

APPEA HSE Conference  
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# Case Study in the Decommissioning of the Jabiru and Challis Oilfields in the Timor Sea, Australia



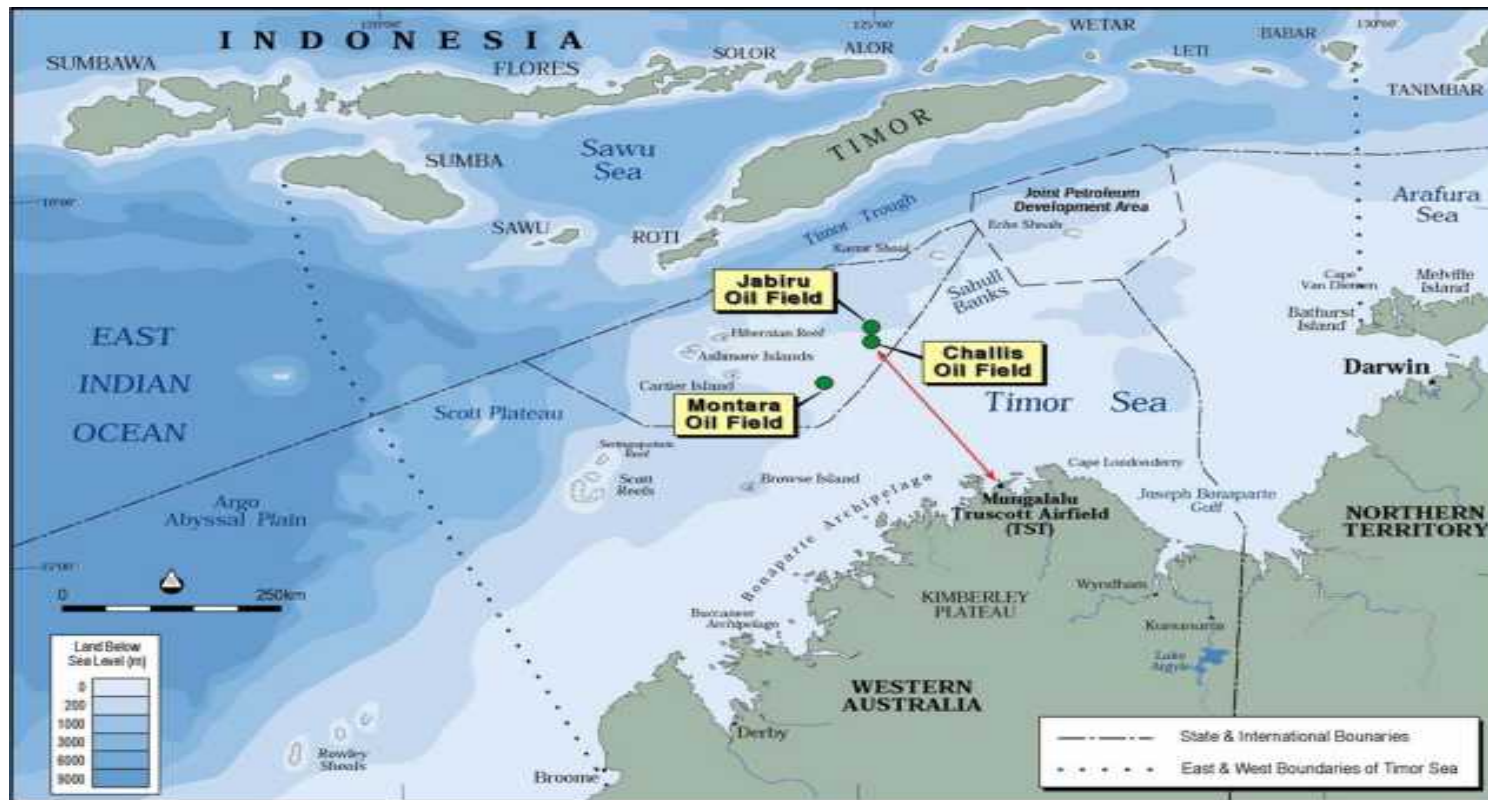
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# Introduction

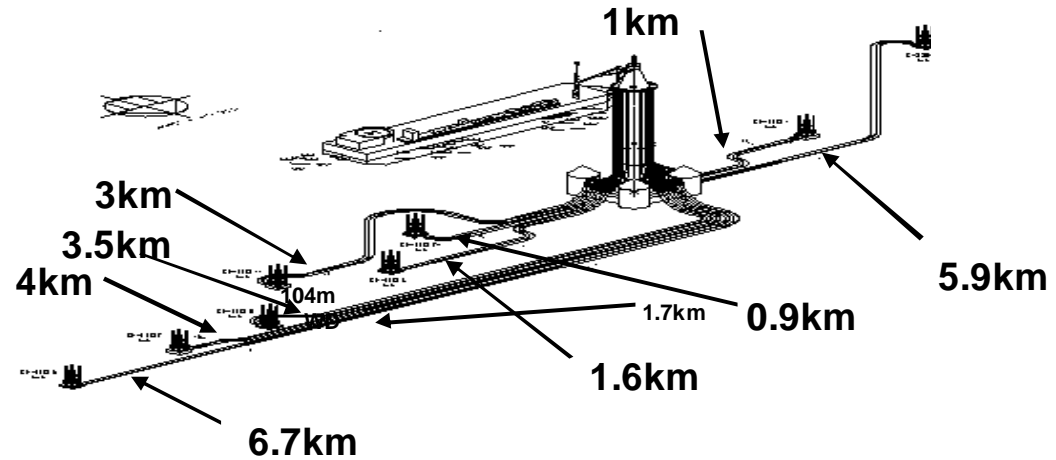
- Australia's largest offshore oilfield decommissioning to date
- 19 subsea wells, 160 kms. flowlines, 2 FPSOs
- Approval process began in 1998, decommissioning occurred 2011-13
- Approach taken to decide the decommissioning method
- Regulatory approvals that were obtained
- The decommissioning that occurred, cleanly and safely



# Location Of Timor Sea Facilities



# Challis Oilfield



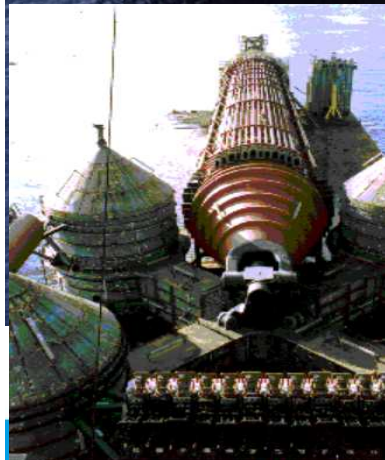
Wells 2 subsea producers, 1 water injector shut-in, 5 producers shut-in, 6 P & A wells, and 3 abandoned wells with WH

Challis Venture FPSO - permanently moored to SALRAM

- HC processing unit : - single train of 3 stages oil& gas separation
  - gas lift
  - gas flaring
  - produced water separation facilities & water injection

Flowlines (production, water injection, gas lift and control umbilicals) flexible F/L tied back to subsea wells

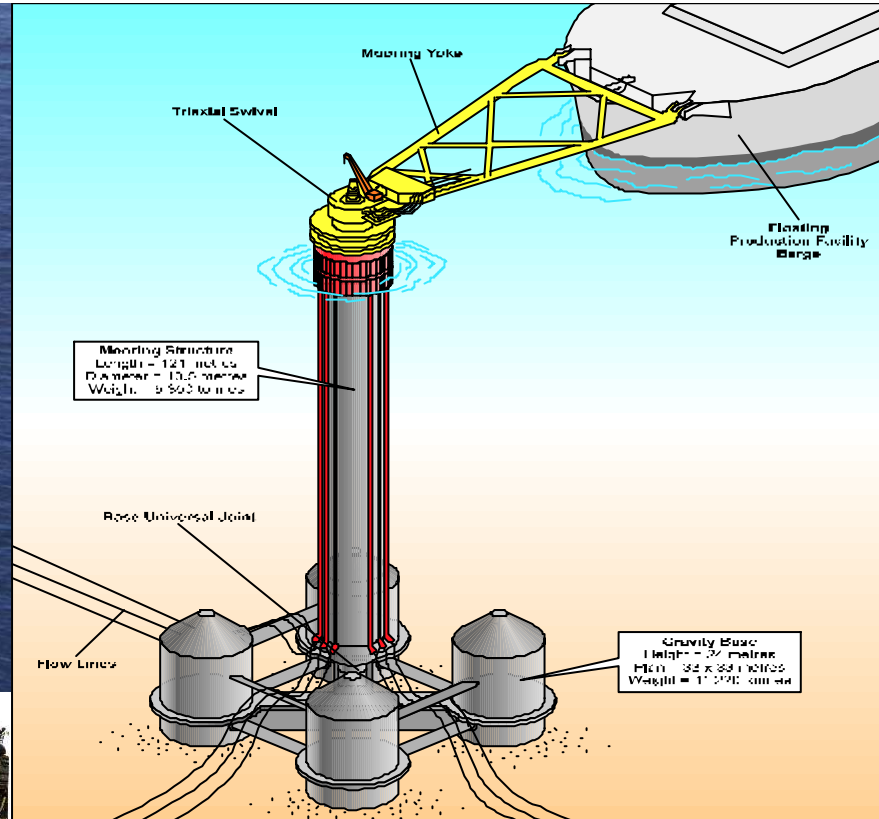
# Challis SALRAM



Challis Field Development **CLOUGH**



Challis Field Development **CLOUGH**



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# Jabiru Oilfield

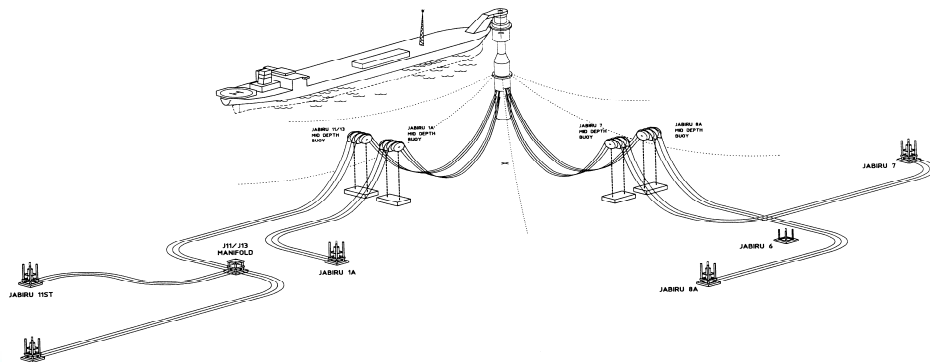


Wells 4 subsea producers, 1 shut-in, 10 P & A wells, and 1 suspended well

Jabiru Venture FPSO - Moored via RTM system

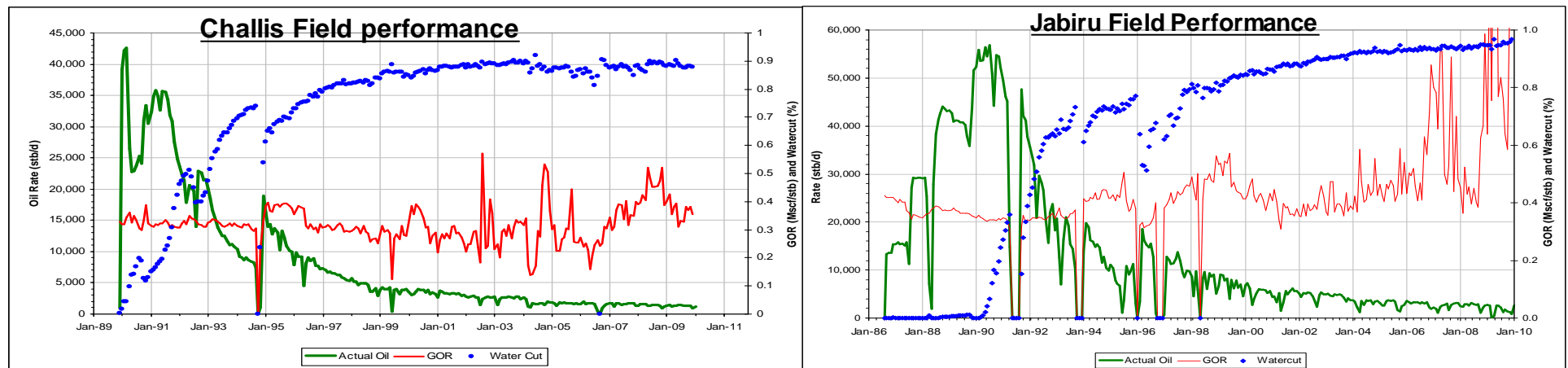
- HC processing unit : - single train of 3 stages oil& gas separation
- gas lift
- gas dehydration
- gas flaring
- produced water facilities

Flowlines (production, gas lift and control umbilicals) flexible F/L tied back to subsea wells



# History

- 1986 - Jabiru production commenced
- 1989 - Challis production commenced
- 2010 - Production ceased from both Jabiru and Challis



# Legal Framework in Australia



- Environmental Protection and Biodiversity Conservation Act 1999  
Requires an Environmental Impact Assessment if the project has potential to impact a matter of “National Environmental Significance”
- Environment Protection (Sea Dumping) Act 1981  
Permit required to dump materials at sea
- Offshore Petroleum and Greenhouse Gas Storage Act 2006  
Petroleum activities (inc decommissioning) to be undertaken in accordance with an accepted Environment Plan and Safety Case.



# International Law



- UN Convention on Law of Sea allows for non-removal of offshore installations
- London Convention considers disposal of offshore installations
  - 1996 Annex provides details
- IMO Resolution A672(16) provides guidance on what is allowable
- IMO Scientific Group guidance on how to assess proposals to leave offshore installations on seabed

# IMO Resolution A672(16)

## Dumping conditions:

- Less than 75m water depth and 4000 tonnes in air must be removed where practicable
- Must not create ongoing risk to safety of shipping or other users
- No significant adverse effects to marine environment or shipping from abandonment
- Safety and cost of removal must be considered
- May be left partially or wholly in place

# Strategy for Obtaining Regulatory Approval



- Analysis of options based on consideration of:
  - Safety
  - Environment
  - Cost
- Review precedents worldwide
- Present case for proposed decommissioning
- Demonstrate environmental suitability of proposed decommissioning
- Consult widely

# Environmental Implications Of Options



	Leave on Seabed	Re-use	Dispose Onshore
Reef Effect	Positive	Negative (Existing habitat destroyed)	Negative (Existing habitat destroyed)
Conflict with Fishing/Navigation	Slight Risk	None	None
Contamination Risk	Negligible	Slight spill risk	Slight spill risk
Resource Utilisation	None	Saves some materials	None
Landfill Utilisation	None	Some	Considerable
Greenhouse Gas Emission	Negligible	Increased	Increased
Overview	Neutral	Slight Negative	Slight Negative

# Environmental Implications Of Leave On Seabed Option



- Deep water (106m), no seabed sensitivity
- Supports biodiversity
- No conflicts with fishing / navigation
- Nearest sensitive area
  - Submerged shoal 80kms away (Vulcan Shoal)
  - Coral reef 140km (Cartier Island)
- All other options have environmental implications

# Safety Implications



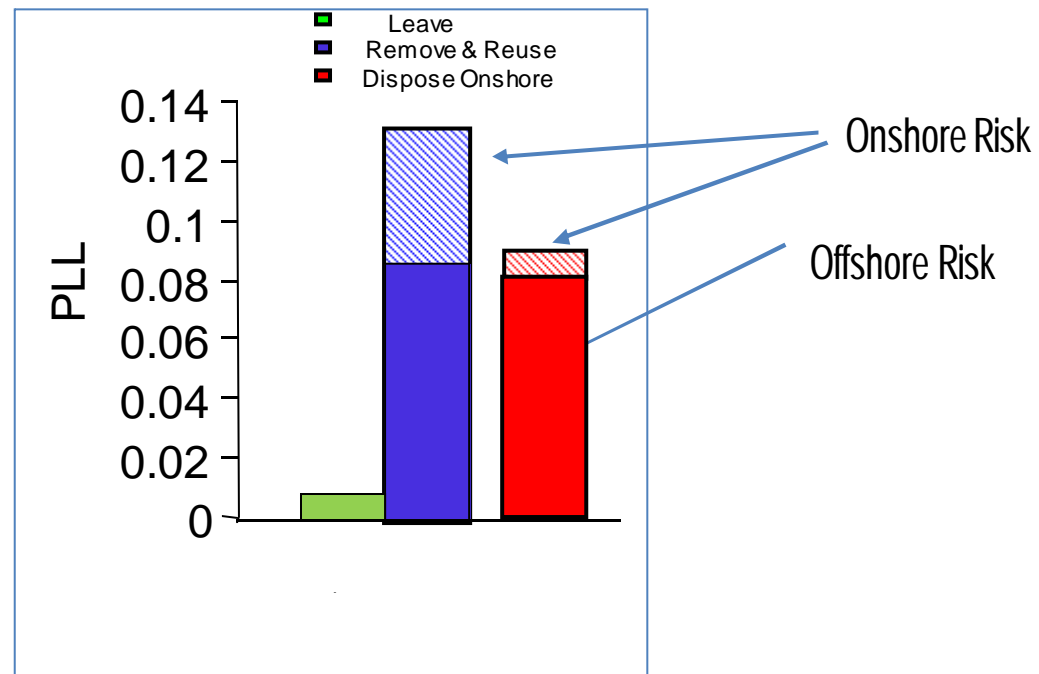
- Removal involves prolonged use of divers
- Removal involves complex engineering
- Dismantling onshore is labour intensive
- Safety implications assessed by examining historical databases
- Potential Loss of Life (PLL) = Number of potential fatalities over the duration of the decommissioning activity

# Example Of PLL Calculation



Option	1. Re-sale	2. Scrap	3. Leave
Total number of lifts	48	267	0
Time per lift (minutes)	5	3	N/A
Total Duration per hour	4.00	22.25	N/A
Drop probability per hour	$3.10 \times 10^{-4}$	$3.10 \times 10^{-4}$	N/A
Probability of personnel hit	0.1	0.1	N/A
Number of fatalities	2	2	N/A
PLL	$2.48 \times 10^{-4}$	$1.38 \times 10^{-3}$	0.0

# Safety Implications Of Options – Challis Riser Base & Riser Column



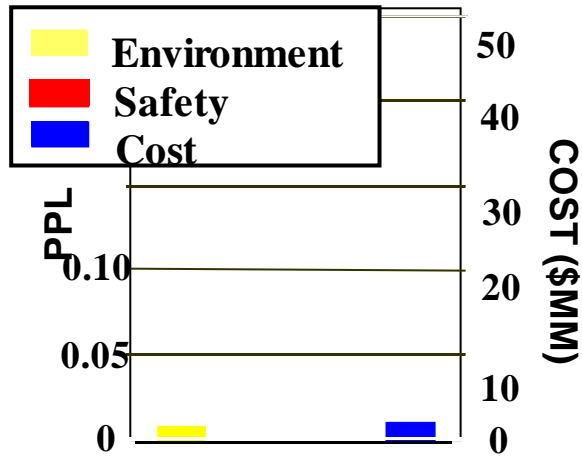


# Capital Cost Of Options - Challis Field



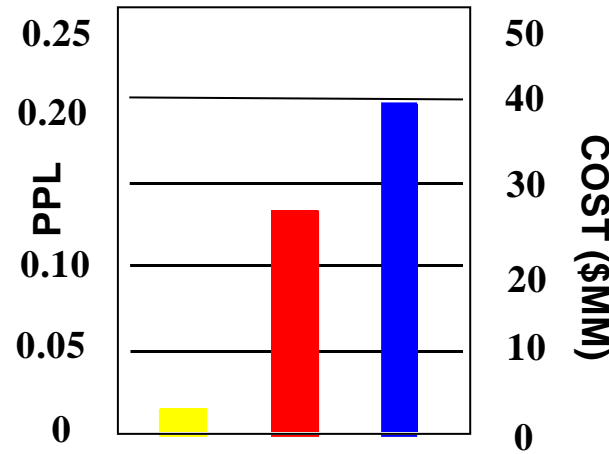
	Leave in Place (\$M)	Take to shore & reuse (\$M)	Take to shore & scrap (\$M)
FPSO	← 2.4	5.0	→ 5.8
Riser Tower	0	4.0	34.6
Riser Base	0	18.1	7.9
Flowlines	3.0		
Wellheads	←	20 - 32	→

# Summary Of Options - Challis Riser Turret Mooring



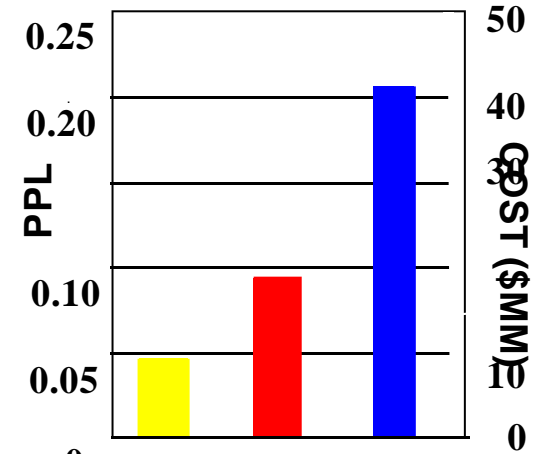
**1. Leave on Seabed**

Contamination	Green
Landfill use	Green
Recycling	Red
GHG emissions	Green
Reef effects	Green



**2. Remove & Re-use**

Contamination	Red
Landfill use	Red
Recycling	Green
GHG emissions	Red
Reef effects	Red



**3. Dispose Onshore**

Contamination	Red
Landfill use	Red
Recycling	Red
GHG emissions	Red
Reef effects	Red

# Precedents In Australia



CATEGORY	NUMBER	COMMENT
Body/Human burial	16	<ul style="list-style-type: none"> <li>• Off various locations</li> </ul>
Chemical	5	<ul style="list-style-type: none"> <li>• Spent caustic soda from LPG production</li> <li>• Black liquor from paper making plant</li> </ul>
Dredge spoil & variations	144	<ul style="list-style-type: none"> <li>• &gt; 168 million tonnes</li> <li>• Mostly port authorities</li> </ul>
Jarosite	10	<ul style="list-style-type: none"> <li>• All in Hobart, Tasmania</li> </ul>
Obsolete equipment	35	<ul style="list-style-type: none"> <li>• Includes 38 vessels, munitions, concrete, steel structures and scrap metal</li> </ul>
Artificial reef	31	<ul style="list-style-type: none"> <li>• Includes 19 +vessels, tyres, concrete pontoons, car bodies, steel/concrete pipe and steel structures</li> </ul>
Variations	3	<ul style="list-style-type: none"> <li>• Variations of existing permits</li> </ul>
Unknown	2	<ul style="list-style-type: none"> <li>• 1 vessel, 1 unknown</li> </ul>

Environment Australia Sea Dumping Database, 1999

# Oil Industry Precedents Worldwide



- Platforms
  - Shallow water - mostly all removed
  - Gulf of Mexico “rigs to reef” programme
- FPSOs
  - Generally re-used or refurbished and reused
- Risers/RTM
  - Some removed, some partly left in place
- Pipelines
  - Mostly left on seabed
- Flex Flowlines
  - Few precedents, some removed
- Wellheads
  - Normally removed

# Best Practicable Environmental Option



- Remove & sell FPSO
- Leave Riser Base and Riser Column
- Leave Flowlines
- Plug wells, remove tree and leave wellhead

# Regulatory Approvals Timeline



- 1998 Discussion commenced with government agencies
- 1999 Studies of decommission options commenced
- 2003 EIA submitted to government under EPBC Act
- 2004 Approval granted under EPBC Act
- 2004 Sea dumping permit for Challis SALRAM granted
- *2010 Production ceased from both Challis and Jabiru*
- 2011 Sea dumping permit for Jabiru RTM granted

# Other Approvals (OPGGSA)



- Safety Case for the oilfield (suspended state)
- Well Operations Management Plan for P&A
- Safety Case Revision for the Ocean Patriot
- Environment Plan for the decommissioning activity
- Environment Plan for the decommissioned state

# Conditions of Approval

- EIA Approval (EPBC Act)
  - Remove any flowlines containing NORM
  - Plug and abandon wells and remove wellheads
  - Dispose of SALRAM in situ
- Sea Dumping Permits
  - Challis SALRAM to be dumped in situ
  - Jabiru RTM and MWBs to be dumped at Challis
  - Post dumping survey to record resting position
  - Location marked on navigation charts



# Decommissioning Operations (1)



- Well plugging and abandonment
  - Ocean Patriot MODU (June 2011 to May 2012)
  - Multiple rig moves (every 3 weeks)
  - Skandi Hawk CSV picks up “wet stored” items
- FPSO removal
  - Flushing flowlines, cleaning, removal hazardous materials from risers
  - Jabiru FPSO disconnect and tow away (Nov 2011)
  - Challis yoke severed and FPSO tow away (March 2012)
- Challis SALRAM sunk
  - Skandi Singapore CSV in support (March 2012)





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# CHALLIS SALM Sinking



# CHALLIS SALM Sinking (cont.)



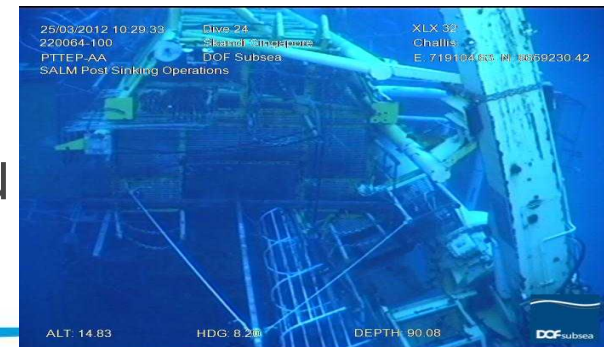
# Jabiru RTM



# Decommissioning Operations (2)



- March 2013 – Jabiru RTM sunk on location, one month before planned removal
- April 2013 – Jabiru MDBs towed to Challis and dumped as per sea dumping license
- May 2014 – Amended Jabiru Sea Dumping License approved to allow Jabiru RTM to remain in situ at sunk location
- May 2014 – EIA approval conditions amended to allow flowlines containing low level NORM scale to remain in situ



# Summary



- Australia's largest offshore oilfield decommissioning to date
- 19 subsea wells, 160 kms. flowlines, 2 FPSOs
- Well P&A, wellhead removal with no significant incident
- The leaving of in situ of risers and flowlines was well justified on the basis of safety, cost and environmental considerations in accordance with IMO guidance
- The Australian regulatory approval decisions were made in a manner consistent with this guidance
- The sinking of the riser structures and laying on the seabed occurred safely and cleanly without significant incident