Supporting Cable and ROV Surveys in British Columbia and Overseas

Kel Kopeck

Terra Remote Sensing Inc.
Sidney BC, Canada

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Presentation Overview

Section 1 : Components of a Cable Project (4min)

Section 2 : Prelay Survey (4min)

Section 3 : Processing and Product Requirements (4min)

Section 4 : Installation (or Repair) (4min)

Section 5: Questions?

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Section 1: Components of a Cable Project

The oven goes out with the turkey half done.

Assemble the troops.

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1. Reason for the project?
   a) Replacement of an existing cable, reactive (faulted naturally, anchor drag, slide induce fault, etc)?
   b) Replacement of an existing cable, proactive?
   c) New corridor, new cables?
   d) Addition of a cable to an existing corridor?
2. Does data exist for the area or corridor in question?
   a) As-laid drawings?
   b) Previous inspection video?
   c) Previous splice repair information and location?
   d) Bathymetric data?
   e) Right of Way info? Is it georeferenced? Do we have to do this.
   f) Topographic data?
   g) Terminal station drawings?

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Components to a Cable Project (continued)

3. Plan field survey/inspection.

   a) What data needs to be collected? Civil vs offshore?

   b) What crew and gear is required and available?

   c) What time of the year can or should the work be completed based on weather, tides, and currents?

   d) What's the distance to anchorage or port? This impacts cost.

   e) Prepare for accommodation, travel, equipment lease.

   f) Prepare field files.

   g) Prepare, test, and pack gear.

   h) Ship in advance gear if required.

   i) Prepare H&S, JSA, ESP, Tailboard, Insurance documents to client?

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Components to a Cable Project (continued)

4. Initiate survey or inspection of the site or corridor.
   a) Book accommodation and travel. On shore? On vessel?
   b) Mobilize/travel to the vessel or nearest community.
   c) Possibly install gear on a vessel at the site.
   d) Transit to the project location.
   e) Collect multibeam data.
   f) Collect side scan data.
   g) Collect topographic data?
   h) Other data? ADCP, mag, sub-bottom?
   i) Field processing?
   j) ROV inspection?

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Components to a Cable Project (continued)

5. Process and interpret data.
    a) Bathymetric. What specific product do we require? Points, contours, surface, formats?
    b) Side scan sonar?
    c) ROV inspection?
    d) Possible diver inspection at landings?
    e) Other data?
6. Route evaluation and selection.
    a) Create Route Position List (RPL).
    b) Create vessel files specific to it's navigation system requirements for ship and ROV.

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Components to a Cable Project (continued)

7. Civil work.
    a) Schedule around low tides?
    b) Prepare civil support files.
    c) Coordinate with client and contractors. When will material be delivered? When is install?

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Components to a Cable Project (continued)

8. Cable installation.
    a) Organize accommodation and travel. On shore or offshore?
    b) Ship gear if required in advance?
    c) All crews mob/travel to the vessel or nearest community.
    d) Install gear on lay vessel. Usually done already.
    e) Will have prepared field files. Ie. Navigation, RPL.
    f) Dry run and begin cable install.

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Components to a Cable Project (continued)

9. Post lay ROV inspection.
    a) ROV normally already on site.
    b) Conduct this following cable install. Based on ROV requirements.
    c) Side scan. If deep is the appropriate vessel available. Do we need this?
    d) Diver inspection at nearshore.
10. Prepare as-laid drawings.
    a) These sheets are already created by now.
    b) Add as-laid cable positions and installation details.

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Section 2 : Prelay Survey

Why wait til the summer, lets do this in November.

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Need an Appropriate Vessel

Requirement is a function of;

- Project location
- Expected sea states
- Equipment requirements

Can we get away with a 27 footer, or a 12 footer….

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Vessel

Or do we need to house bodies and deploy larger gear.

Do we need an 60 footer with an A-Frame?

Using familiar vessel can significantly cut down on install time and costs by

- Known offsets.
- Known abilities.
- Known captain

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Vessel

Or do we need to put a sea can on the deck and get away with a crane instead of an a-frame?

Are we running 24/7 = two full crews, or 12hr shifts, or 6hr shifts?

Are we back at dock at night or offshore and need to provide food and accom?

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Gear Installation

GPS and nav spread.

Run wires from survey shack to bridge? Bridge to survey?

Multibeam

- Shallow water?
- Deep >300m?
- Deeper >1000?
- If offshore then need robust pole. How fast do we need/want to go?
- Cables long enough for sensor to survey?
- IMU to survey.

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Continue Installation

Side scan

- Water depth will determine winch requirements.
- Can we weld winch to deck or do we need a plate. Aluminum vs steel hull.
- Are hydraulics or AC power required and close by for winch?

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Continue Installation

Side scan

- Most commonly 150 to 800m of cable will suffice in these parts.

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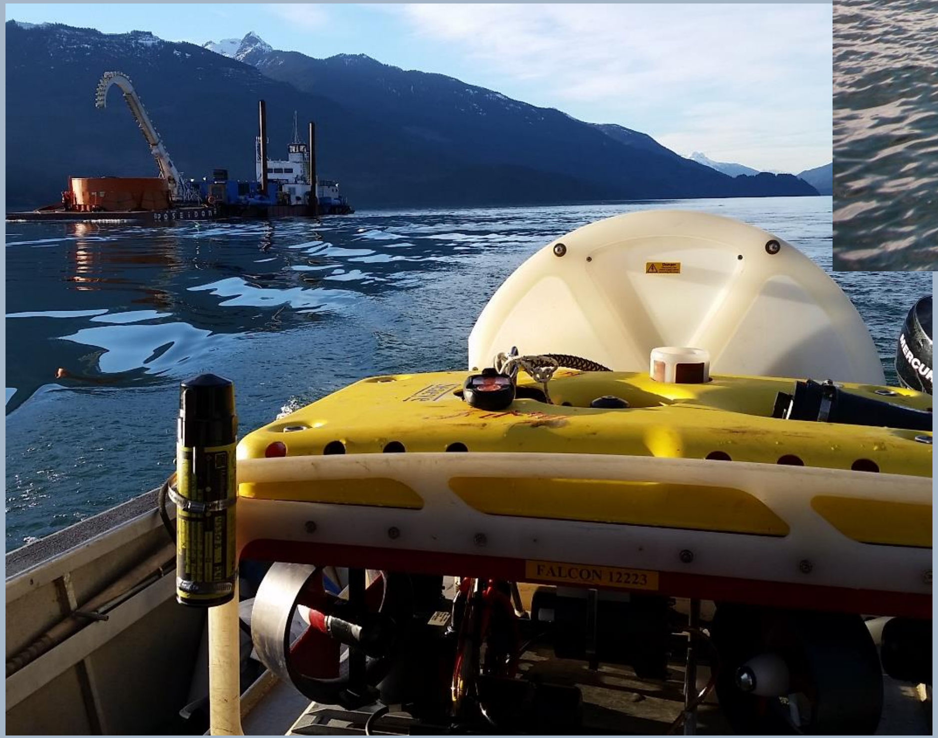
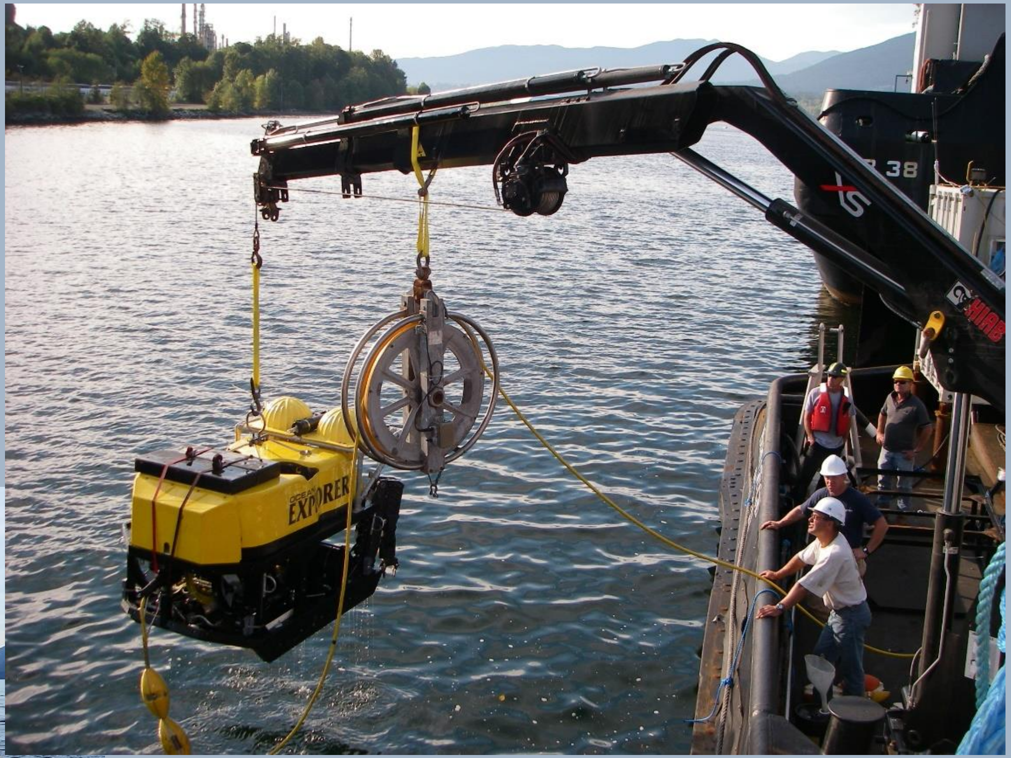
Continue Installation

ROV

- Will follow MB/SS program.
- Water depth will determine ROV and winch size.
- Small ROV to 200m+/- typ.
- Large ROV over 250m +/- typ.





Monitor;

- Tide window.
- Marine weather.
- Concurrent projects.
- Gear availability.
- Crew availability.

Pick your weather window and go.

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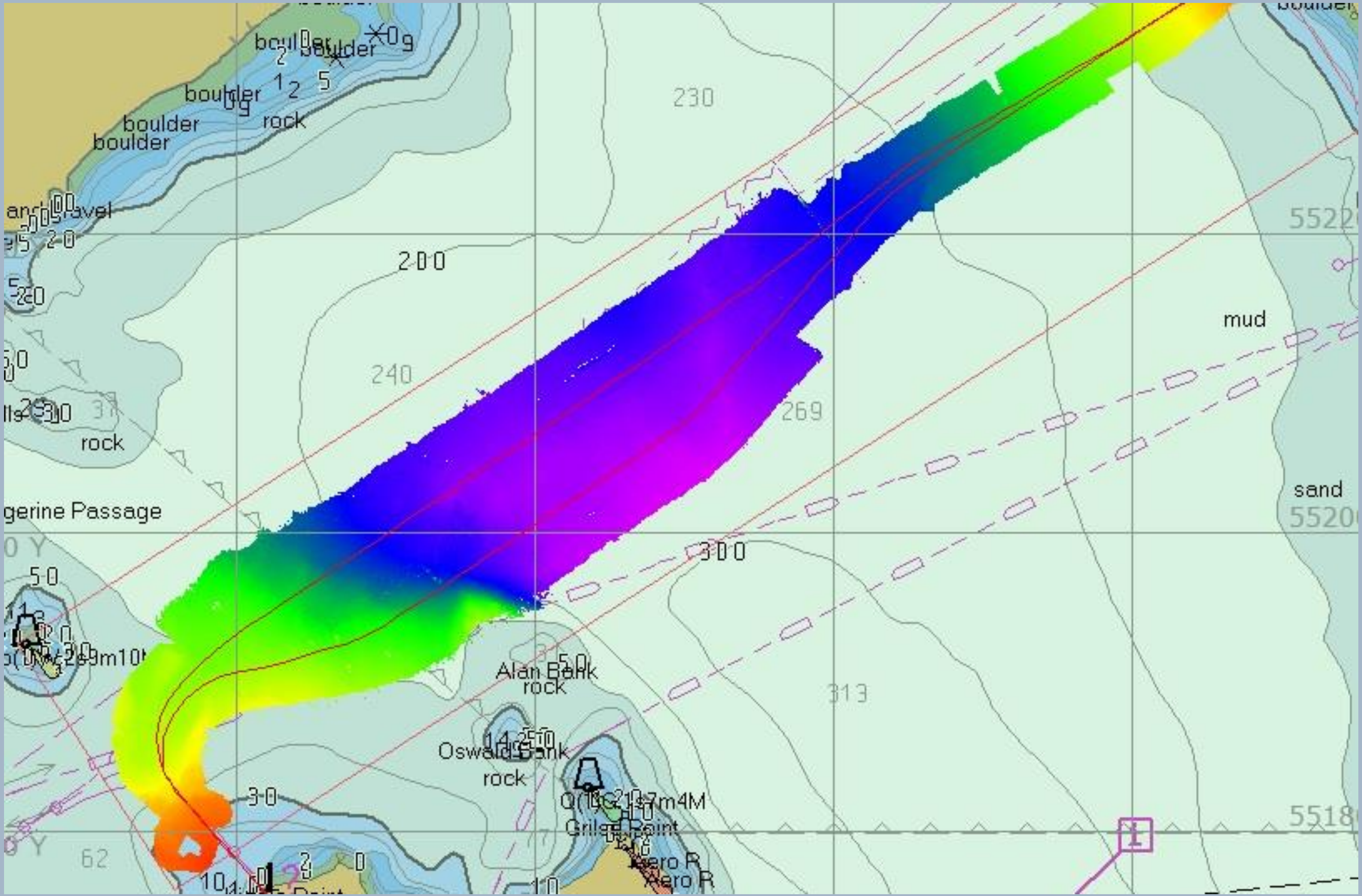
Bathymetry

- On site conduct velocity casts to seabed.
- Plan line orientation in advance to maximize coverage and minimize survey time.
- Normally cover required corridor plus 50-75m outside of RW.
- RW may not exist yet.
- Do what's required first if it makes sense!
- BACKUP DATA.



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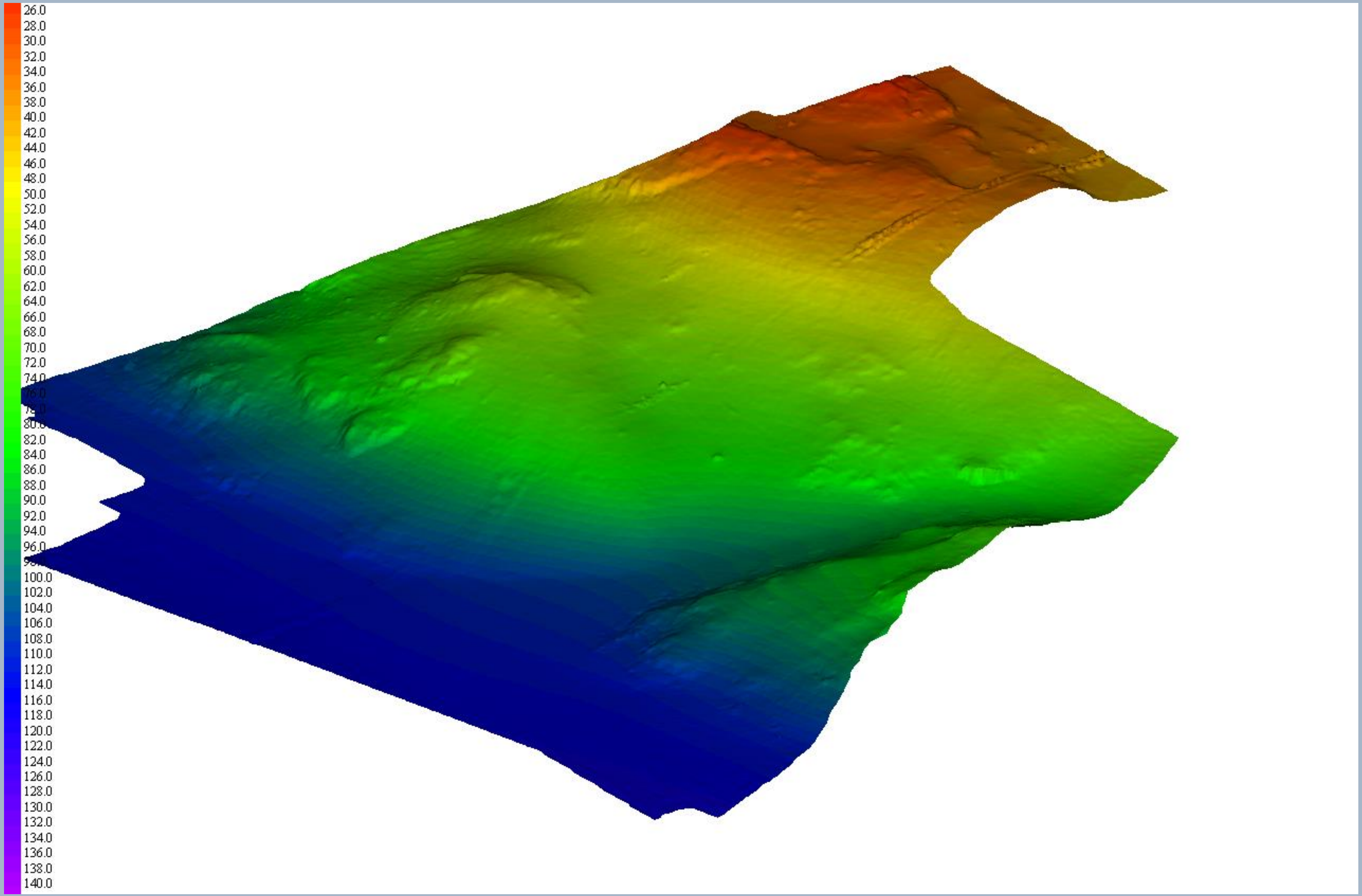
Create shaded relief or contours

- Infield products help line planning of side scan and ROV tasks…..



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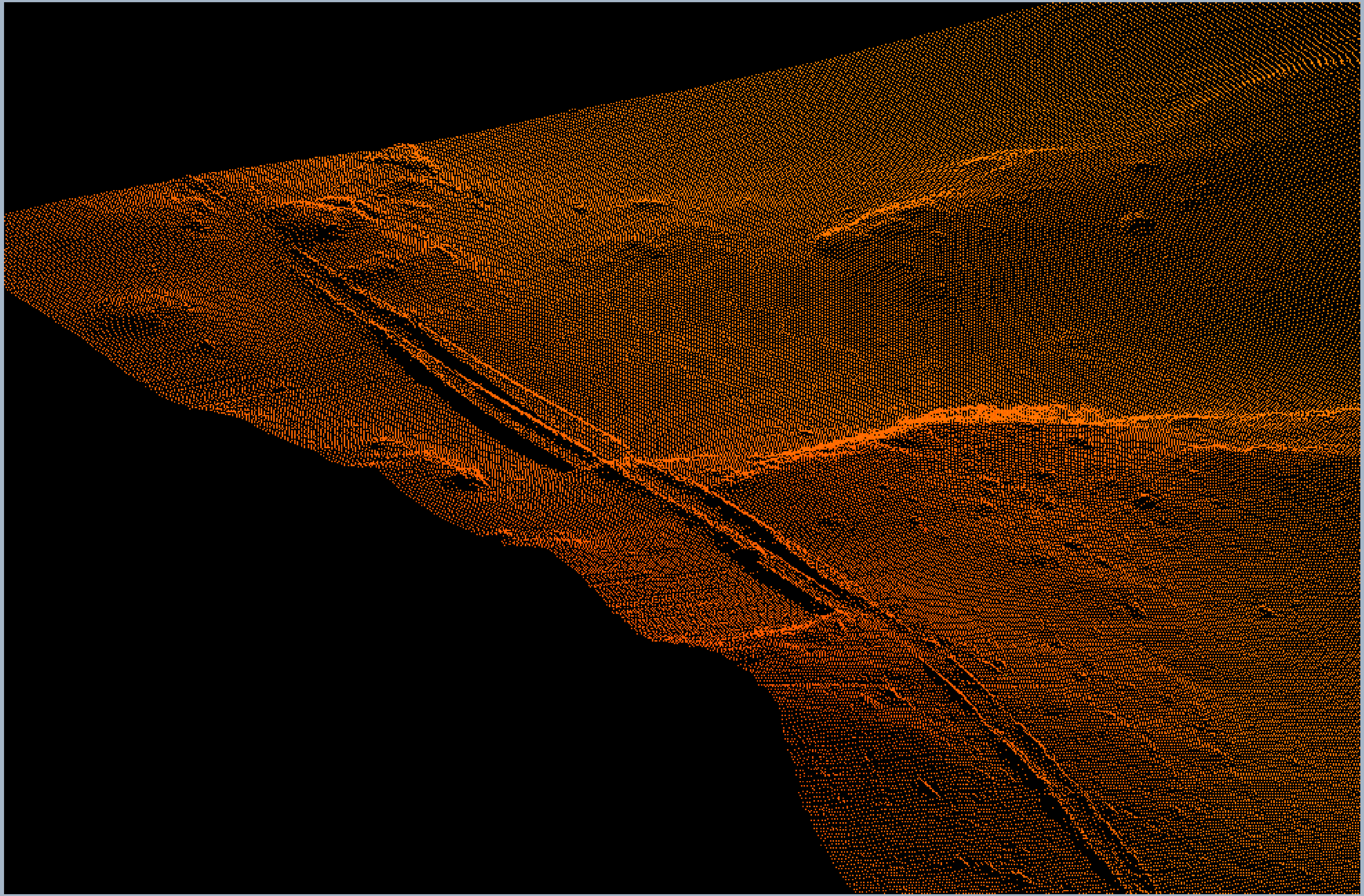
Or whatever helps most.

- …based on existing manmade and natural features.
- Often along existing cables or pipes.
- Or if faulted cable, what KP is fault at?
- This is where the “Sherlock Homes” hat often comes out. How much do we know about what happened?



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Start side scan

- Plan lines in advanced based on bathymetry to optimize efficiency. Deep water turns can take an hour.
- Do what is required first! If it’s a fault deal with that then move on to rest of corridor.
- BACK UP DATA.

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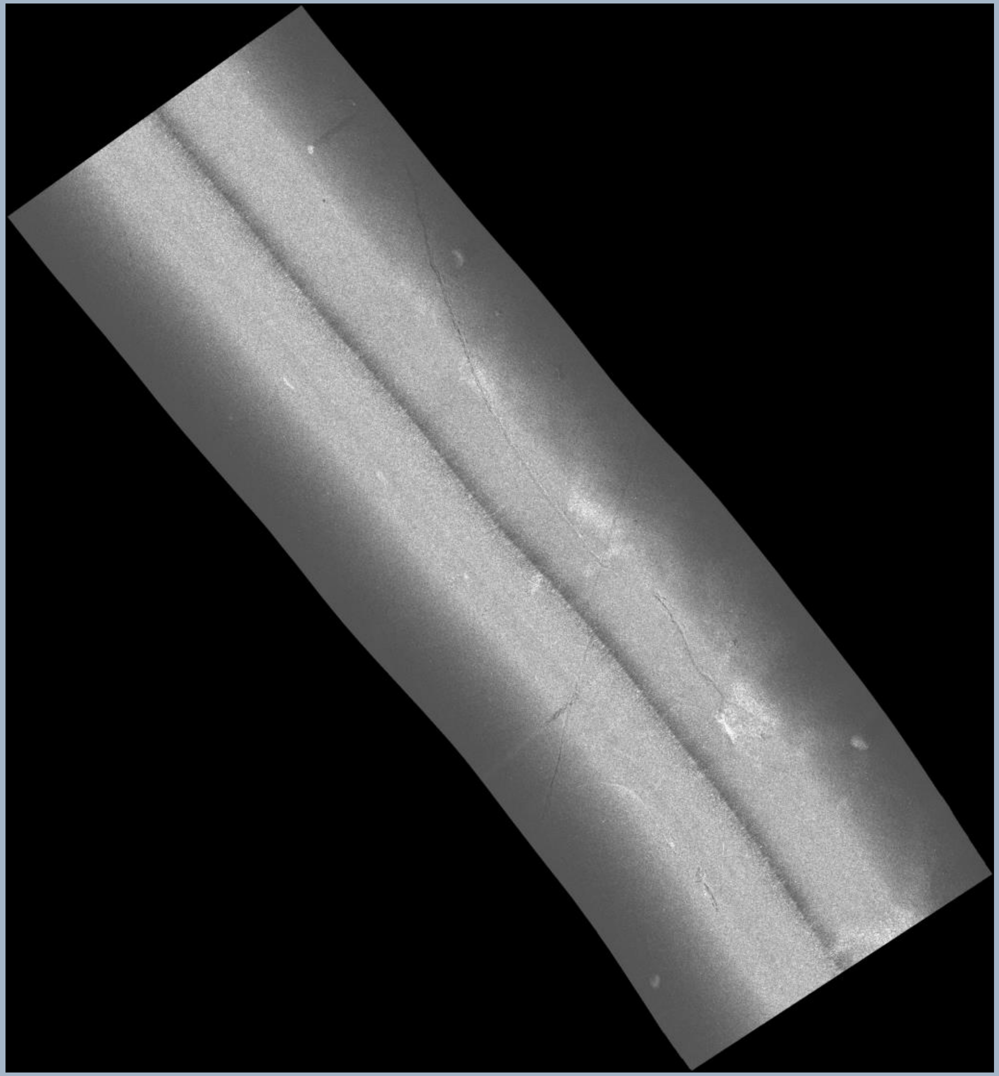
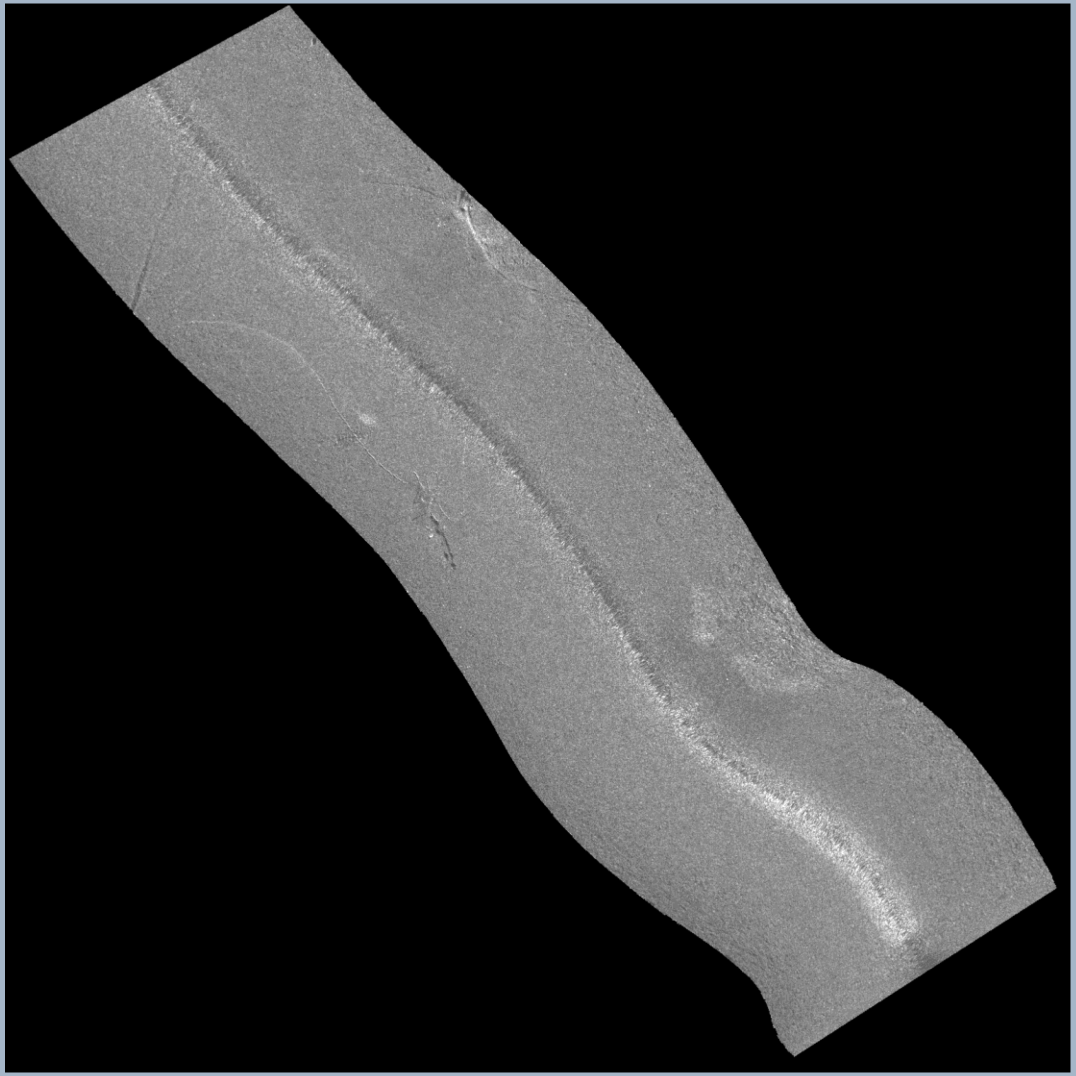
Side scan

- If dealing with a fault look for evidence then focus in on it.





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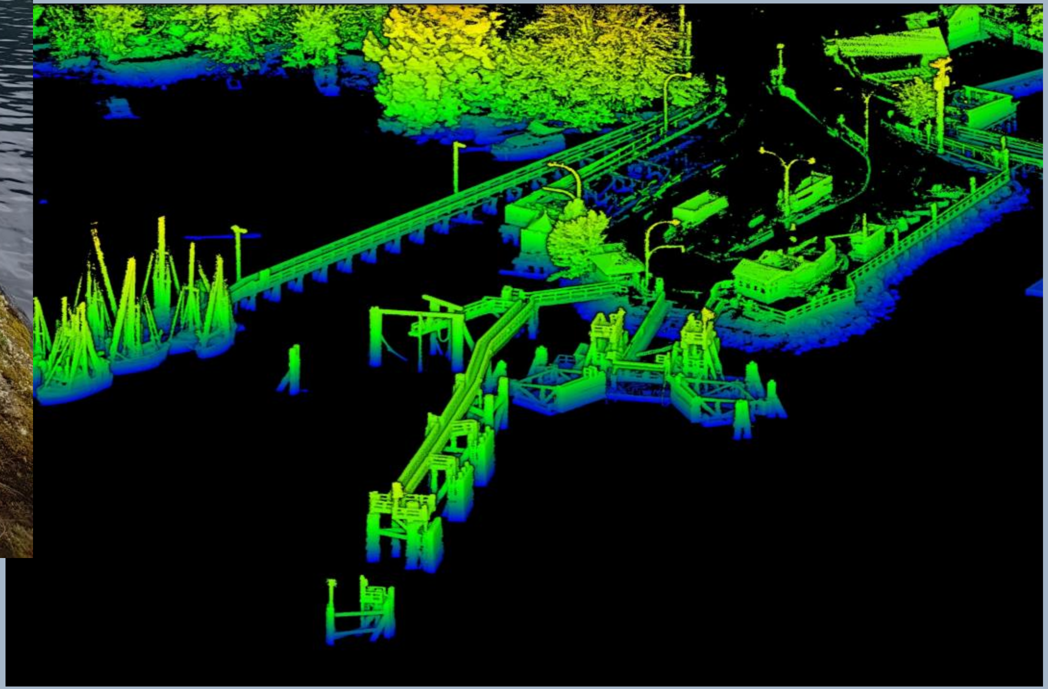
Topo and control?

Onshore topo

- May collect topo and control concurrently if new cable route.
- Or vessel based LiDAR.
- This is used for civil planning.



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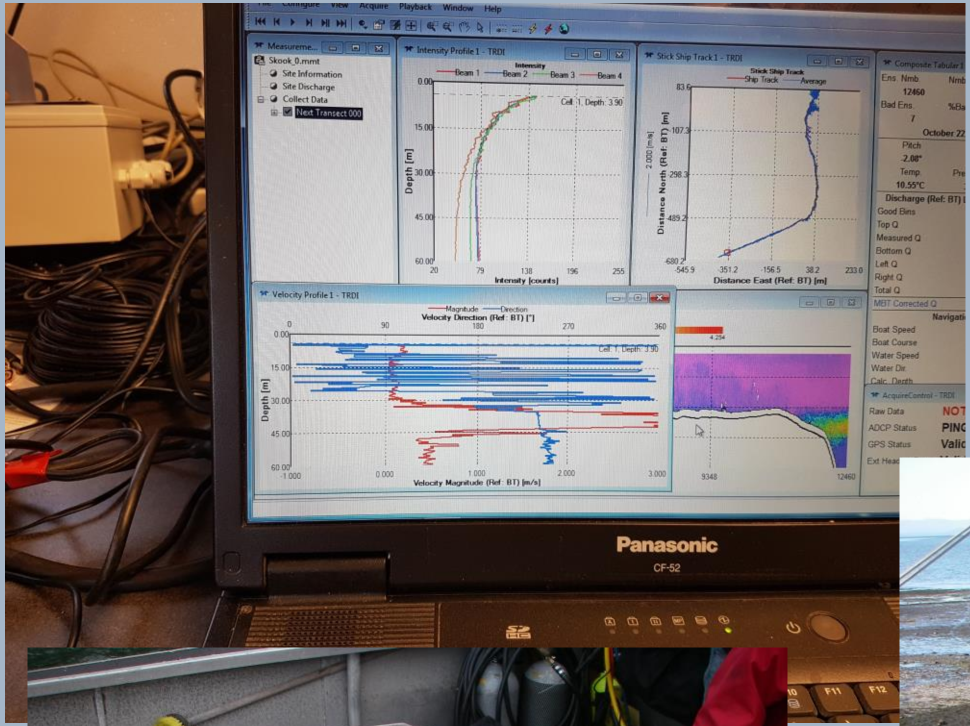
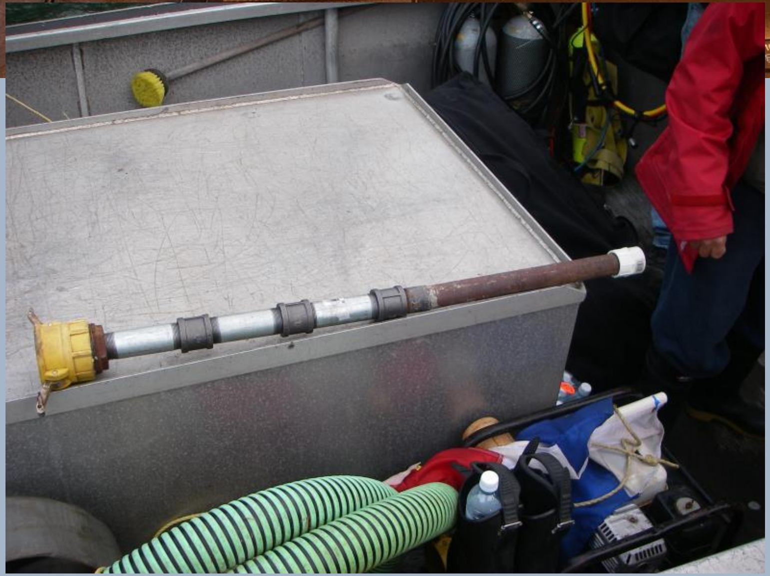
Collect other data?

- Mag
- Seismic
- Diver burial assessment
- Thermal resistivity
- ADCP





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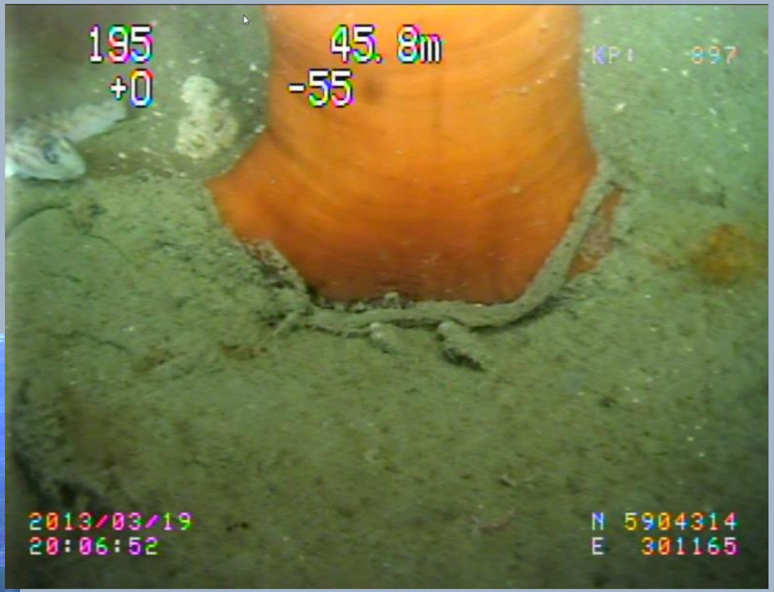
Start ROV inspection

- If dealing with a fault KP has been identified and inspection will take place now.
- If new corridor inspect following route selection.
- Side scan has been conducted and processed.



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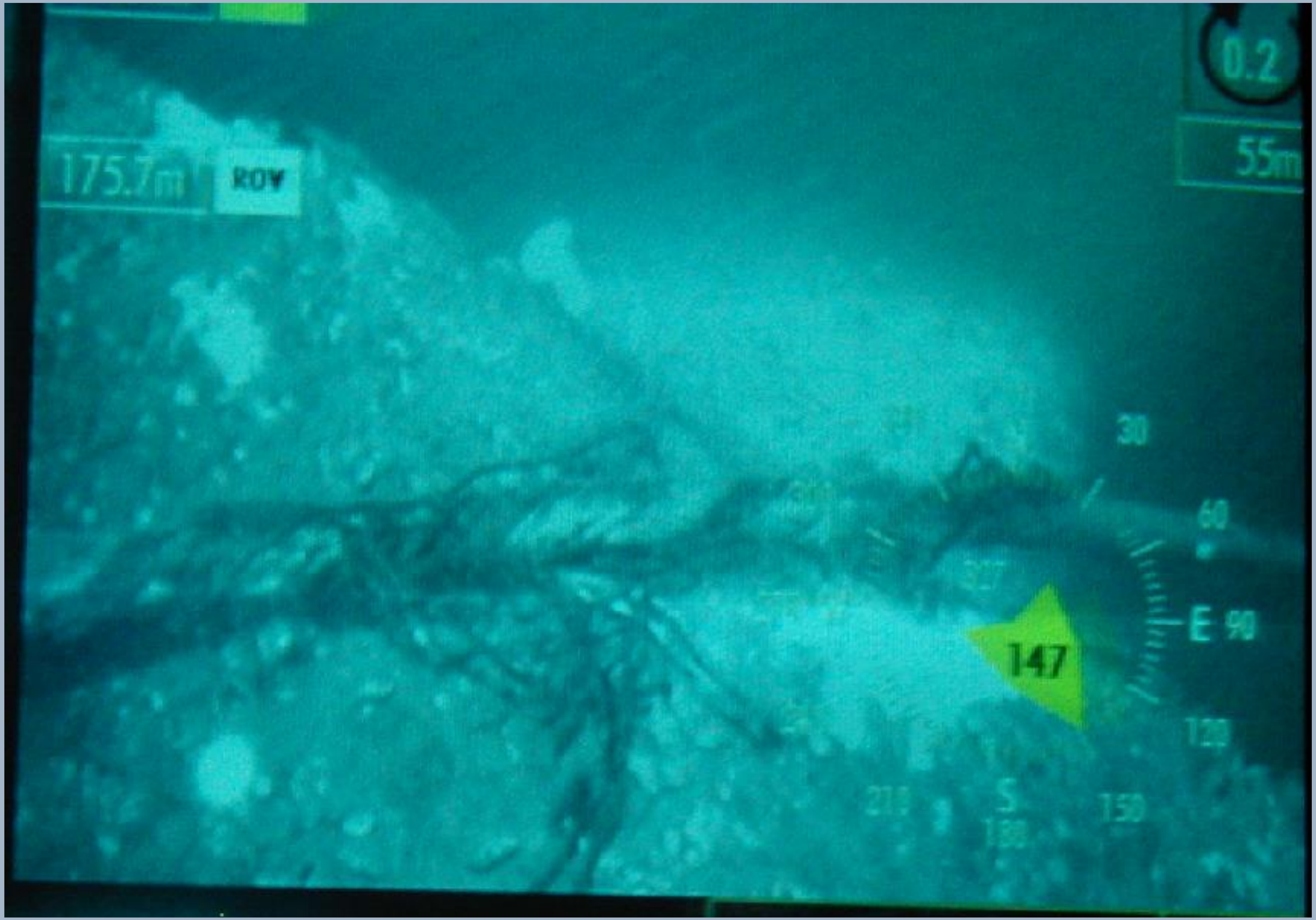

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Section 3 : Processing and Product Requirements

Now we have some data…..what do we do with it?

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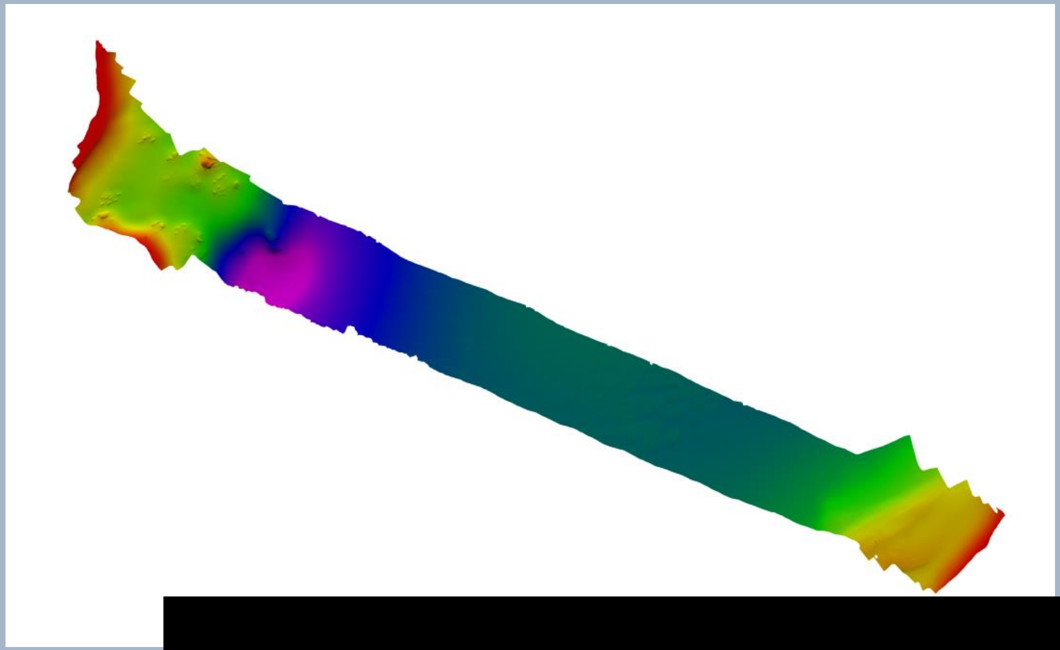
Process Data



Multibeam

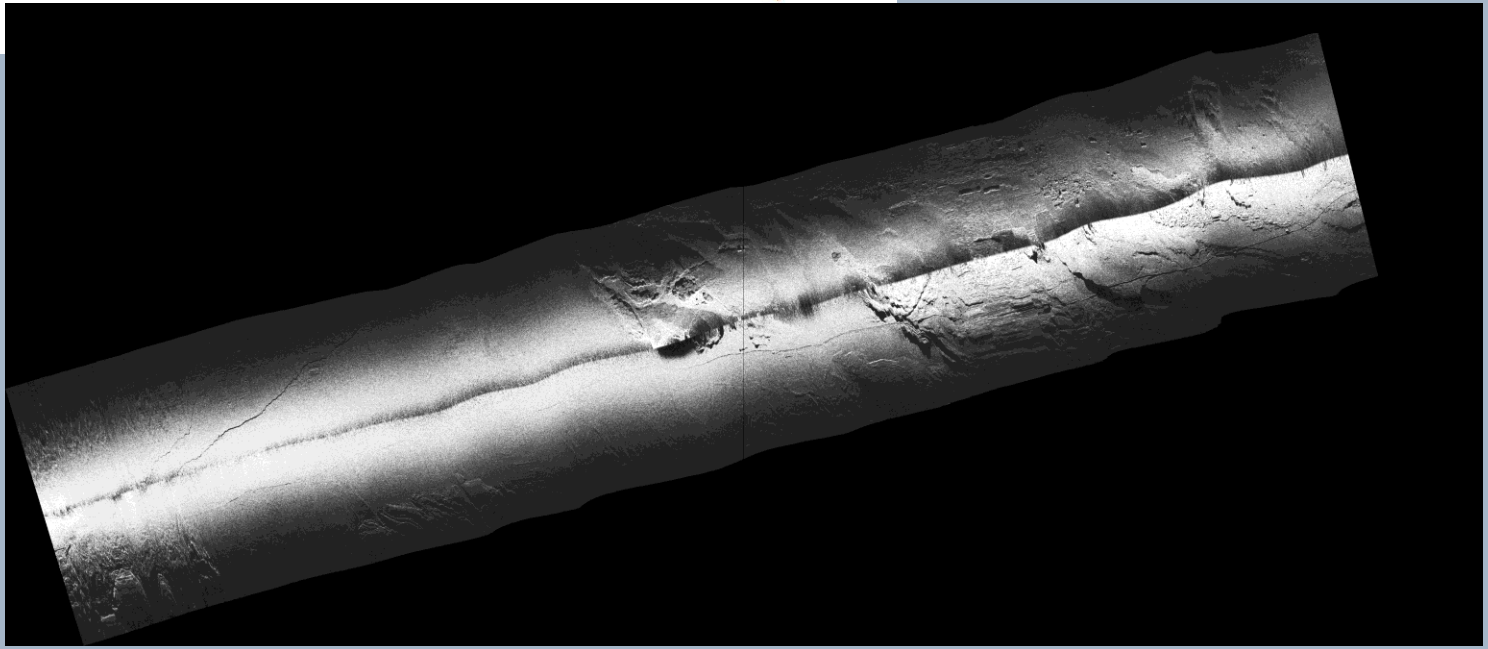
- Clean and reduce multibeam to datum.
- Produce XYZ, contours, and shaded relief.
- Import to main project drawing.

Side scan sonar

- Process and output geotiffs.
- Bring into CAD/GIS and interpret.
- Produce Seabed Features and bring into main drawing.

ROV

- Produce track line coverage.
- Bring this into main drawing.



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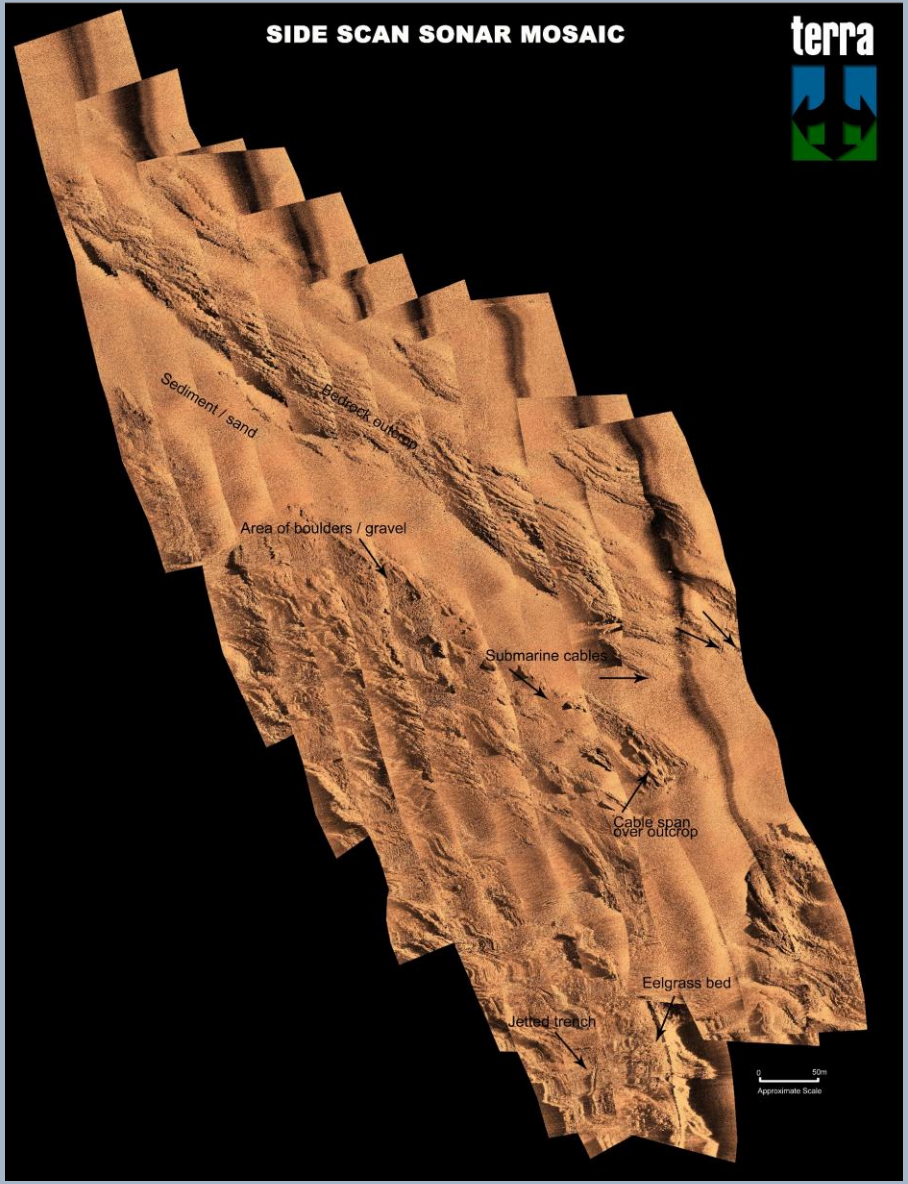
SS Mosaic

- Cables over bedrock.



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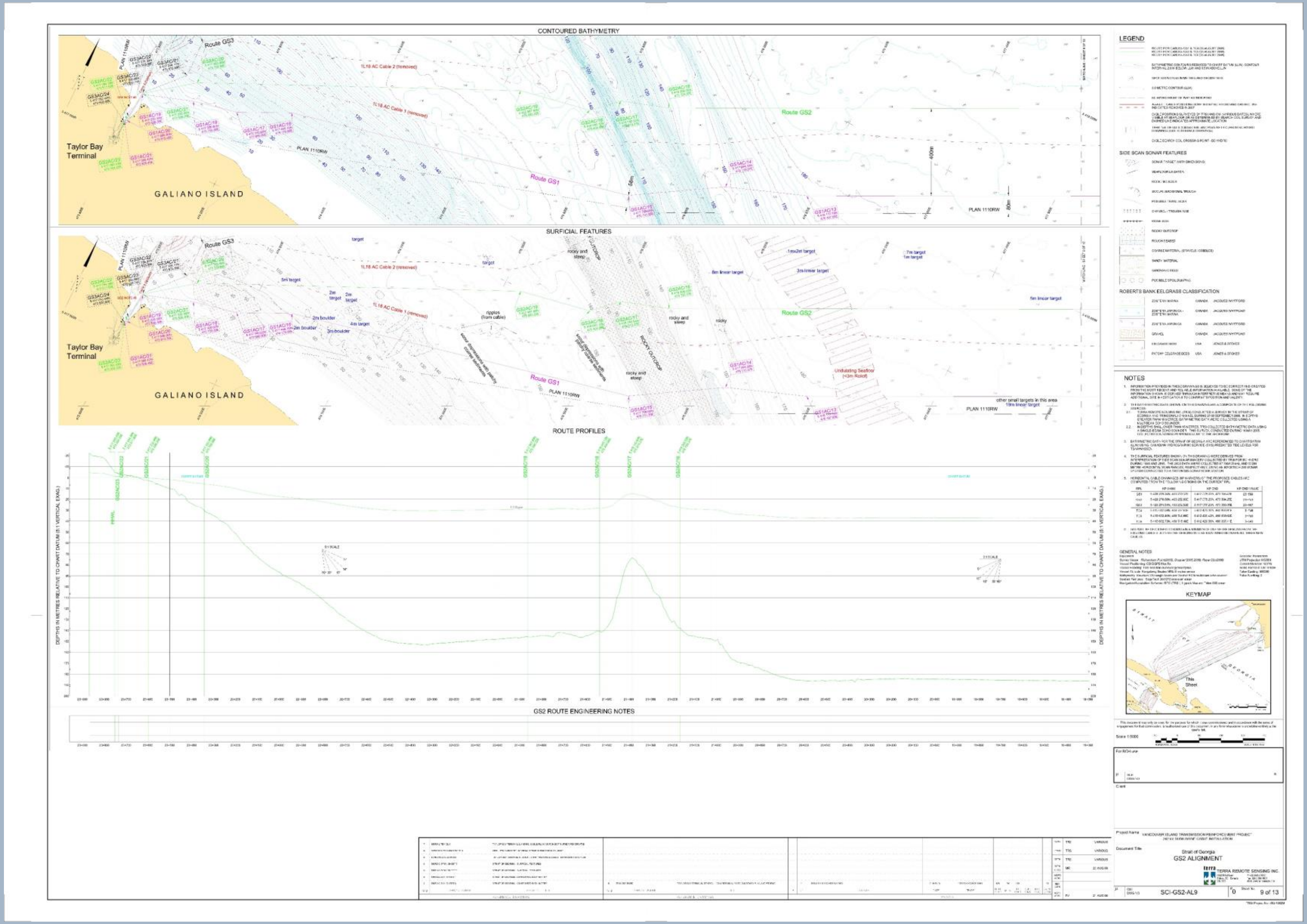
Map Products

Specific products?

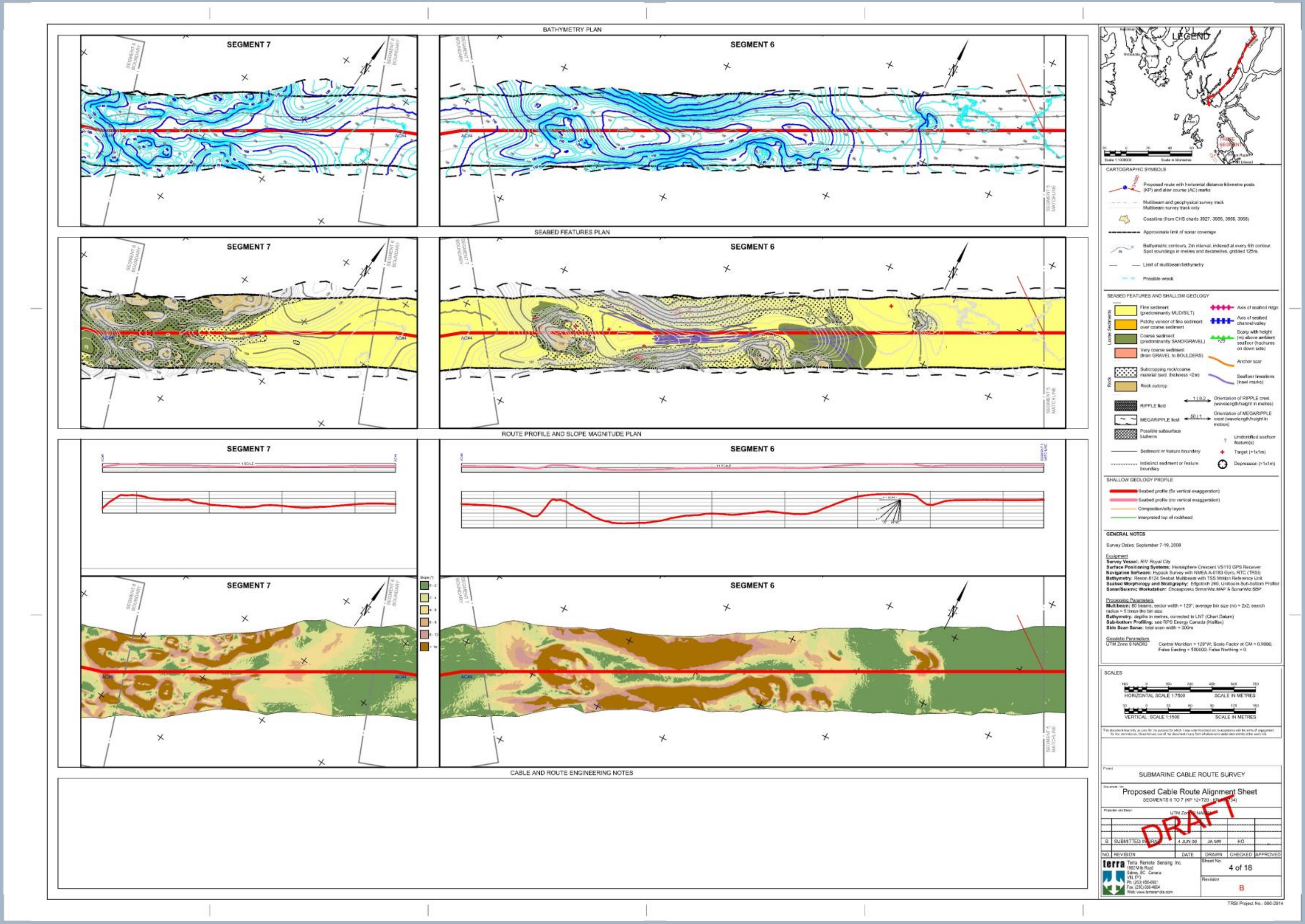
- Plan view marine survey drawings are typical to start planning?
- Move to alignment and civil drawings prior to IFC?



Map Products

Specific products?

- Another sample with segmented panels between AC's.



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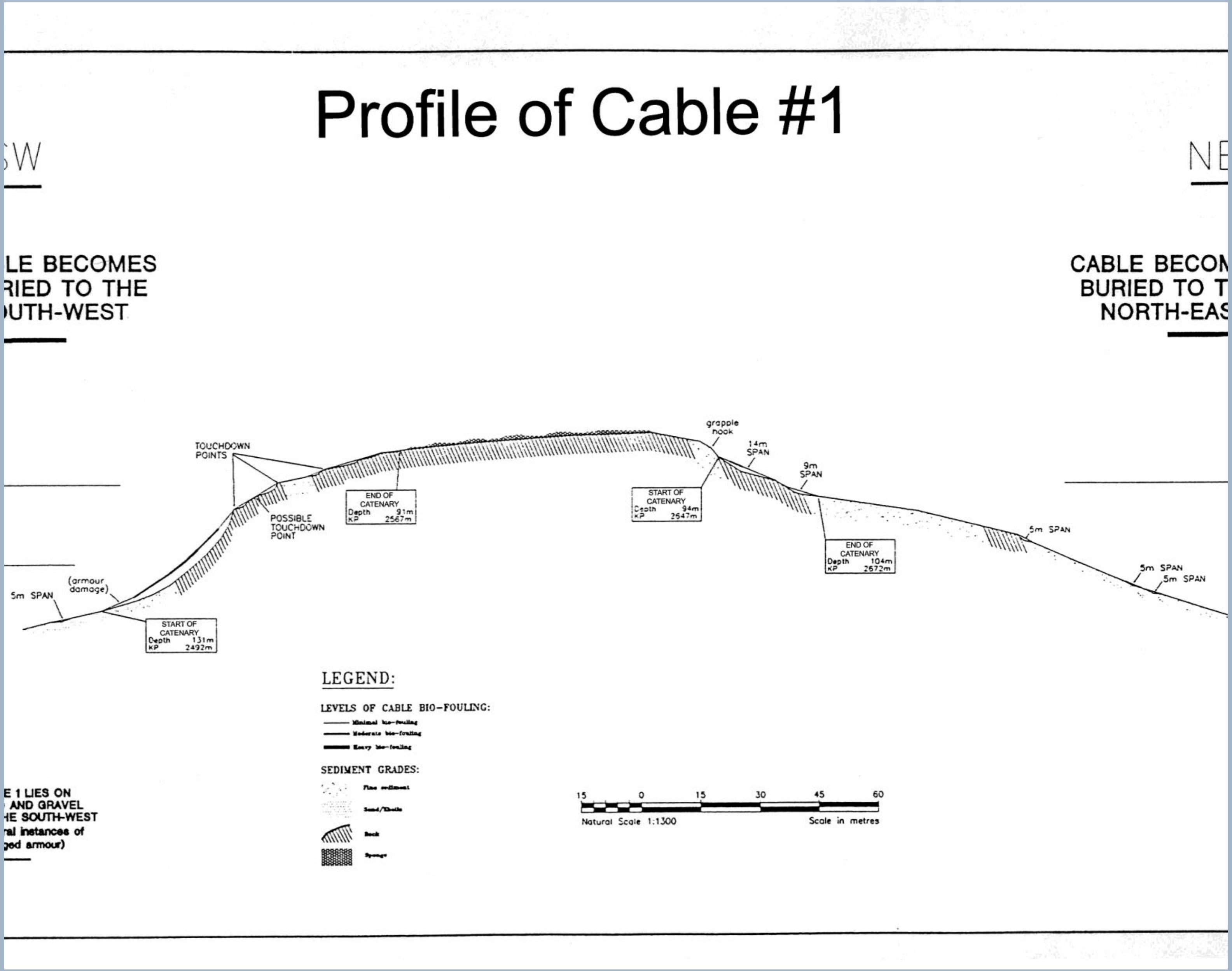
Products

Location specific drawings.

- Difficult areas require special attention.



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Section 4 : Installation Day(s)

Or repair, and postlay.

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Civil Work Completed

- Landing sites ductwork ready to accept cables.

Retrieval

- Pick up old cable where it exists and has been found.

Install gear

- Install all navigation, ROV, subsea tracking, ADCP in advance on cable vessel and survey vessels.
- All crews to site.
  - 6-8 shore crew
  - 4 survey crew
  - 12 lay vessel crew
- Cables loaded.
- H&S Tailboard meeting.

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Final preparations

- Cable in turntable
- ROV on board
- Divers on site

Lay Vessel Deck

- Small cables on reels

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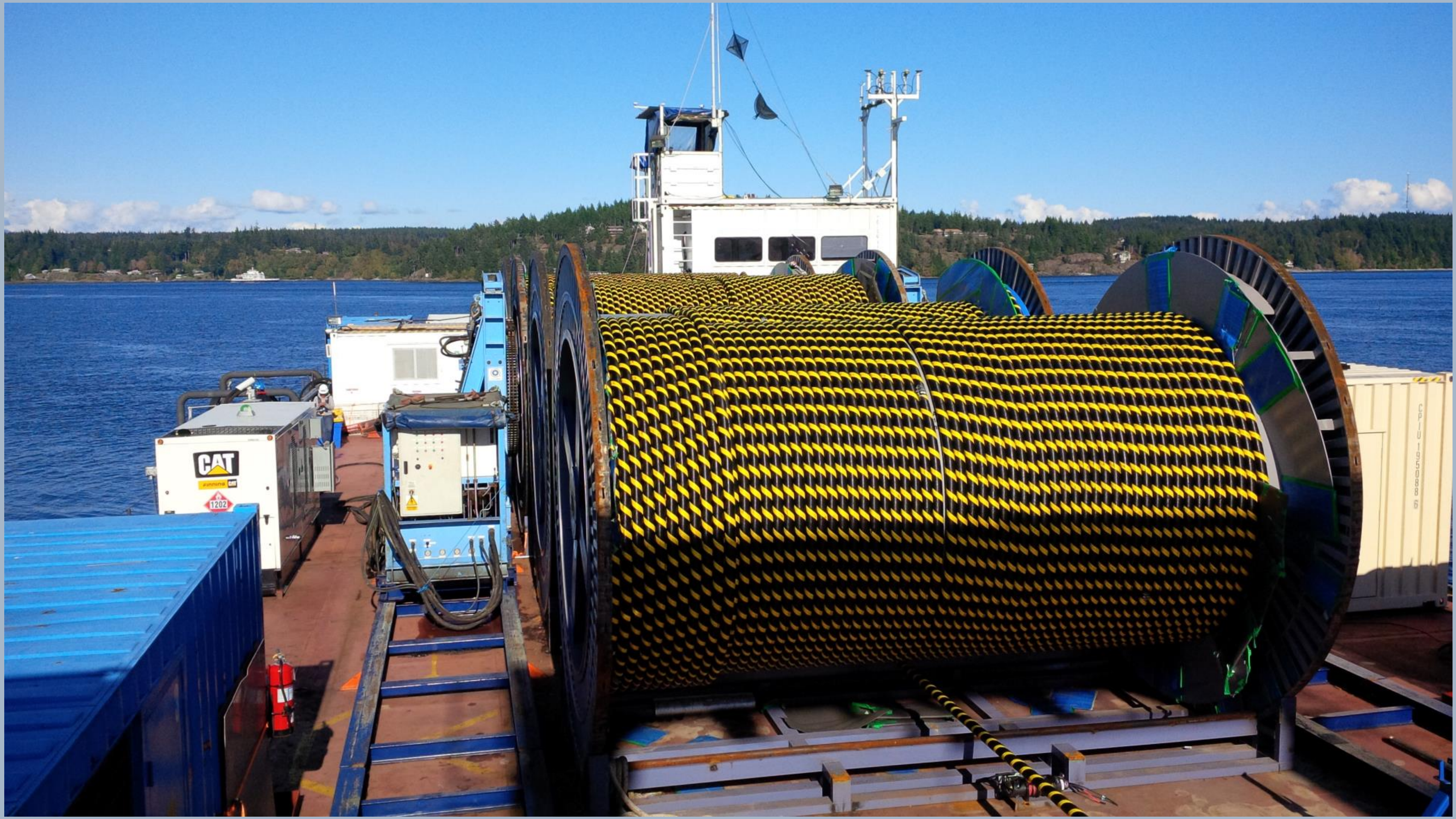
Lay Vessel Deck

- Or large cables on reels



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Support Vessel Ready

Install gear

- Medium ROV to monitor touchdown.

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Linear Cable Machine

Install gear

- Crew floating cable off ship.
- LCM holding cable.

Start laying

Pulling cable onshore

- Cables into concrete cable race.
- Cable floating offshore towards ship.

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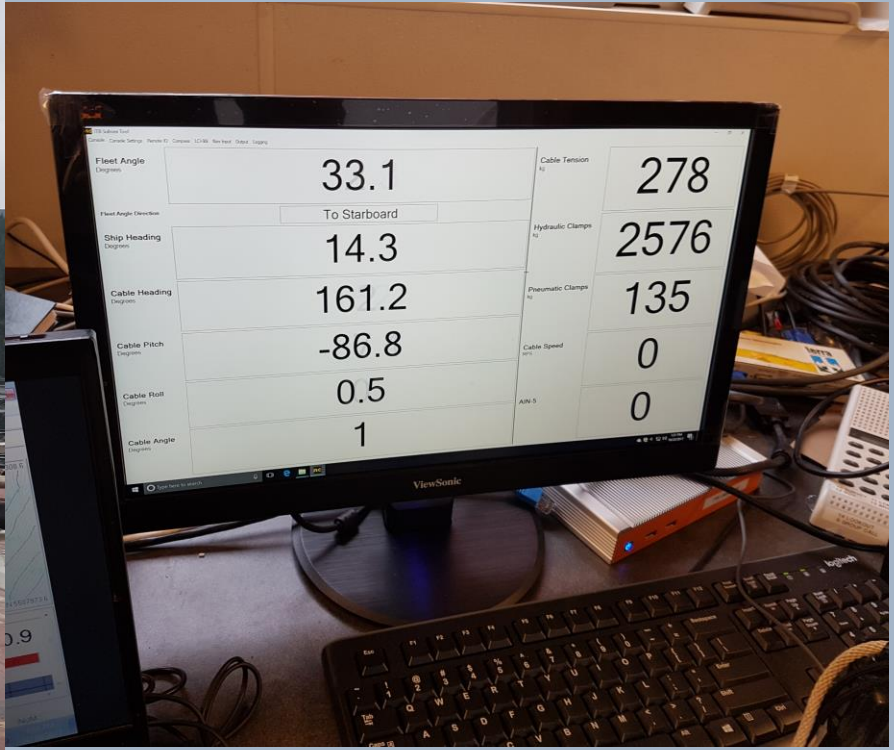
Monitor lay parameters

- Inclinometer, tension, and speed data coming to survey shack and sent to bridge.
- Vessel speed, LCM, and turntable braking have to work together to achieve correct bottom tensions.
- Lay too fast and we can get a loop
- Too slow and we get a loop, or strumming where we don't want it.



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Laying

- Support ROV vessel monitoring touchdown.

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Splice Time?

- Vessel is anchored, or if DP holding position.
- About 5-6 hrs for a splice.
- If no splice carry on with lay.

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Laying

Modifying route

- Using DP to avoid hazards.

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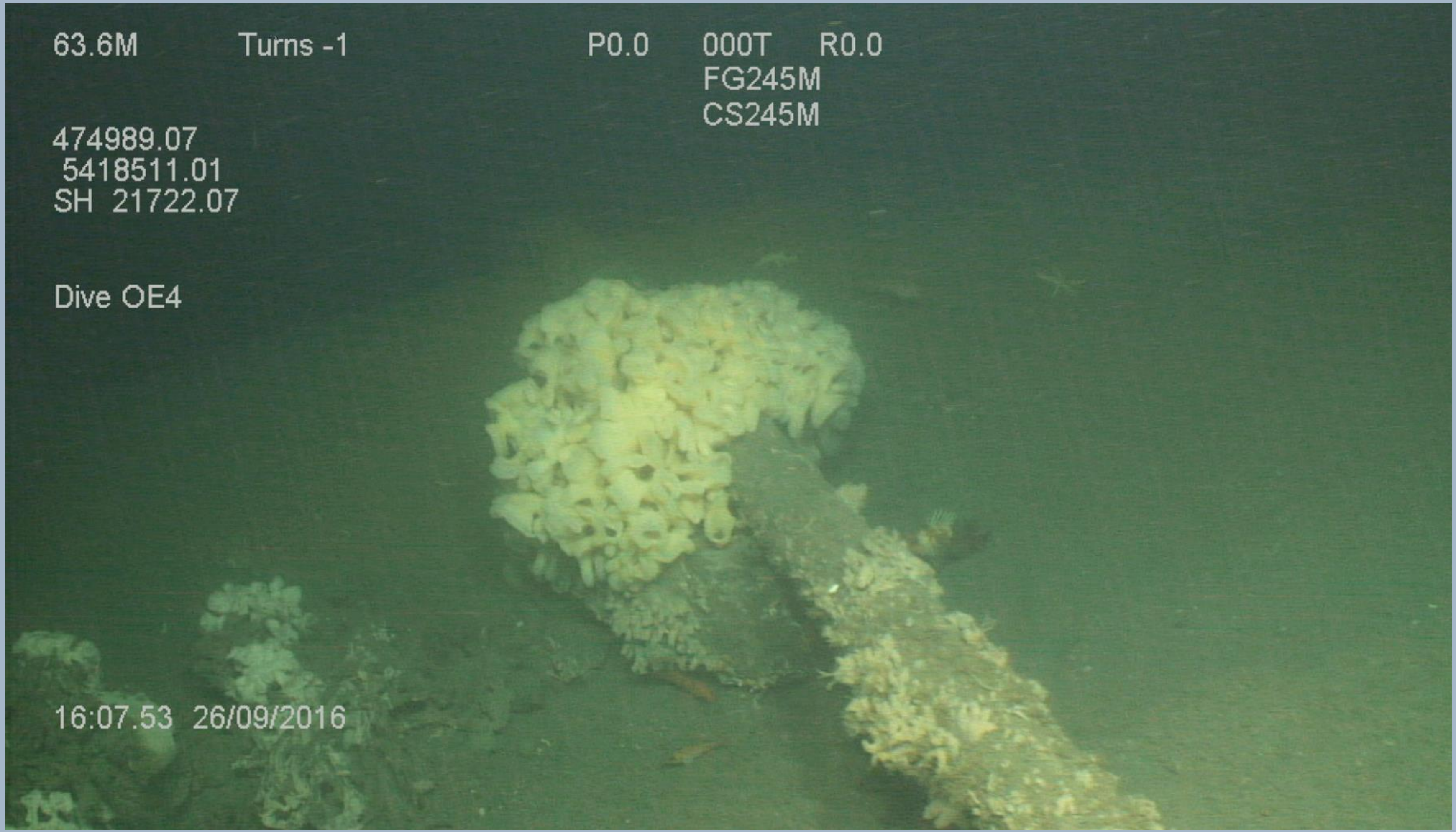
ROV display

- Date/time
- Depth
- Umbilical turns
- Roll/Pitch
- KP along cable



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Cable in duct

- One down 3 to go!

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Final Push

Typical late night

- Heavy gear to pull cable up slope to pole.
- Usually later at night.

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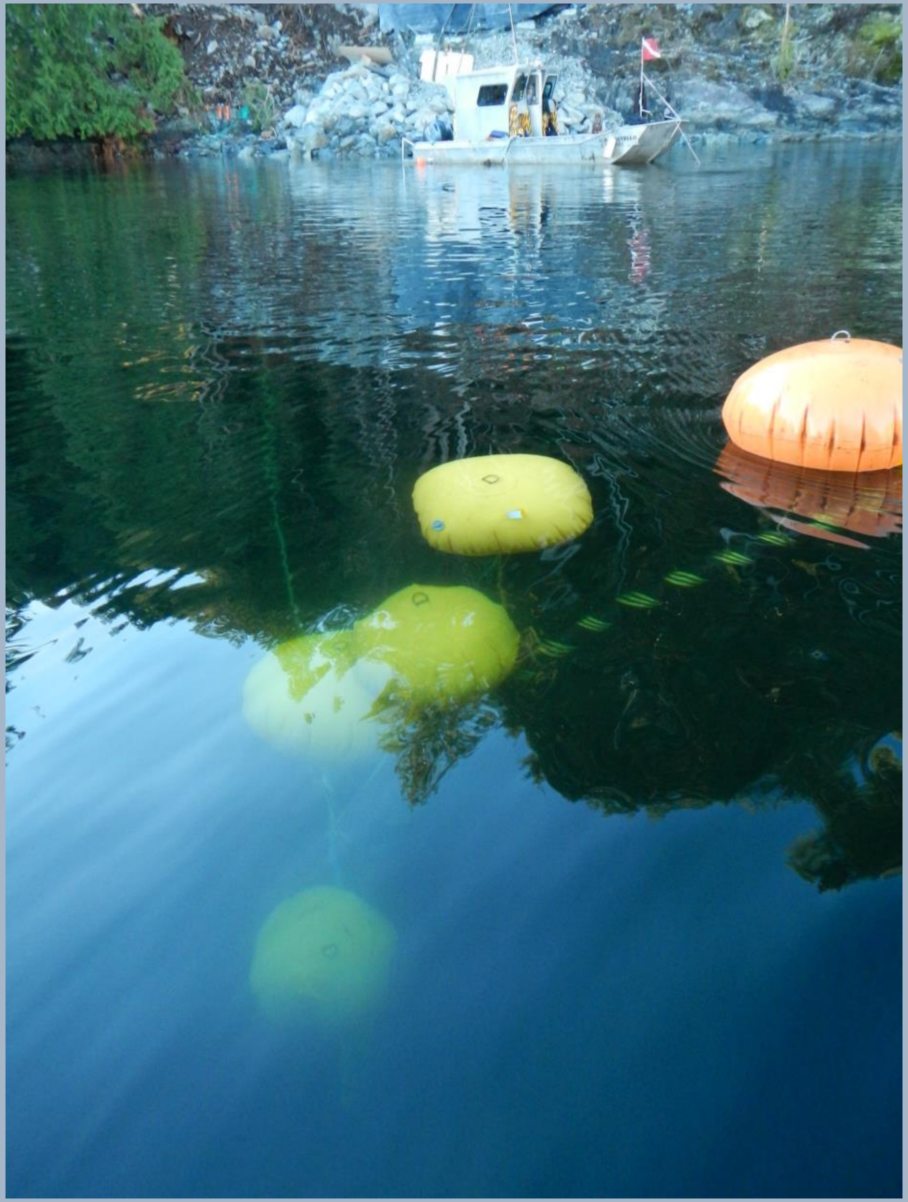
Final Push

And so you can see it.

- Holdback in place.
- Floating cable off deck.
- Cut and capped and into the conduit.
- Divers cut floats.
- ROV monitoring touchdown for movement.
- Survey/ROV vessel using surface position to align cable as well.



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Final Push

- Three installed
- Post lay inspections being conducted during shore pulls and any down time.

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Section 5 : Questions

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