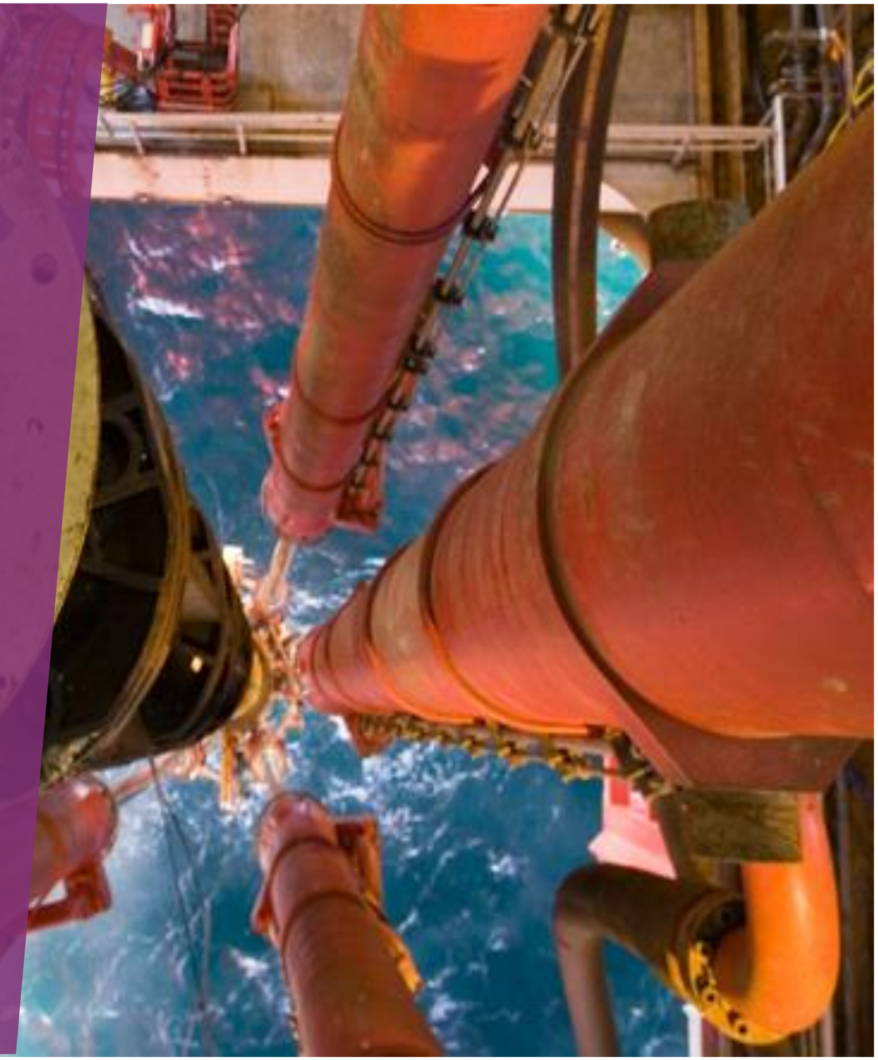
IOGP Hazard Survey Guidelines and Technical Notes

Andy W Hill, BP America,
March 2016



Summary

- Background to the IOGP Guidelines for the Conduct of Offshore Drilling Hazard Site Surveys (DHSS)
- Objective of the Guidelines and the Technical Notes
    - Most significant *Recommendations* in the Guidelines
- Planned future updates
    - What is driving the update of 373-18-1 now?
- Q & A

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A Brief Document History

1992	“Guidelines for the Conduct of Mobile Drilling Rig Site Surveys“, Volumes 1 and 2 issued by UKOOA
1997	“Guidelines for the Conduct of Mobile Drilling Rig Site Surveys”, Volumes 1 and 2 update issued by UKOOA
2000	”Guidelines for the Conduct of Mobile Drilling Rig Site Investigations In Deep Water”, Addendum published by UKOOA
2006	UKOOA Guidelines adopted by the IOGP Geomatics Committee
2007	IOGP Launch Initiative to update the UKOOA Documents
2011	“Guidelines for the conduct of Offshore Drilling Hazard Site Surveys”, 373-18-1 published by IOGP
2012	“Guidelines for the conduct of Offshore Drilling Hazard Site Surveys”, 373-18-1 update published by IOGP
2015	“Conduct of Offshore Drilling Hazard Site Surveys - Technical Notes”, 373-18-2 published by IOGP
2016	**Update of 373-18-1 on normal update cycle**

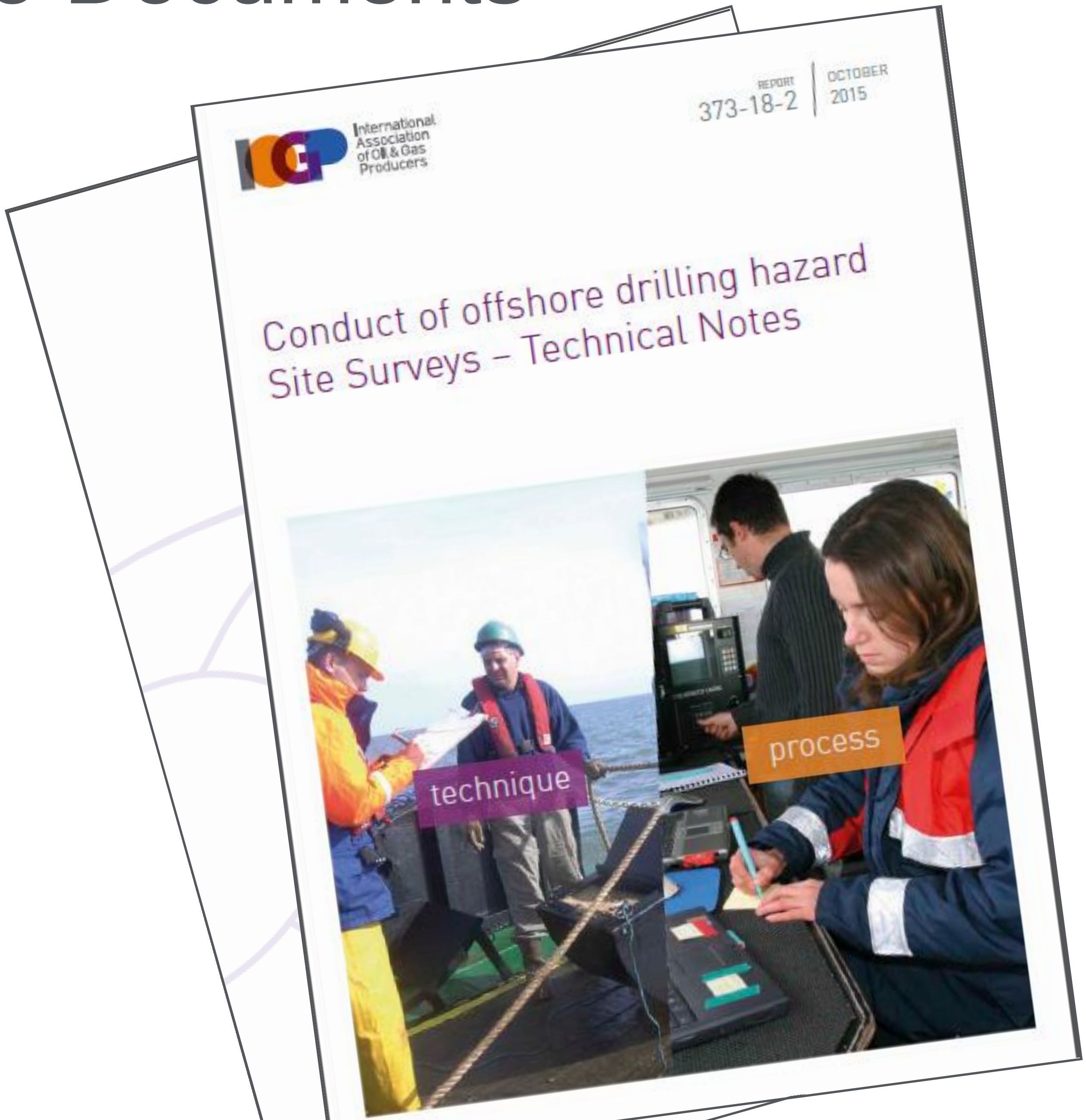
IOGP Task Force: a True Cross Industry Group

- Andrew W. Hill — BP (Initial Chair)
- Palle J. Jensen — Maersk Oil (Current Chair)
- Gareth A. Wood — BP
- Dag Lundquist — Statoil
- Thierry des Vallieres — Total (now retired)
- Øyvind Ruden — Shell
- Eric Cauquil — Total

- Ken Games — Gardline Geosurvey
- Richard Salisbury — Fugro Geoconsulting

- [Karen Dalton] — RPS Energy
- Mick Cook — IECO

Two Documents



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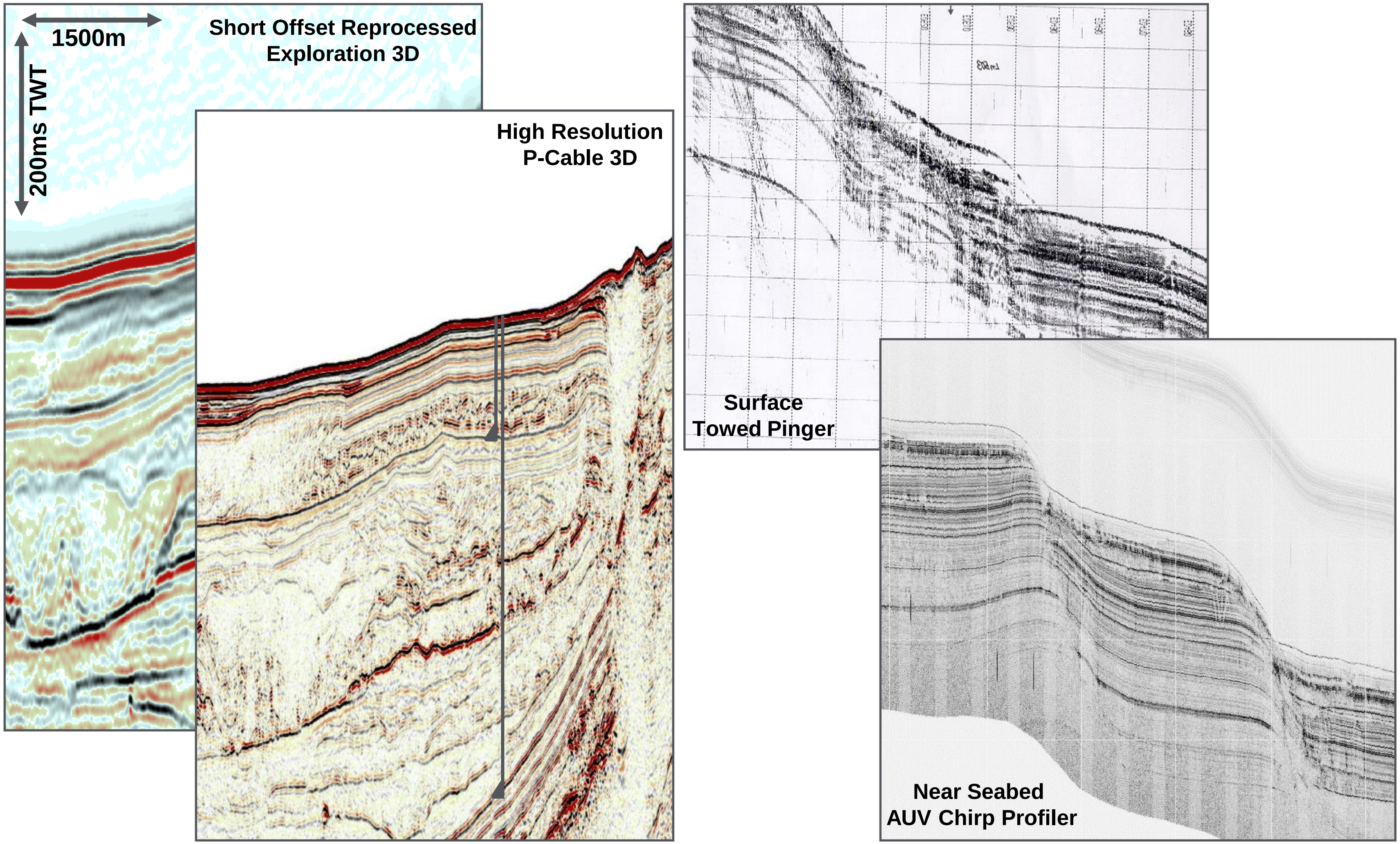
Right Tool, Right Manner, Right Time, Right Place



Guidelines Summary

- Every site has to be considered on its individual needs based on:
    - The Geological setting (complexity)
    - The Planned operation
    - The data already to hand
- Using a carbon copy survey template is inappropriate
    - Ignores the setting, operation etc.
- The Desk study therefore at the start of a project is an imperative
- Project timing is also highly dependent on local regulatory timing (Environmental permits, contract approvals, acquisition permits etc.)
- Data validity guidance is guidance: needs careful appraisal on a site to site, operation to operation basis.

The Technical Notes

- Built to support application of the "Guidelines" and explain use of relevant specialist tools:
  - Greater detail on Survey Planning and linkages to other IOGP Documents (e.g. Report 432, Managing HSE in a Geophysical Contract)
  - Explanation on the different types of equipment, their operation and data output
  - Brief guidance on interpretation and reporting
  - Much expanded Glossary of terms
- *112 pages in all!*

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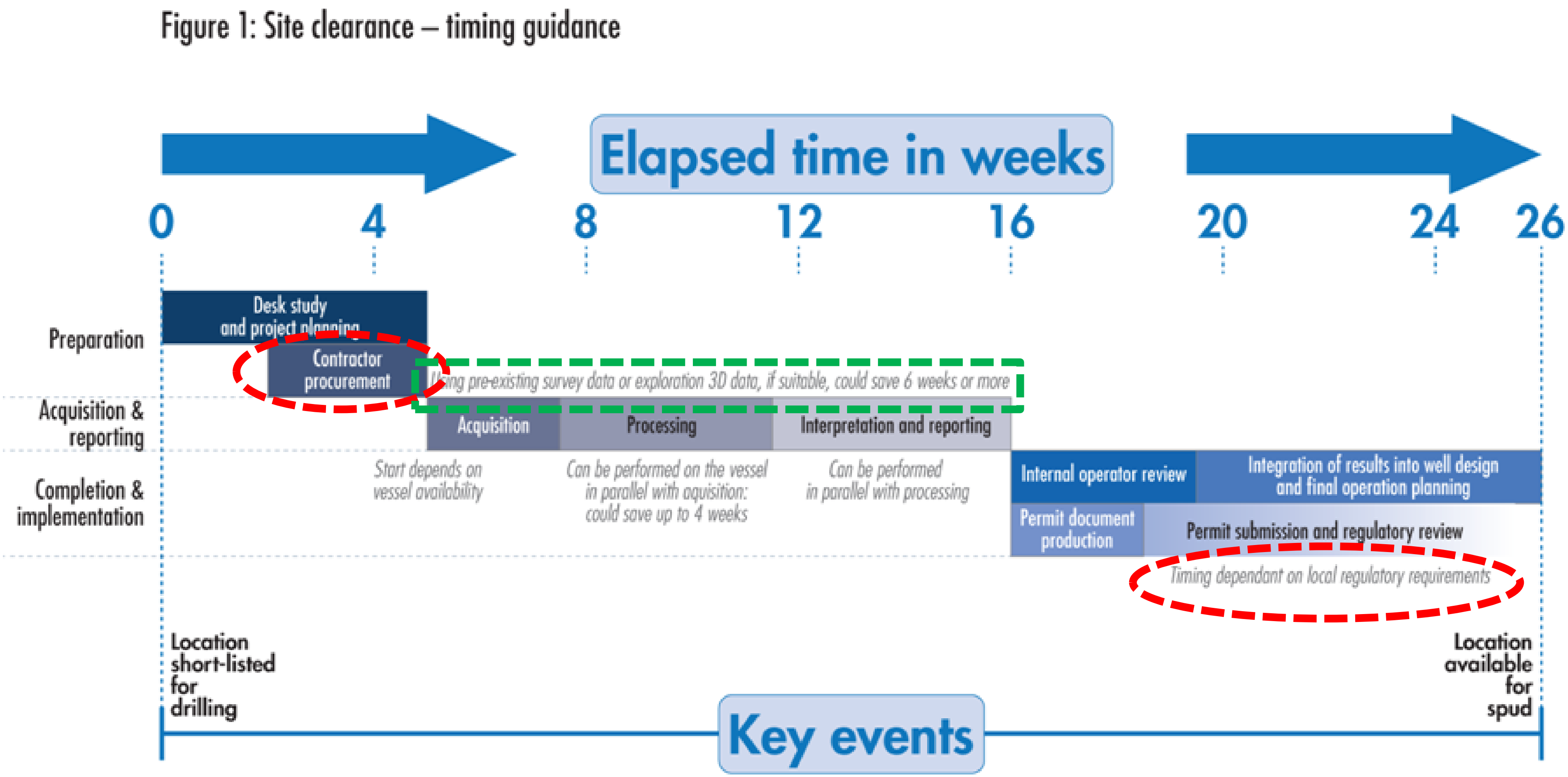
IOGP Guidelines Document Recommendations – or bones of contention?

- Project Schedule
- Site Survey Decision tree
- Data validity
- Use of 3D exploration seismic data

Conceptual project timeline



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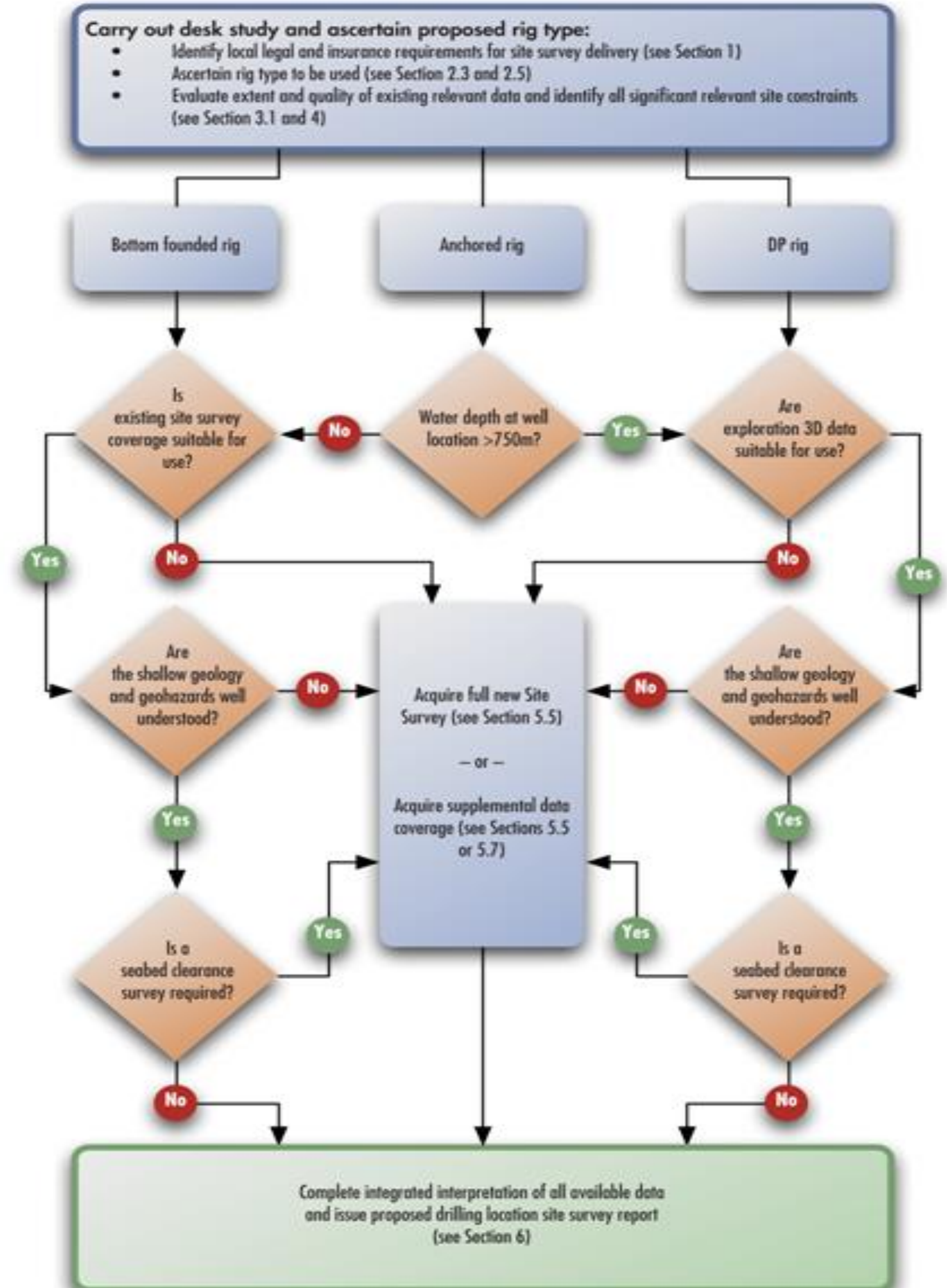
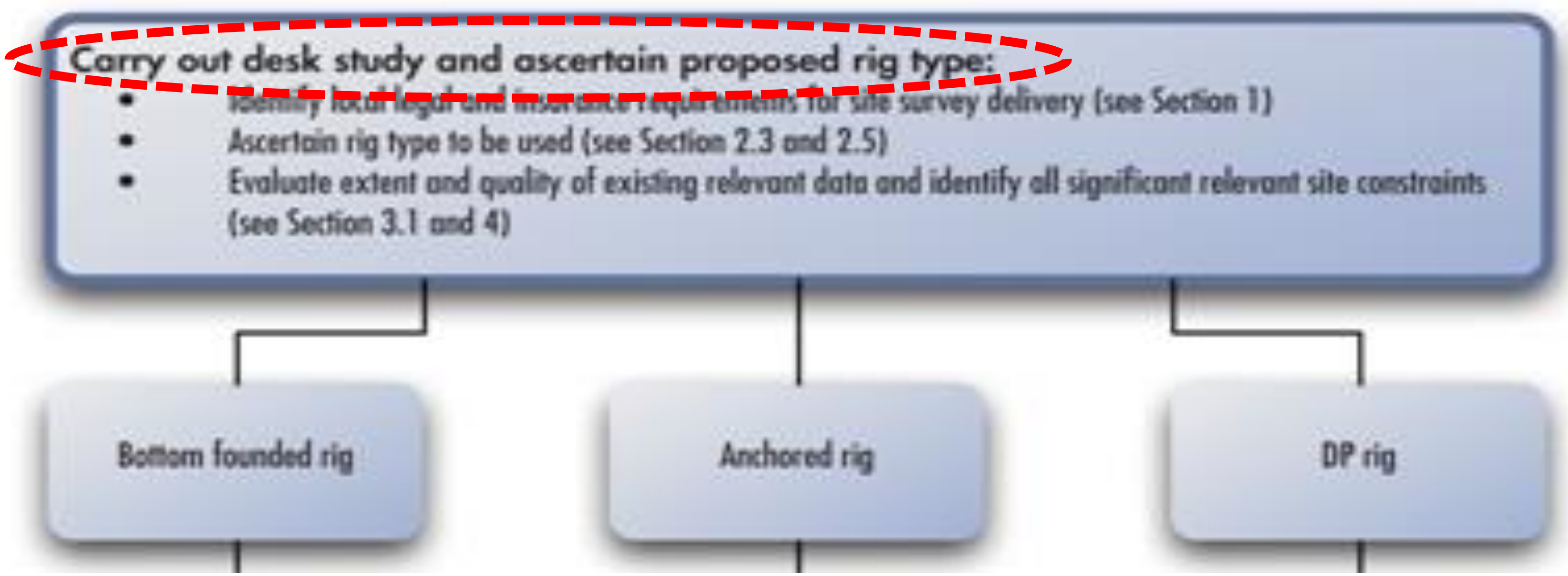
Site Survey Decision Tree

Figure 2 – site survey decision tree



Site Survey Decision Tree (Detail)

Figure 2 – site survey decision tree



- What data are available: review critically for validity for your project!
- Compare to site constraints to be addressed.
- What rig type will be used?
- Design survey or use existing data (Site Survey or 3D)

Pre-Existing Data Validity Guidance

Table 2: pre-existing data validity guidance

Activity Condition	Seabed Data	Subsurface Data
No Activity	5 years	10 years
Engineering Activity	1 year	10 years
Well Control Incident	Invalid	Invalid

- Validity decision is not black and white: *Pre 1990 vs pre 2000 vs ???*
  - Data volume specific: *age, availability (paper, tapes), equipment used, line spacing, direction, processing, overall quality etc.*
- Past activity in area: *wells drilled, pipelines laid, etc.*
- Replacement or enhancement with 3D data: *targeted reprocessing?*
- Value added to other activities: *Environmental baseline assessment?*
- Technology advancement: *new data would be a step change?*

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Main Line Spacing Guidance

Table 3: Main line spacing guidance

Data type	Water depth range			
	<25m	**25m to 150m**	**150m to 750m**	**>750m**
Swathe bahymetry	≤50m	50m – 150m	200m	150m (AUV)
Side scan sonar/profiler	50m	100m	200m 300m (Deep Tow)	150m (AUV)
2D HR seismic	25m – 50m	50m	50m – 100m	≥150m

- Normally acquired in structural dip direction
  - Depending on environmental constraints:
    - *Currents? Obstructions? Infill to existing data?*
- Activity type planned: *Wildcat exploration vs. Development??*

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3D data acceptability criteria for SI Purposes

- Spatial, temporal, bit resolution and sampling interval
- Data loading criteria and data resolution
- Recommended minimum quality standards for:
  - Frequency content
  - Seafloor reflection integrity
  - Acquisition artifacts
  - Merge points
  - Bin sizes
  - Sample interval
  - Imaging: velocity model and migration.
  - Multiple energy
  - Data coverage
  - Minimum water depth

Hazard Impact Tables

Constraint, hazard or concern	Impact on operations			Investigatory data requirement
	Bottom founded rig or platform	Anchored rig	Dynamically positioned rig	
Water depth	*Suitability of Rig:* • Barge drought • Barge freeboard • Leg length • Expected seabed penetration – relative to vessel draught or leg length • Achievable air gap	*Suitability of Rig:* • Maximum permissible draught (coastal waters) • Anchor system limitations (limb length and winch capacity) • Boat support needs for anchoring • Riser length available • Maximum useable mud weight (in deep water) • Amount of fatigue loading on riser	*Suitability of Rig:* • Riser length available • Maximum useable mud weight • Direction of departure in event of emergency disconnect, hanging off with riser fully deployed, or approaching back on to location to latch on to BOP.	Derived from results from a precise bathymetric survey using Swathe Bathymetry and single channel echo sounder systems (see section 5.5.1). For individual well locations in water depths greater than 750m, that are not related to a field development, use of a properly depth converted exploration 3D Seabed event may be an adequate replacement (see sections 5.5.2 and 5.6).
Natural seabed features • Seabed topography and relief • Seafloor sediments • Sand: banks, waves, and mega-ripples • Mud: flows, gullies, volcanoes, lumps, lobes • Fault escarpments • Diapiric structures • Gas vents and pockmarks • Unstable slopes • Slumps • Collapse features • Fluid expulsion features • Gas hydrate mounds • Rock outcrops, pinnacles and boulders • Reefs • Hardgrounds • Seabed channels and scours	*Choice of:* • Rig type (barge, mat or multi-leg jack up) • Well location *Impacts on:* • Risk of scou r • Rig stability • Spud can damage	*Choice of:* • Well location • Anchor locations • Catenary touchdown points *Impacts on:* • Anchor deployment and slippage • Requirement for piggy back anchors • Difficulty of spudding the well • Leveling of wellhead • Wellhead scour caused by current focusing.	*Choice of:* • Well location • Difficulty of spudding the well • Leveling of wellhead • Layout of seabed acoustic array • Wellhead scour caused by current focusing. • Direction of departure in event of emergency disconnect, hanging off with riser fully deployed, or approaching back on to location to latch on to BOP.	Mapped on the basis of an integrated use of: • Bathymetric data • Side scan sonar data • Profiler data See section 5.5.1. In some cases in shelf waters, where bottom founded rigs would operate, exploration 3D seismic imagery might assist an integrated study depending on 3D data quality. In water depths over 750m exploration 3D data can replace the need for bathymetry or side scan sonar data (see sections 5.5.2 and 5.6).
Man made features • Platforms: active, abandoned, or toppled • Pipelines: on or buried below the seabed • Power and umbilical lines • Communications cables • Wellheads and abandoned well locations • Manifolds and templates • Pipeline terminations, valves and protection frames • Subsea isolation valves • Rock dumps • Non oil and gas infrastructure such as navigation buoys, wind turbines etc. • Ordnance and chemical dumping grounds • Miscellaneous debris	*Choice of:* • Well location • Emergency transit locations • Stand-off location(s) • Direction of approach onto and departure from location • Positional tolerance • Anchor locations to aid in bringing rig onto location. *Can result in:* • Structural damage to rig or seabed facilities. • Spud can damage • Spills and emissions • Loss of Operator reputation.	*Choice of:* • Well location • Anchor Locations and appropriate offsets to identified features • Design of anchor catenary profile • Requirement for mid-line anchor line buoys. *Can result in:* • Damage to seabed facilities. • Spills and emissions. • Loss of Operator reputation.	*Choice of:* • Well location • Direction to leave location when hanging off with riser fully deployed, or approaching back on to location to latch on to BOP. *Can result in:* • Damage to seabed facilities. • Spills and emissions • Loss of Operator reputation.	*Presence identified from a desk study review of:* • Nautical charts for the area • Communications cable databases • Published Pipeline and Cable route charts See Section 4. *Mapped from the integrated use of:* • Side scan sonar data • Towed magnetometer • data • Profiler data See Section 5.5.1. When the above data are not acquired in water depths greater than 750m, the well location should be visually inspected by the rig's ROV immediately prior to, and during spudding, of the well.

Document Update Drivers

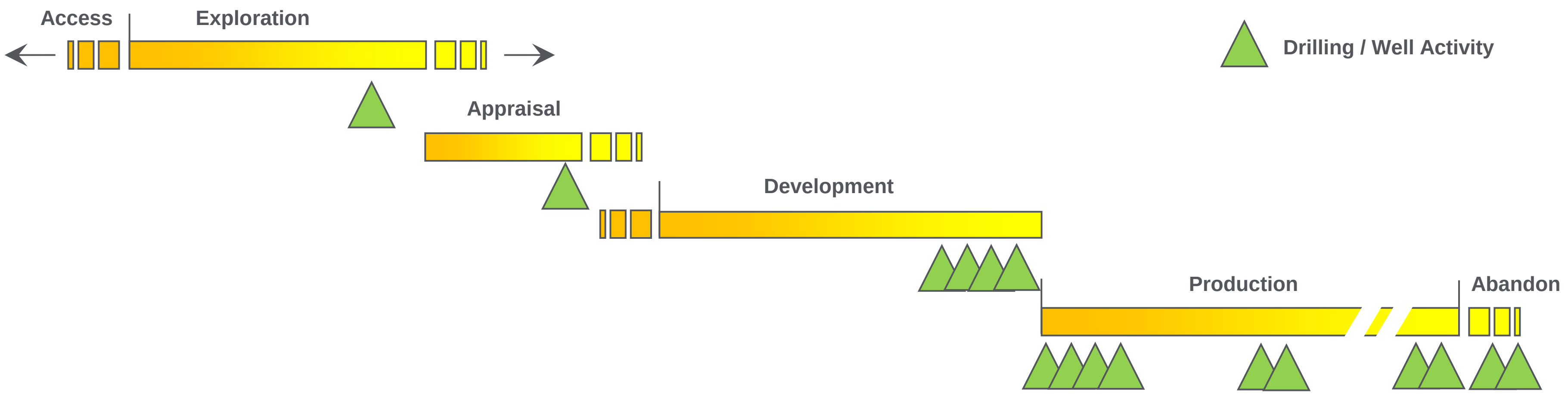
- General technology update
- Global application:
    - Irrespective of Water Depth or Geological Setting
- Wider target audience
- Improved usability
- Use of 3D Exploration Seismic Data
- Exhaustive list of potential drilling hazards
    - Applicability to Rig Type
- Data Longevity
- Glossary of Terms

Remit Driver: Safety & Environment

- Safety and Environment
  - The underlying remit of all Marine Geohazards work:
    - ***To deliver safe, compliant and reliable operations***
      - Across all phases of offshore operations:

        - ➢ Exploration and Appraisal
        - ➢ Drilling
        - ➢ Development
        - ➢ Production
        - ➢ Abandonment

Remit Drivers: Operational Life Cycle



Remit Drivers: Operational Time Frame

- Magnus, Northern North Sea
  - Discovered: 1974
  - Platform Installed: 1981
  - First Oil: 1983
  - Projected Life: Mid 1990s

  - Water-Alternating-Gas Injection
    - Project start-up: 2003

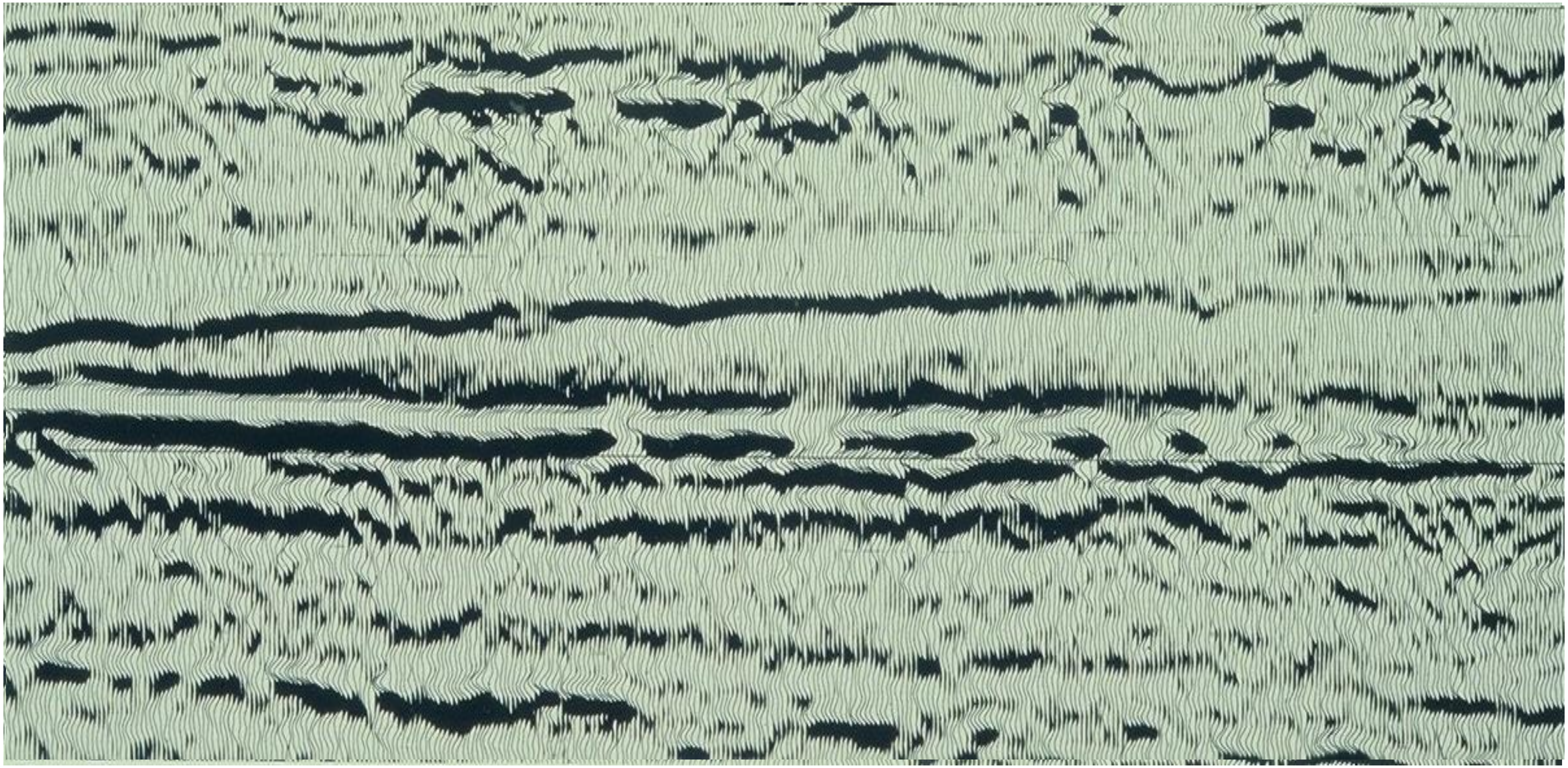
  - Restarting Drilling: 2015

  - Current Projected Life: 2020s

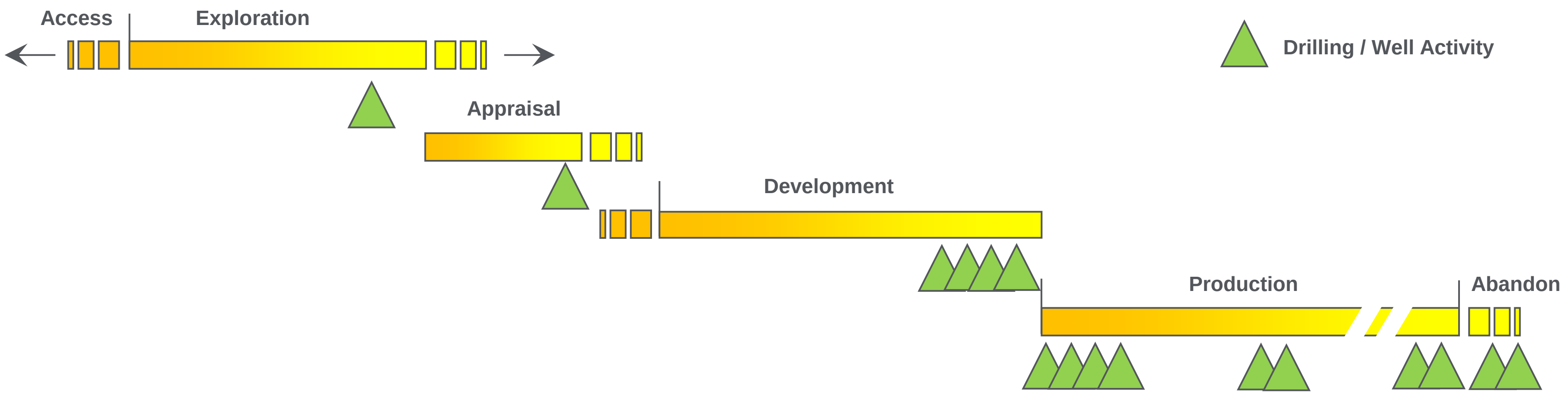
    …. and beyond….

HR Acquisition operations at Magnus Platform, June 1984

Magnus HR Multichannel Data 1984 Vintage



Remit Drivers: Operational Life Cycle



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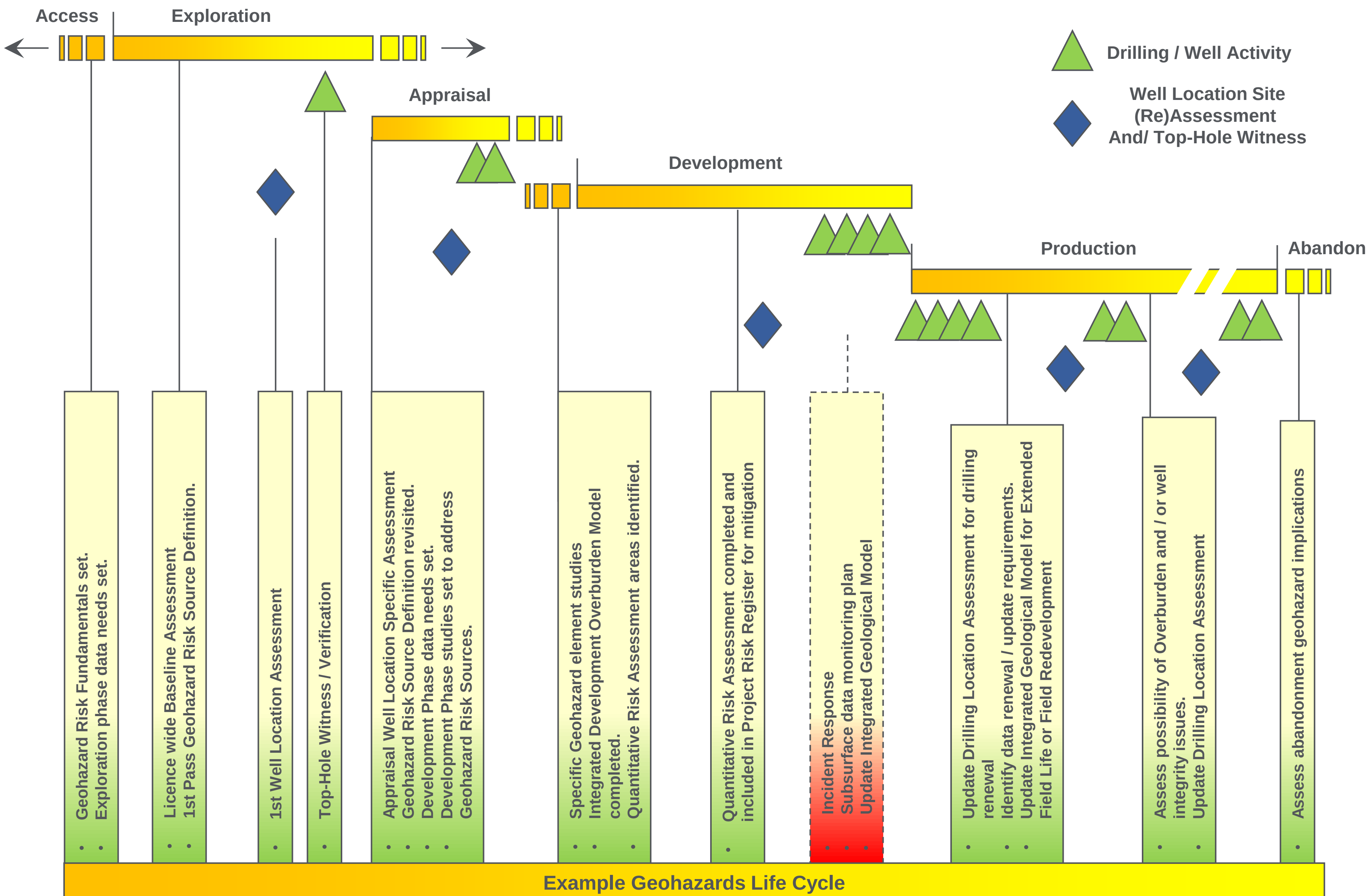
Drivers for Integrated Study

- Scope
  - Scale and Complexity
- Available Technologies
  - Geophysical technology take-up in the round
- Delivery
  - Across the Life of License

Example Geohazards Lifecycle



Update Schedule

- 373-18-1 (Originally updated 2012),
  - Automatic scheduled review about to start
    - *Sub-Committee Members have submitted issues to be addressed*
    - *Presenter has visited Ministry in Trinidad and Tobago, BOEM in GoM USA and will visit EGAS in Cairo in two weeks time to gather comments*
  - *Input and comment from all OGP members would be welcomed*
    - *Some feedback already received highlights need to tighten up wording e.g. “Requirements vs. Guidance”*
  - Technology moves on: acquisition and processing capability

- 373-18-2 (Published October 2015)
  - No scheduled update for two years.

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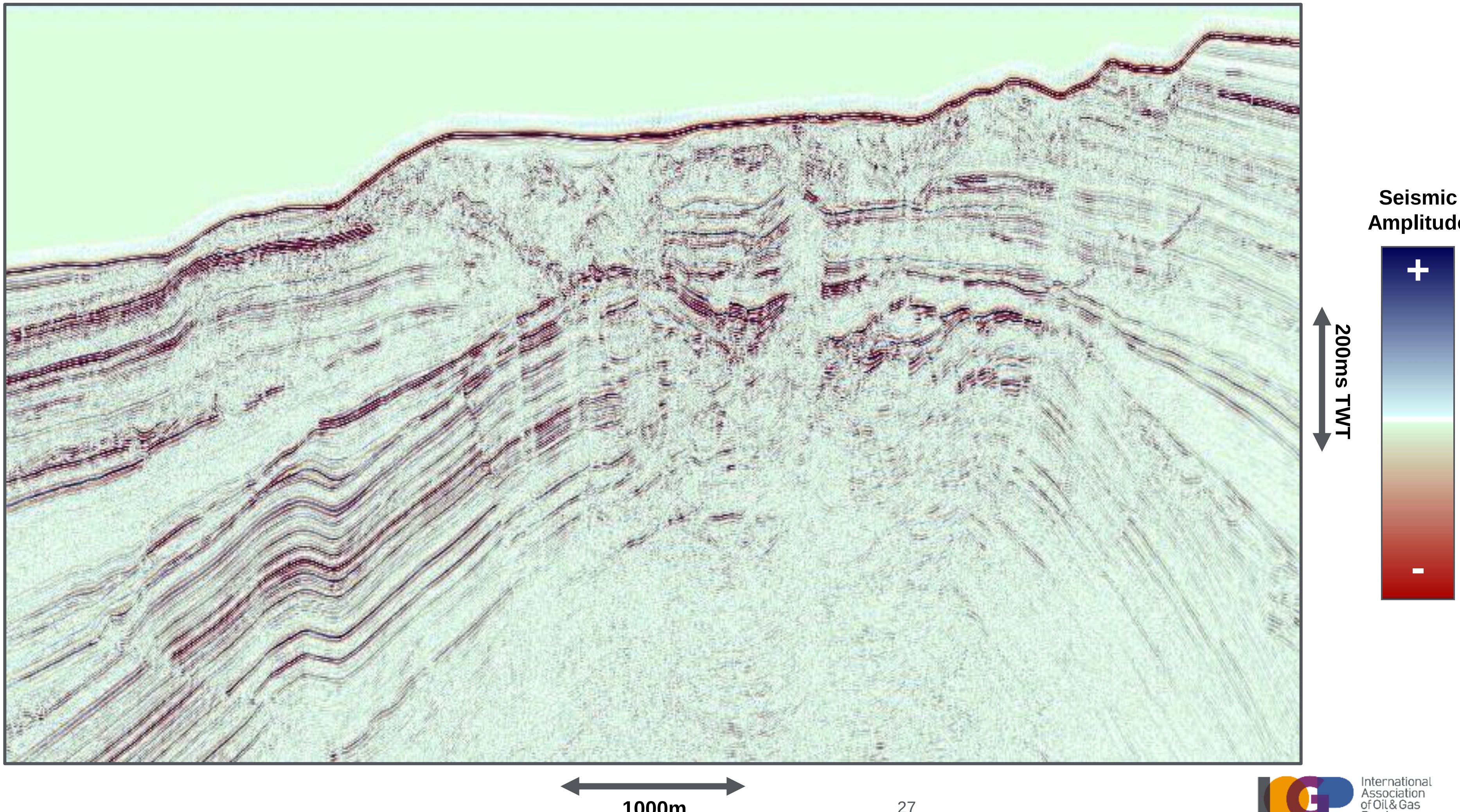
3D Data Usage

- This is an area that has limits that are changing constantly

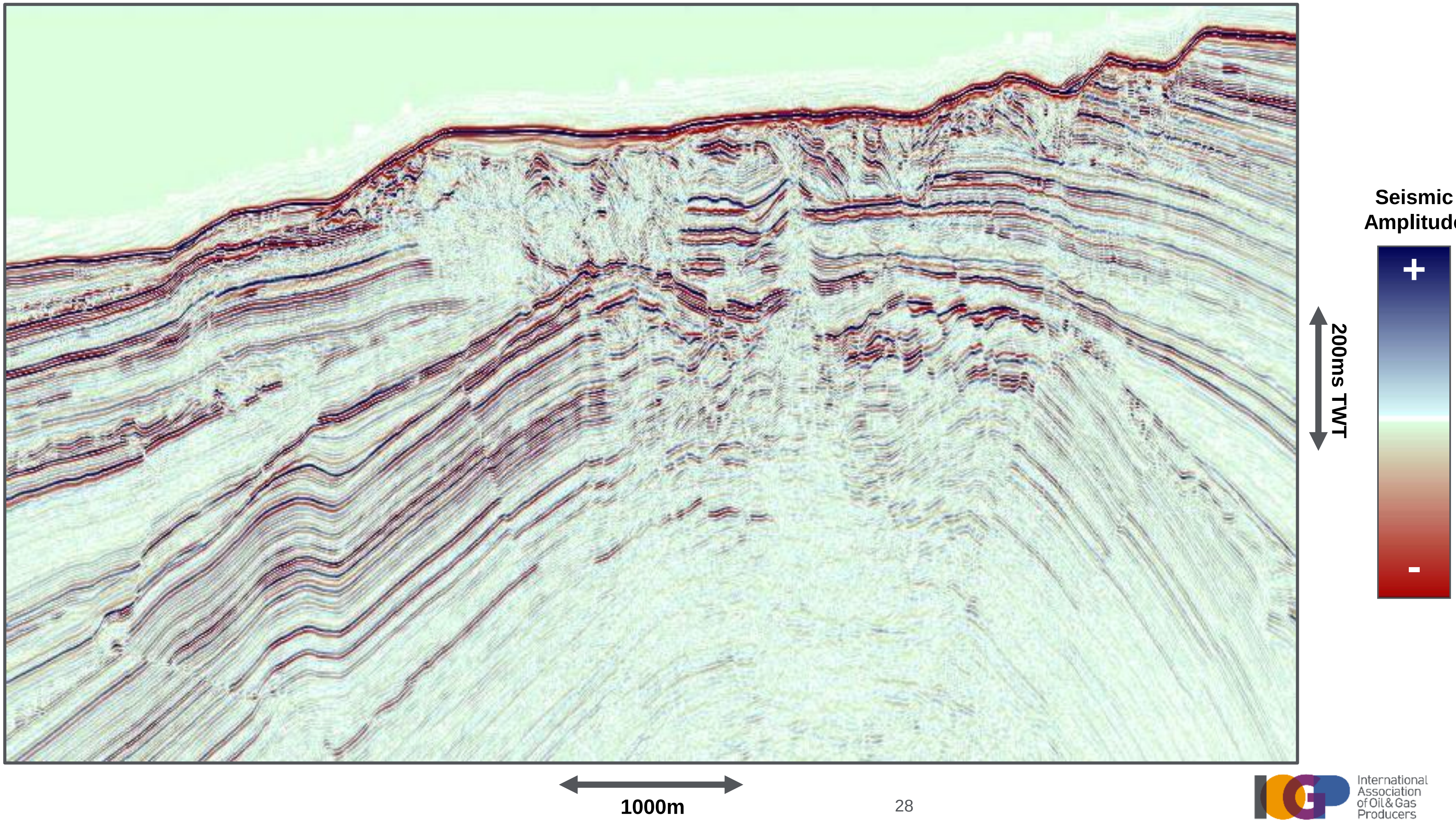
- Five years ago OBC and OBN surveys would not have been considered for use in or support of Site Investigation
    - Mirror migration has changed this

- In Deep Water however use of 3D has become very much a standard approach around the world – with few provisos
    - Advent of Broadband seismic solutions is making this approach even more valid
    - Careful processing is making even WATS data usable for geohazards screening

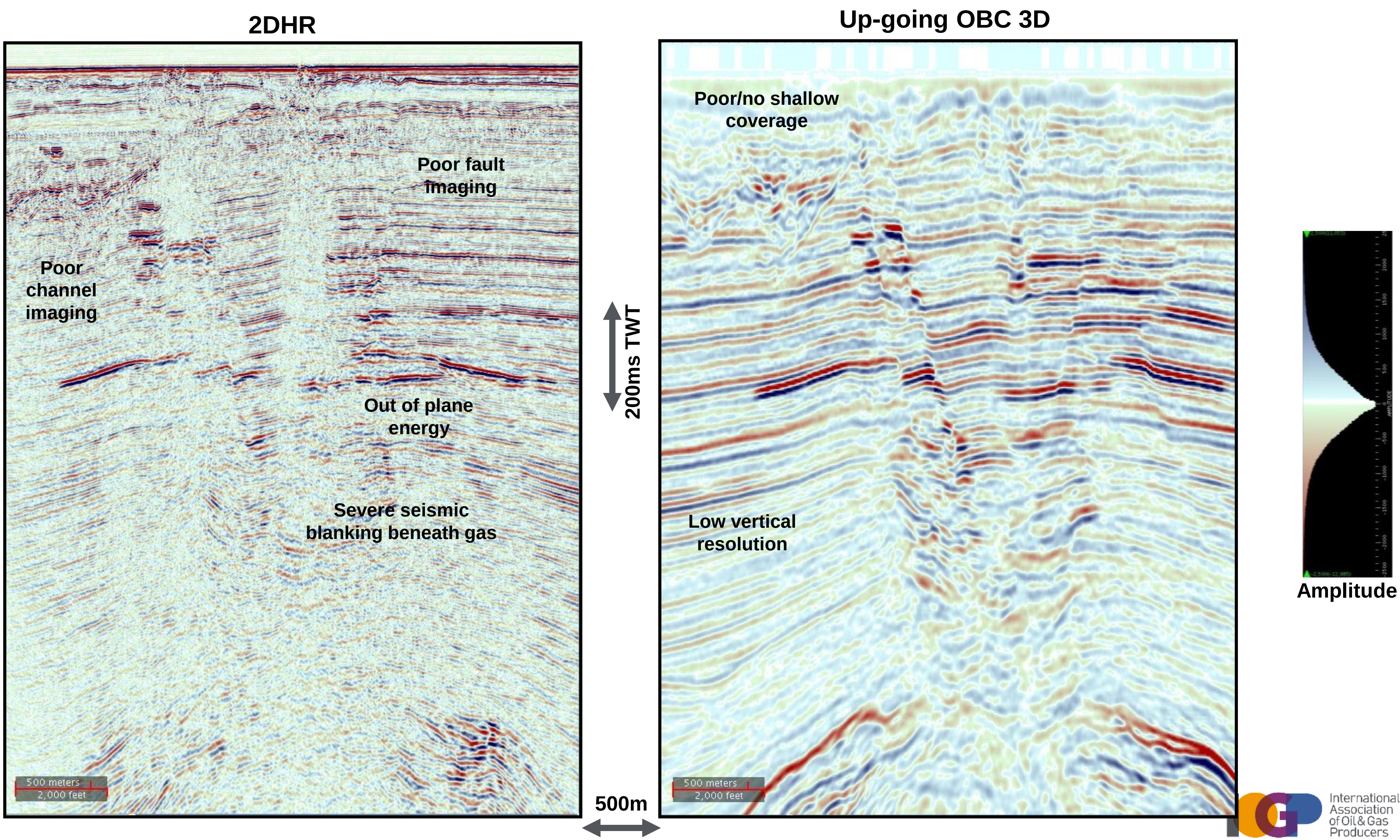
1995 2DHR – Dip Line SE of Central Azeri



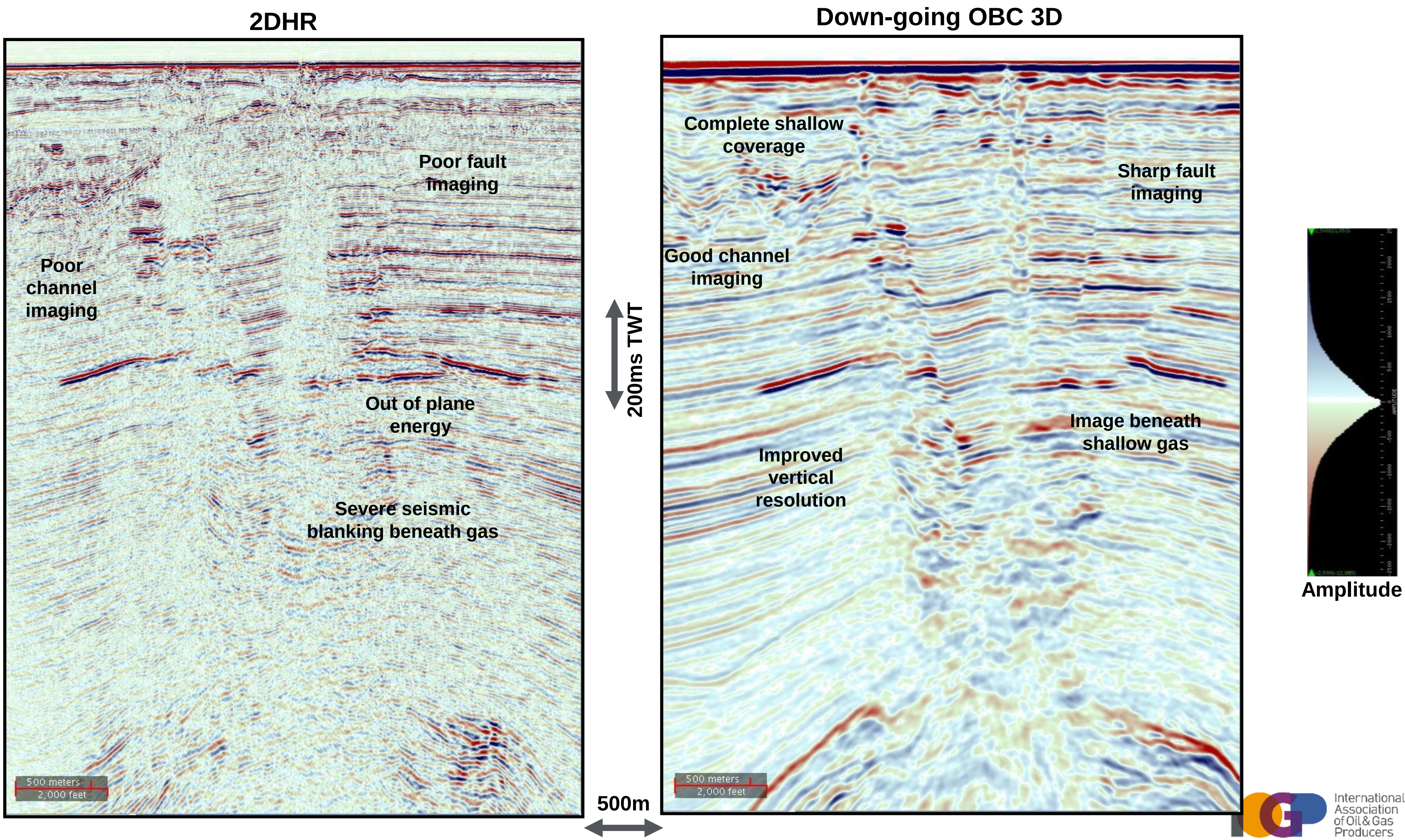
2012 3DHR – Dip Line SE of Central Azeri



Imaging: 2DHR vs. OBC upgoing wavefield



Imaging: 2DHR vs. OBC downgoing wavefield



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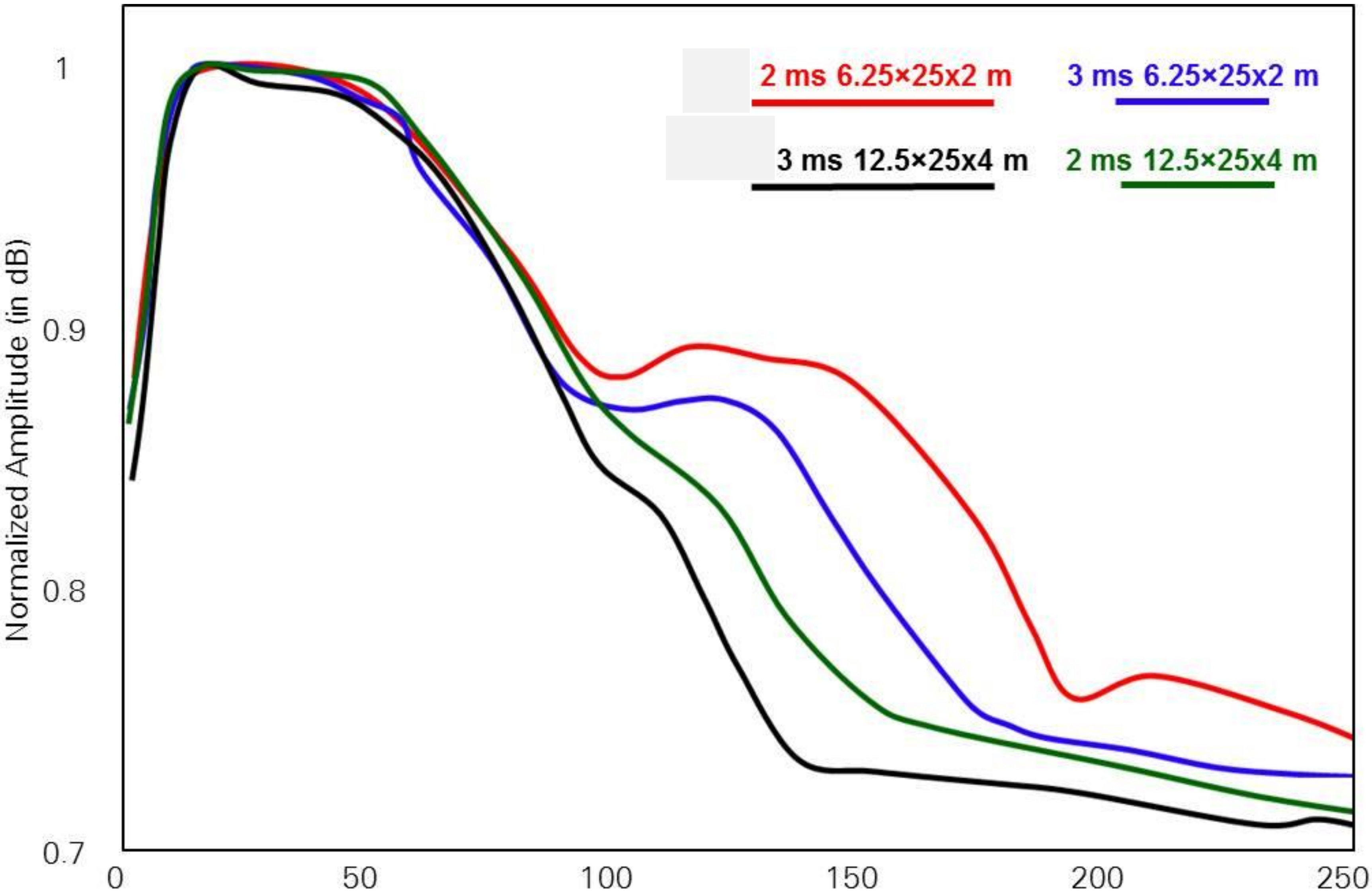
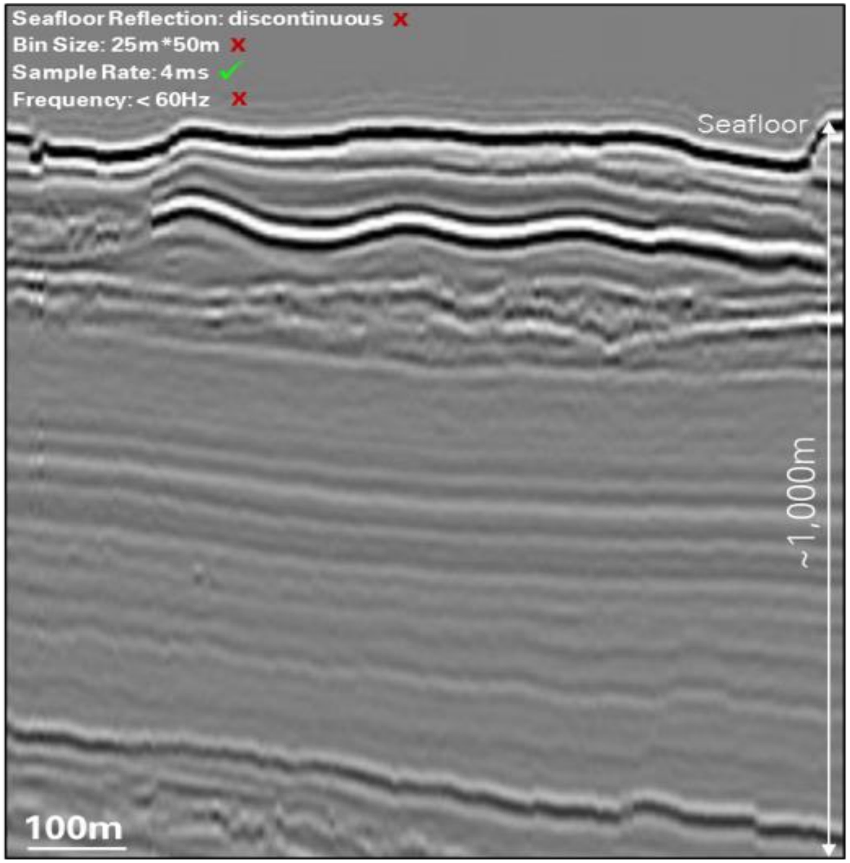
Broadband Seismic Technology

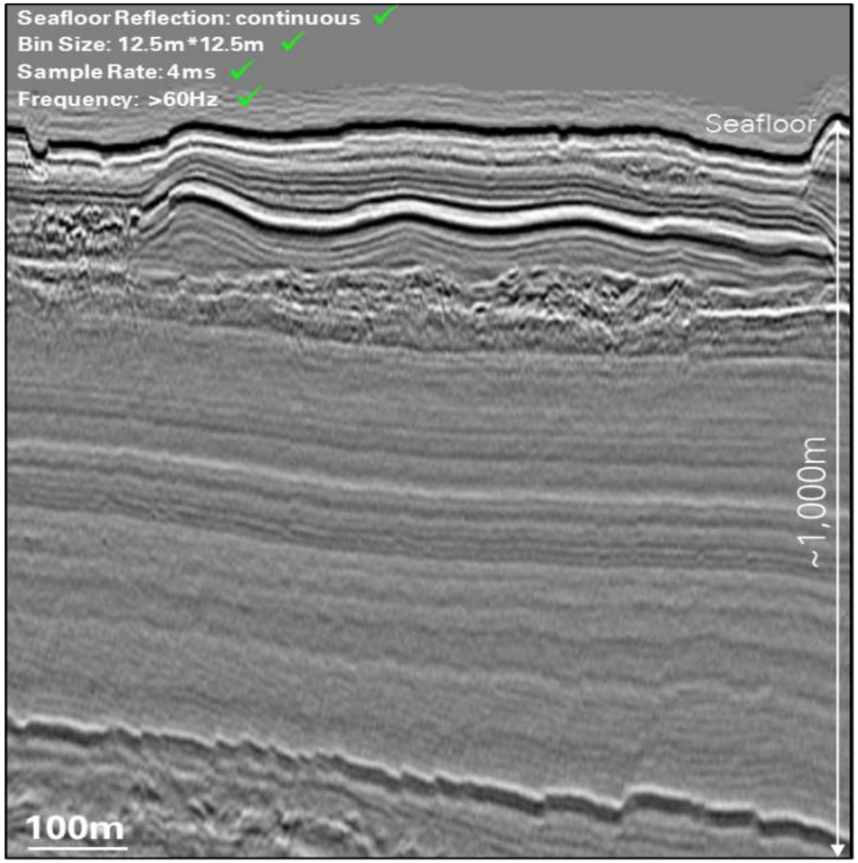


WATS 3D Data Processed for Shallow Imaging

3D WATS - Original



3D - WATS Reprocessed for Geohazards



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Update Schedule

- 373-18-1 (Originally updated 2012)
  - *Input and comment from all OGP members would be welcomed*

- 373-18-2 (Published October 2015)
  - *No scheduled update for two years.*

Download the Documents from www.iogp.org or via direct links below:

http://www.iogp.org/pubs/373-18-1.pdf

http://www.iogp.org/pubs/373-18-2.pdf

Formal Questions or Comments:

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