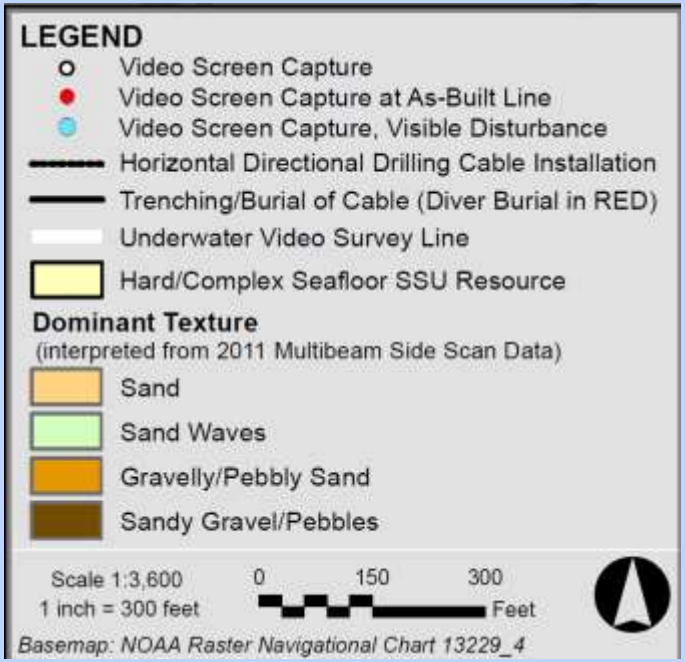


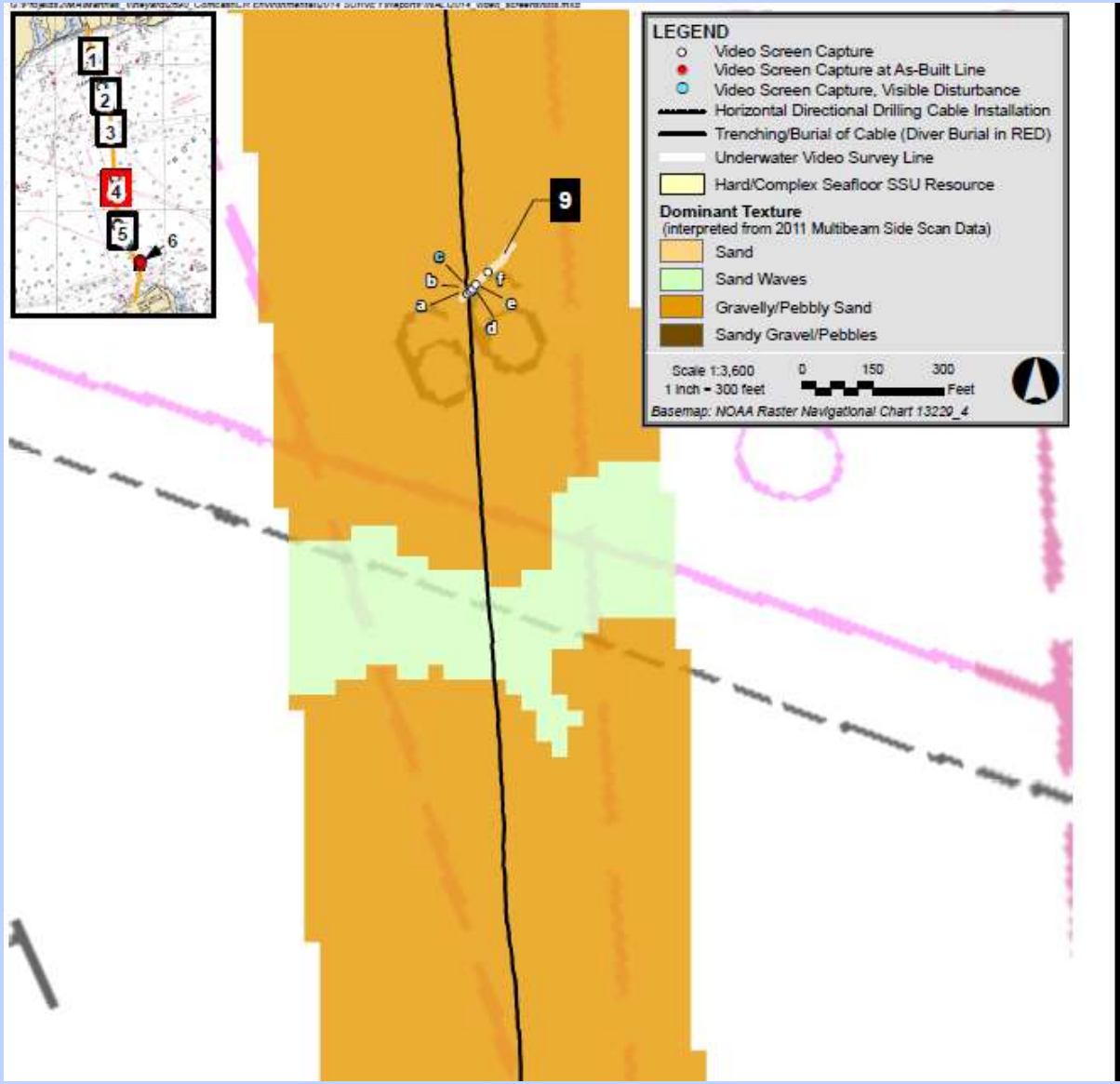
8e (Sand Waves 95%, Pebble 5%) Sand Collar, Moon Snail Egg Mass

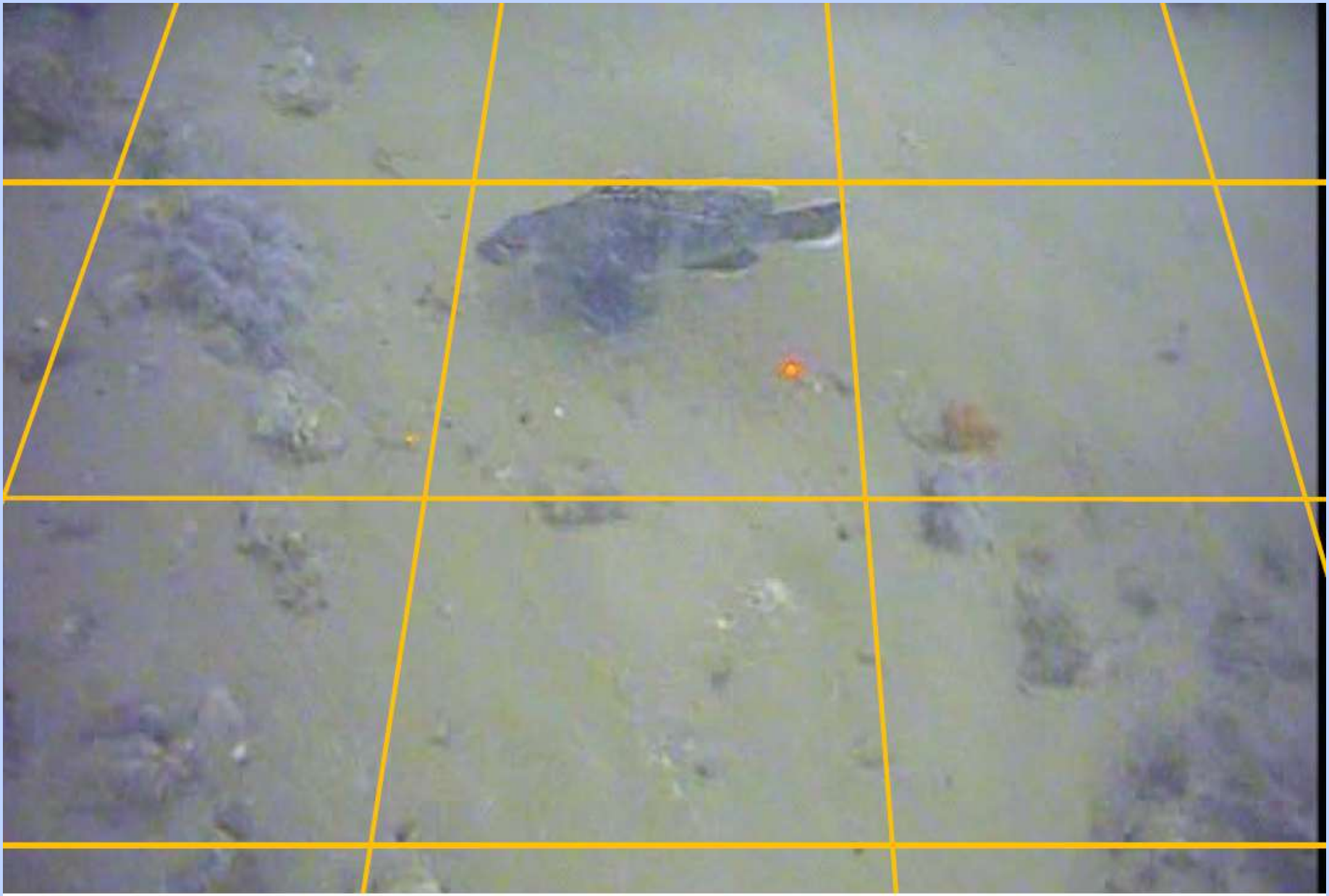
U/W Video

Transect 9

- Plow Burial







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9a (Flat Sand 80%, Pebble 20%) Sea Bass

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9c Plow Burial Cable Crossing (Flat Sand 95%, Pebble 5%)

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www.crenvironmental.com

9d (Flat Sand 70%, Pebble 20%, Cobble 10%) Common Barnacles

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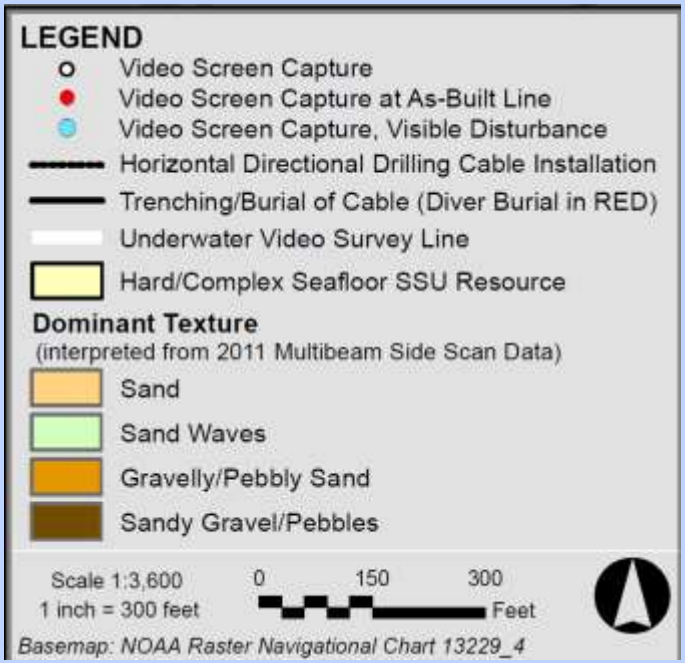
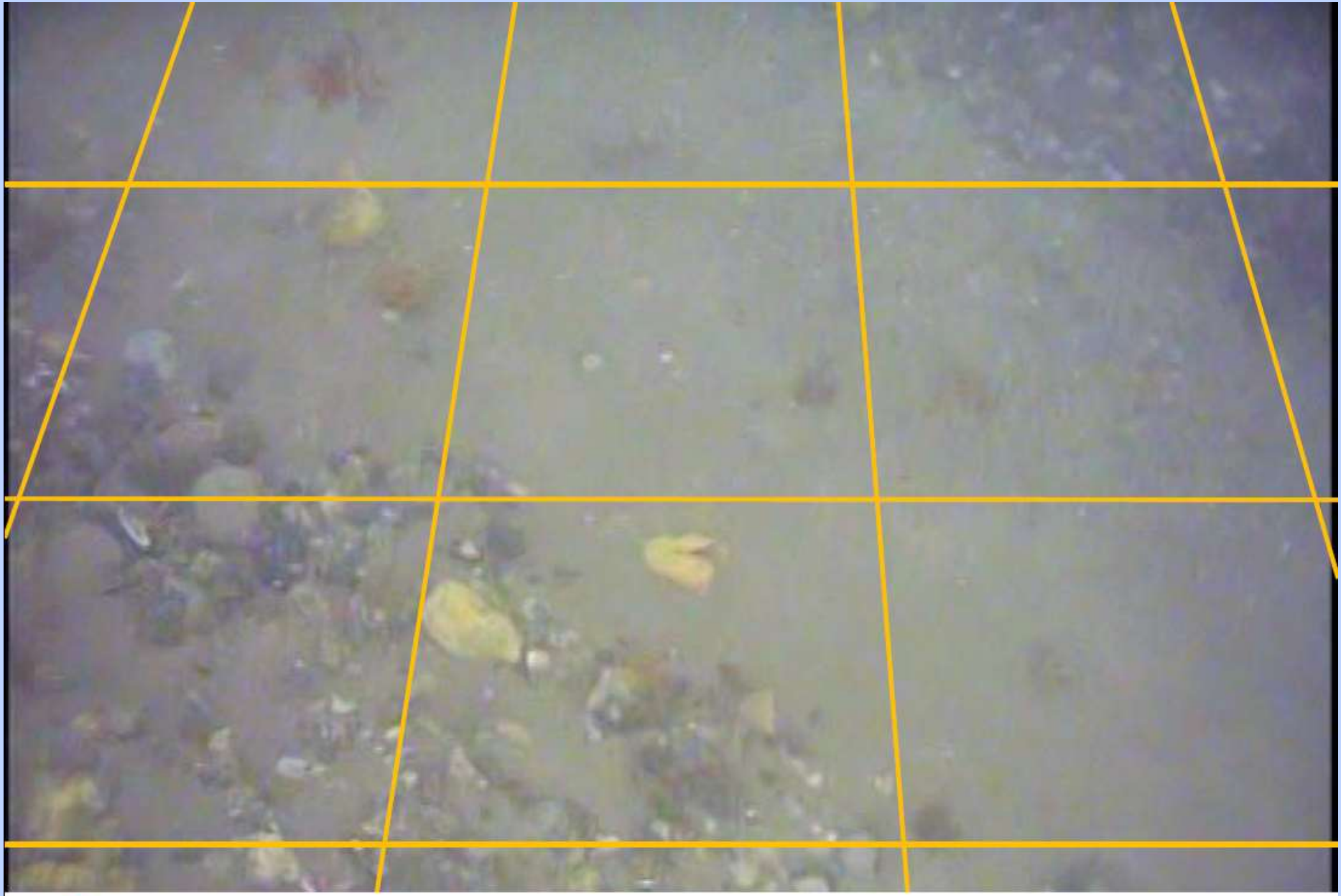
U/W Video

Transect 10

- Plow Burial





10b Near Plow Burial Cable Crossing (Flat Sand 65%, Pebble 35%) Sulfur Sponge

10c Plow Burial Cable Crossing (Flat Sand 80%, Pebble 20%) Sulfur Sponge

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10d (Flat Sand 60%, Pebble 35%, Cobble 15%) Sulfur Sponge, Sand Sponge, Brown Algae

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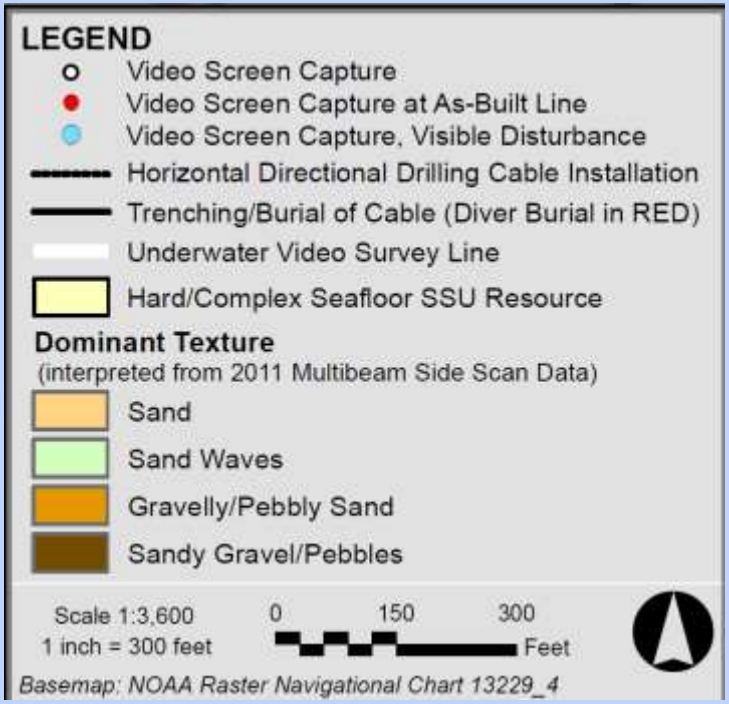
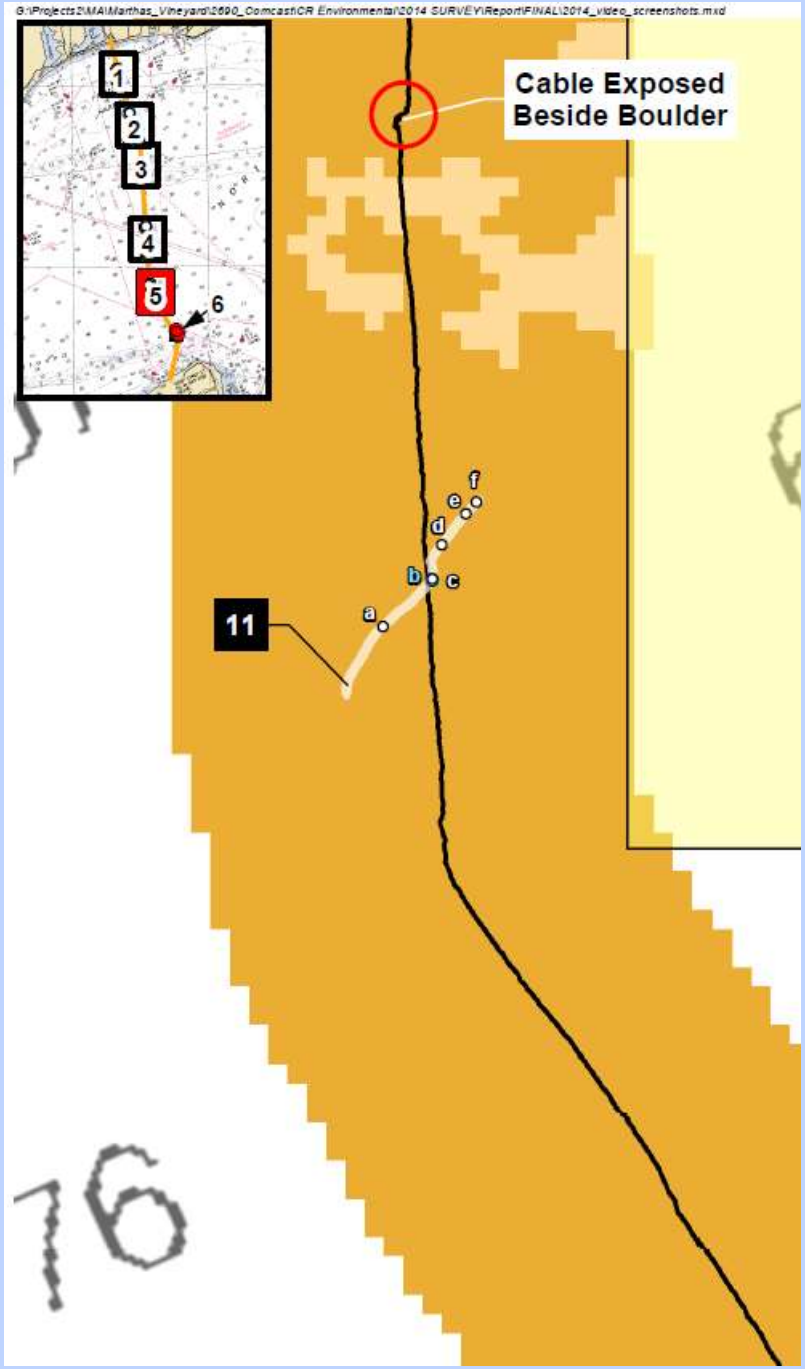
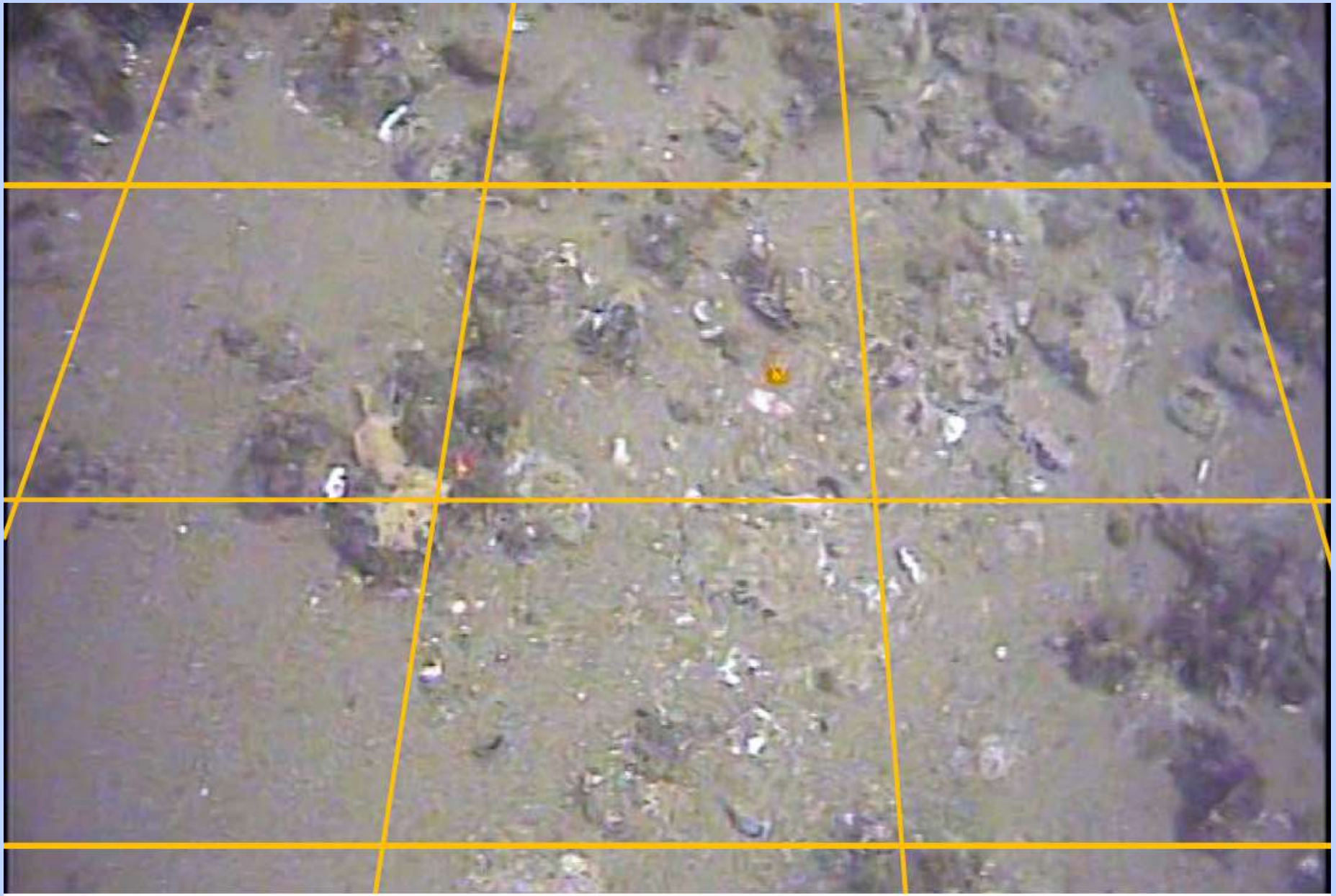
U/W Video

Transect 11

- Plow Burial







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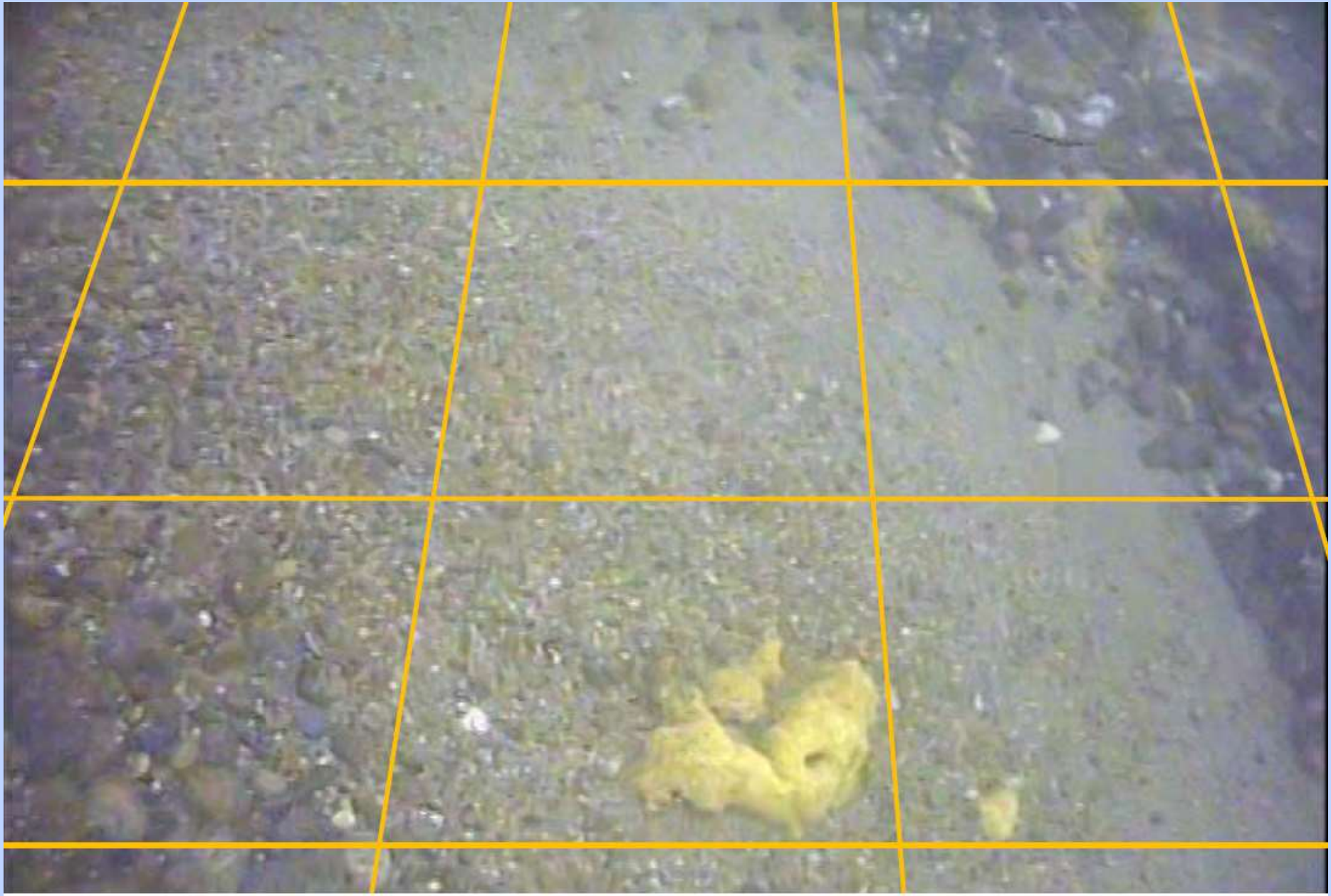
11a (Flat Sand 70%, Pebble 20%, Cobble 10%) Shells, Branched Hydroids, Bread Crumb Sponge

Epsilon



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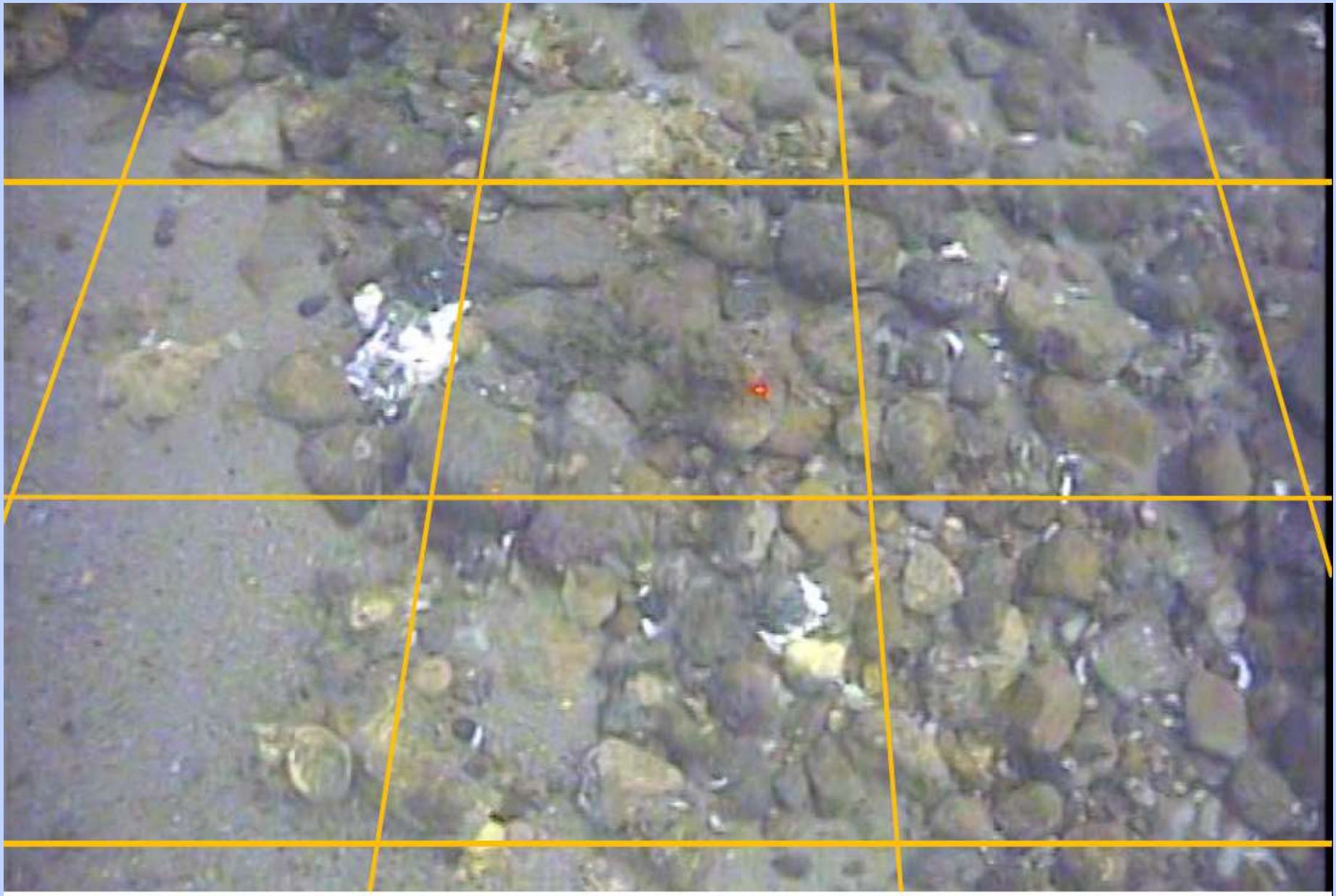
11b Plow Burial Cable Crossing (Flat Sand 60%, Pebble 40%)
Sulfur Sponge

Epsilon Associates Inc.



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11c (Flat Sand 40%, Pebble 40%, Cobble 20%) Invasive White Tunicate, Bread Crumb Sponge

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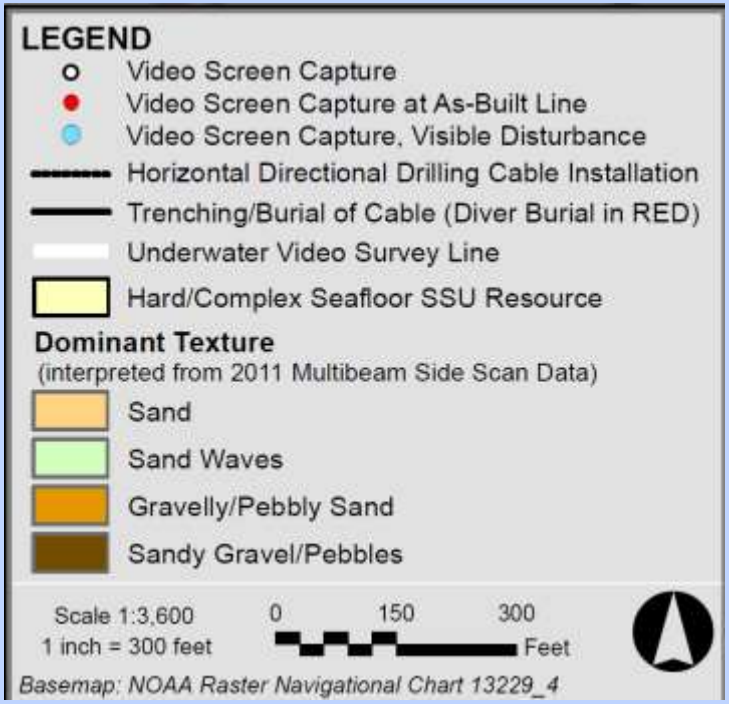
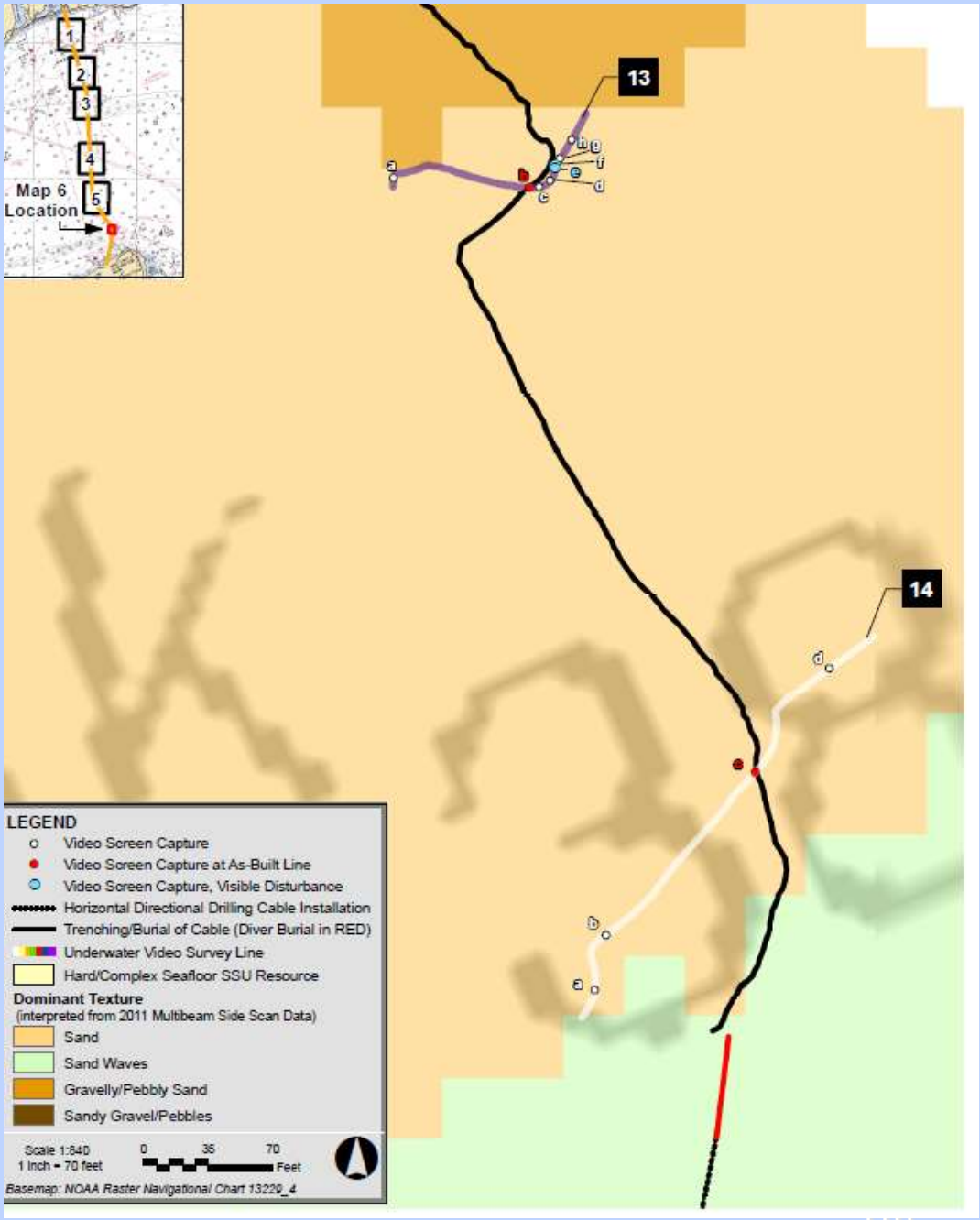
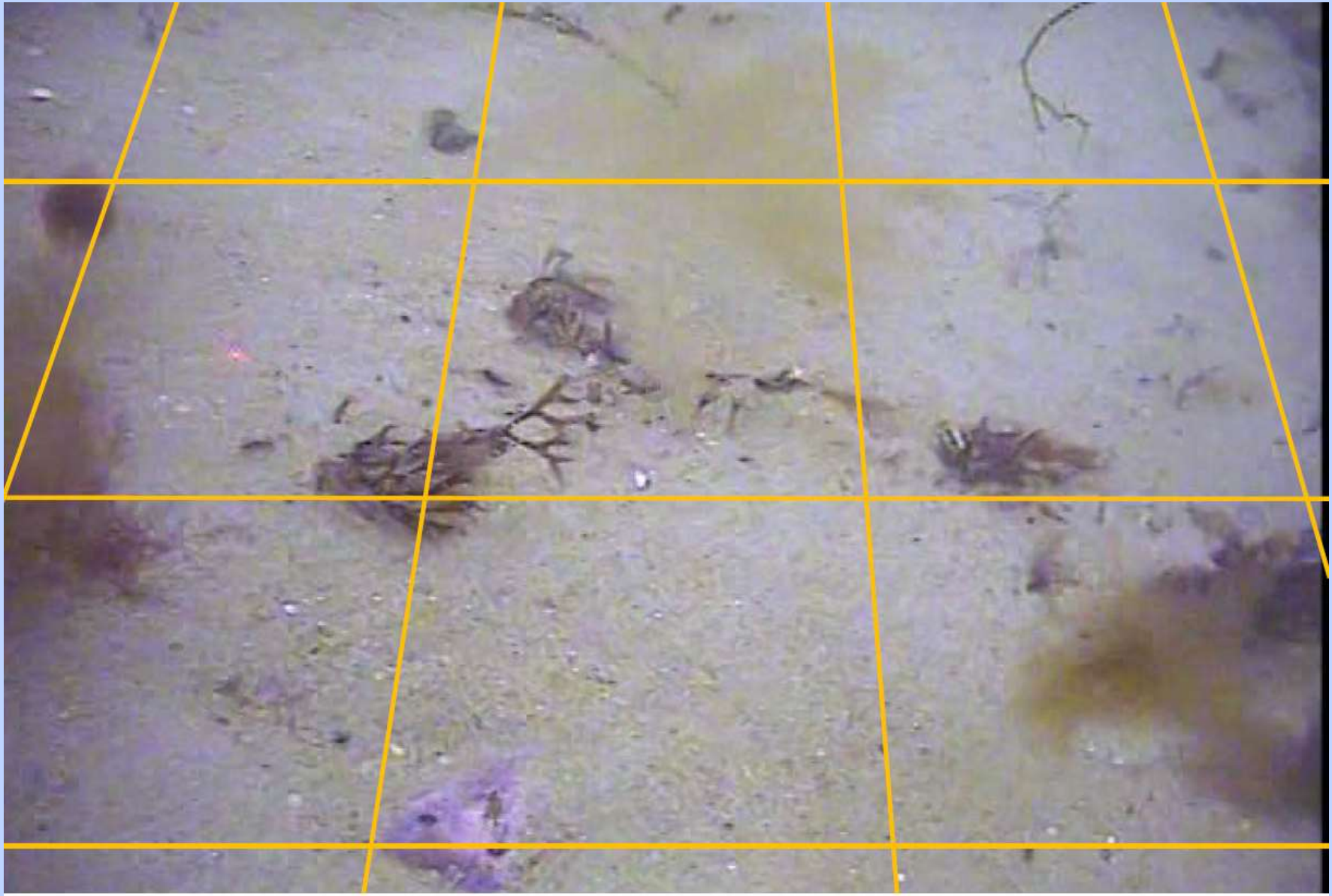
U/W Video

Transect 14

- **Plow Burial**







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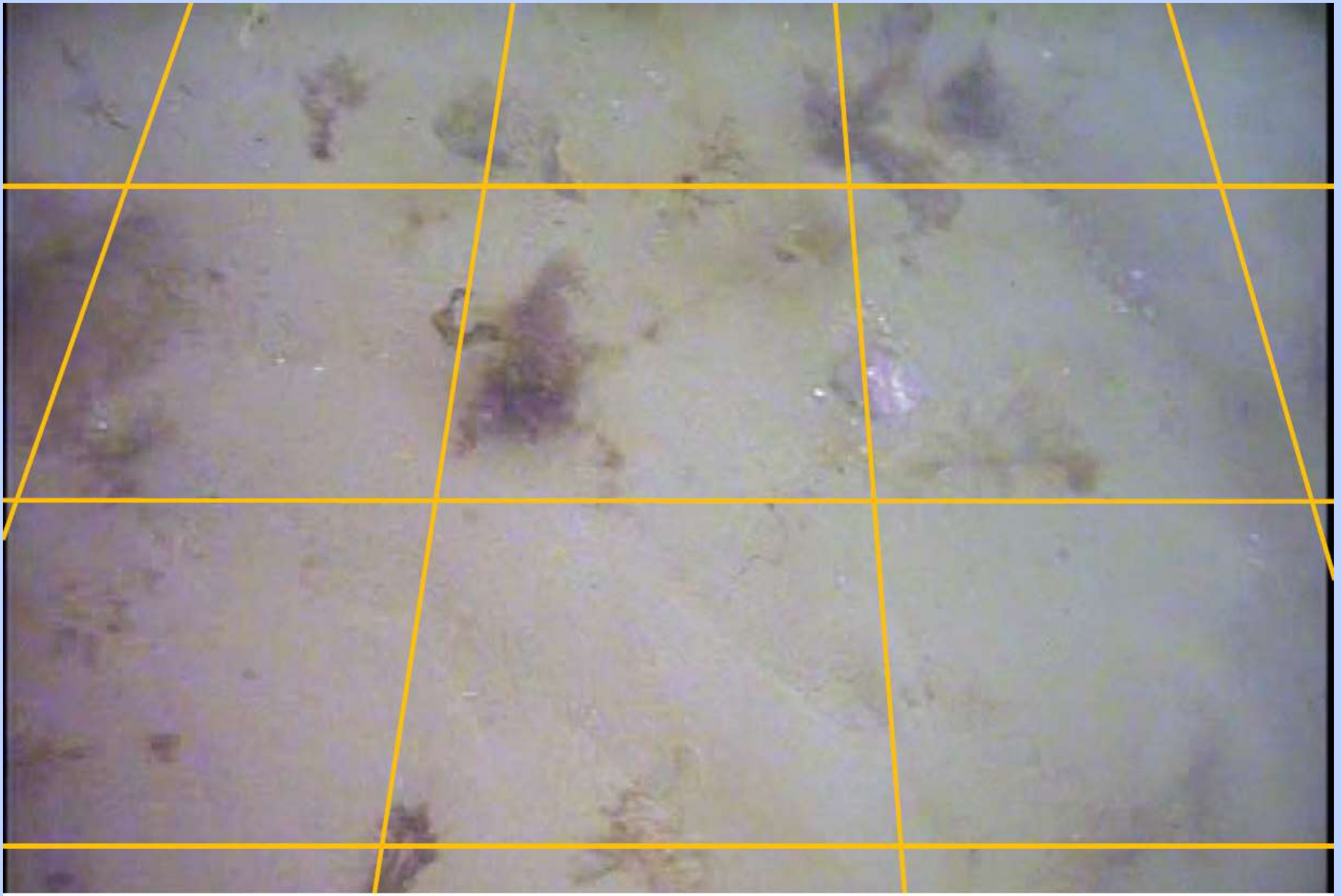
14b (Sand Waves 95%, Pebble 5%) Brown Algae, Branching Red Algae

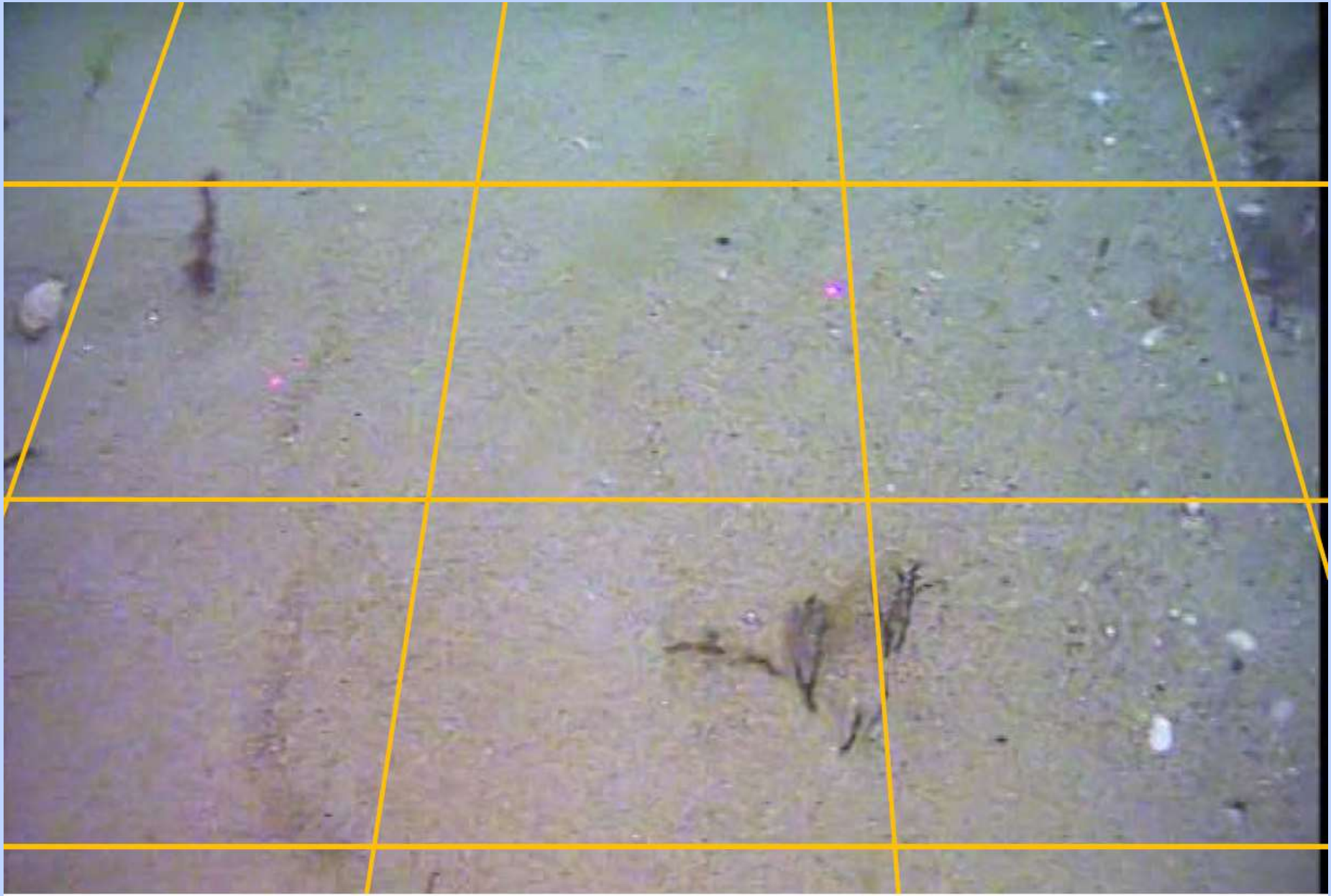
Epsilon ASSOCIATES INC.



www.crenvironmental.com

14c As-Built Crossing Location (Sand Waves 97%, Pebble 3%) Brown Algae, Branching Red Algae

Epsilon Associates Inc.

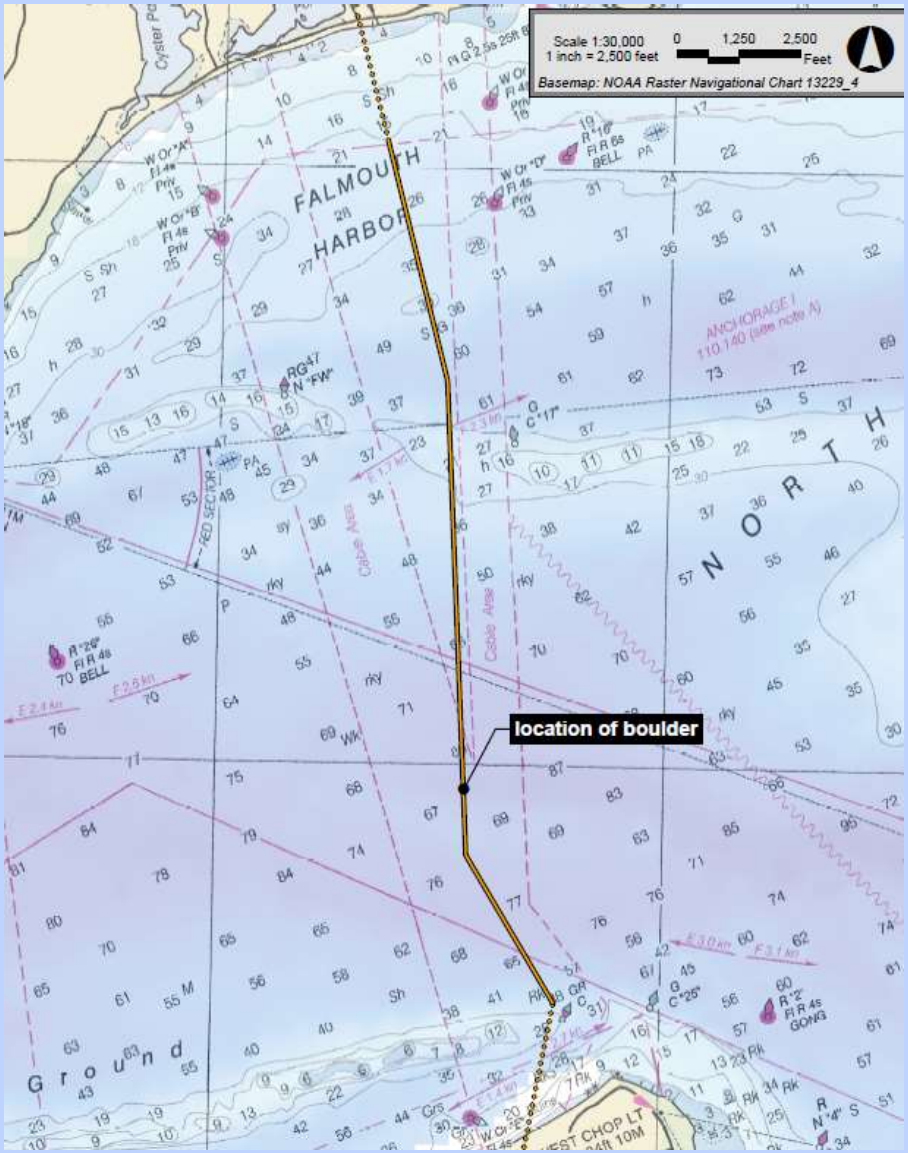


www.crenvironmental.com

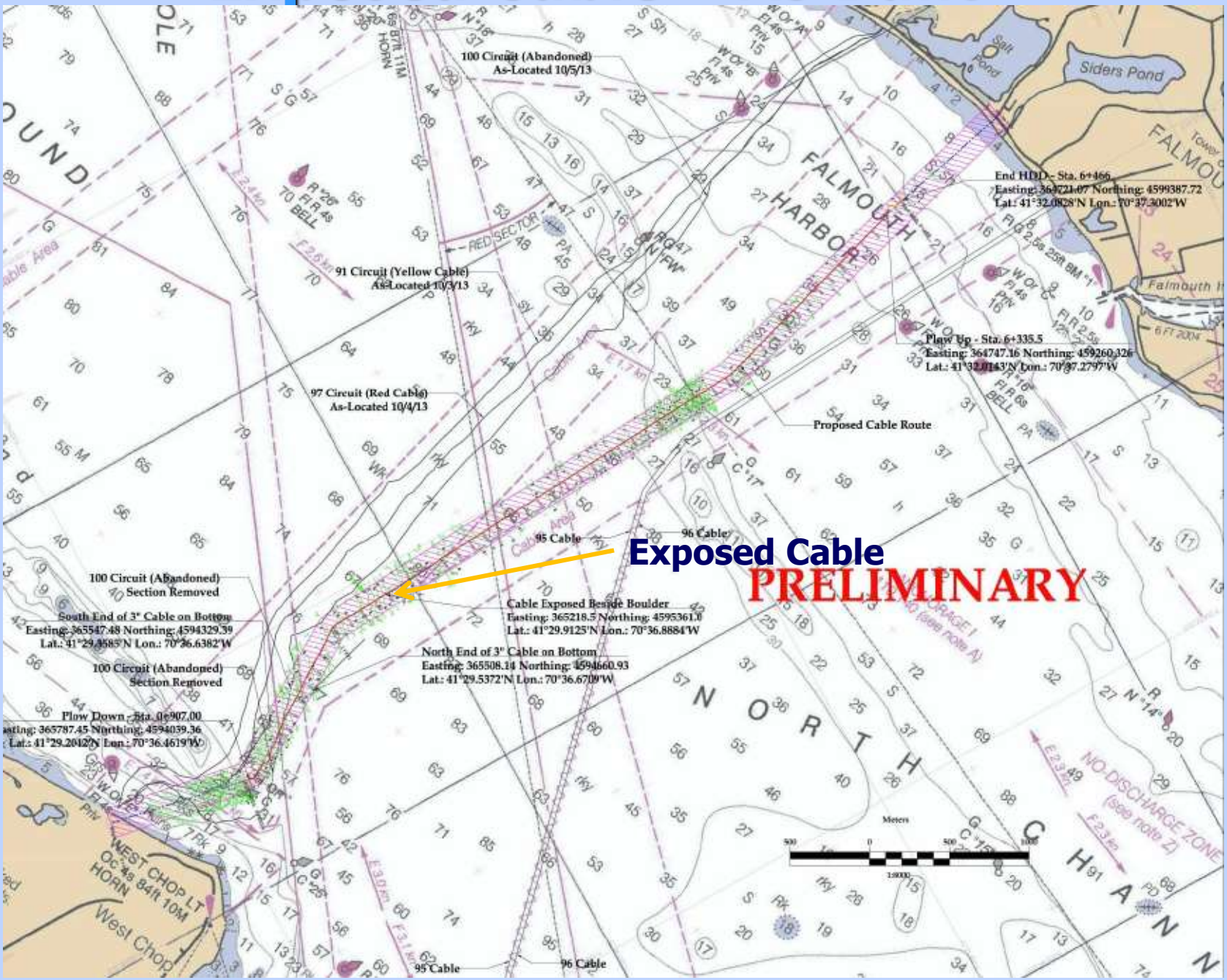
14d (Sand Waves 95%, Pebble 5%) Branching Red Algae, Shells

Epsilon Associates Inc.

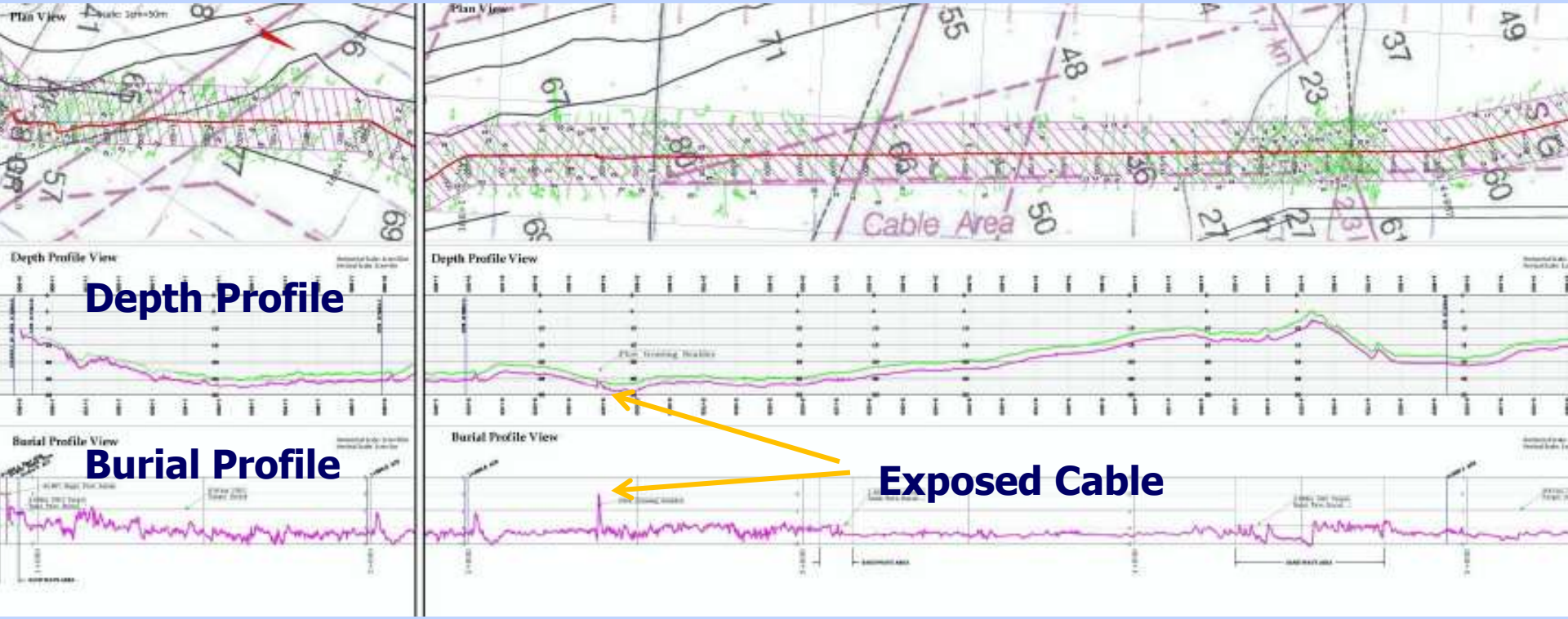
Exposed Cable



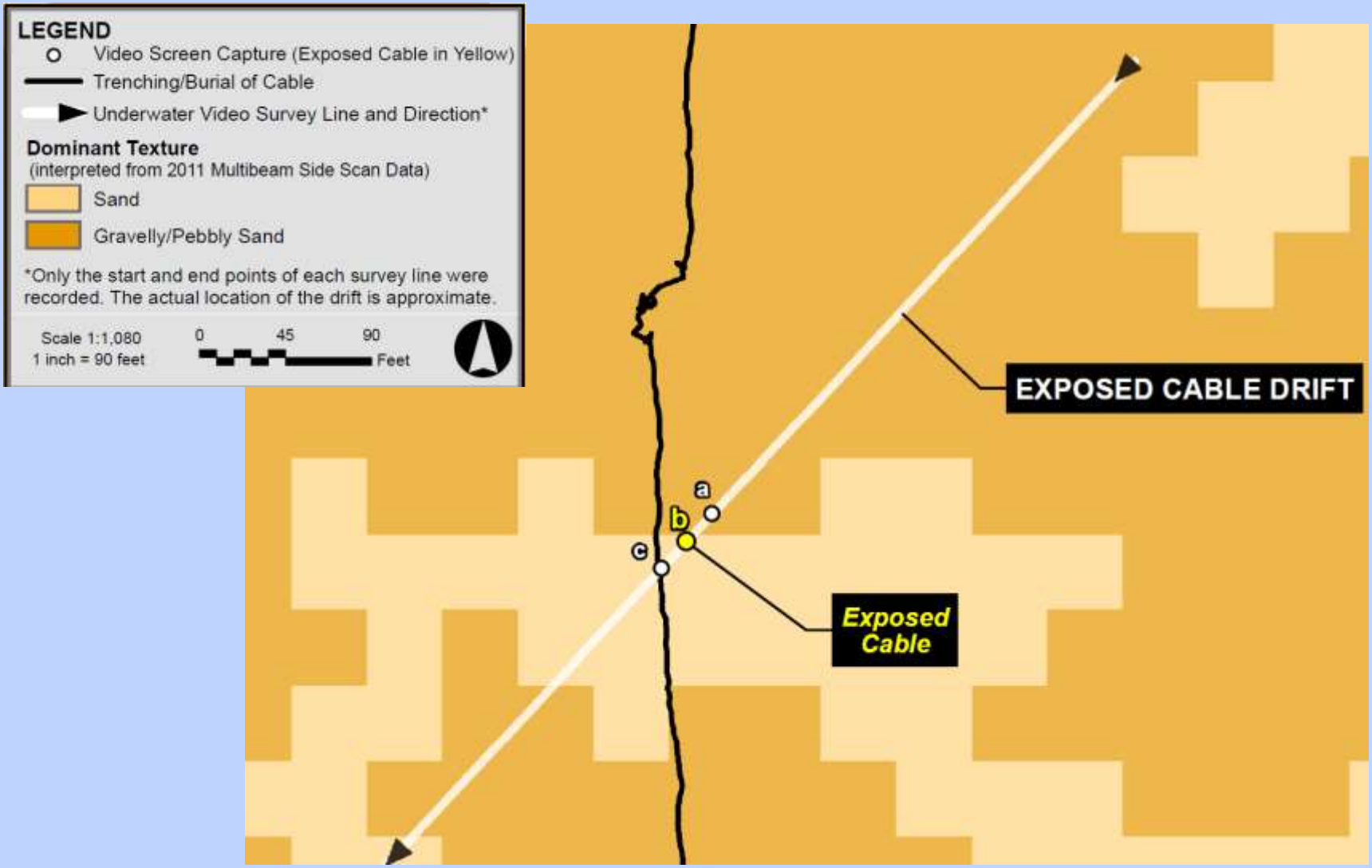
Exposed Cable – As Built



Exposed Cable – As Built



Exposed Cable – U/W Video Survey

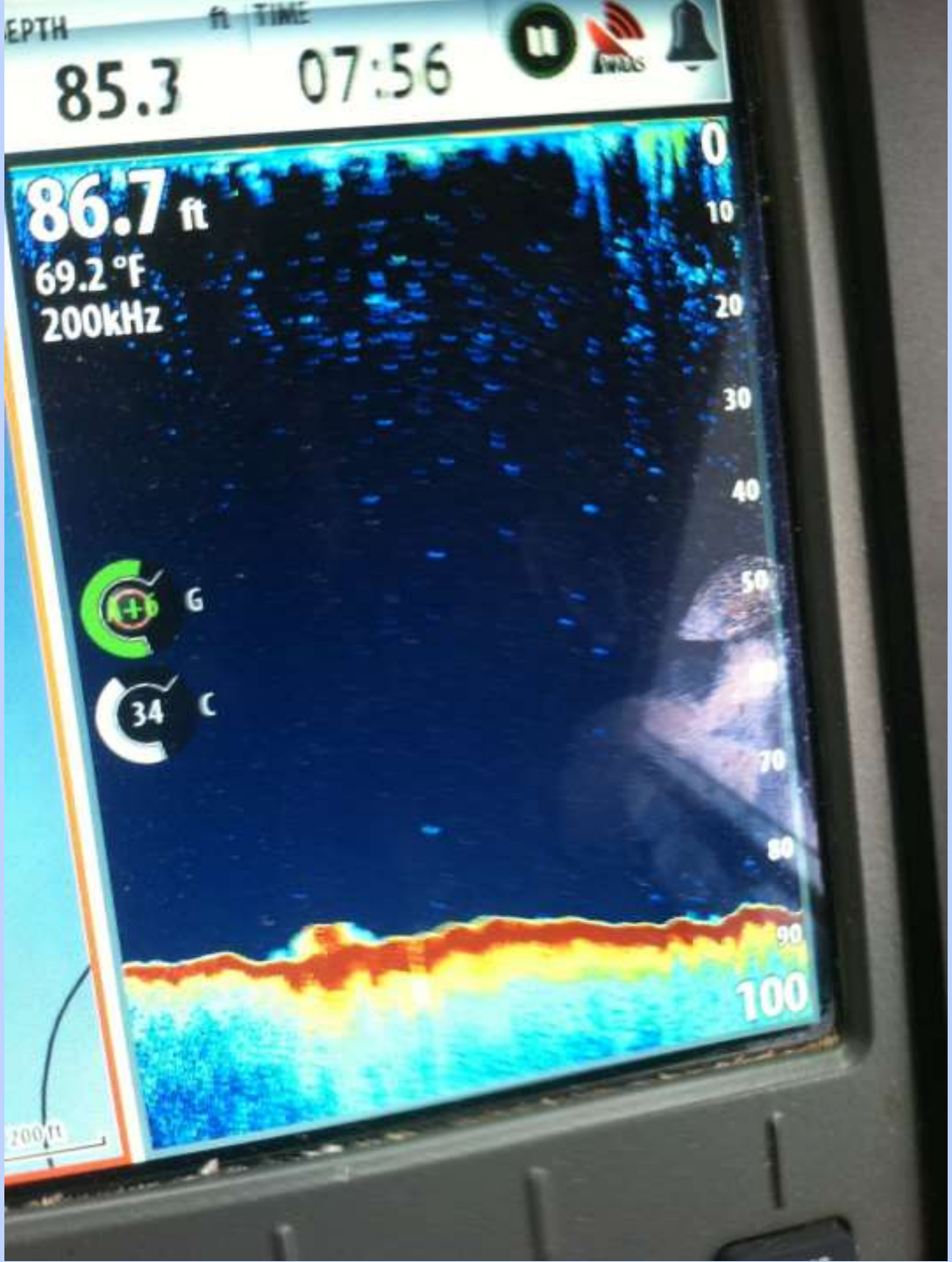


Exposed Cable and Rock

Exposed Cable

Exposed Cable

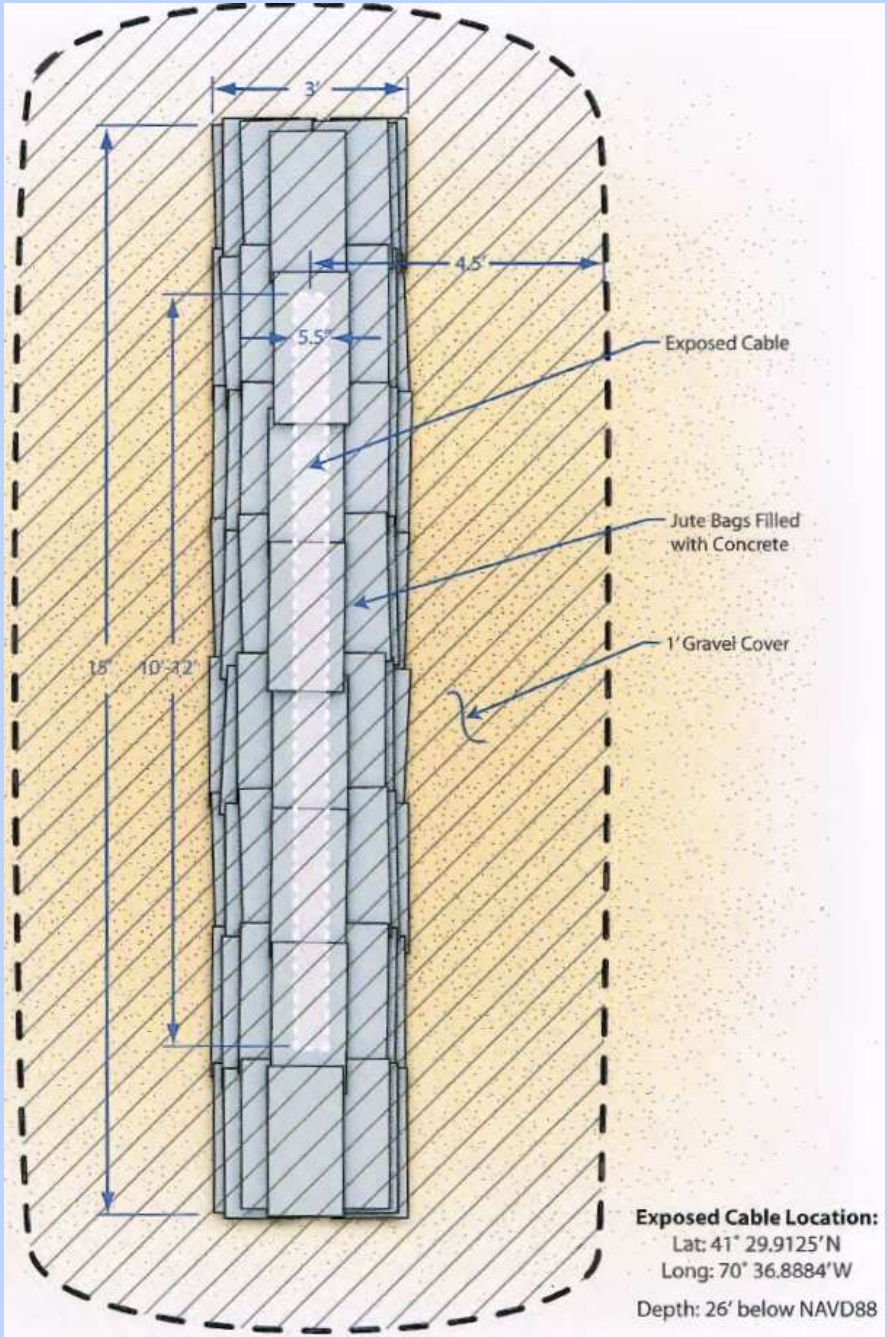
Multibeam Bathymetry



Exposed Cable

Concrete Bag and Sand Cover

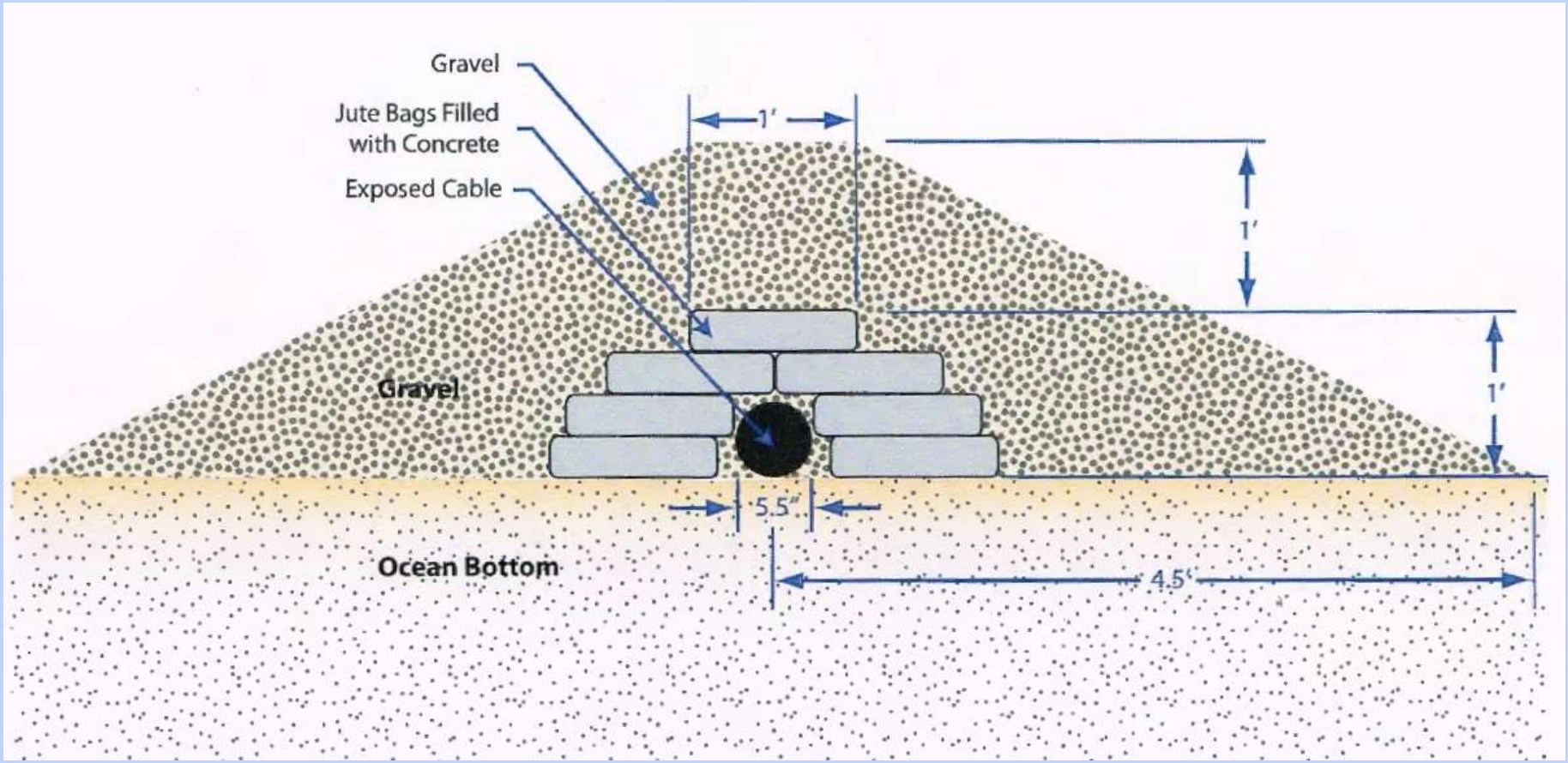
Plan View



Exposed Cable

Concrete Bag and Sand Cover

Section View



Summary
&
Conclusions

Summary

Project was reviewed and vetted through:

- Massachusetts Ocean Team & State Permitting
- MEPA Review
  - Expanded Environmental Notification Form,
  - Single Environmental Impact Report,
  - Notice of Project Change, and
  - Public Benefit Determination
- US Army Corps of Engineers

Numerous Meetings:

- State (Coastal Zone Management, Div. of Marine Fisheries, MassDEP)
- Federal (US Army Corps of Engineers)
- Regional (Cape Cod Commission & Martha's Vineyard Commission)
- Local (Falmouth and Tisbury)

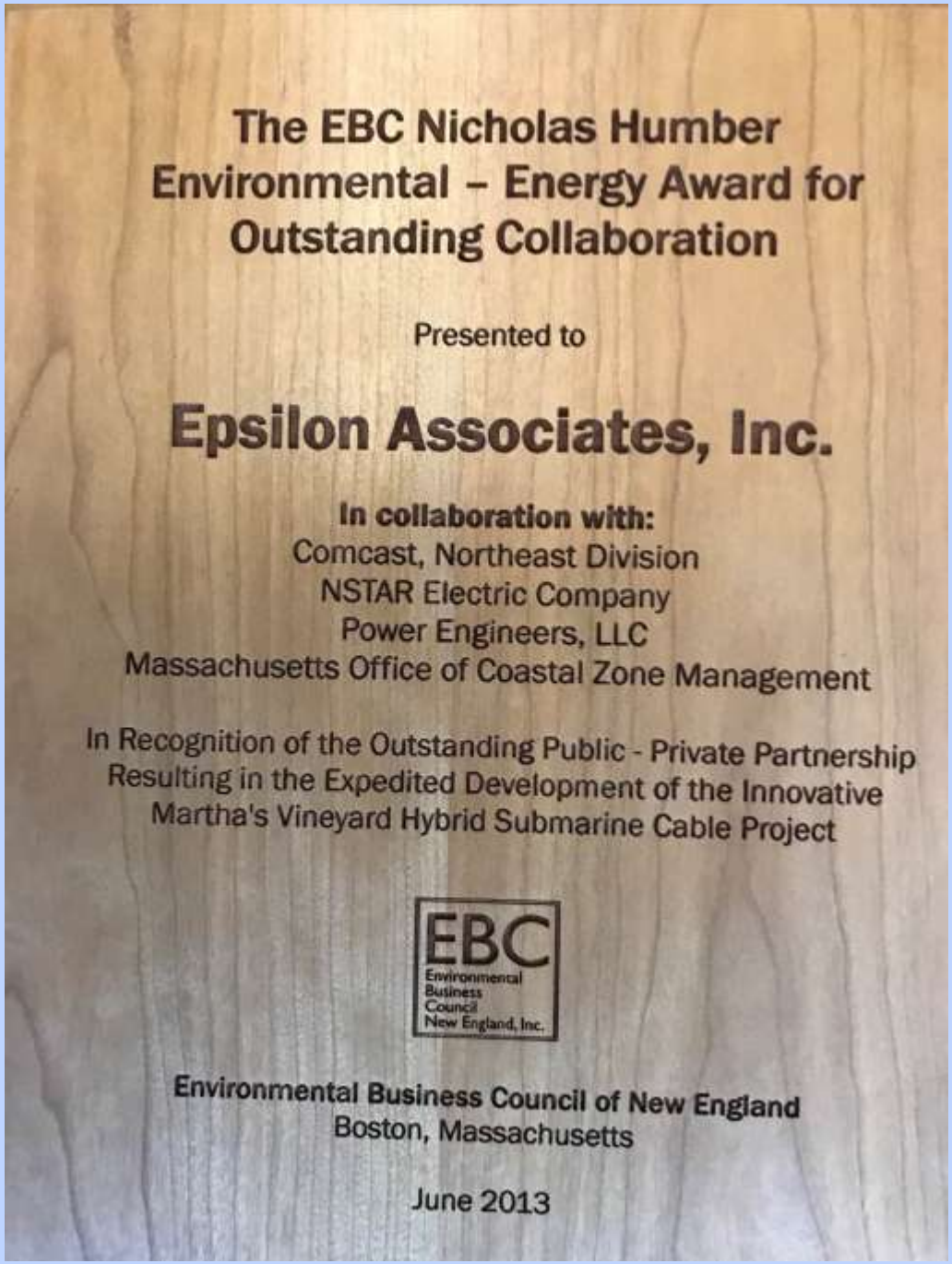
Conclusions

Post Construction Survey & Report

- No Significant Damage to SSUs
- Only observed change to bottom was the creation of a narrow sand furrow – which formed Black Sea Bass Habitat
- 10-12 ft Exposed Cable due to the plow hitting a boulder - protected by cover with Jute Bags filled with concrete and topped with 1 ft of sand

Successful Installation

- Brought needed electric power and fiber optic communication services to Martha's Vineyard.
- First project to be permitted through the state's Ocean Management Act and Plan.


The EBC Nicholas Humber
Environmental – Energy Award for
Outstanding Collaboration
Presented to
Epsilon Associates, Inc.
In collaboration with:
Comcast, Northeast Division
NSTAR Electric Company
Power Engineers, LLC
Massachusetts Office of Coastal Zone Management
In Recognition of the Outstanding Public - Private Partnership
Resulting in the Expedited Development of the Innovative
Martha's Vineyard Hybrid Submarine Cable Project
EBC
Environmental
Business
Council
New England, Inc.
Environmental Business Council of New England
Boston, Massachusetts
June 2013

End of Presentation