



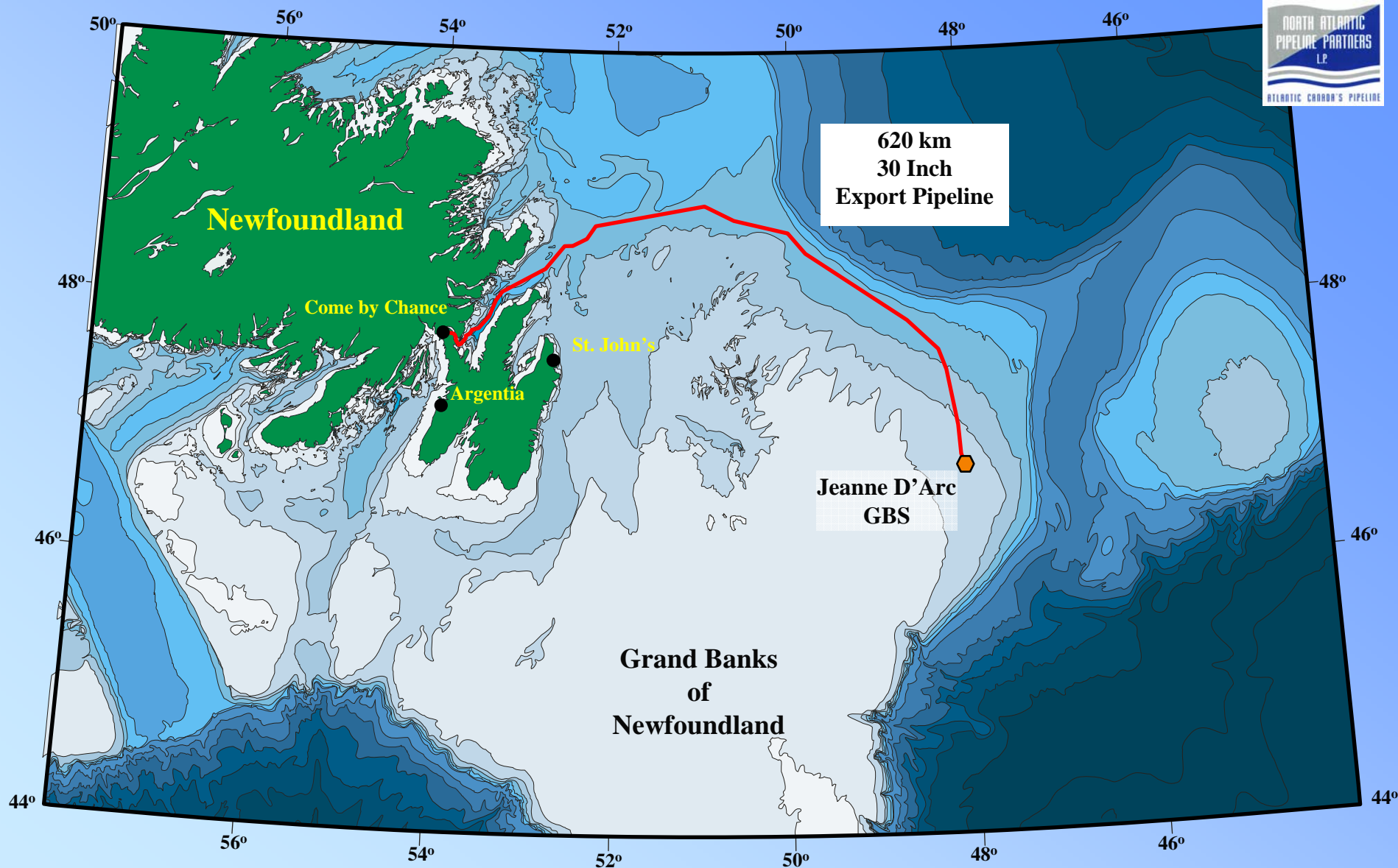
***The Construction and Maintenance Plan for a
Grand Banks Multi-Purpose Pipeline***

D.W. (Don) Wilson, Director, North Atlantic Pipeline Partners, L.P.

NOIA 2000 Conference

June, 2000





620 km
30 Inch
Export Pipeline

Jeanne D'Arc
GBS

Grand Banks
of
Newfoundland

Newfoundland

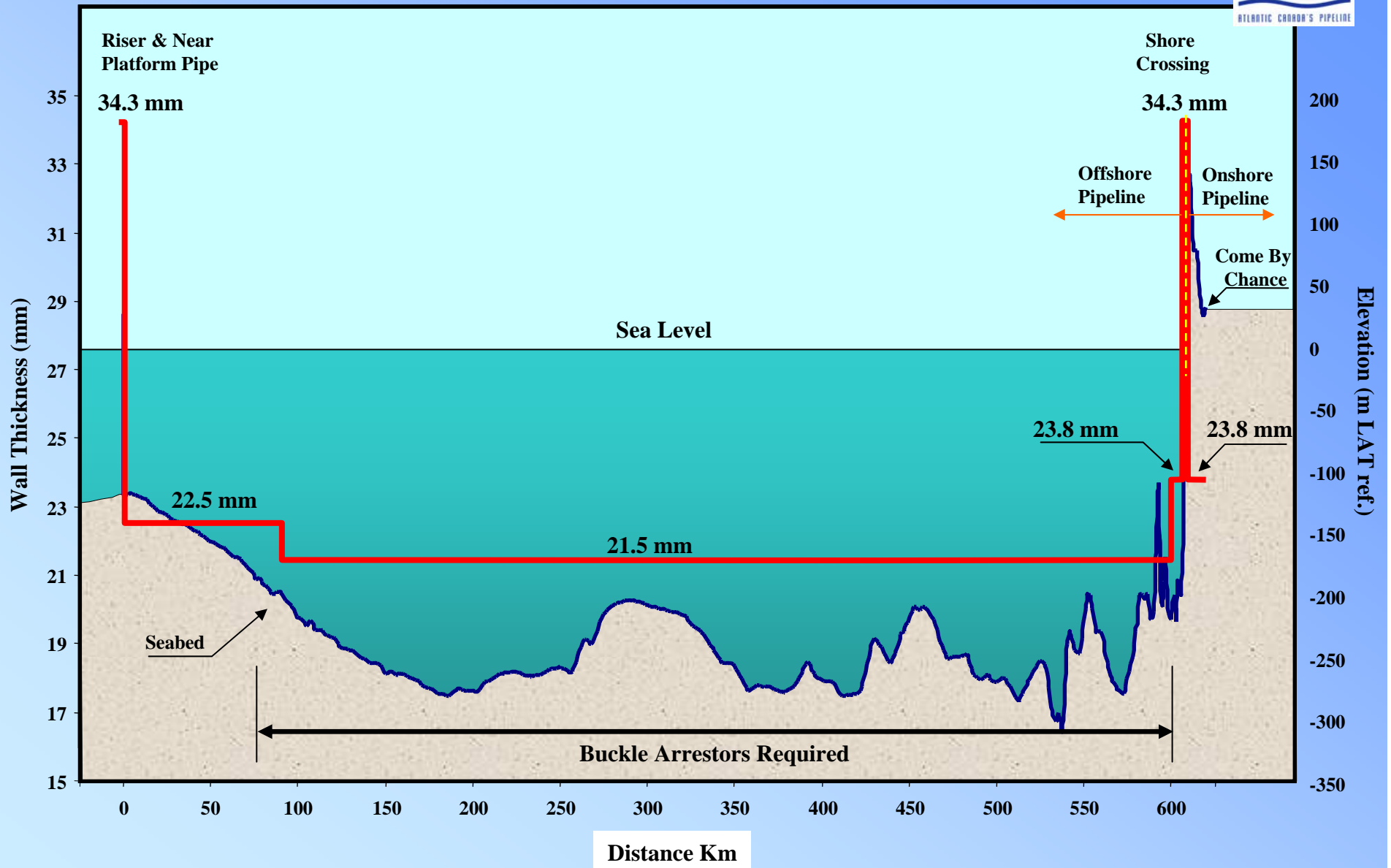
Come by Chance

St. John's

Argentia

Grand Banks Multi-Purpose Pipeline Route

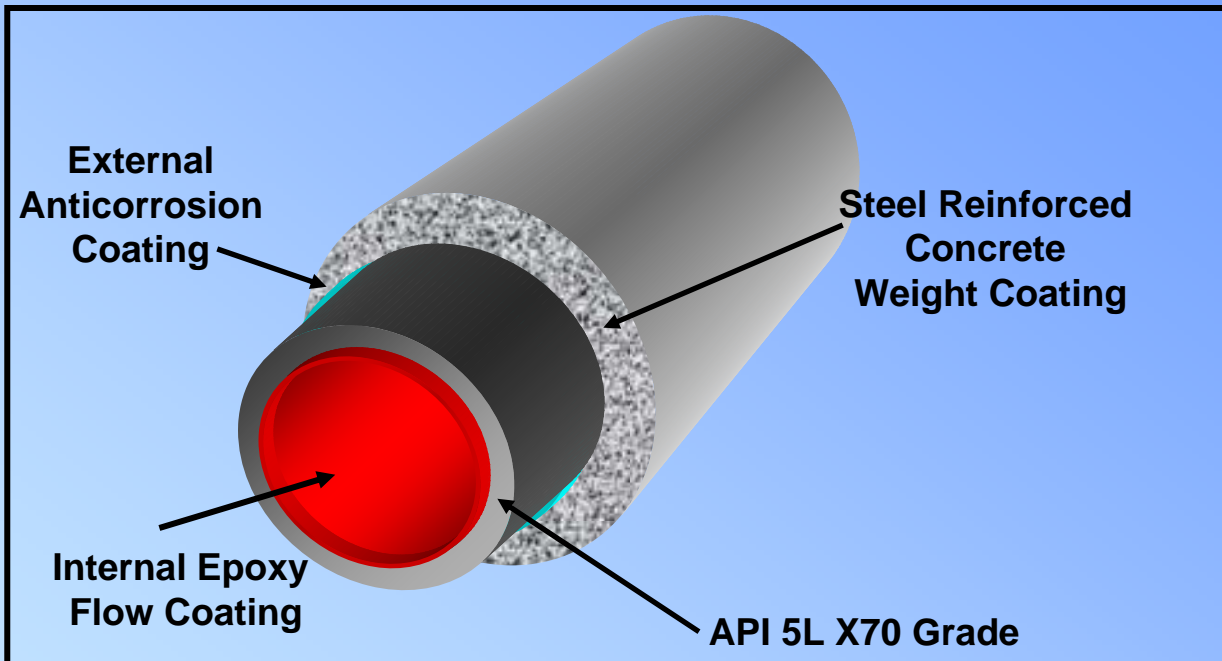
Grand Banks Pipeline Profile and Wall Thickness



North Atlantic Pipeline Partners, L.P.

Grand Banks Pipeline

Cross Section



Design Parameters

● Pressure & MAOP	3150 psig
● Length	620 Km
● Water Depth	256 m av. / 305 m max.
● Pipeline Outside Diameter	30 inch
● Steel Grade	API 5L X70 Grade
● Wall Thickness	0.846 - 0.938 inch
● Concrete Coating Thickness	40 mm - 100 mm
● External Cathodic Protection	Aluminum Anodes
● External Anticorrosion Coating	Asphalt Enamel
● Internal Epoxy Flow Coating	Roughness = 0.01mm

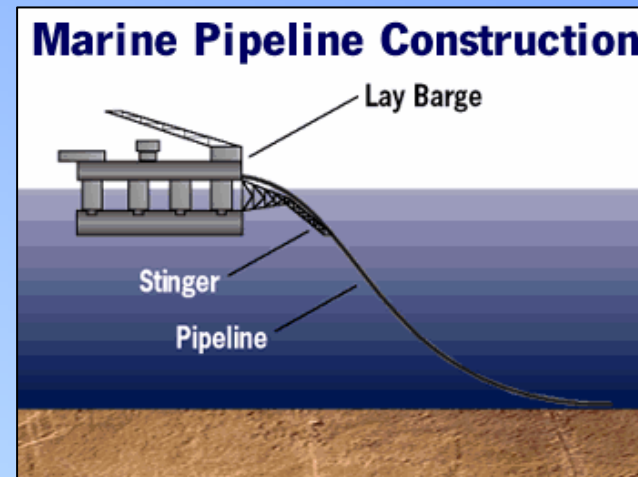


North Atlantic Pipeline Partners, L.P.

Pipeline Installation



- Moderate Depths
- Conventional S-Lay



- At least 4 or 5 conventional lay barges available with requisite capability

North Atlantic Pipeline Partners, L.P.

Pipeline Installation



DP PIPELAY VESSEL



SEMISUBMERSIBLE PIPELAY VESSEL



North Atlantic Pipeline Partners, L.P.



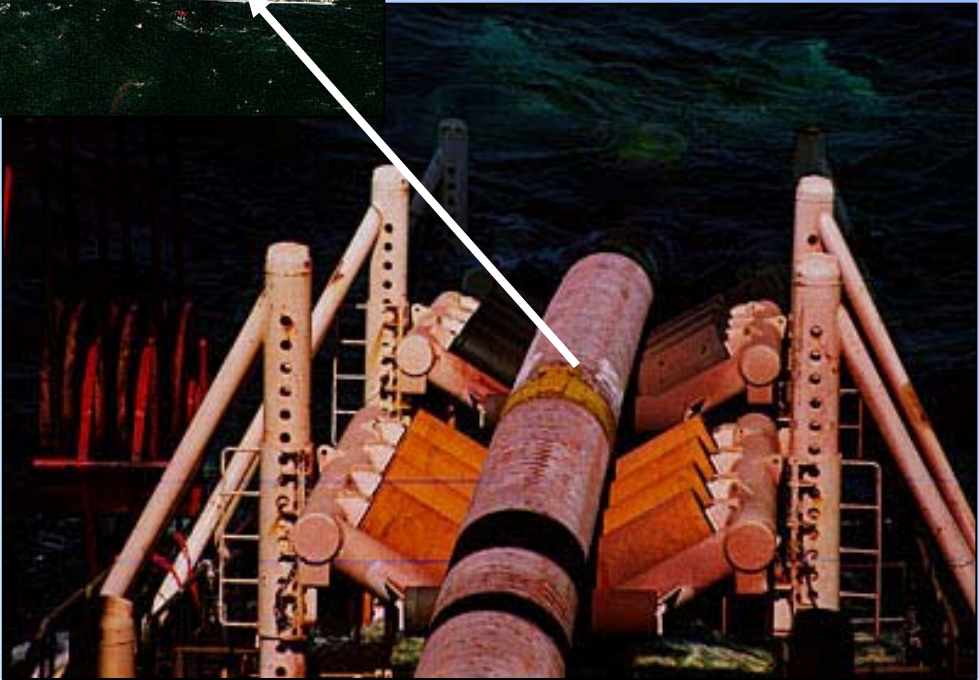
Pipeline Assembly Onboard Pipelay Vessel



North Atlantic Pipeline Partners, L.P.



Pipeline Installation Stinger



North Atlantic Pipeline Partners, L.P.



**Shaw & Shaw
pipecoating
facility at
Sheet
Harbour, Nova
Scotia**



North Atlantic Pipeline Partners, L.P.



EXTERNAL INSPECTION:

Via Remotely Operated
Vehicle (ROV)



INTERNAL INSPECTION:

Via Intelligent pigging



North Atlantic Pipeline Partners, L.P.



Pipeline Cleaning:

**Cleaning pig train
including the use of bi-
directional pigs and
solvent swab**





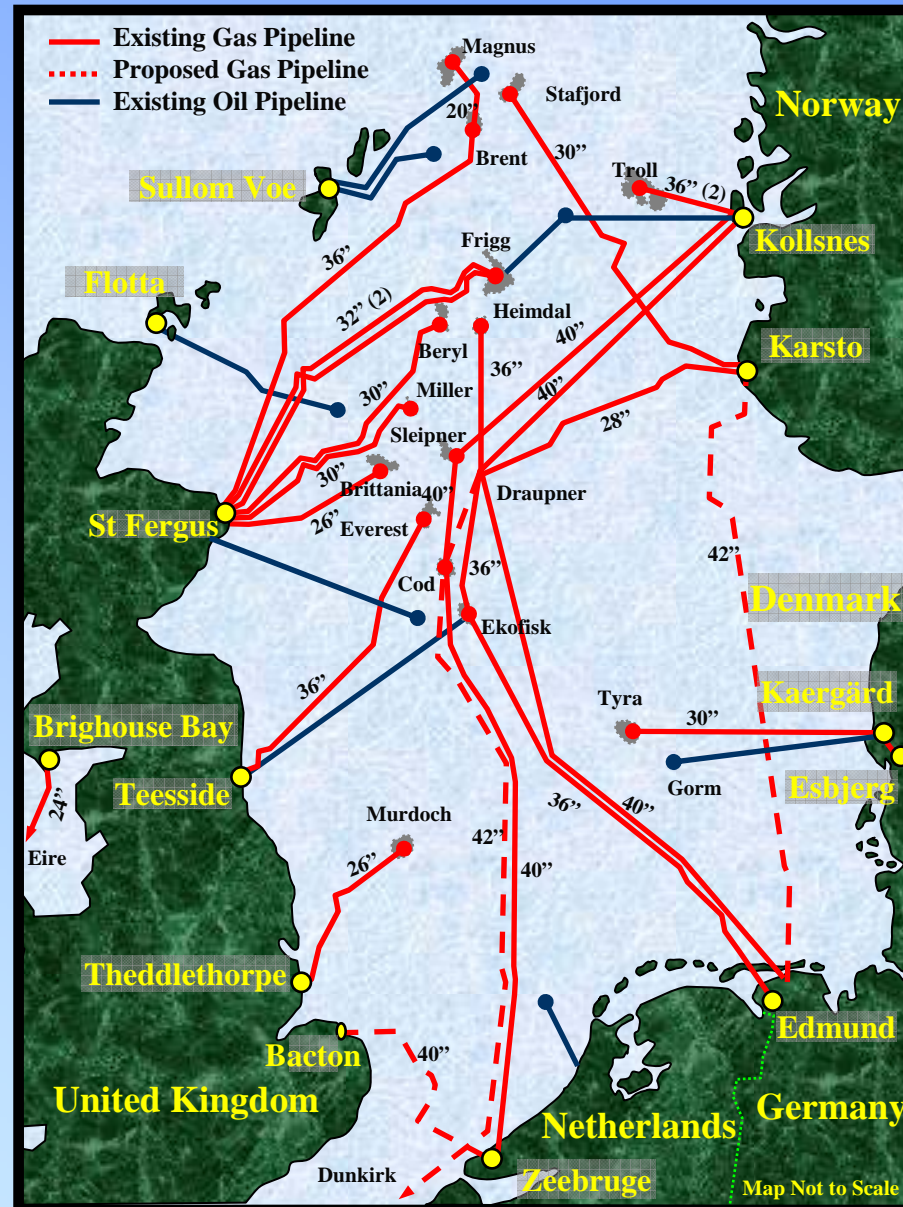
Pipeline Repair Protocol

- 1 Leak detection and compressor shut down**
- 2 Damage location**
- 3 Excavate pipe**
- 4 Remove concrete**
- 5 Cold-cut pipe ends**
- 6 Insert pipeline plugs**
- 7 Deploy hyperbaric chamber**
- 8 Perform hyperbaric repair welding**
- 9 Repair coating**
- 10 Recommission pipeline**

North Atlantic Pipeline Partners, L.P.



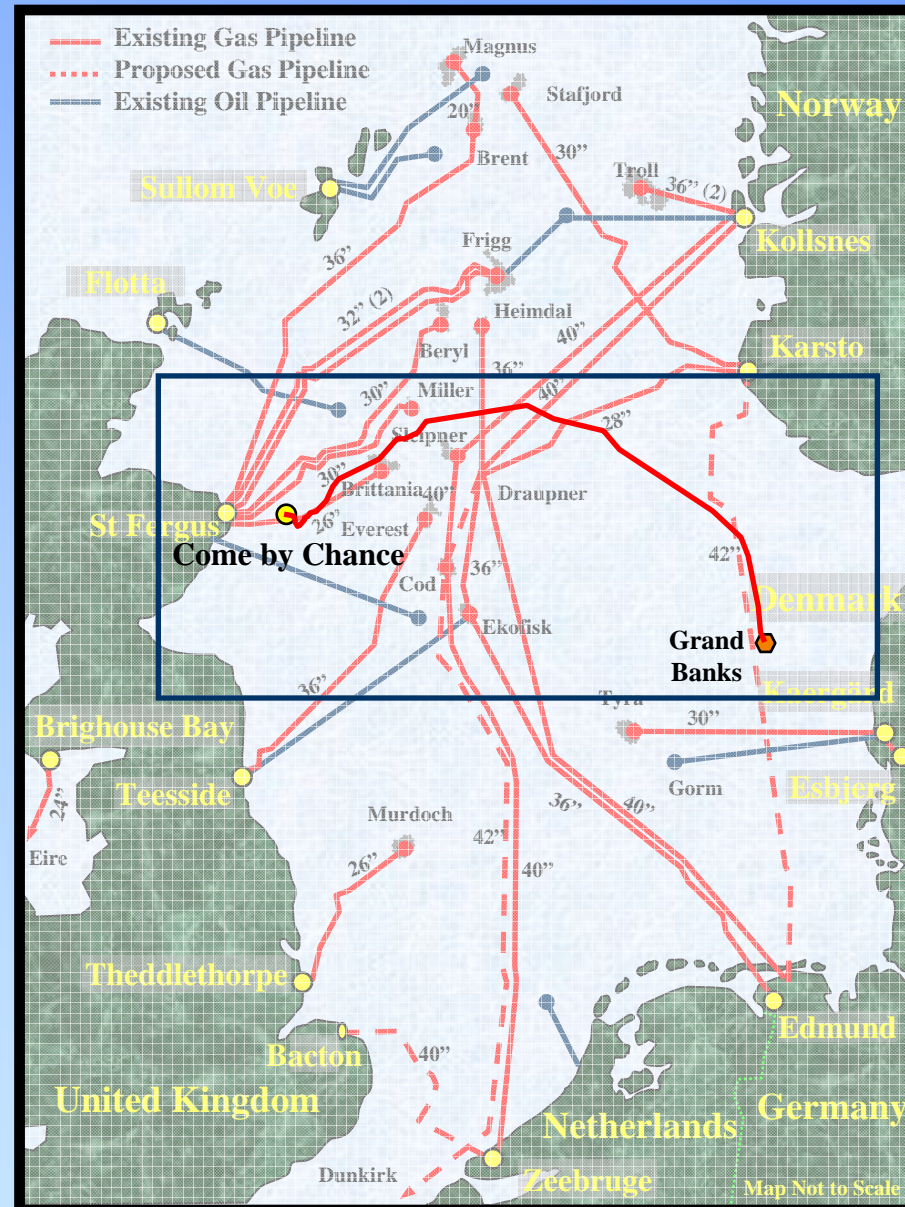
Major North Sea Pipelines



North Atlantic Pipeline Partners, L.P.



Comparison of Grand Banks Pipeline to North Sea Pipelines





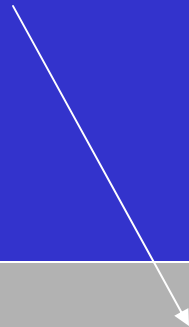
North Atlantic Pipeline Partners, L.P.

End of Presentation

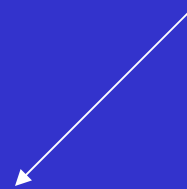


REPAIR OF A DAMAGED SECTION OF PIPELINE AT 250 m WATER DEPTH USING A HYPERBARIC WELDING SYSTEM FROM A DP- DSV

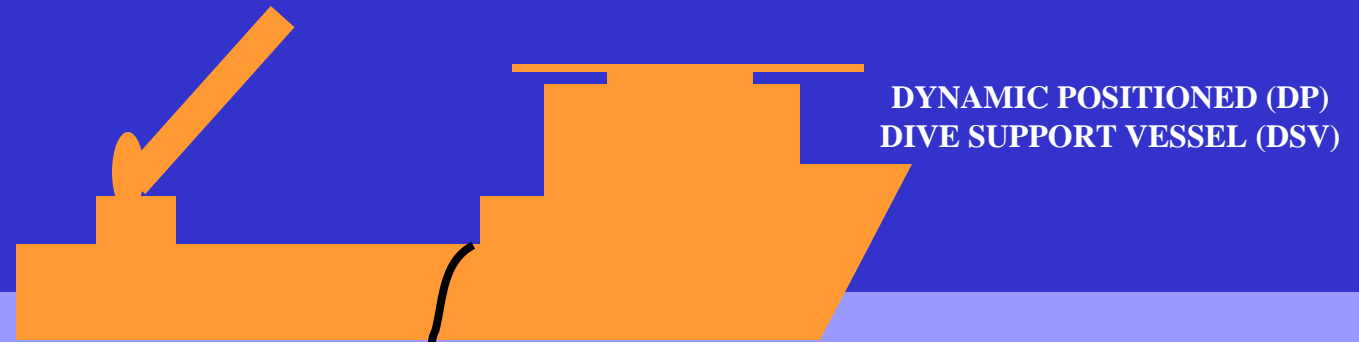
PIPELINE



PIPELINE FAILURE,
CRACK, BUCKLE ETC.

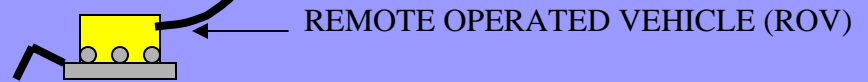


Once the pipeline pressure has been controlled a DP-DSV would mobilise to site



DYNAMIC POSITIONED (DP)
DIVE SUPPORT VESSEL (DSV)

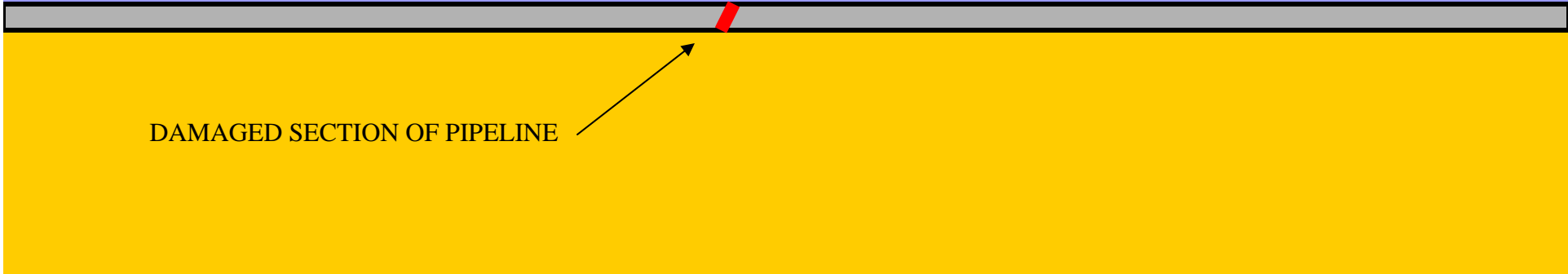
**THE ROV WOULD
FIRSTLY INSPECT
THE SITE**



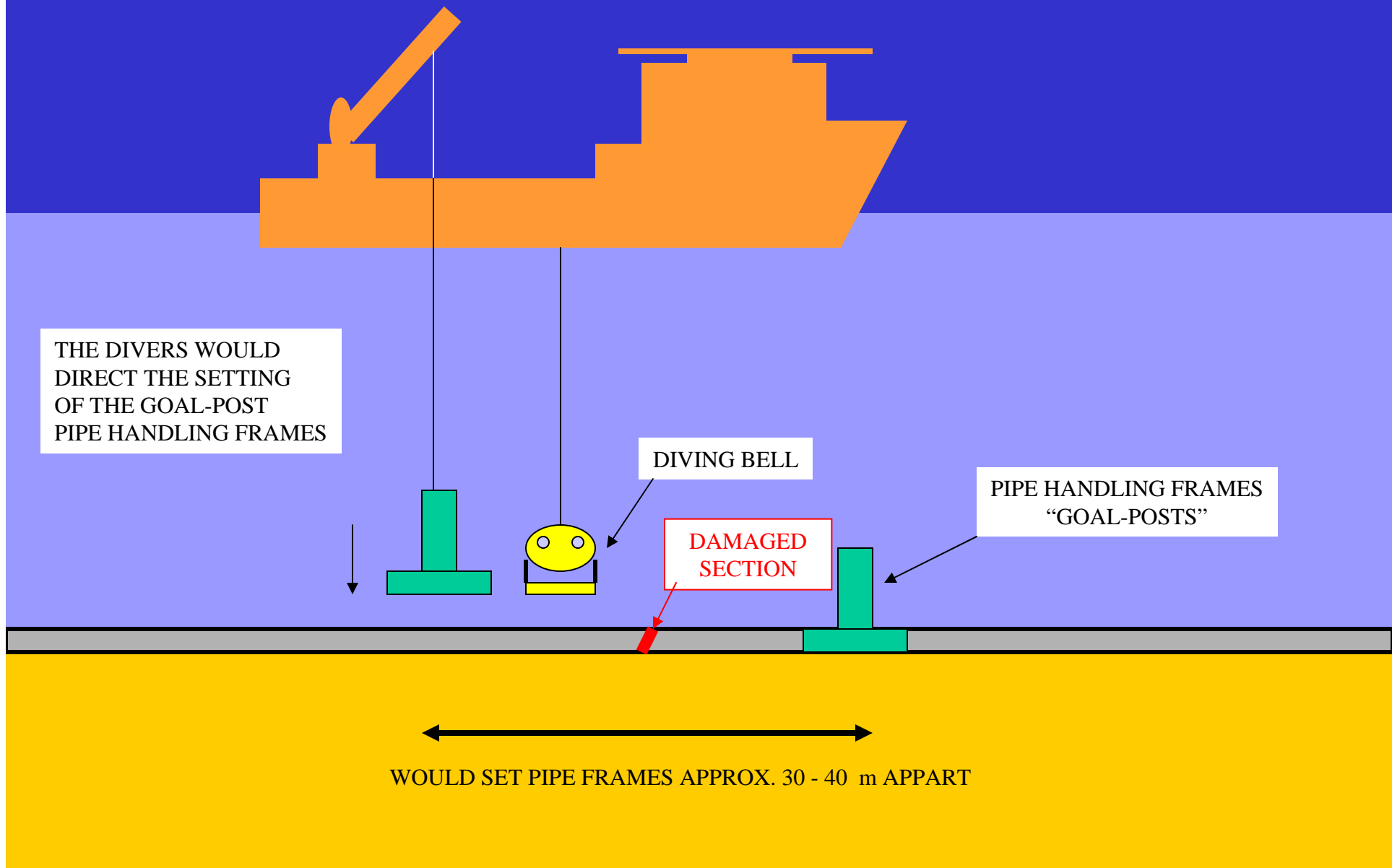
REMOTE OPERATED VEHICLE (ROV)

PIPELINE

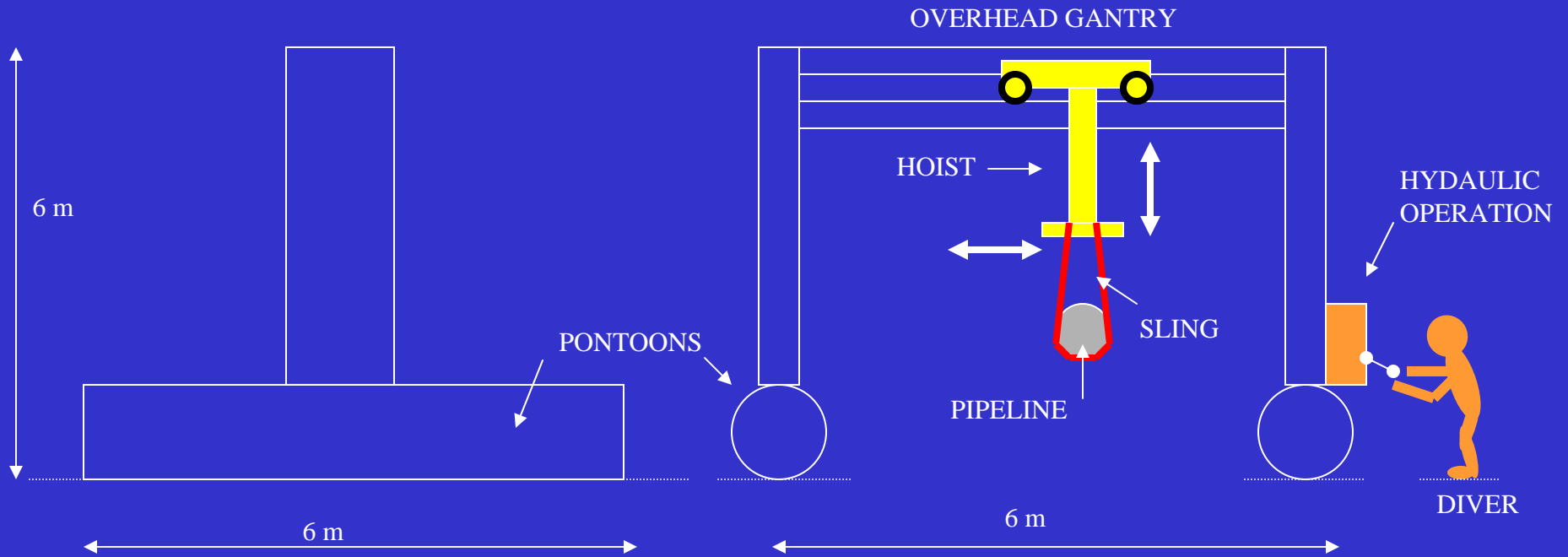
DAMAGED SECTION OF PIPELINE



SETTING OF THE PIPE HANDLING FRAMES



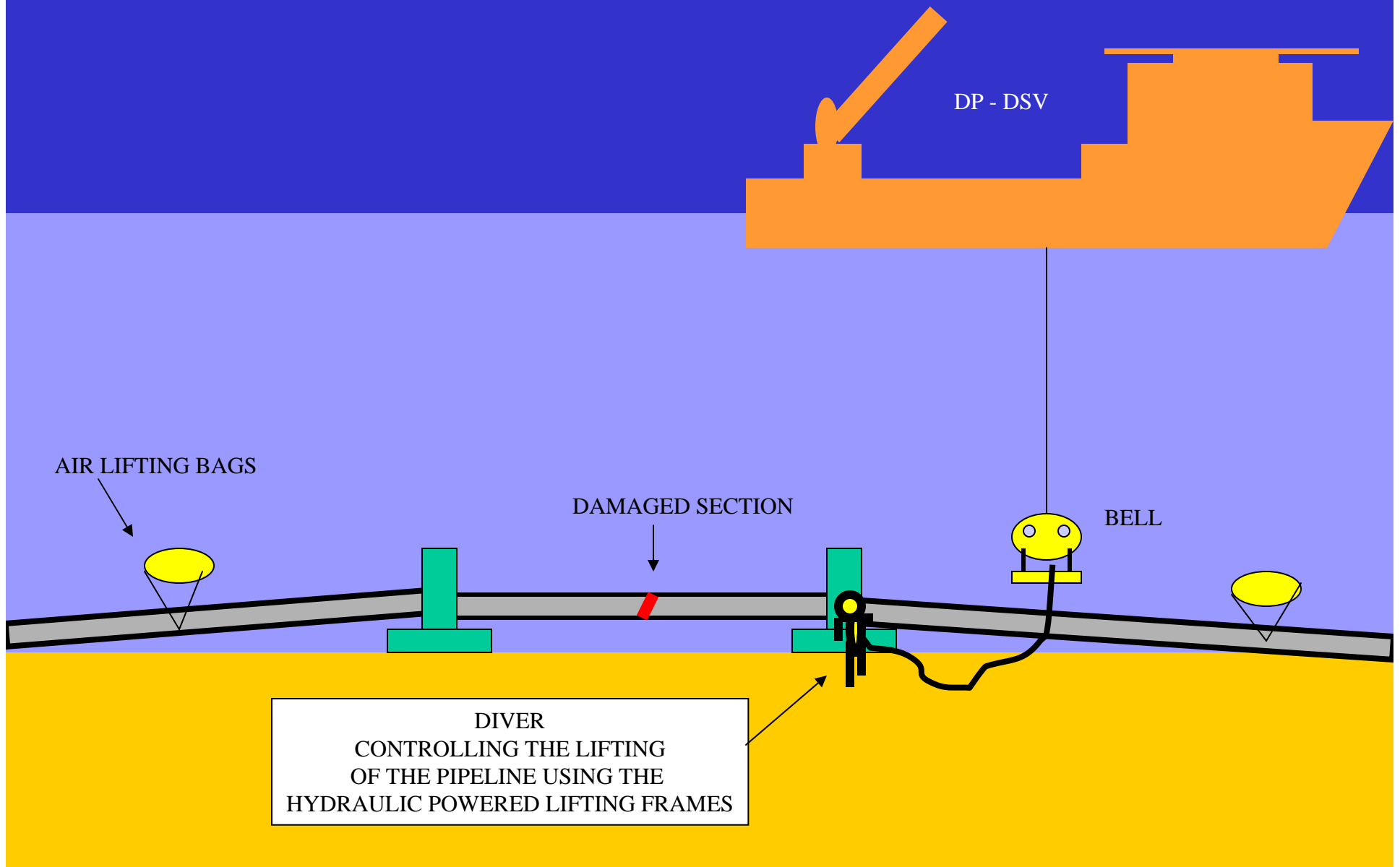
Typical “goal-post” pipe lifting frames



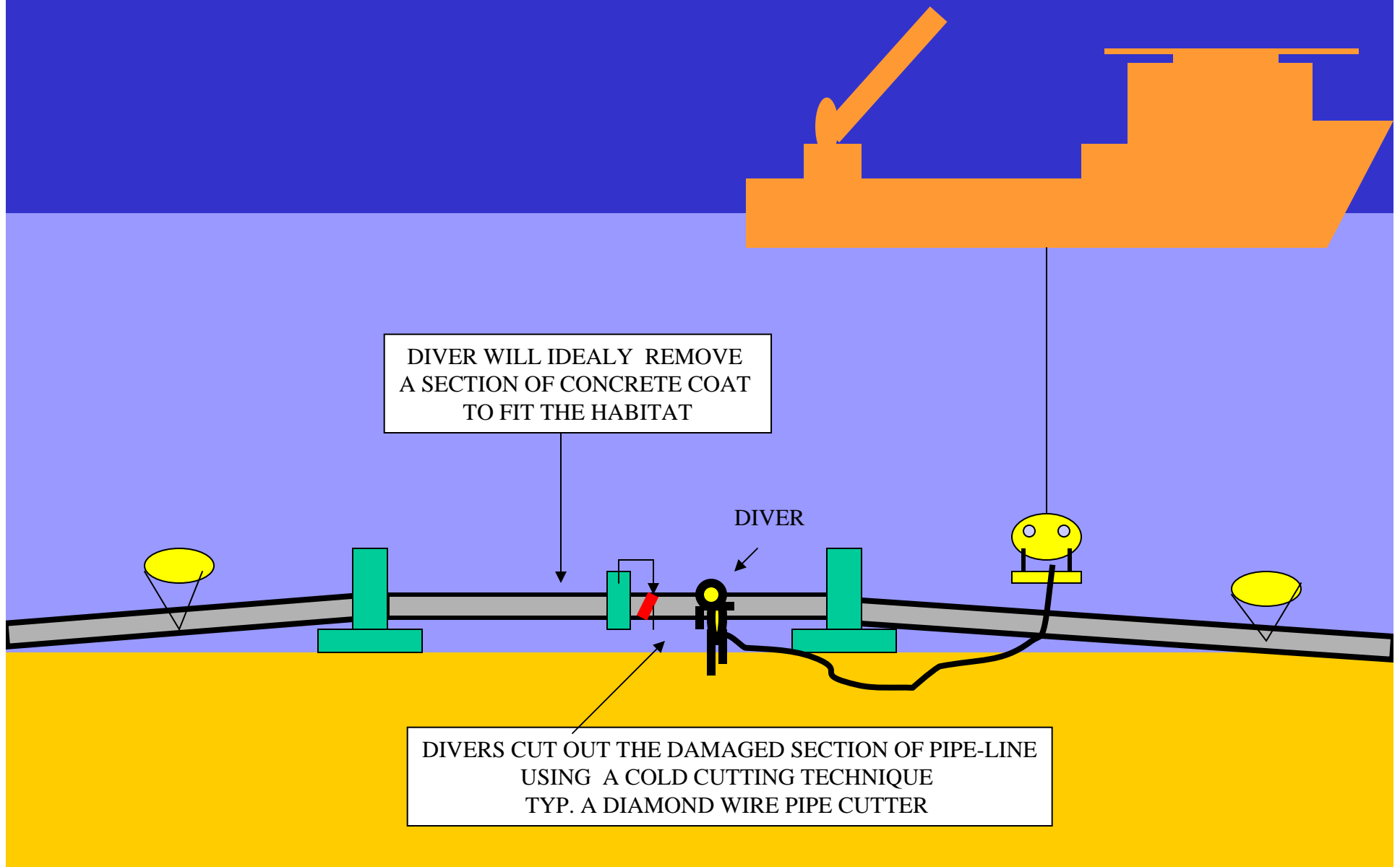
SIDE ELEVATION

END ELEVATION

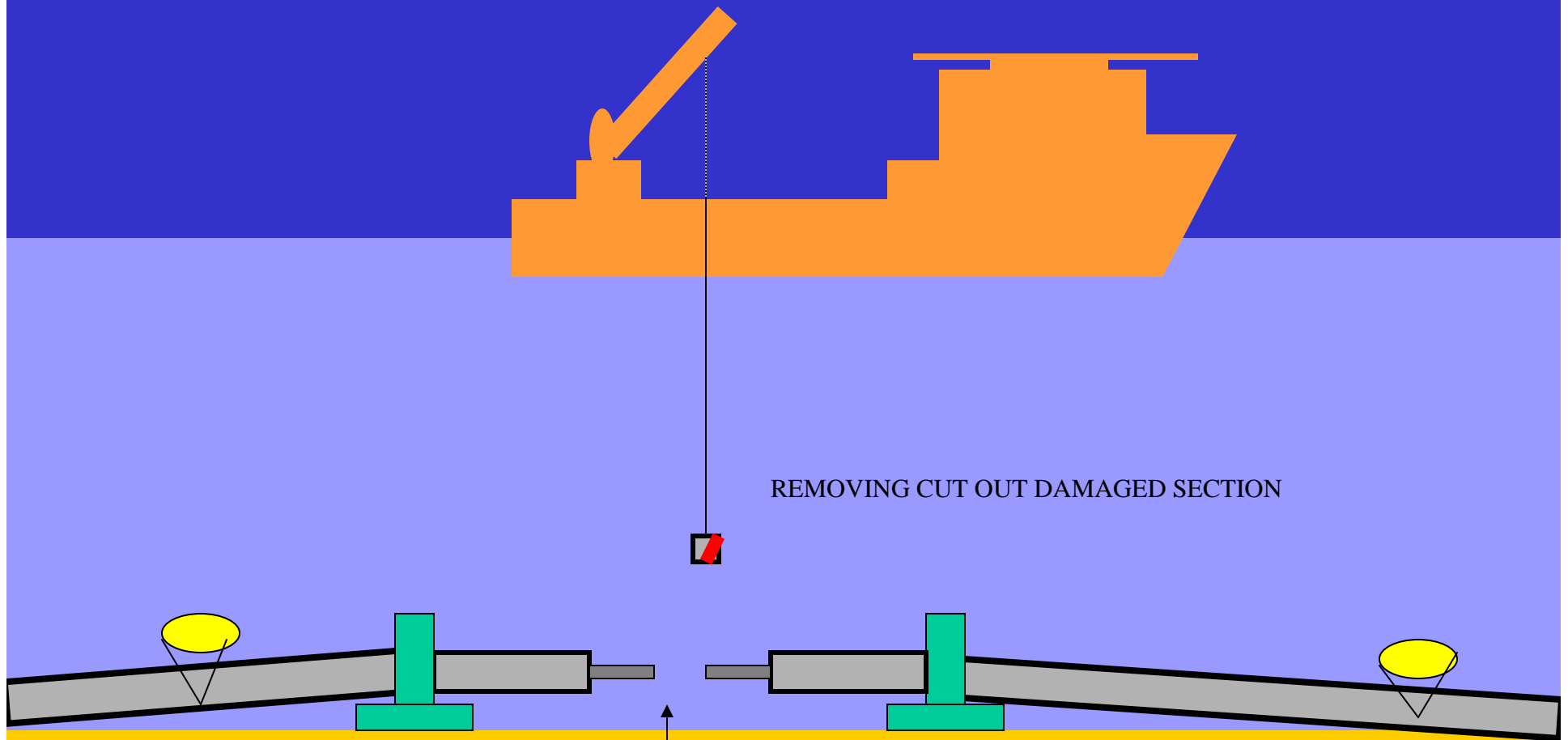
DIVERS RAISE THE PIPELINE SECTION OFF SEABED USING COMBINATION OF LIFTING FRAME AND AIR LIFTING BAGS



Divers cut out the damaged section of pipe



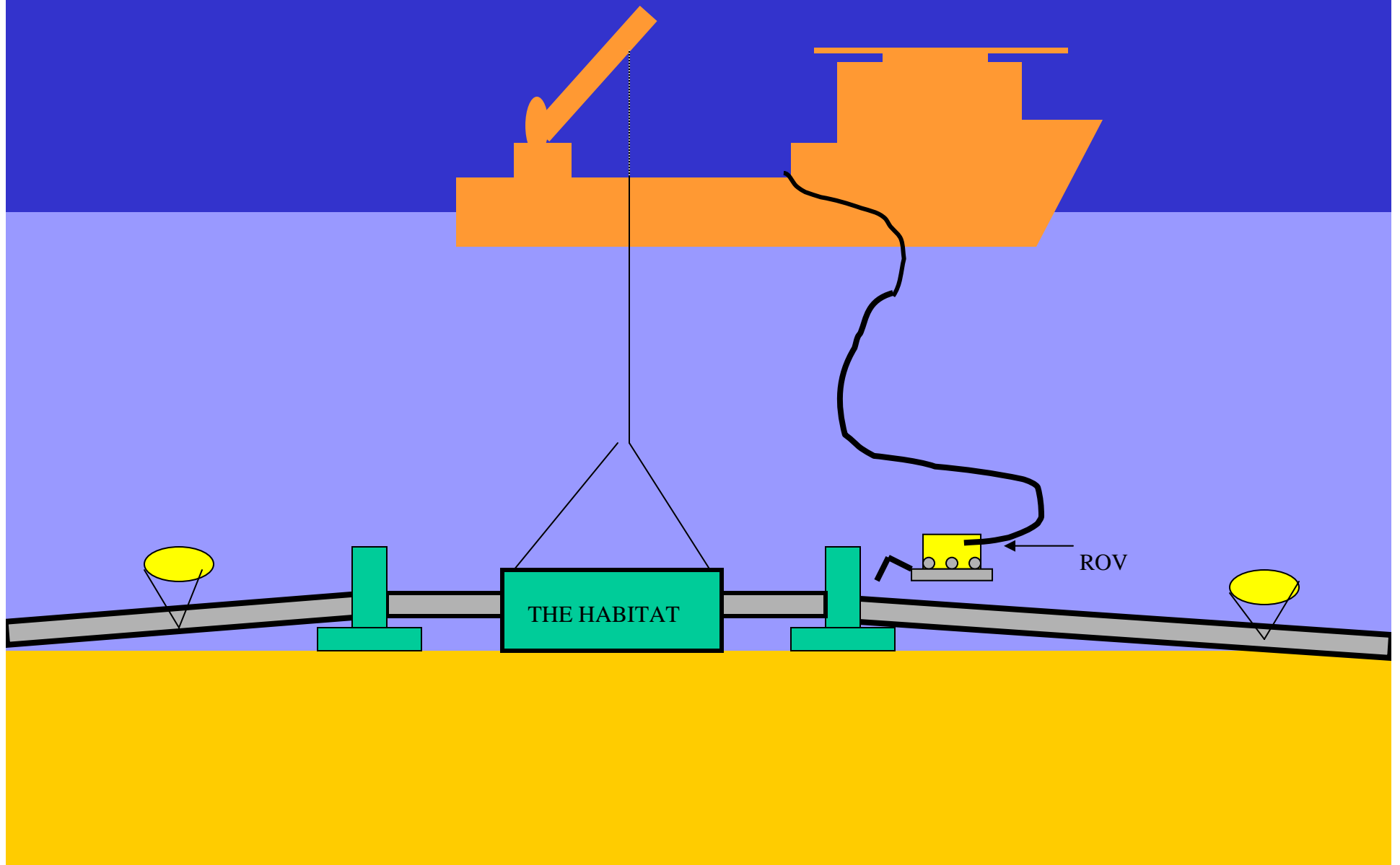
PREPARING THE PIPE FOR PLACEMENT OF HABITAT



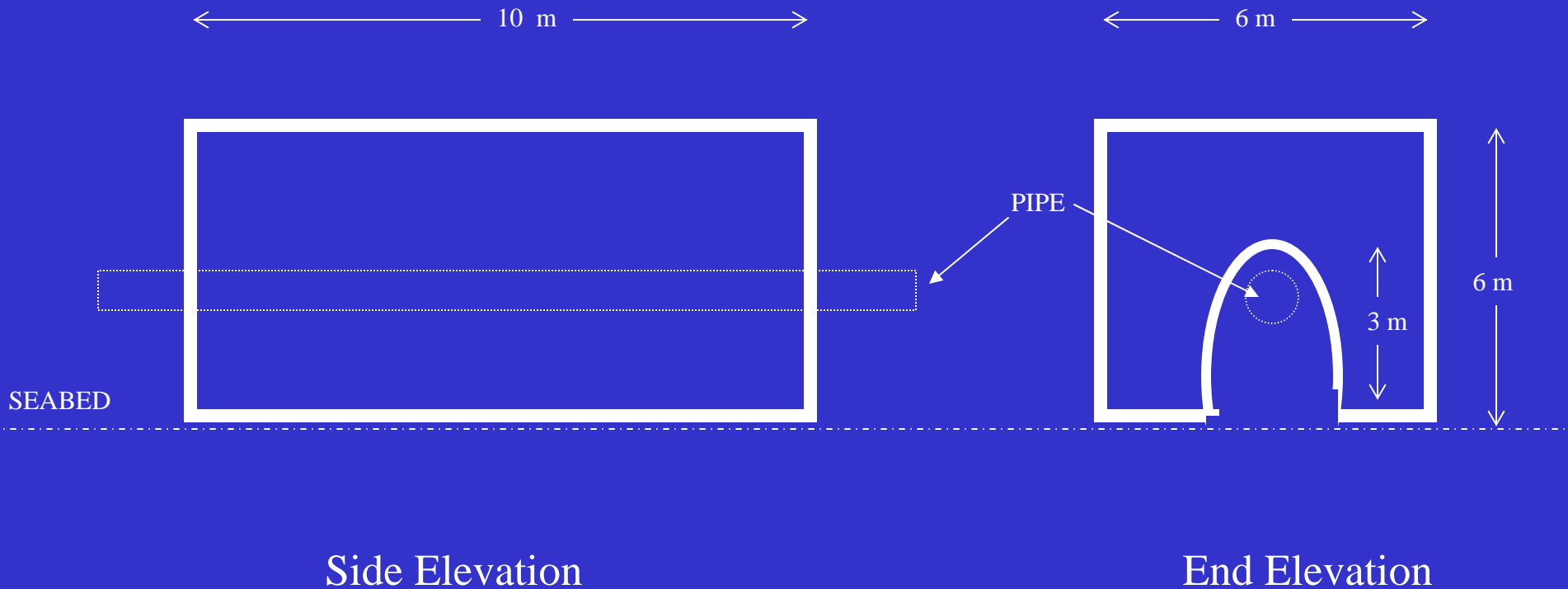
TO PREPARE FOR THE HABITAT

- THE CONCRETE IS REMOVED FROM AROUND THE CUT ENDS
- THE CUT ENDS ARE ROUGH BEVELED
- BLADDER PIGS INSERTED IN SIDE EACH CUT END

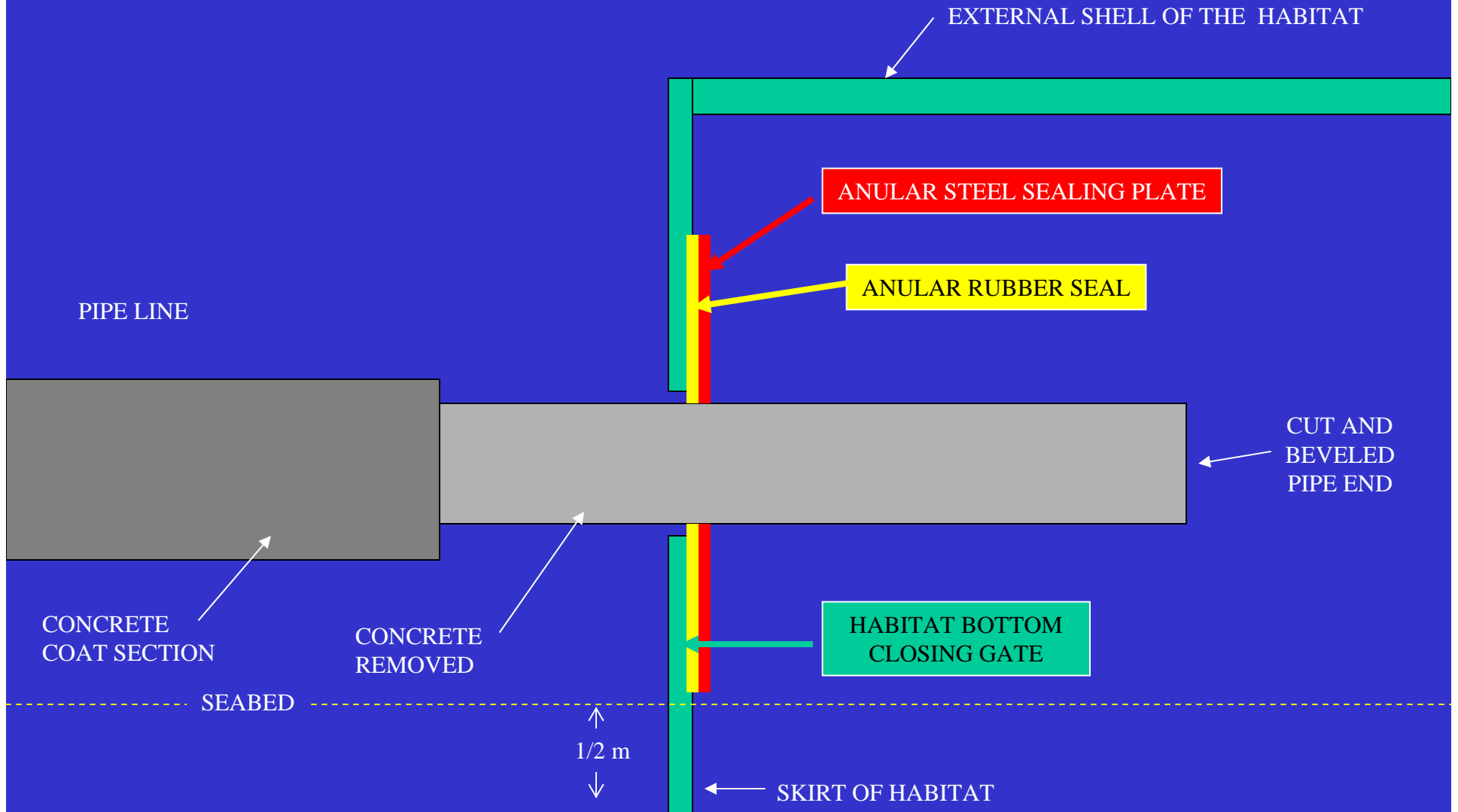
DSV PLACES THE HABITAT



Typical principal dimensions of a Hyperbaric Welding Habitat



The sealing of the pipeline inside the habitat



Setting the habitat ready for work (pumping dry)

BACK TO DSV

HABITAT UMBILICAL CONTAINING :

- DIVERS GAS, COMMS, HOT WATER, VIDEO
- HABITAT , POWER GAS, COMMS, VIDEO
- WELDING, GAS POWER LEADS, SURVEILANCE ETC.

HABITAT GAS PRESSURE WILL BE MAINTAINED AT APPROX. 0.2 BAR ABOVE THE AMBIENT SEA PRESURE

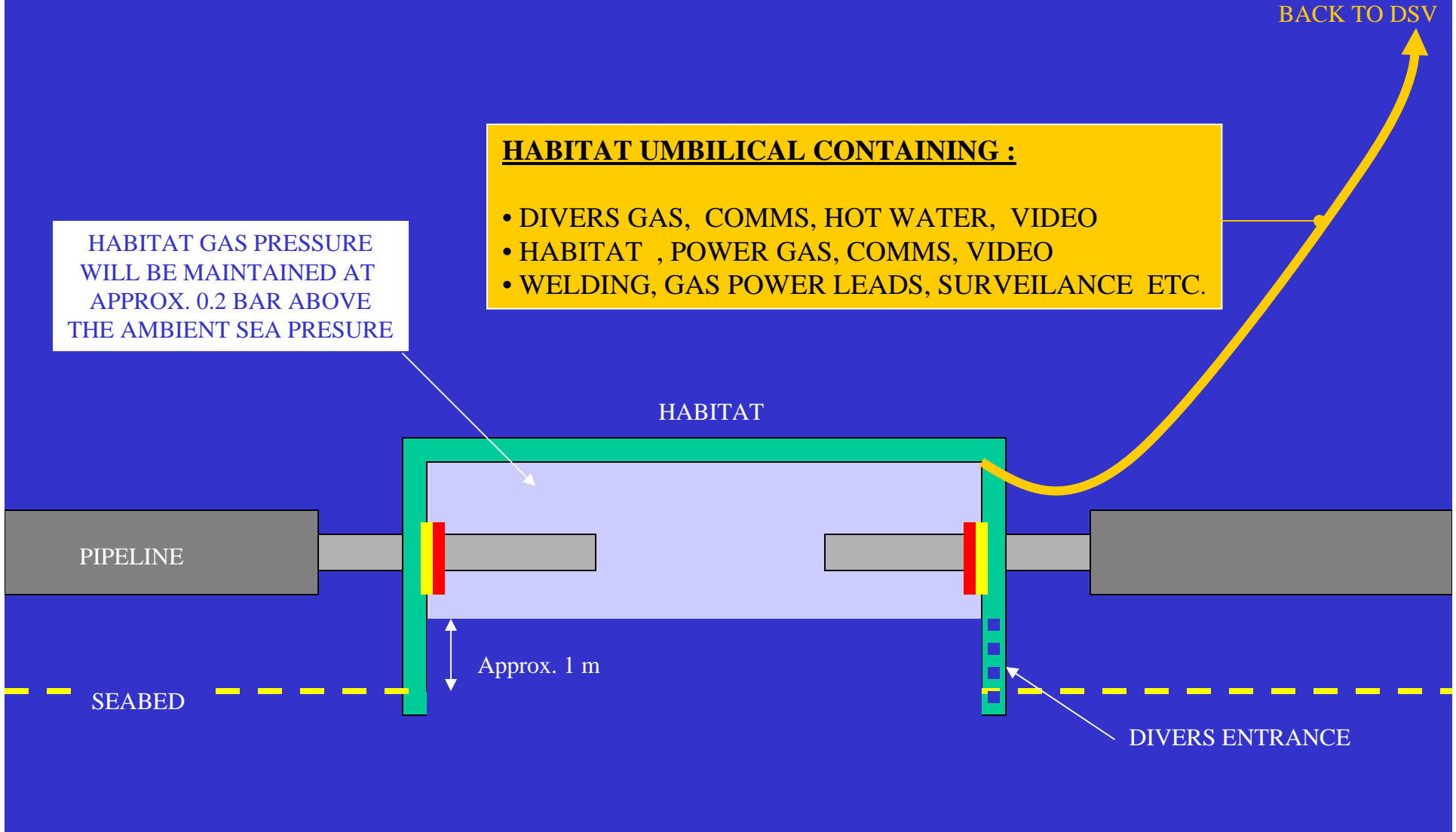
HABITAT

PIPELINE

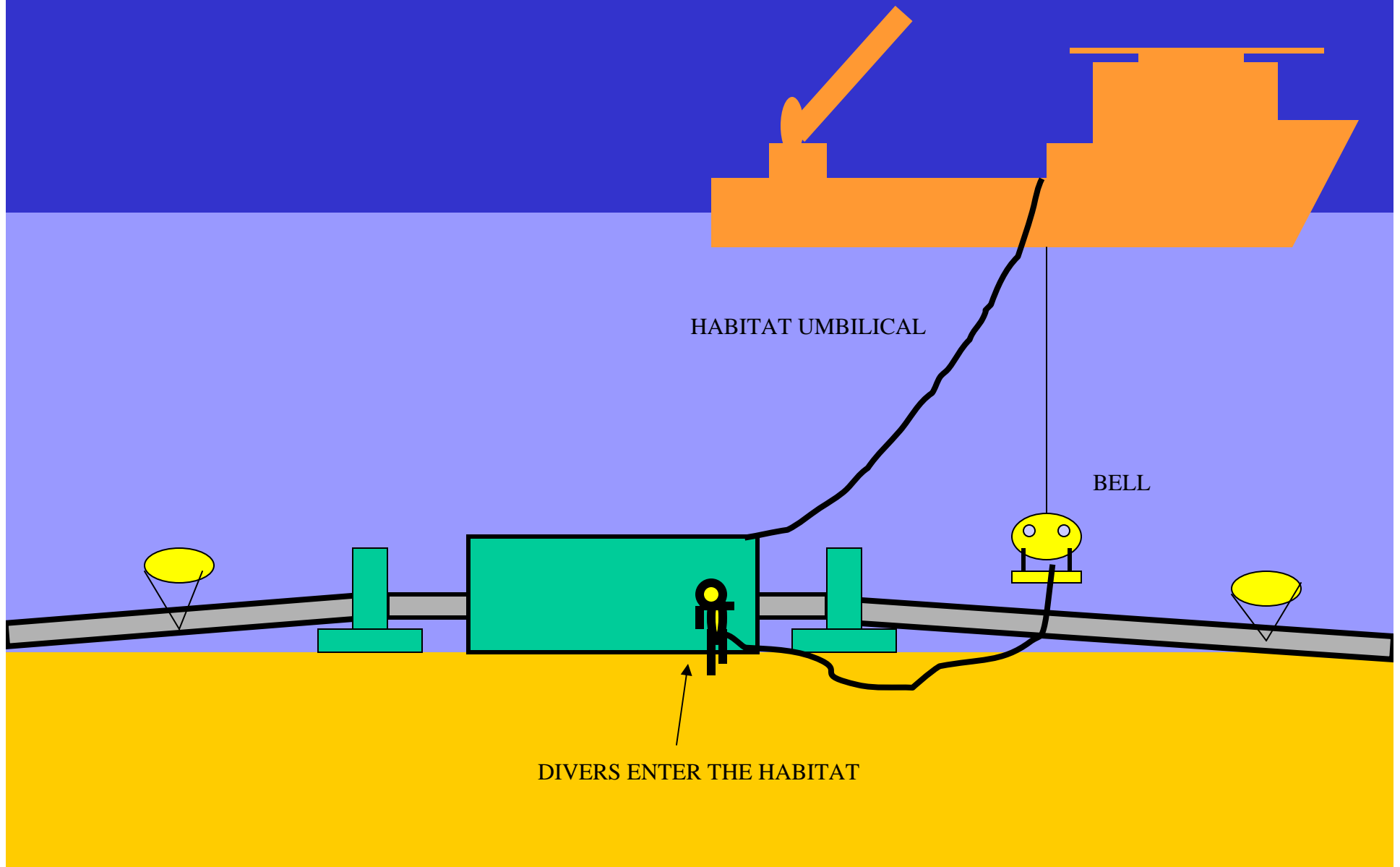
Approx. 1 m

SEABED

DIVERS ENTRANCE

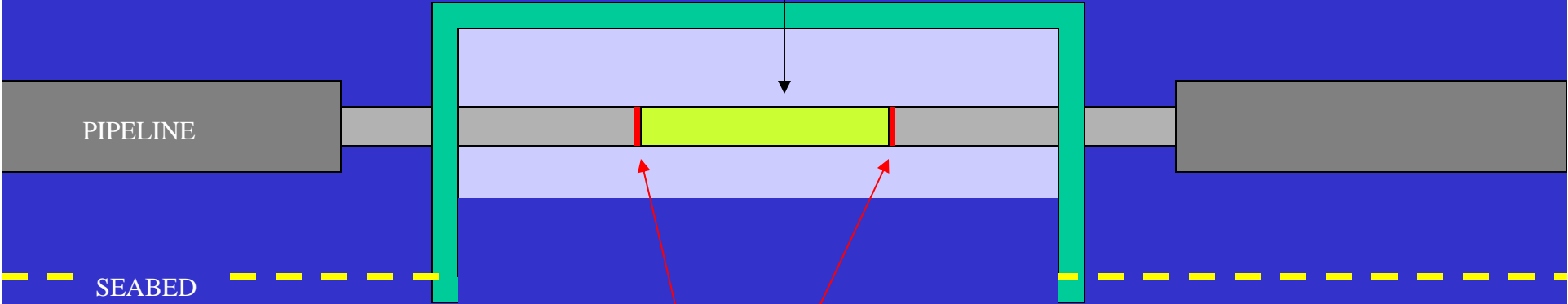


Once the habitat is set the divers set the seals, pump dry and then commence the hyperbaric weld



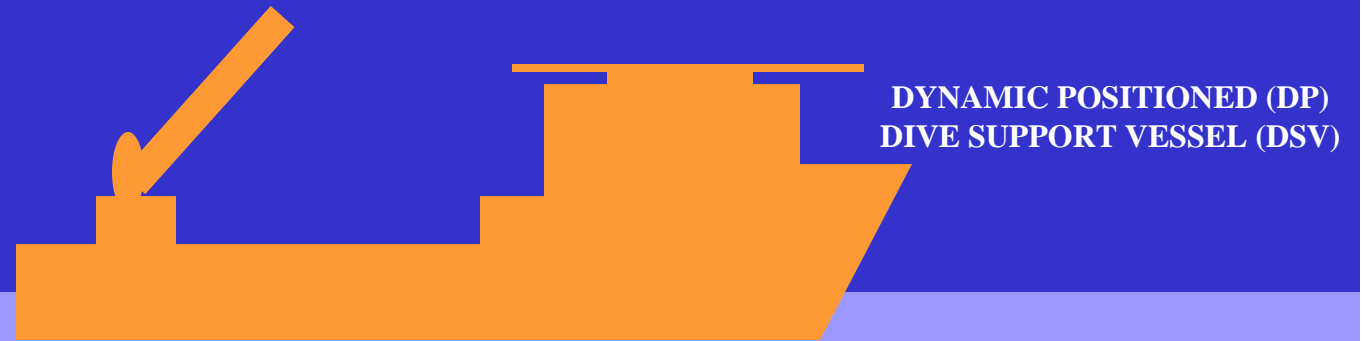
The hyperbaric weld

NEW SECTION OF PIPELINE "PUP" WELDED IN-LINE



TWO FULL CIRCUMFERENTIAL GIRTH WELDS PERFORMED, NDT, AND CORROSION COATING APPLIED

Once the pipeline has been repaired the DP-DSV would recover the hyperbaric spread



NON-CONCRETE COATED SECTION OF PIPE LINE



← APPROX. 12 m →

PIPELINE



REPAIRED SECTION OF PIPELINE

Once the pipeline has been repaired the DP-DSV would place a protection frame or concrete mats

DYNAMIC POSITIONED (DP)
DIVE SUPPORT VESSEL (DSV)



PIPELINE

CONCRETE MATTRESSES OR PROTECTION FRAME
PLACED OVER THE REPAIRED SECTION OF PIPELINE

