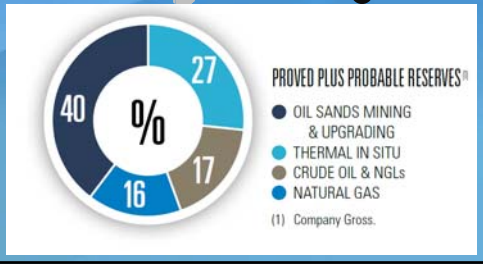
CNR International

# Stakeholder Consultation

## Ninian Northern Platform Decommissioning

## Who are CNR ?

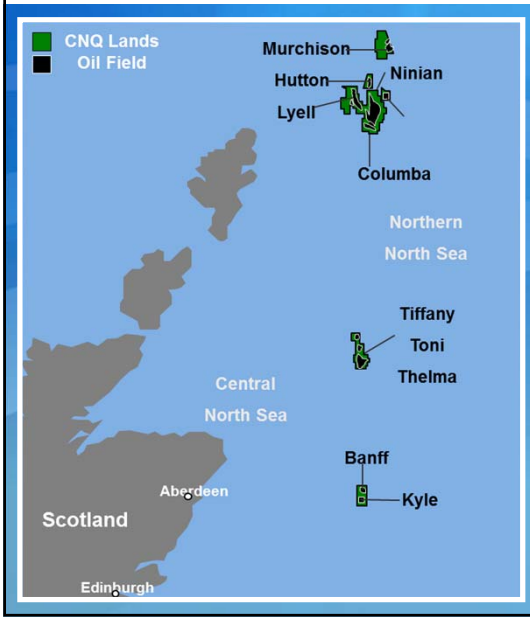
- Canadian Natural Resources
- Oil & Natural Gas Operator
- Canada, UK & Africa
- Large, balanced, high quality, diverse asset base
- Effective and efficient operations




Canadian Natural

CNR International

## North Sea Assets




4 platforms, 1 Floating Production, Storage and Offtake vessel (FPSO)

100% operated with average working interest of ~85%

Murchison decommissioning
Progressing on track





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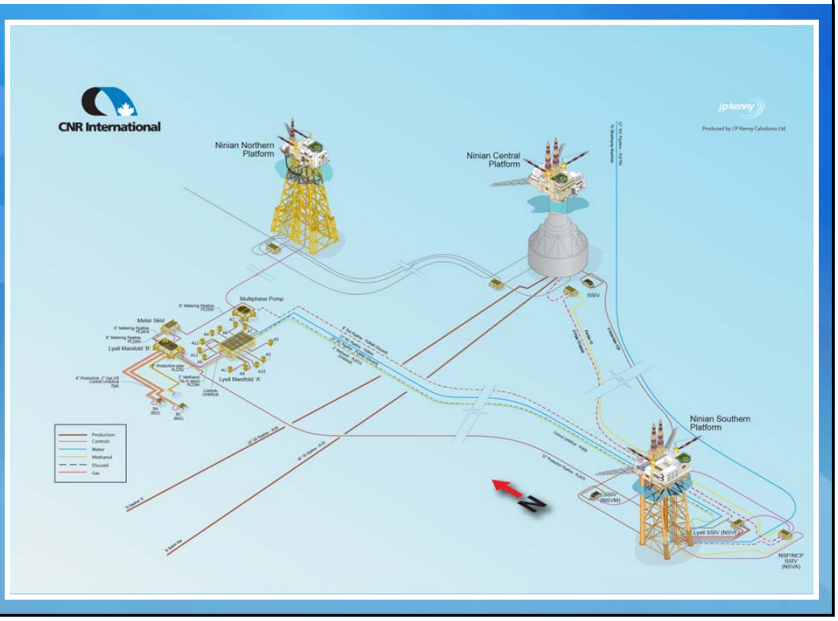
# Decommissioning

## Ninian Northern Platform

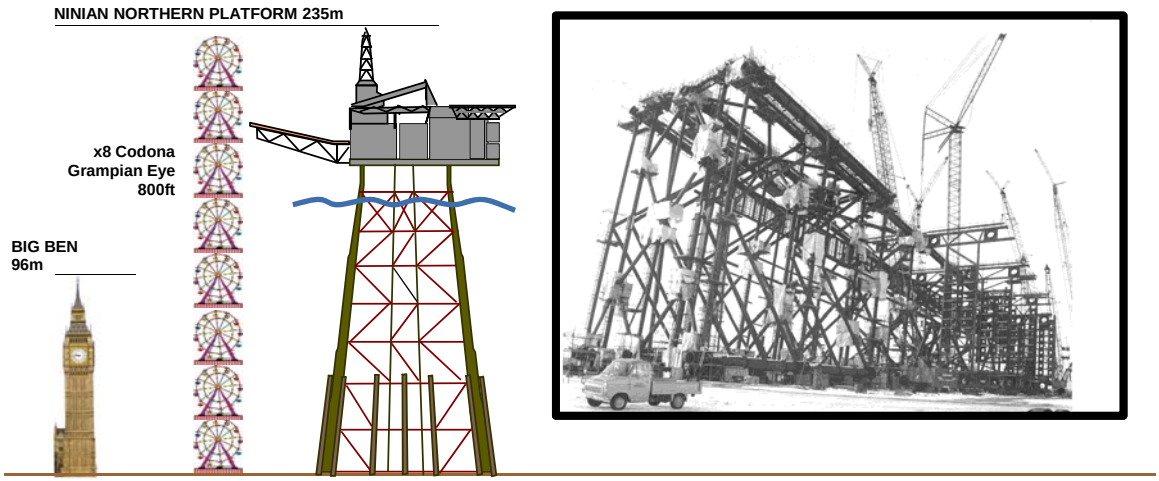
## Location


## Ninian Northern Platform

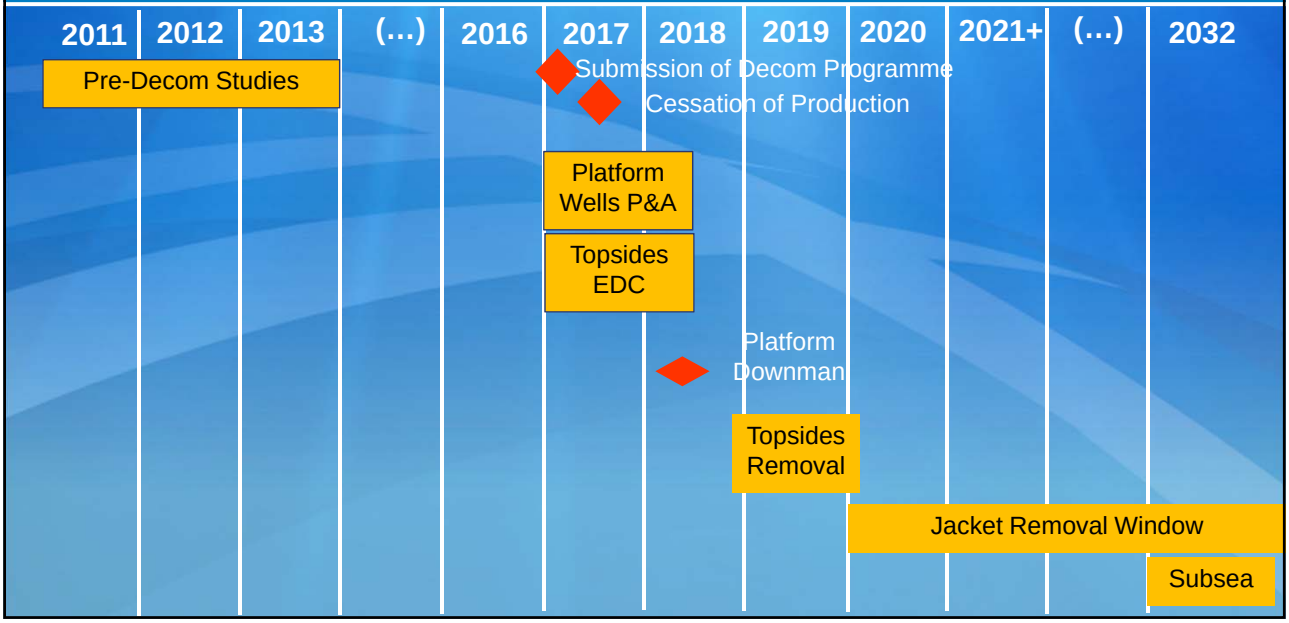
| Ninian Northern | Fast Facts |
|---|---|
| **Region:** | East Shetland Basin |
| **Location:** | 100mls NE of Shetland Isles |
| **Water Depth:** | 141m (463ft) |
| **Discovered:** | 1974 |
| **Installed:** | 1978 |
| **First Oil:** | 1980 |
| **Platform Description:** | Drilling, Production, 8 legged Steel Jacket |
| **Topsides Weight:**<br>**Jacket Weight:** | 12,453 tonnes<br>15,560 tonnes |

## Scale






## Ninian Northern Project Timeline



## Decommissioning Proposals

- Plug and Abandon all 24 platform wells and recover conductors. Conductor recovery to derogation height
- Remove and dispose of the platform Topsides
- **Partial removal of the jacket down to derogation height before 2032 (COMPARATIVE ASSESSMENT)**
- **Leave the drill cuttings in-situ (COMPARATIVE ASSESSMENT)**
- To be cleaned and left in-situ until wider Ninian field decommissioning
- Long term monitoring regime to be agreed with BEIS

## Comparative Assessment

What workscopes went through a Comparative Assessment & what were the comparisons?

Jacket Removal:

1. Full Jacket Removal
2. Partial Jacket Removal down to top of Footings (-88.5m)

Drill Cuttings:

1. Recover to topsides and separate liquids and solids. Return solids onshore
2. Recover to topsides and return liquid + solids onshore.
3. Recover to topsides and re-inject into the reservoir
4. Re-distribute the cuttings around the surrounding seabed
5. Leave in-situ

## Comparative Assessment

What is the assessment criteria used during the Comparative Assessment?

1. Technical
2. Safety
3. Environmental
4. Societal
5. Economic

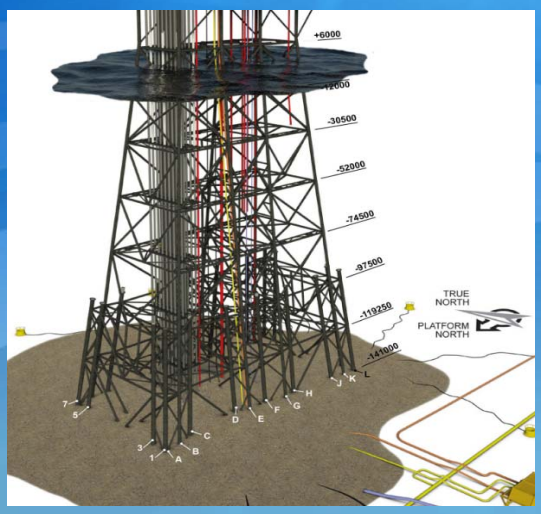
# TECHNICAL

## Technical – sub-criteria

**The following are CNRI's Technical Feasibility sub-criteria:**

- **Technical Feasibility**
- **Ease of Recovery from Excursion**
- **Use of Proven Technology and Equipment**

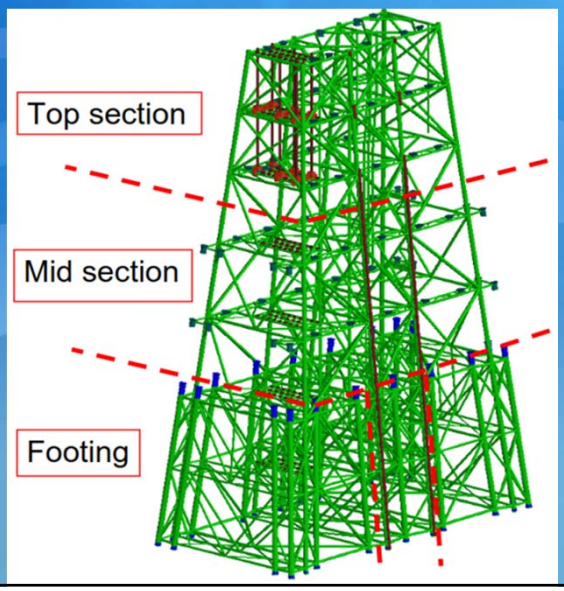
## Ninian Northern Jacket

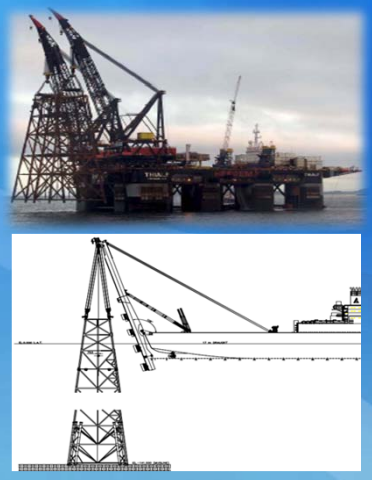



| Jacket Group | Gross dry weight (tonnes) |
|---|---|
| Jacket structure + piles + grout + marine growth + flooded members | 17,570 |
| Jacket + marine growth from surface Down to -88.5m (top of footings) | 9,391 |
| Estimated weight of marine growth | 2,009 |

**Jacket is candidate for derogation under OSPAR 98/3**

## Jacket Removal



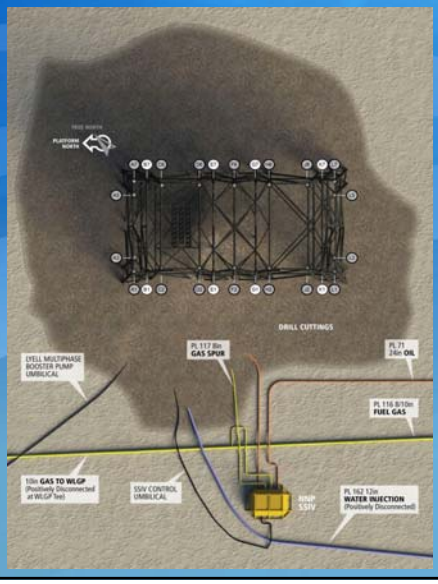



Full and Partial removal options for Jacket with presumption of full removal to a clean seabed basis of the Comparative Assessment Process

## Technical feasibility – jacket removal

| | Option 1 | Option 2 |
|---|---|---|
| | Full Removal | Partial Removal |
| Technical feasibility | Size and weight of footings | High level methods definable |
| Ease of recovery | Complexities | Acceptable |
| Proven technology | No clear track record | Track record |

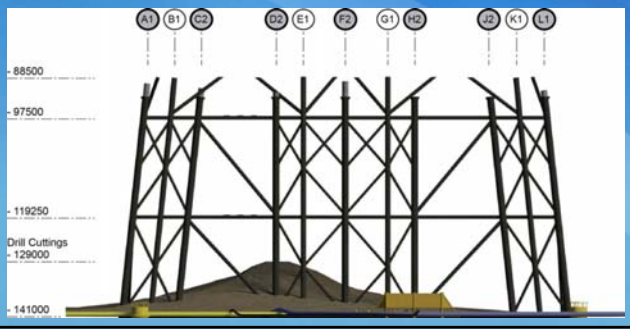
## Drill Cuttings Pile




**Cuttings pile covers nearly the entire footprint of the jacket.**

**Height of 11.93m**

**Volume of 33,144m$^3$**




## Drill cuttings management options

1. Liquids offshore, solids onshore
2. Liquids and solids onshore
3. Offshore injection

Excavate to surface and dispose

4. Re-distribute offshore

Spread over adjacent seabed

5. Leave *in situ*

# Technical feasibility – drill cuttings

| | Option 1 | Option 2 | Option 3 | Option 4 | Option 5 |
|---|---|---|---|---|---|
| | Liquids offshore, solids onshore | Liquids and solids onshore | Offshore injection | Re-distribute offshore | Leave in situ |
| Technical feasibility | 15:1 – water / cuttings | | Wells unknown | Higher blockage potential | No operations |
| Ease of recovery | Specialist equipment | | Well loss | ROV based ops | |
| Proven technology | Unproven equipment | | New cuttings re-injected | Previously utilised | |

# Comparative Assessment Conclusions

| Jacket Decommissioning Options Comparative Assessment Summary | | | |
|---|---|---|---|
| **Criteria** | **Metric** | **Full Removal** | **Partial Removal** |
| Safety | Risk to personnel (offshore and onshore) | 0.025 | 0.010 |
| | Risk to other users of the sea | 0 | 2.3 x 10 $^{-5}$ PLL $_{pa}$ |
| Environmental | Energy Consumption | 297,654 GJ | 530,148 GJ |
| | Emissions to Atmosphere | 24,277 Tonnes | 31,064 Tonnes |
| | Environmental Impacts | 66% | 100% |
| Technical | Technical Feasibility | 25% | 100% |
| | Ease of Recovery from Excursion | 75% | 100% |
| | Use of Proven Technology and Equipment | 33% | 100% |
| Societal | Commercial Impact on Fisheries | 100% | 94% |
| | Socio-economic Impact on Amenities | 100% | 100% |
| | Socio-economic Impact on Communities | 100% | 100% |
| Economic | Total Project Cost | 53% | 100% |

# Comparative Assessment Conclusions

| Drill Cuttings Decommissioning Options Comparative Assessment Summary | | | | | | |
|---|---|---|---|---|---|---|
| **Criteria** | **Metric** | **Treat Liquids Offshore** | **Recover Liquids and Solids to Shore** | **Offshore Injection** | **Re-distribution** | **In-situ** |
| Safety | Risk to Personnel | 8% | 6% | 5% | 25% | 100% |
| Environmental | Energy Consumption | 120,821 GJ | 304,063 GJ | 109,497 GJ | 87,278 GJ | 0% |
| | Emissions to Atmosphere | 7,666 Tonnes | 21,138 Tonnes | 6,480 Tonnes | 6,480 Tonnes | 0% |
| | Environmental Impact | 59% | 53% | 95% | 48% | 100% |
| Technical | Technical Feasibility | 6% | 6% | 5% | 11% | 100% |
| | Ease of Recovery | 11% | 11% | 4% | 16% | 100% |
| | Use of Proven Technology | 5% | 5% | 6% | 16% | 100% |
| Societal | Fisheries, Amenities and Communities | 10% | 8% | 34% | 25% | 100% |
| Economic | Total Project Cost | 3% | 3% | 2% | 10% | 100% |

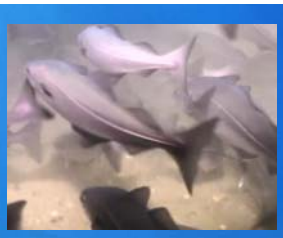
# ENVIRONMENT

## Environment – Receptors

Receptors – who or what could be affected

### Biological

- Benthos
- Fish and Shellfish
- Marine Mammals
- Water Column (plankton)
- Seabirds
- Coastal Sites



### Physical

- Use of Resources
- Seabed Sediments
- Water Column
- Atmosphere
- Use of Disposal Facilities

### Other

- Stakeholder Concerns
- Cumulative Impacts
- Transboundary Issues

Images courtesy of Decom North Sea and WoRMS

## Environment – Sources

Sources – where the contamination can come from

- Vessels, transport, manufacture of new material resulting in energy consumption and emissions to atmosphere
- Anchoring activities causing seabed disturbance
- Cutting tools and vessels causing underwater noise
- Non-routine events, for example, oil spills to sea
- Cleaning of marine growth offshore and disposal onshore
- Onshore dismantling and disposal to landfill
- Collapse of footings disturbance of the drill cuttings pile

# Supporting Studies

- 72 Studies
- Inventory – Asset wide
- Engineering – Engineering Down and Cleaning
- Topsides – Deconstruction and Removal Studies
- Jacket – Removals, Weights, Footings Degradation
- Drill Cuttings Pile – Modelling, Assessment of Management Options
- Environmental – Baseline Survey, EIA Scoping, Noise, Marine Growth

# Ensuring Adequate Coverage

Jacket – Example Partial Removal

| Operation/ End-point | Potential impact | Mitigation | Scoring criteria | Physical and chemical | | | | | | Biological | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Drill cuttings pile disturbance | Seabed disturbance | Water quality | Air quality | Land | Freshwater (including brackish) | Sediment biology (benthos) | Water column (plankton) | Finfish and shellfish | Marine mammals | Seabirds | Terrestrial flora and fauna |
| Anchoring of vessels on the seabed. | Physical disturbance to seabed and suspension of sediment into the water column from the cuttings pile. | • Anchor plan/ pre-planning of anchor pattern.<br>• Rolling anchors or piggyback anchor.<br>• Safe operation.<br>• Pre-surveys of area.<br>• As-left survey.<br>• Post-decommissioning monitoring programme.<br>• Remedial intervention in the event of any anchor mounds or scars. | L | A | F | F | | | | F | F | F | | | |
| | | | C | 2 | 2 | 2 | | | | 2 | 2 | 2 | | | |
| | | | R | 2 | 13 | 13 | | | | 13 | 13 | 13 | | | |

Outcome of CA – Partial removal of jacket results in a lower impact on the environment

# Ensuring Adequate Coverage

## Drill Cuttings Pile – Example Treating Solids Onshore

| Operation/ End-point | Potential impact | Mitigation | Scoring criteria | Physical and chemical | | | | | Biological | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Seabed disturbance | Water quality | Air quality | Land | Freshwater (including brackish) | Sediment biology (benthos) | Water column (plankton) | Finfish and shellfish | Marine mammals | Seabirds | Terrestrial flora and fauna |
| Discharge of oily water under permit in a coastal environment. | Planned release of treated seawater resulting in release of contaminants to the coastal environment. | • Separation systems for oil recovery from bilge.<br>• Discharges of oil fluids to marine environment will be within permitted levels. | L | | F | | | F | | F | F | F | F | |
| | | | C | | 2 | | | 2 | | 2 | 2 | 1 | 1 | |
| | | | R | | 13 | | | 13 | | 13 | 13 | 10 | 10 | |

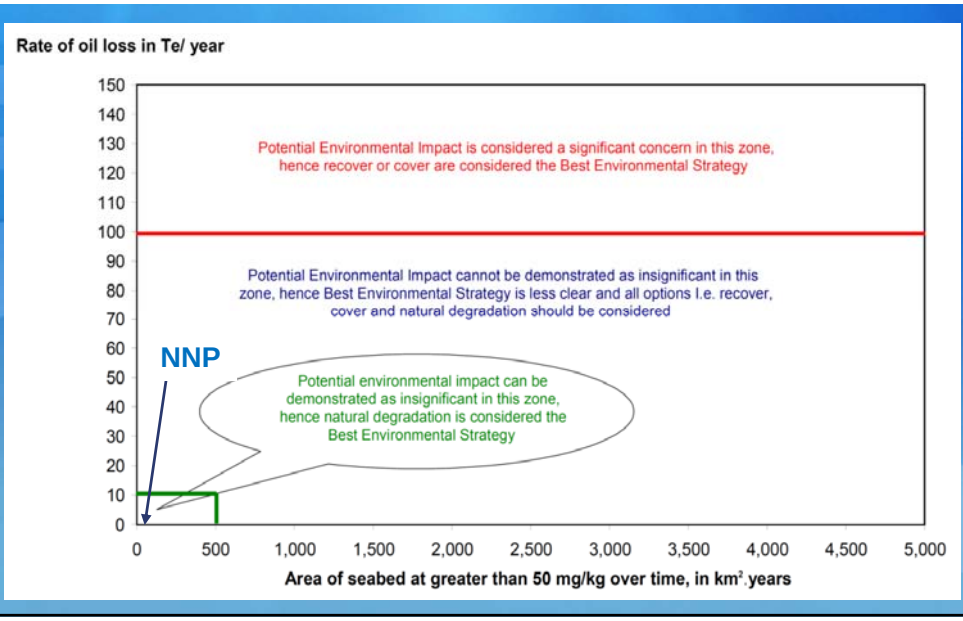
Outcome of CA – Leaving the drill cuttings pile in-situ results in a lower impact on the environment

# Environmental Impact – Drill Cuttings Pile

| | Liquids offshore, solids onshore | Liquids and solids onshore | Offshore injection | Re-distribute offshore | Leave *in situ* |
|---|---|---|---|---|---|
| **Energy Use** | <1 year energy use during NNP operations | | | | |
| **Emissions** | <1 year emissions during NNP operations | | | | |
| **Operations** | Dredge blockages | Increased onshore treatment | Dredge blockages | New contamination | |

## Long Term Presence of Drill Cuttings Pile

- Leaching of contaminants
- Long term pile presence
- Collapse of footings




## Conclusions

- From an Environmental perspective the outcomes of the CA identified the following recommended options:
  - Partial removal of the jacket
  - Leaving the drill cuttings pile in-situ to degrade naturally

# SAFETY

## Supporting Studies

- Engineering – Engineering Down and Cleaning
- Topsides – Deconstruction and Removal Studies
- Jacket – Removals
- Safety of personnel offshore and onshore – Quantitative Assessment
- Safety of other users of the sea – Quantitative Assessment
- Hazard Identification Study for Drill cuttings

# Safety Risk – Jacket Removal

**Potential for Loss of Life (PLL)**
Offshore and Onshore Project Risks

**PLL per year**
Long Term Fishing Risk

Total Offshore and Onshore Durations over 2 Years

Fishing Risk over 325 Years?

| | | |
|---|---|---|
| **Full Removal** | **0.025** | **0** |
| **Partial Removal** | **0.010** | **$2.3 \times 10^{-5}$ pa** |

Question: how can you balance short term operations risk with long term fishing risk?

Take fishing snagging risk over 325 years of footings life = PLL 0.0075, which is still less than full removal when added to partial removal of the jacket

# Safety Risk – Drill Cuttings Pile

| | Liquids offshore, solids onshore | Liquids and solids onshore | Offshore injection | Re-distribute offshore | Leave *in situ* |
|---|---|---|---|---|---|
| **Personnel offshore** | Long duration: up to 579 days | Long duration, increased vessels | Loss of Well Control | Long duration | |
| **Personnel onshore** | Long processing duration | | No onshore operations | | |
| **Fishermen** | Negligible | | | | |

# Conclusions

- From a Safety perspective the outcomes of the CA identified the following recommended options:
  - Partial removal of the jacket
  - Leaving the drill cuttings pile in-situ to degrade naturally

# Comparative Assessment Conclusions

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# Questions

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## We'd like your feedback!

- Interactive time –
  - Dialogue with project team
  - Tablets located on the two stands
  - Feedback form (in the delegate pack)
  - Directly on posters (post-its with project team)
  - Challenge board
- Overview presentation repeated this afternoon followed by societal impacts presentation

# SOCIETAL

## Societal Considerations

UK Pelagic Trawler



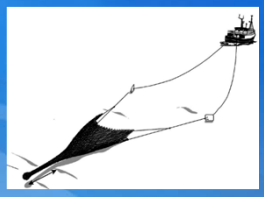
Disposal Yard

## Impact on Commercial Fisheries

- **Interference to fishing activities**
  - Potentially caused by physical presence of decommissioning vessels
  - Majority of fishing activity in the vicinity of the platform is by vessels towing mobile gear rather than fixed gear ➡ interference not expected to be significant
  - Decommissioning vessels will operate within the platform's 500m safety zone (pipelines and subsea infrastructure to be decommissioned at a later stage)
  - CNRI will establish lines of communication to inform other sea users, including fishermen, of vessel operations during decommissioning activities i.e. notify UK Hydrographic Office and Kingfisher

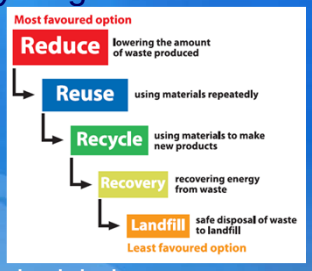
## Impact on Commercial Fisheries

- **Damage to or loss of fishing gear**
  - Potential for fishing gear to become fastened on subsea infrastructure left in-situ i.e. jacket footings, pipelines, other infrastructure
  - Vessels operating demersal gear have the highest snagging risk
  - Socioeconomic impacts from loss or damaged gear:
    - *Time spent repairing / changing the gear*
    - *Loss of catch*
  - CNRI will undertake Post Decom surveys around the Ninian Northern 500m safety zone and associated subsea structures i.e. over trawl survey
  - FishSafe System, Admiralty Charts and Fisheries Legacy Trust (FLTC) will be utilised to promote awareness of left in situ structures to the users of the sea



## Impact on Communities & Amenities

- Onshore impacts associated with deconstruction, recycling and disposal of Ninian Northern materials
  - Dust, Noise
  - Odour from marine growth
  - Use of landfill space (*last resort*)




- Onshore licensed disposal site to undertake activities
  - Compliant with applicable waste management / environment legislation
  - Subject to 3rd party inspection and CNRI audit

# Comparative Assessment Conclusions

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