PEGASUS WEST 43/13B-7
SENTINEL WELL MONITORING

SPIRIT ENERGY

SENTINEL subsea

PASSIVE TECHNOLOGY

March 2020
Spirit Energy identifies opportunity to deploy Gas based system onto live well

June 2021
Pegasus West deployment

September 2019
Successful Field Trial deployment from the Noble Hans Deul drilling rig

February 2021
Gas Triggers available for deployment

December 2018
Field trial offered for passive SWIFT technology with support from NZTC

January 2020
Gas Trigger development started

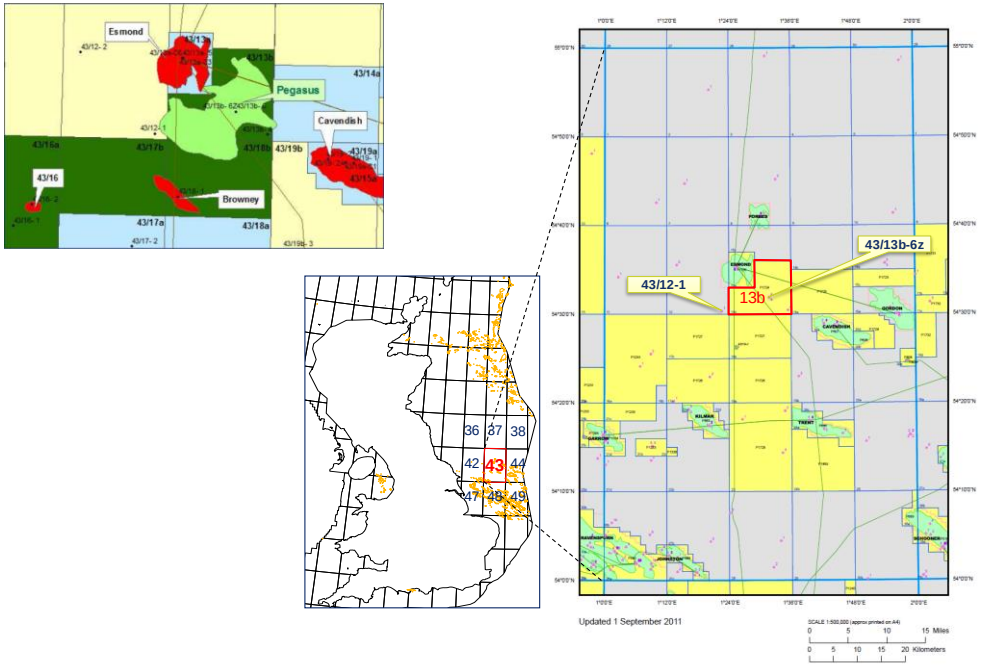
April 2018
Sentinel incorporated

November 2018
Tracer based Trigger (SWIFT) solution development starts

August 2019
Wet tested system in Buckie Harbour

PEGASUS WEST 43/13B-7 - LOCATION

- UKCS Block 43/13b
- Southern North Sea (SNS)
- West of the Cavendish Field, East of the Andromeda
- 30km NW of Trent (43/24a)
- 55km West of Cygnus (44/12a)
- Drilled by NJR (B391) Jack Up in 2014



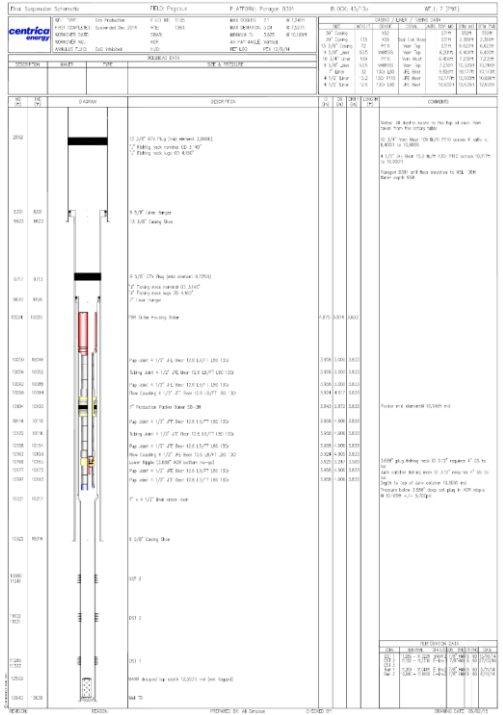
WELL HISTORY AND SUSPENSION STATUS

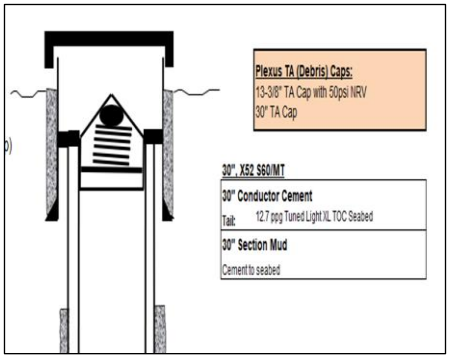
Well History

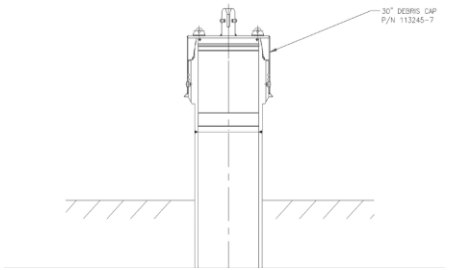
- 43/13b-7 drilled by the NJR (B391) in 2014
- Full hole casing design – 9 5/8” liner / no tieback
- Well logged & tested 3 separate zones
- Well suspended for future re-entry

Current Status

- 4 ½” liner perforated across 3 sands
- Hydrocarbon gas across the perforations in 4 ½” liner
- Lower completion tailpipe left in place
- Wireline plug installed in completion tailpipe nipple
- Well displaced to 11.05 ppg $CaCl_2$ kill weight brine
- 9 5/8” and 13 3/8” bridge plugs set in casing
- 13 3/8” Corrosion cap installed below mudline
- Trash Cap installed on the 30” conductor

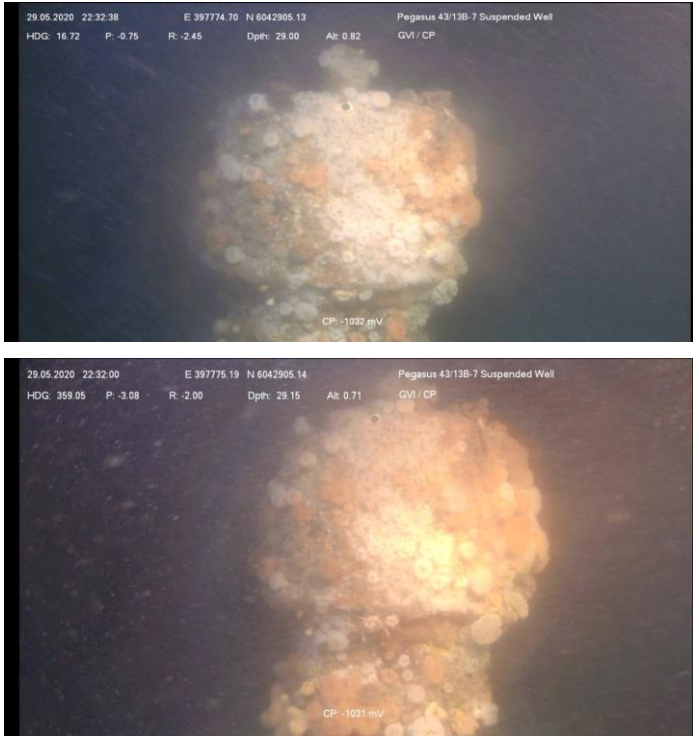






THE CHALLENGE

- Long-term suspended well without active monitoring
- No infrastructure in place
- Bi-annual visual inspection (IRM) only
- Looking for a remote monitoring solution
- Deployment integrated with ‘routine’ IRM campaign



June 2020 IRM

PEGASUS WEST 43/13B-7 SOLUTION

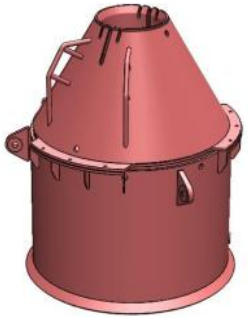
- Modified 30” Debris Cap (Coral Unit) housing WellSentinel™ passive monitoring equipment
  - Collects and physically detects gas and /or oil in the subsea environment
  - Technology does not require active electronics for emission detection
  - Passive detection Triggers degraded by natural gas
  - Once exposed an individually coded Alert Beacon is released to surface and communicates via satellite
- 10+ years monitoring with no intervention
- Simple deployment with DSV during existing IRM campaign
- Early alert through existing Iridium satellite network

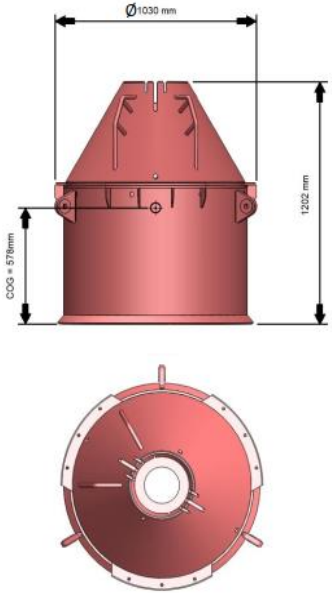
Modified 30” Debris Cap

CAP MODIFICATION (CORAL UNIT)

- Modify this…

- To this…

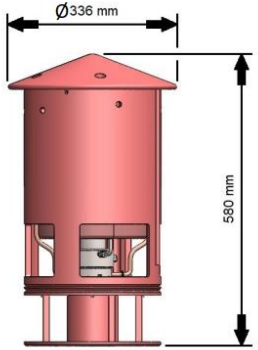


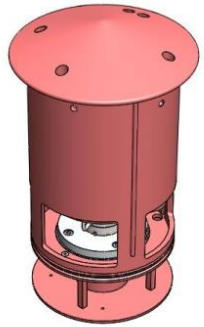


Assembly SA-10002-A - Coral MDS
Est'd mass in air : 440 kg
Est'd buoyancy in sea water : -3.6 kN

MONITORING MODULE

- Sub-assembly houses all the critical monitoring equipment (Triggers, locking mechanism, alert beacon, silo unit, reaction chamber etc.)
- Deployed into top aperture of the modified Debris Cap (Coral Unit)
- Small and lightweight modular design
- Designed for ROV handling





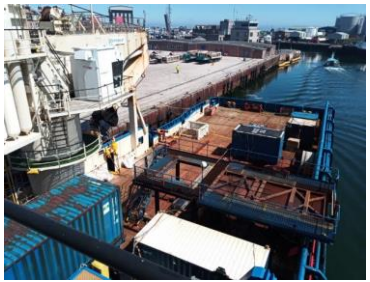
PEGASUS WEST WELL OBJECTIVE

- Remove existing Debris Cap from conductor and install replacement Coral Unit fitted with WellSentinel™ monitoring device
- Provide continuous integrity monitoring of the Pegasus West well

DEPLOYMENT VESSEL

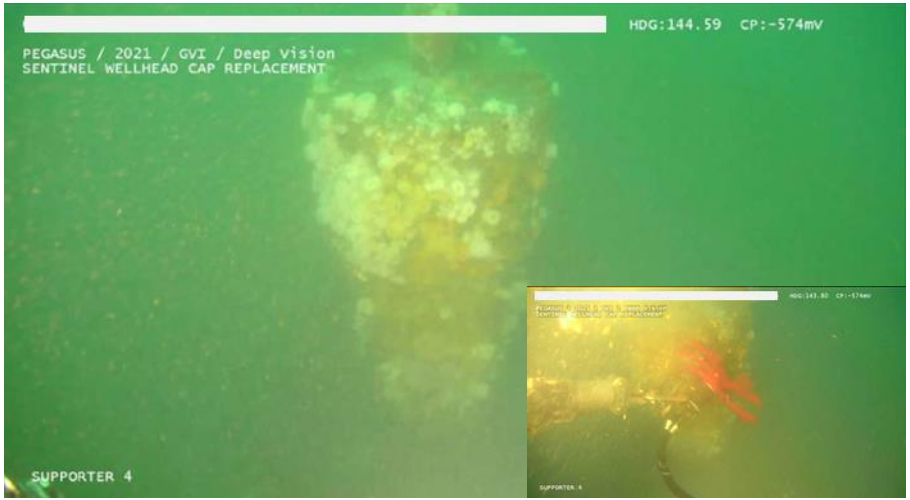
- Subsea IRM and survey vessel
- DP 2
- 60Te active heave compensated crane
- 1 OBS Class ROV (ObsROV)
- 2 Work Class ROV (WROV)
- Deployment part of 3 week IRM campaign

DEEPOCEAN



ARRIVAL, AS-FOUND & PREPARATION

- Conductor and existing cap were found to be in good condition, with no evidence of damage, debris or gas at the wellhead
- Evidence of marine growth was as expected
- Gross marine growth was removed from the existing cap/conductor interface and the lifting points on the top of the cap



EXISTING CAP REMOVAL

- The rigging assembly and sling set installed via WROV onto the cap
- The crane then lifted the existing cap from the wellhead
- The cap was then placed inside a subsea basket for recovery at a later point in the operation
- When the existing cap was removed, gas was observed at the wellhead

CORAL UNIT INSTALLATION

- The Coral Unit was rigged on deck and lowered down by the crane to the conductor
- The cap was aligned with the WROV manoeuvring the Coral Unit into place
- ObsROV was located at the base of the conductor, looking upwards, to assist with the alignment

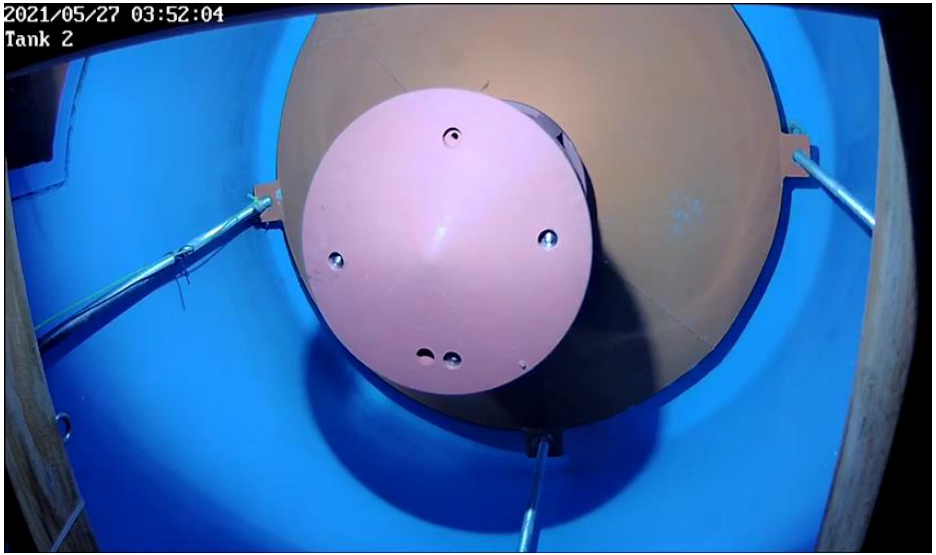
MONITORING MODULE INSTALLATION

- Prior to installation, a number of pre-launch assembly and systems checks were performed on deck
- Including
  - Activation of Alert Beacon and check of satellite comms
  - Insertion of Triggers
  - Final assembly
- The Monitoring Module was secured to the tool drawer of the WROV

MONITORING MODULE INSTALLATION (CONT..)

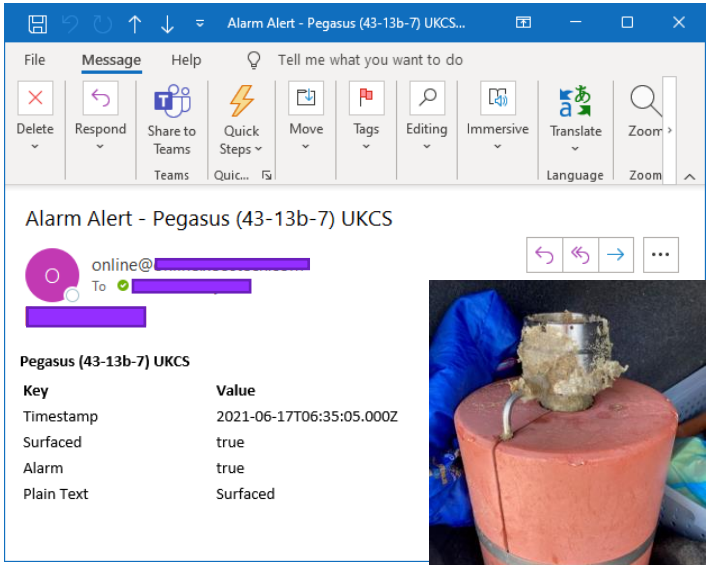
BEACON RELEASE

- After installation the system reacted to the gas observed and operated as designed (beacon released, surfaced and sent alert signal via satellite)
- This was not a false alarm:
  - Hyperbaric testing of Trigger material to equivalent of 3,600 m water depth
  - Test tank testing studying flow rates, concentrations, reaction times
  - Heriot-Watt lab testing
  - In-house equipment testing



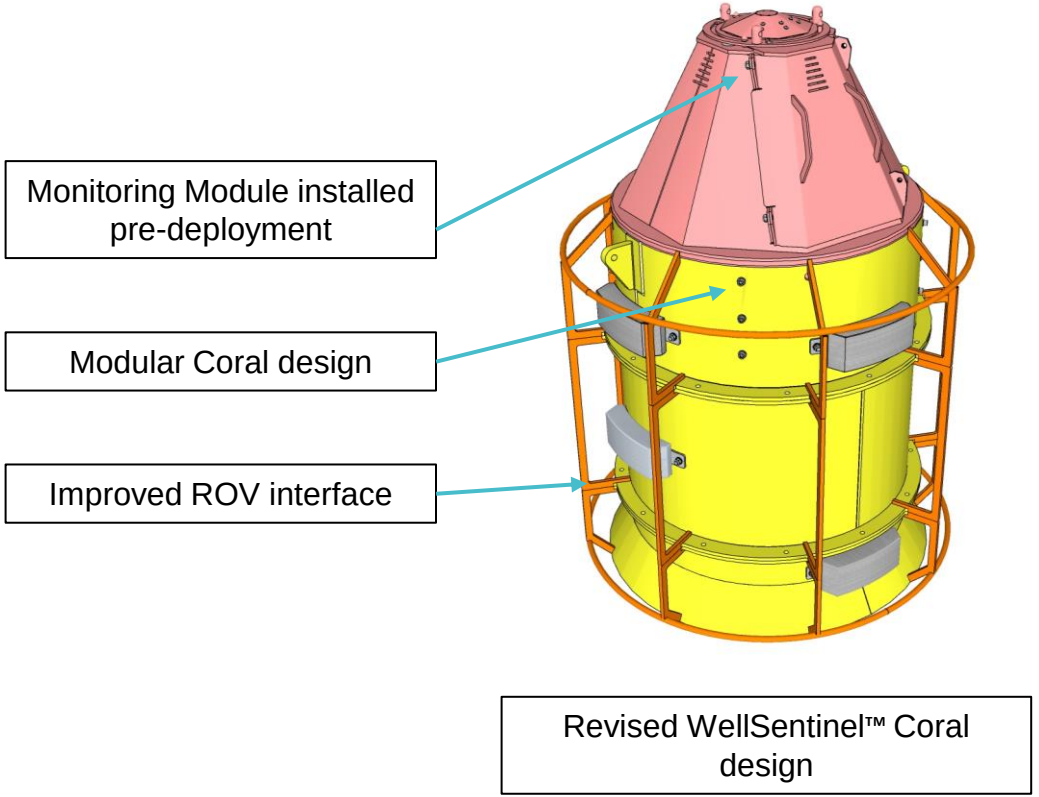
Monitoring Unit release in test tank

ALERT SIGNAL AND TRACKING



LESSONS LEARNED

- Minimise the need for ROV handling/intervention
- Deploy the system with the Monitoring Module pre-installed in the Coral unit.
- Modular Coral design for increased flexibility
  - Short wellheads, PBG, space constraints



Revised WellSentinel™ Coral design

KEY OUTCOMES

- Early adoption of passive monitoring technology by an innovative Operator
- First operational deployment of WellSentinel™ system
- First operational release of alert beacon

Q&A