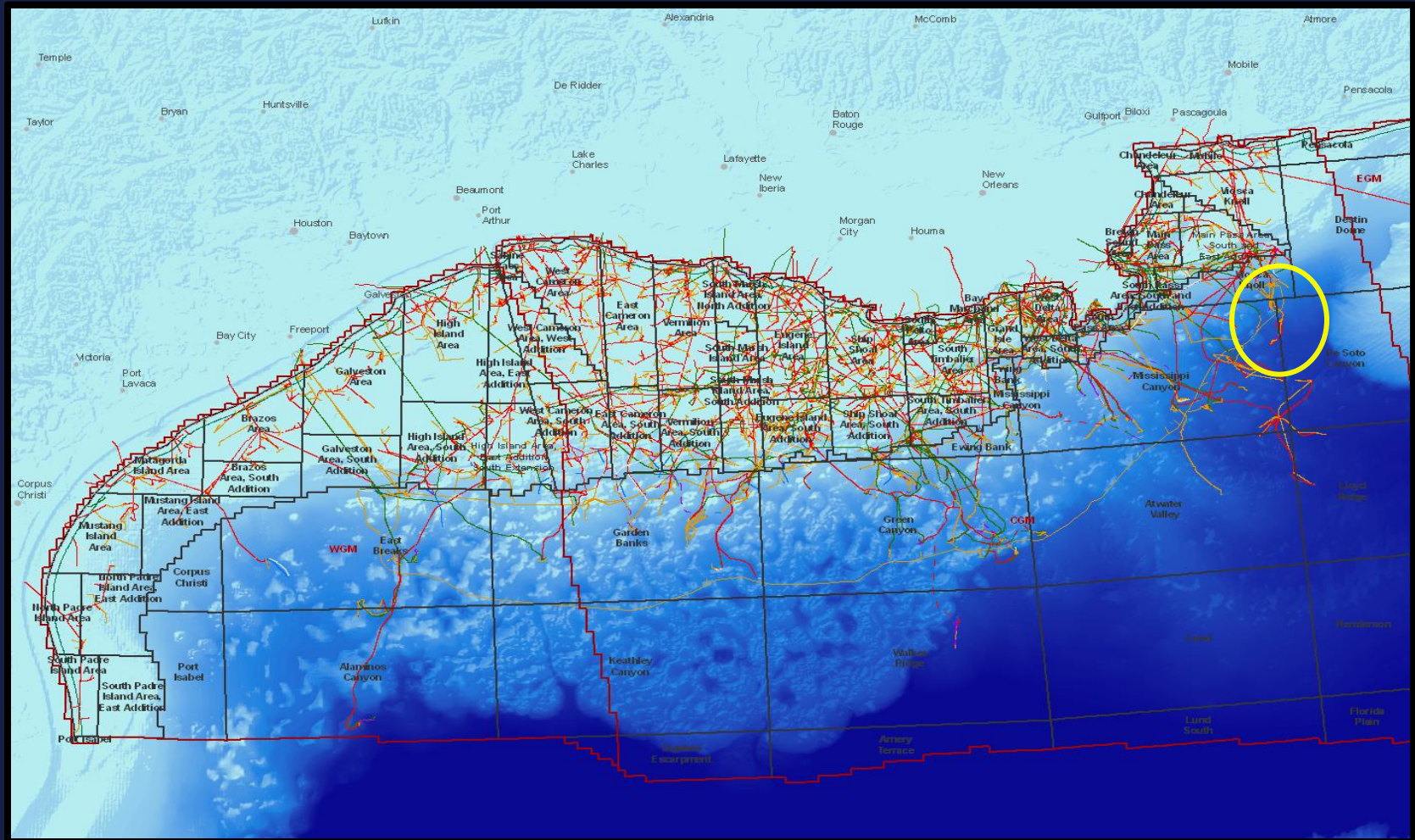


Successful Hydrate Remediation in Ultra-Deepwater GOM

James C. Wells
ATP Oil & Gas Corp.



Canyon Express Pipeline System



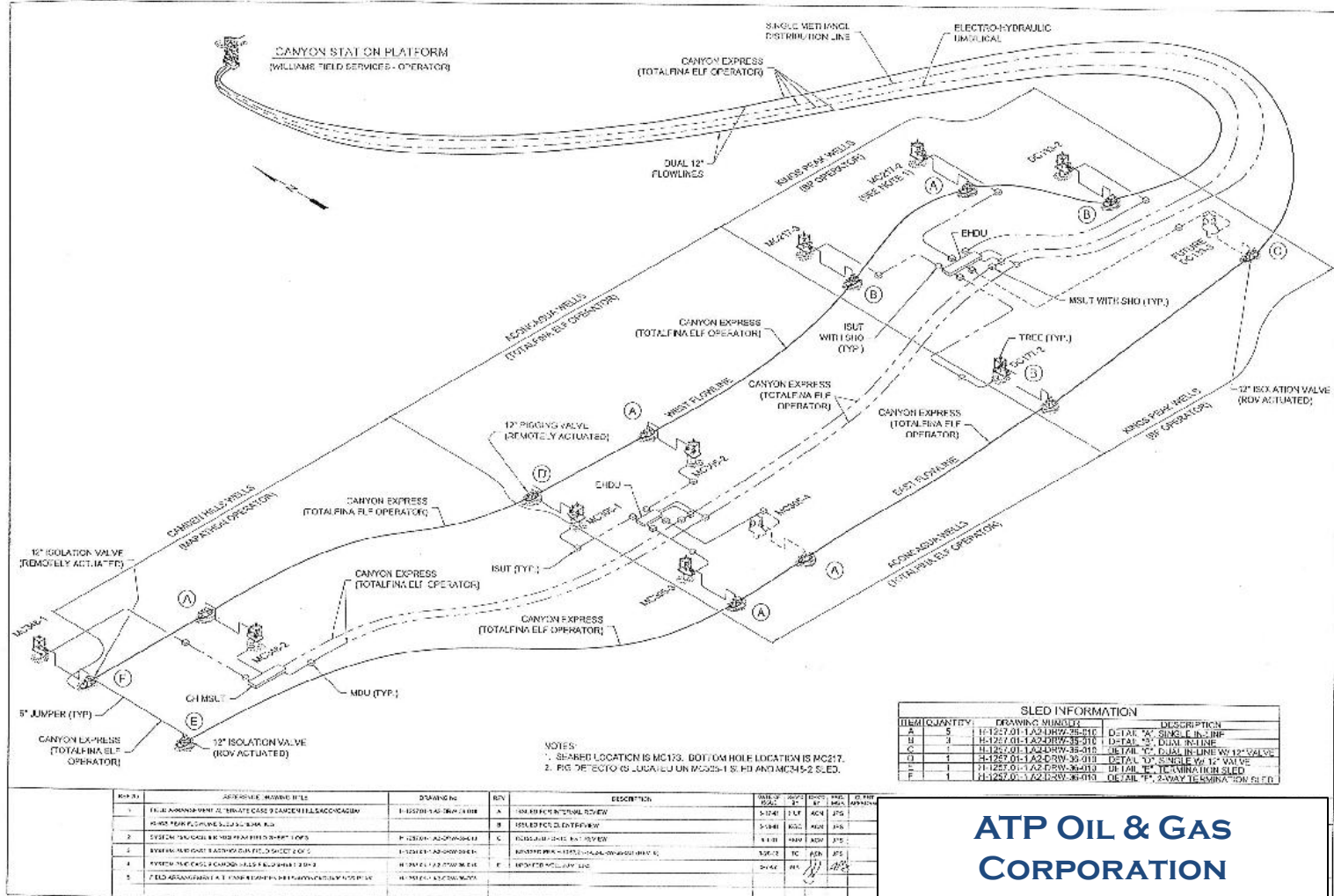
Canyon Express Pipeline System

Subsea Overview:

- Three subsea fields: 6400' – 7200' water depth
- 56 mile tieback to host platform
- Two 12" flowlines – East Line & West Line
- Subsea architecture installed 8 years ago
- Late life production – gas & high water volumes



Canyon Express Pipeline System



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Hydrates Formed in 2008

Cause:

- Main subsea computer failure - topsides
- Followed by Emergency Shut Down (ESD)
- Subsea computer problems fixed next day
- Brought wells back online
- Pipeline pressure increased at Camden Hills
– Shut-in well



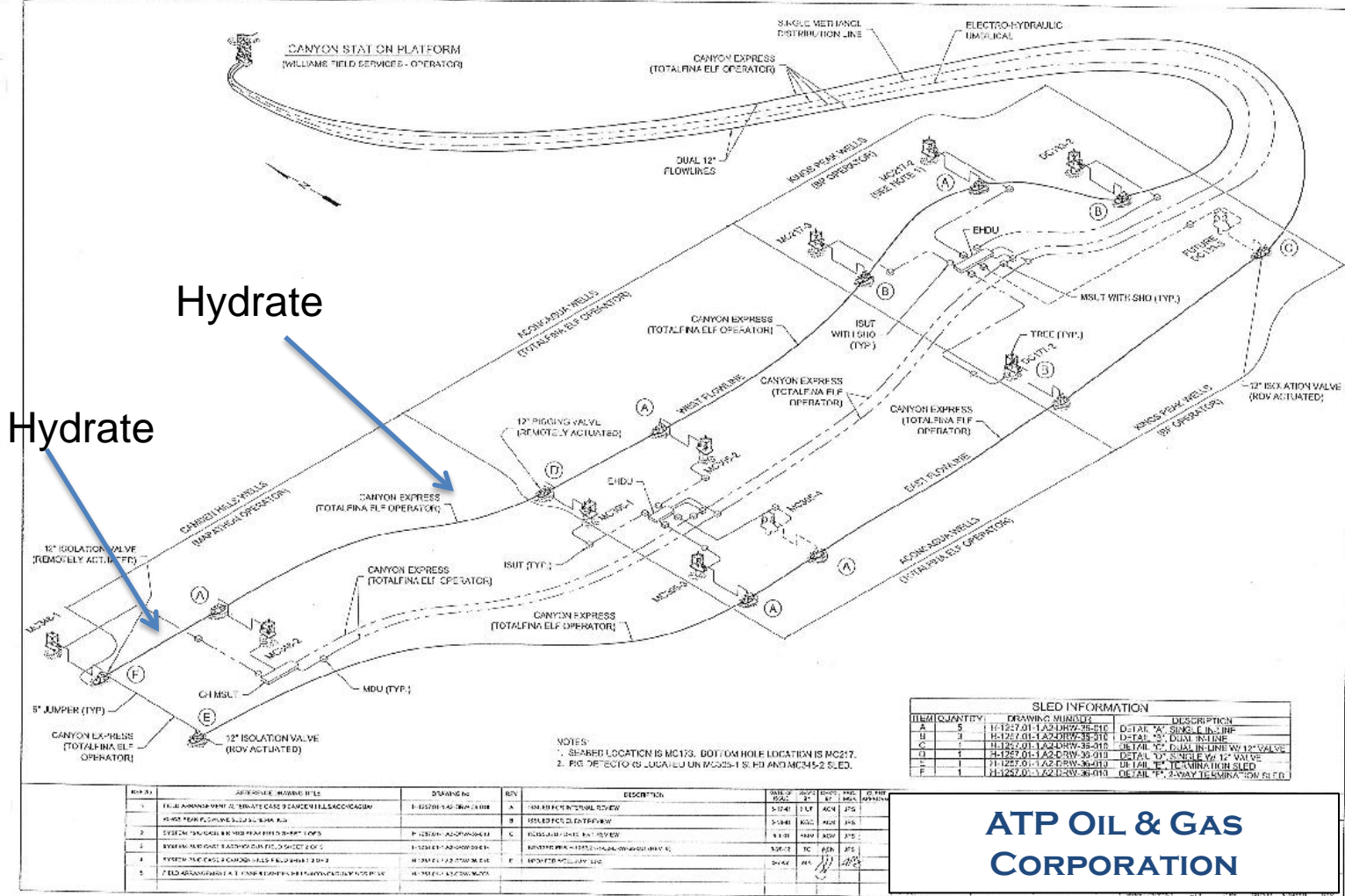
Hydrates Formed in 2008

Cause:

- Determined ESD had shut-in 12” pipeline valve
- Opened 12” pipeline valve
- Large pressure differential remained
- ***HYDRATES HAD FORMED***



Location of Hydrates



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Hydrate Remediation Intervention #1

Intervention in 2008:

- Disconnected jumper at MC 348 #1
- Used DSV & rental hydrate remediation skid
- Objective – dewater & depressurize flowline to disassociate hydrates



Hydrate Remediation Intervention #1

Lessons Learned:

- Pumping out water & gas allowed hydrates to form in return line
- Gas from flowline reduced efficiency of pump
- Need for subsea separation
- Need for higher injection rates of hydrate inhibitor
- Need for higher discharge rate from pump (observed only 1-2 GPM pump rate)



Hydrate Remediation Intervention #1

Successfully cleared hydrate between 348-1 & 348-2

Decision to be made:

- 1) Continue intervention knowing inefficiencies of equipment & extended duration of project
- 2) Demobilize and ...

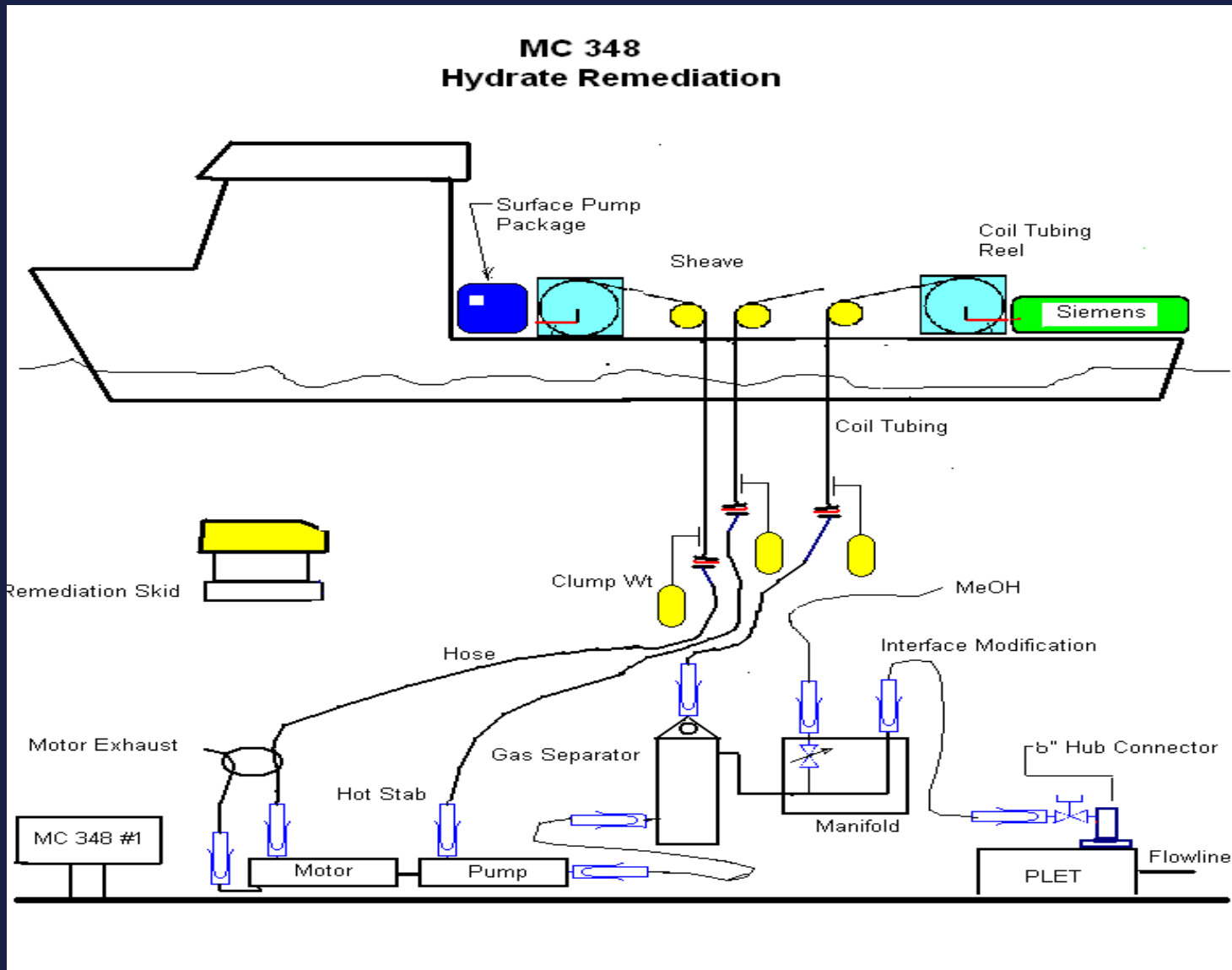
Build a bigger mouse trap!



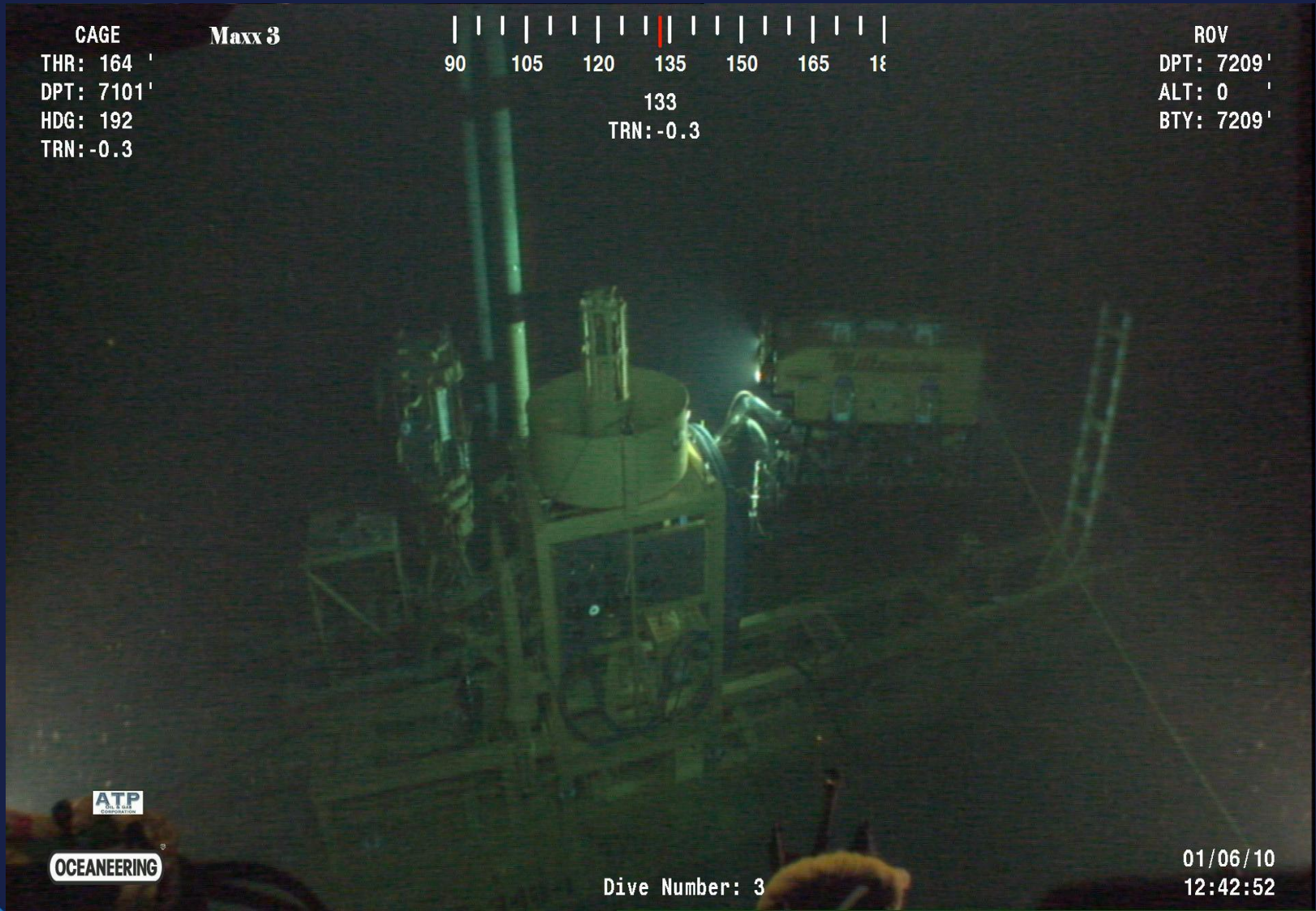
The Tools



The Plan



The Installation Subsea



CAGE
THR: 164 '
DPT: 7101 '
HDG: 192
TRN: -0.3

Maxx 3



133
TRN: -0.3

ROV
DPT: 7209 '
ALT: 0 '
BTY: 7209 '

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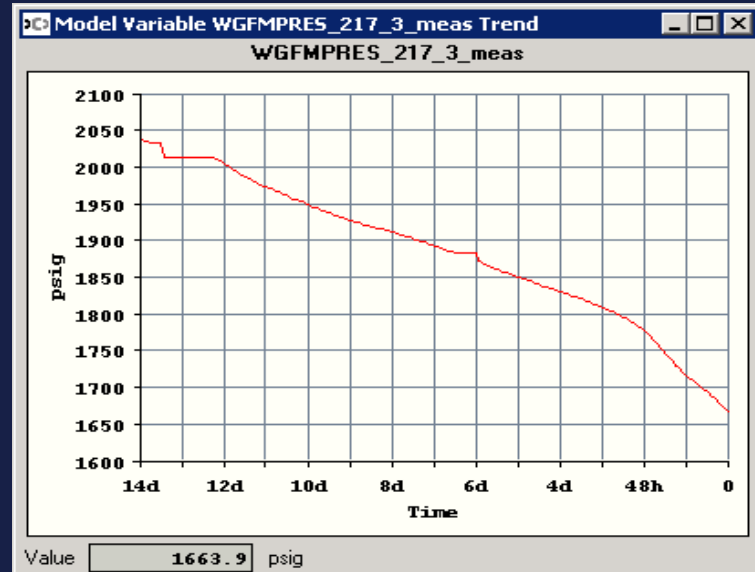
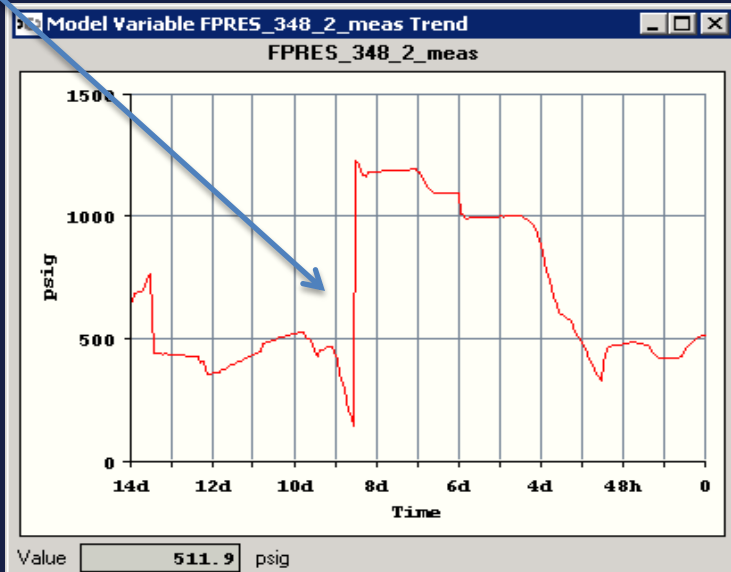
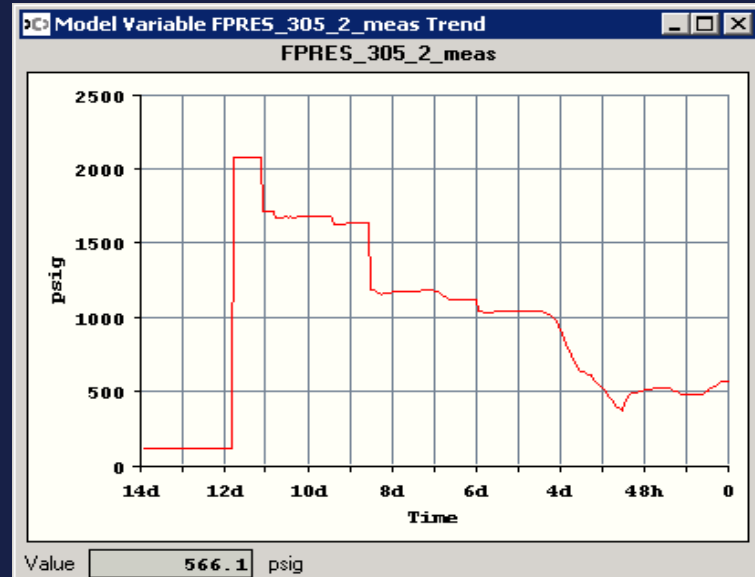
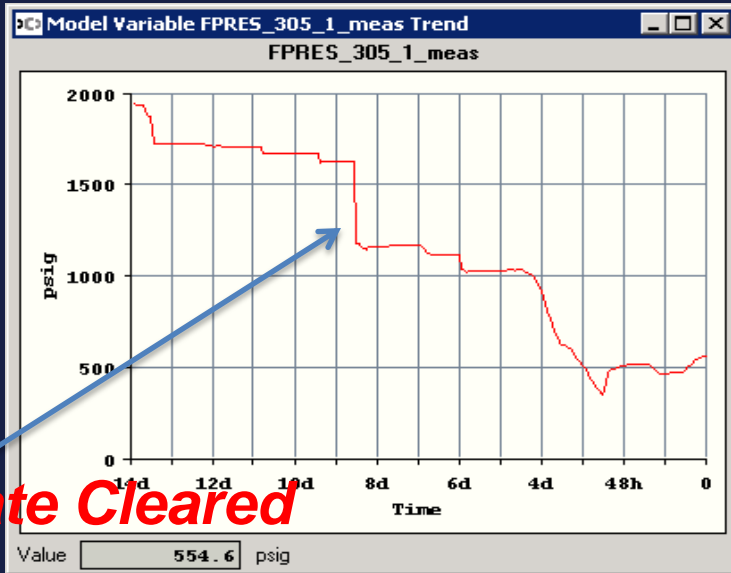
OCEANEERING

Dive Number: 3

01/06/10
12:42:52

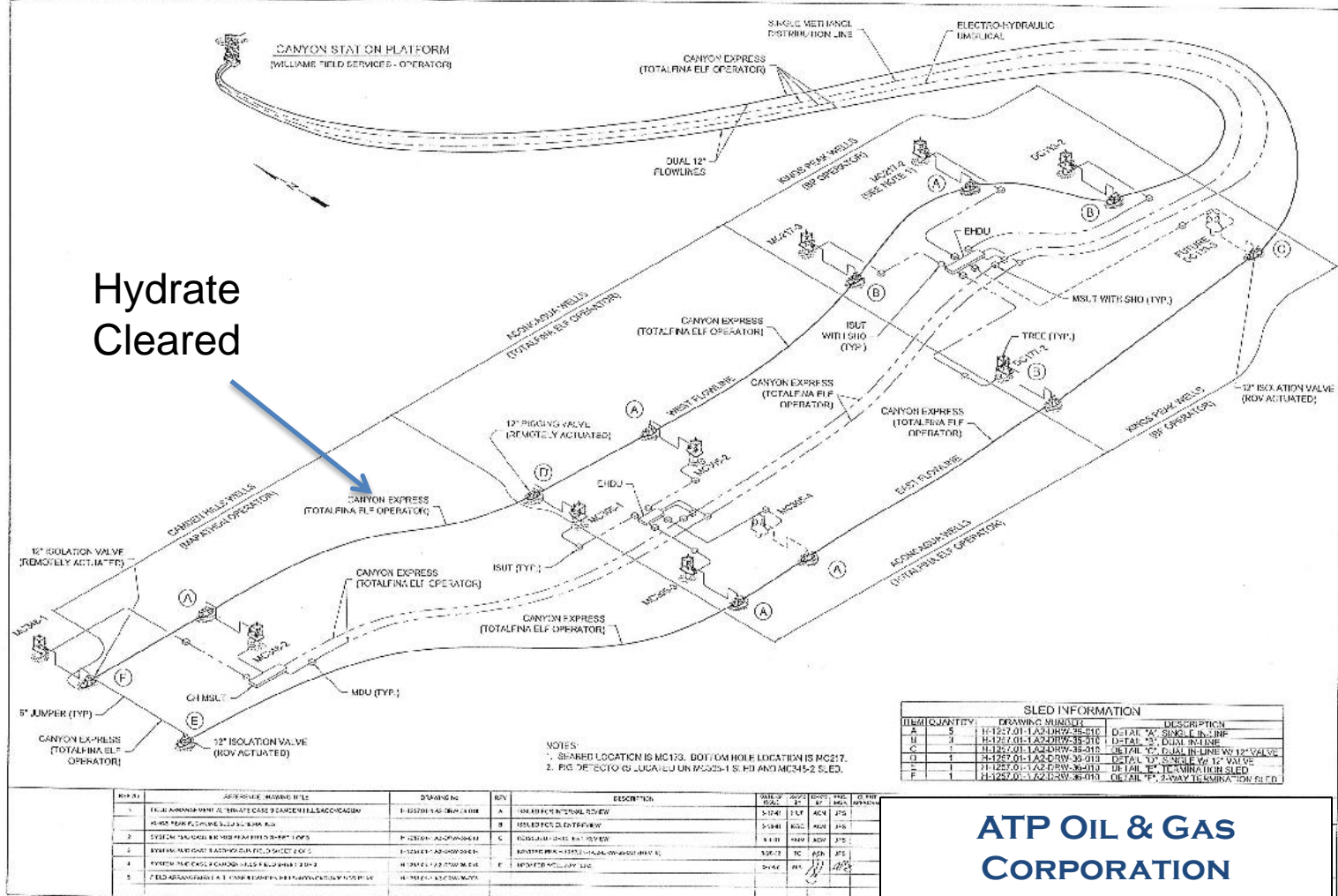


The Results



Hydrate Cleared

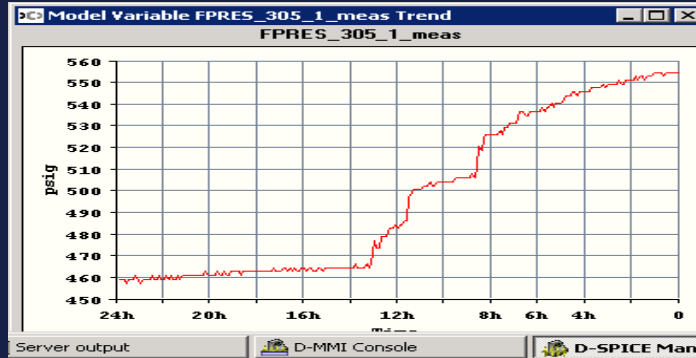
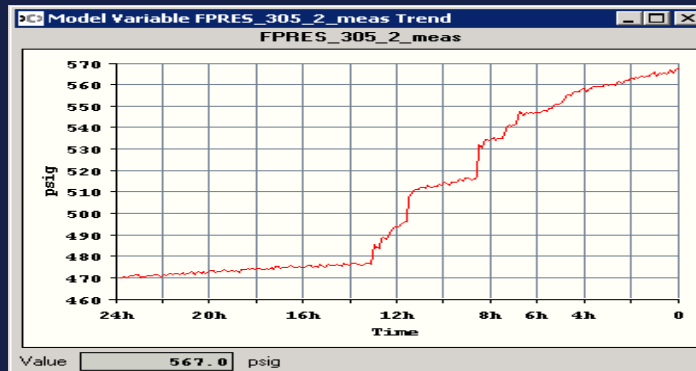
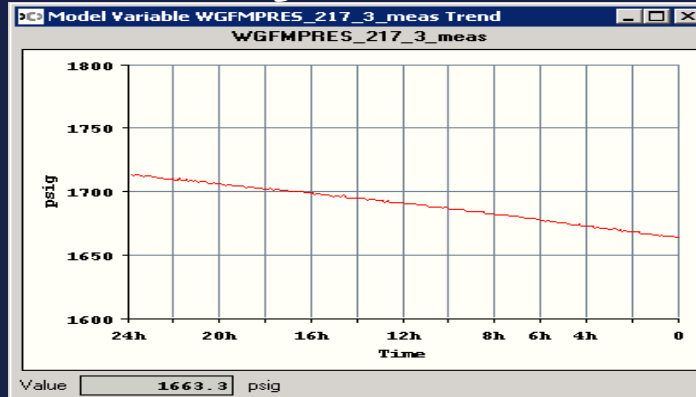
Hydrate
Cleared



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Downtime – Hydrates Still Break



Hydrate Remediation Intervention #2

Lessons Learned:

- Friction in system prevented max pump discharge rates (1/2 BPM vs. 1 BPM)
- Increase coil tubing ID's, number of lines, & pump capacity (less friction)
- Shaft seals need additional engineering & development
- Weather remained the largest cause of downtime



Successes

- Pumped out over 6000 bbls
- Reached minimum pump suction & P/L pressure of 150 psi
- Prevented hydrates in return line
- Cleared pipeline hydrates in 7200' water depth



Acknowledgements

- Ron Quates (DTC International): Concept Development & Field Management
- David Wright (WWCS): Subsea Pump & Subsea Gas Separator Development & Packaging
- James McAllister (Oceaneering): Subsea Disconnects, MeOH Distribution, ROV Tooling, & Vessel Ops



Questions?



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