APPENDIX 2:
ENERGY CATEGORISATION OF DECOMMISSIONING OPTIONS

Introduction

The quantification of energy and emissions was an integral part of DNV GL's EIA for the Brent Field Decommissioning and is required under the Department of Energy and Climate Change (DECC) Guidance Notes on Decommissioning [1]. In support of the EIA, DNV GL prepared an *Energy Use and Gaseous Emissions Report* [2] which quantifies the energy use and gaseous emissions likely to arise from the decommissioning options for the Brent Field facilities**Error! Reference source not found.**.

This Appendix categorises the energy consumption calculated in DNV GL's *Energy Use and Gaseous Emissions Report* for each of the Brent Field decommissioning options using an 'energy impact key' (Table 1). They key is based on a methodology taken from the 2002 OLF *Handbook for Environmental Impact Assessment for Offshore Decommissioning* [3], and has been applied in various offshore decommissioning projects.

The key was developed to highlight significant differences between alternatives and to rank the alternatives in relative terms. The categorisation is not definitive and could be different if set in a different context. For example, an energy impact defined as 'large negative' using this key might be 'insignificant' when compared against national energy consumption.

The categorisation for each Brent Field facility and decommissioning option is outlined in Table 2.

Table 1: Energy Impact Key

Reference Unit	Energy Category				
	None/ Insignificant	Small Negative*	Small-moderate Negative*	Moderate Negative	Large Negative
Energy (Million GJ)	<0.1	0.1-0.8	0.8-1	1-3	3-6

*energy categories have been modified slightly because original key did not have a 'small-moderate negative' category, as per DNV GL EIA methodology.

Table 2: Energy Categorisation for Decommissioning Options

Facility	Option Number	Energy (million GJ)	Energy Category
Topsides	Option 1	1.2	Moderate negative
Brent A Upper Jacket	Option 1	0.2	Small negative
Brent A Jacket Footings	Option 1	0.4	Small negative
	Option 2	0.4	Small negative
	Option 3	0.4	Small negative
GBS	Option 1	4.9	Large negative
	Option 2	3.8	Large negative
GBS Attic Oil	Option 1	0.4	Small negative
GBS Cell Contents	Option 1	4.2	Large negative
	Option 2	1.0	Moderate negative
	Option 3	1.2	Moderate negative
	Option 4	1.4	Moderate negative
	Option 5	0.07	None/Insignificant
GBS Drilling Legs	Option 1a	0.3	Small negative
	Option 2a	0.1	Small negative
	Option 3a	0	None/Insignificant

Facility	Option Number	Energy (million GJ)	Energy Category
	Option 4a	0	None/Insignificant
	Option 1b	1.4	Moderate negative
	Option 2b	0.7	Small negative
	Option 3b	0.3	Small negative
	Option 4b	0.3	Small negative
	Option 5	0	None/Insignificant
GBS Minicell Annulus	Option 1	0.3	Small negative
	Option 2	0.1	Small negative
	Option 3	0.1	Small negative
	Option 4	0.1	Small negative
	Option 5	0	None/Insignificant
Seabed Drill Cuttings	Option 1	0.07	None/Insignificant
Brent A Seabed Drill Cuttings	Option 1	0.2	Small negative
	Option 2	0.09	None/Insignificant
	Option 3	0.1	Small negative
	Option 4	0.2	Small negative
	Option 5	0.03	None/Insignificant
Cell Top Drill Cuttings	Option 1	0.005	None/Insignificant
	Option 2	0.3	Small negative
	Option 3	0.3	Small negative
	Option 4	0.3	Small negative
	Option 5	0.5	Small negative
	Option 6	0.03	None/Insignificant
GBS Tri-cell Drill Cuttings	Option 1	0.0	None/Insignificant
Seabed Structures and Debris	Option 1	0.2	Small negative
Wells	Option 1	3.3	Large negative
Pipelines Group 1	Option 1, 2, 3	0.1	Small negative
Pipelines Group 2	2A: Option 2	0.05	None/Insignificant
	2A: Option 3	0.05	None/Insignificant
	2A: Option 4	0.06	None/Insignificant
	2A: Option 5	0.07	None/Insignificant
	2A: Option 6	0.06	None/Insignificant
	2A: Option 7	0.07	None/Insignificant
	2B: Option 1	0.3	Small negative
	2B: Option 4	0.3	Small negative
	2B: Option 5	0.3	Small negative
	2B: Option 6	0.3	Small negative
	2B: Option 7	0.3	Small negative
	2C: Option 1	0.4	Small negative
	2C: Option 6	0.5	Small negative
	2C: Option 7	0.4	Small negative
	2C: Option 8	0.5	Small negative
	2C: Option 9	0.5	Small negative

Facility	Option Number	Energy (million GJ)	Energy Category
	2D: Option 2	0.005	None/Insignificant
	2D: Option 3	0.006	None/Insignificant
	2D: Option 5	0.005	None/Insignificant
	2D: Option 6	0.005	None/Insignificant
	2E: Option 1	0.04	None/Insignificant
	2E: Option 4	0.05	None/Insignificant
	2E: Option 5	0.05	None/Insignificant
	2E: Option 6	0.05	None/Insignificant
	2E: Option 7	0.06	None/Insignificant

[1] DECC, Guidance Notes, *Decommissioning of Offshore Oil and Gas Installations and Pipelines under the Petroleum Act 1998*, Version 6, March 2011.
[2] DNV GL, *Energy Use and Gaseous Emissions Report for the Brent Field Decommissioning EIA*, DNV GL Report No.: 187KVXJ-3, Rev 5, 2016.
[3] Norwegian Oil Industry Association, OLF, *Handbook for Environmental Impact Assessment for Offshore Decommissioning*, 2002.

APPENDIX 3:

SUMMARY OF ENVIRONMENTAL UNDERWATER NOISE ANALYSIS FOR THE BRENT FIELD DECOMMISSIONING EIA

EXECUTIVE SUMMARY

This Appendix reproduces the executive summary from the environmental underwater noise analysis conducted by DNV GL for the Brent Decommissioning Programme (BDP) [i]. The reader should refer to this report if they wish to examine in further detail.

On behalf of the owners Shell U.K. Limited (Shell) and Esso Exploration and Production UK Limited (Esso), the operator Shell is presently preparing the plan to decommission the Brent Field, one of the largest hydrocarbon accumulations on the United Kingdom Continental Shelf. Decommissioning of the Brent Field is likely to be the largest decommissioning project in the UK sector of the North Sea.

The aim of this study is to investigate underwater noise from the decommissioning of the Brent Field with regards to marine life. It is generally accepted that anthropogenic sound can induce a range of adverse effects on marine life. These range from insignificant impacts to significant behavioural changes and psychological stress. Effects may include temporal reduction in hearing sensitivity which returns to normal over time *(Temporary Threshold Shift, TTS)* or a permanent reduction in hearing sensitivity *(Permanent Threshold Shift, PTS).*

Marine mammals such as whales and dolphins rely on sound for orientation in their environment, to communicate with each other, locate prey and identify hazards. All these activities, critical to their survival, may be interfered with by the increasing levels of man-made noise. Seals, which tend to stay closer to shore, are also susceptible to noise impacts.

The results of this study are used within the Environmental Statement (ES) which presents the findings of the Environmental Impact Assessment (EIA) for the decommissioning of the whole of the Brent Field.

Brent Field Operations

Underwater noise sources include ships, underwater cutting, dredging, water jetting, rock dumping and pipe-laying. The environmental underwater noise is in this project primarily dominated by noise from shipping activity and cutting activity. Received noise levels have been estimated for a range of pipeline and platform decommissioning options, where vessel spread sheets were received from Shell.

Ranges for injury and behavioural disturbance were estimated. The affected area was correlated with sightings of cetaceans in vicinity of the Brent Field to obtain an indication of the number of individuals that might be affected. No greater than **small negative** impacts (which represent a disturbance impact for a short period of time) are expected for any modelled scenarios.

Based on the observed density of cetaceans in the area and the magnitude and frequency of the source noise levels, it is unlikely that any individuals will experience auditory injury in the form of Temporary Threshold Shift (*TTS*) or Permanent Threshold Shift (*PTS*).

The onset of *TTS* and *PTS* depends on the amount of physical stress exerted on the middle and especially inner ear (cochlea) of mammals. The degree of physical stress depends predominantly on the peak pressure levels and the total amount of energy received over time.

Continuous noise sources, such as those that might occur during the Brent Field decommissioning, will generally not have major pressure excursions. However, "moderate" energy levels prevailing over time will exert a continuous stress on the inner ear and the hair cells. Depending on the "loudness" and the exposure time, permanent damage can be induced.

PTS is most often associated with damage or death of the hair cells in the inner ear. Mammals cannot regenerate such cells. *TTS* occurs when there is minor damage that may be repaired, thereby introducing a non-permanent reduction to the animal's ability to perceive sound.

All *TTS* and PTS results are based on the Southall criteria for continuous sound exposure over a period of 24 hours. The ranges determined, and thereby also the indicated number of animals exposed, may therefore be regarded as conservative. It is unlikely that the animals will remain in the area for the full 24 hour period, but are expected to move out of the area while the operation is in progress, to return after completion.

This is further emphasized by shorter exposure times of 1 second, 1 minute, 1 hour, 2 hours and 24 hours. For example, the furthest range modelled where cetaceans may be inflicted with *TTS* was ~900 metres. To be inflicted with *TTS* by being close to the source for shorter durations the animals must be 1 metre from the source for 1 second, 9 metres from the source for 1 minute, 86 metres from the source for 1 hour or 133 metres from the source for 2 hours. This illustrates that the animals have sufficient time to move away from the source. Similarly, for cetaceans to obtain *PTS* they must stay ~40 metres from the source for a 24 hour period and 10 metres from the source for 2 hours.

A summary of the injury and disturbance ranges estimated is displayed in the report [i], which shows *TTS* and *PTS* ranges for the modelled typical case and worst case scenarios as well as indicated mild behavioural disturbance range for the worst case scenario. The furthest *TTS* and *PTS* ranges obtained for cetaceans are most often obtained for *low-frequency cetaceans*. Because of the lower levels required to introduce injury in pinnipeds, the *TTS* and *PTS* ranges are significantly higher for these animals. However, because pinnipeds are usually found close to shore they are unlikely to be found in a significant number in the vicinity of the Brent Field 130 km offshore. The results also show that some options may have shorter worst case cetacean injury ranges than other options, but longer typical ranges. The typical levels are however lower and comparable with source levels frequently emitted in the vicinity of offshore fields.

The worst case non-cutting noise occurs when vessel cavitation noise is present. This will likely occur during poor weather conditions when a vessel is required to operate at high power. Worst case ship noise may also occur if pressure side cavitation occurs. Pressure side cavitation is only an issue on vessels with pitched propellers when operating at low load and high rpm, similar to a ferry pitching its propellers when loading or offloading thereby generating the characteristic loud noise. This will typically occur during good weather conditions. It may be avoided on vessels with the ability to reduce propeller rotational speed.

Noise levels of a magnitude that could cause mild behavioural disturbances were calculated out to ranges of ~6,000 metres, affecting an indicated ~50 individuals. This result occurred during cutting operations. Research on behavioural disturbance of marine mammals is a more complex and less mature field of research than the research on PTS and TTS. The species familiarity

with the sound source and how the animal actually perceives is important; it may perceive a noise as threatening, potentially resembling a predator or other known hazards.

The likelihood for the worst case noise scenario is assumed to be greater during cutting operations because the level will be unaffected by weather conditions during operation. There are, to DNV GL knowledge, no underwater noise source data available for Diamond Wire Cutters (DWC) or commercial Abrasive Water Jets (AWJ). AWJ levels have been derived from hand-held diver-operated AWJ equipment and are therefore uncertain. Source levels for AWJ were used for all cutting activity in this study. All pipeline cutting will be performed by DWC and the pipeline noise levels may therefore be considered conservative. In order to obtain a less conservative, more accurate estimate of the affected ranges, measurements of underwater noise levels emitted from the selected cutting equipment should be obtained.

No greater than small negative impacts (which represent a disturbance impact for a short period of time) are expected for all modelled scenarios.

Nearshore Operations

Noise analysis for operations was also conducted to examine underwater noise during:

- SLV operations in the Brent Field
- SLV transit (from Brent Field to shallower waters nearshore)
- Transfer of the topsides from SLV to barge (off the coast of Teesside, UK)

It is not expected that the SLV noise will increase general noise level in areas beyond a 1 km radius from the SLV vessel, or that SLV operations will have anything other than temporary disturbance effects on marine mammals such as seals.

[i] DNV GL, Environmental Underwater Noise Analysis for the Brent Field Decommissioning EIA, Report No.: 1-87KVXJ-14

APPENDIX 4:

INVENTORY OF SUBSEA PIPELINES FOR THE BRENT FIELD DECOMMISSIONING EIA

Table A.1: Pipeline Material Inventory – Group 1 (Qualitative Lines)

Qualitative CA Summary Data for Decommissioning of Brent Pipelines														
Shell P/L	**N0310**	**N0311**	**N0402a**	**N0738**	**N0739**	**N0913**	**N0841**	**N9900**	**N9902**	**N1844**	**N2801**	**N9901**	**N0830**	**N0952**
Decommissioning option	**Recover by Reverse Reeling**	**Recover by Reverse Reeling**	**Recovery by cut and lift**	**Leave in trench**	**Leave in trench**	**Leave in trench**	**Leave in trench**	**Recover by cut and lift**	**Recover by cut and lift**	**Recover by reverse reeling**	**Recover by reverse reeling**	**Recover by cut & lift**	**Recover by reverse reeling**	**Leave in existing rock dump**
Total steel (t)	527	51	71	776	279	361	0	0	0	0	0	0	0	6
Total concrete (t)	0	0	66	0	0	0	0	0	0	0	0	0	0	0
Total protective coatings & plastic (t)	130	9	3	107	38	0								0.2
Total weight of pipeline excluding anodes (t)	657	60	140	882	318	361	133	63	69	96	3	55	13	6
Total length recovered (m)	2,633	273	147	0	0	0	0	2,100	2,300	2,924	430	2,200	500	0
Total length left in field (m)	0	0		5,000	1,800	5,000	5,300	0	0	0	0	0	0	0.03
Steel recovered (t)	527	51	71	0	0	0	0	0	0	0	0	0	0	0
Concrete recovered (t)	0	0	66	0	0	0	0	0	0	0	0	0	0	0
Protective coatings & plastics recovered (t)	130	9	3	0	0	0	0	63	69	96	3	55	13	0.2
Pipeline recovered (t)	657	60	140	0	0	0	0	63	69	96	3	55	13	0
Steel left in field approx. (t)	0	0	0	776	279	361	0	0	0	0	0	0	0	6
Protective coatings & plastics left in field (t)	0	0	0	107	38	0								0.2
Pipeline left in field (t)	0	0	0	882	318	361	133	0	0	0	0	0	0	6
Concrete mats recovered (t)	114	0	0	0	0	0	0	0	0	92	99	0	58	0
Concrete mats left in field (t)	00	0	0	165	213	159	140	0	0	0	0	0	0	0

Table A.2: Pipeline Material Inventory – Group 2 (Quantitative Lines)

Quantitative CA Summary Data for Decommissioning of Brent Pipelines						
Shell P/L No.	**N0201**					
Decommissioning option	**2**	**3**	**4**	**5**	**6**	**7**
Description	**Leave tied-in at platforms, trench & backfill the non-platform end**	**Leave tied-in at platforms & rock dump the non-platform end**	**Trench & backfill whole length**	**Rock dump whole length**	**Recover whole length by cut & lift**	**Recover whole length by reverse S lay (single joint)**
Total steel (t)	629					
Total concrete (t)	600					
Total protective coatings (t)	16					
Total weight pipeline excl. anodes (t)	1,246					
Total length recovered (m)	100	100	180	180	1,300	1,300
Total length left in field (m)	1,200	1,200	1,120	1,120		
Steel recovered (t)	48	48	87	87	581	581
Concrete recovered (t)	46	46	83	83	554	554
Protective coatings & plastics recovered (t)	1	1	2	2	15	15
Total weight pipeline recovered (t)	96	96	173	173	1,149	1,149
Weight of concrete left in field (t)	554	554	517	517	47	47
Protective coatings & plastics left in field (t)	15	15	14	14	1.3	1.3
Total weight pipeline left in field (t)	1,150	1,150	1,074	1,074	97	97
Concrete mats recovered (t)	83	83	83	83	83	83
Concrete mats left in field (t)	0	0	0	0	0	0
Burial Status	Rigid steel pipeline exposed on the seabed with occasional mattresses. No reduction in exposure by natural burial has occurred in 23 years of inspection history.					
Spanning status	Majority of spans relatively stable and persistent. No FishSAFE spans (>10m length and >0.8m high) present.					

Quantitative CA Summary Data for Decommissioning of Brent Pipelines						
Shell P/L No.	**N0301**					
Decommissioning option	**2**	**3**	**4**	**5**	**6**	**7**
Description	**Leave tied-in at platforms, trench & backfill non-platform ends**	**Leave tied-in at platforms & rock dump non-platform ends**	**Trench & backfill whole length**	**Rock dump whole length**	**Recover whole length by cut & lift**	**Recover whole length by reverse S lay (single joint)**
Total steel (t)	384					
Total concrete (t)	321					
Total protective coatings (t)	25					
Total weight pipeline excluding anodes (t)	730					
Total length recovered (m)	50	50	100	100	2820	2820
Total length left in field (m)	2,770	2,770	2,720	2,720		
Steel recovered (t)	7	7	14	14	384	384
Concrete recovered (t)	6	6	11	11	321	321
Protective coatings & plastics recovered (t)	0	0	1	1	25	25
Total weight of pipeline recovered (t)	13	13	26	26	730	730
Weight of steel left in field (t)	378	378	371	371	0	0
Weight of concrete left in field (t)	315	315	309	309	0	0
Protective coatings & plastics left in field (t)	25	25	24	24	0	0
Total weight of pipeline left in field approx. (t)	717	717	704	704	0	0
Concrete mats recovered (t)	70	70	70	70	70	70
Concrete mats left in field (t)	0	0	0	0	0	0
Burial Status	Rigid steel pipeline exposed on the seabed. • Mattress cover over N0803 & C0815 crossings. No reduction in exposure by natural burial has occurred in 23 years of inspection history.					
Spanning Status	3 relatively stable and persistent spans. Remainder of spans appear and decay with time. • No FishSAFE spans (>10m length and >0.8m high) present.					

Quantitative CA Summary Data for Decommissioning of Brent Pipelines						
Shell P/L No.	**N0302**					
Decommissioning option	**2**	**3**	**4**	**5**	**6**	**7**
Description	**Leave tied-in at platform, trench & backfill non-platform end**	**Leave tied-in at platform & rock dump non-platform end**	**Trench & backfill whole length**	**Rock dump whole length**	**Recover whole length by cut & lift**	**Recover whole length by reverse S lay (single joint)**
Total steel (t)	284					
Total concrete (t)	296					
Total protective coatings (t)	21					
Total weight of pipeline excluding anodes (t)	600					
Total length recovered (m)	50	50	125	125	2300	2300
Total length left in field (m)	2,250	2,250	2,175	2,175		
Steel recovered (t)	6	6	15	15	284	284
Concrete recovered (t)	6	6	16	16	296	296
Protective coatings & plastics recovered (t)			1	1	21	21
Total weight of pipeline recovered (t)	13	13	33	33	600	600
Weight of steel left in field (t)	277	277	268	268	0	0
Weight of concrete left in field (t)	289	289	280	280	0	0
Protective coatings & plastics left in field (t)	20	20	20	20	0	0
Total weight of pipeline left in field approx. (t)	587	587	567	567	0	0
Concrete mats recovered (t)	0	0	0	0	0	0
Concrete mats left in field (t)	0	0	0	0	0	0
Burial Status	Rigid steel pipeline exposed on the seabed. • No reduction in exposure by natural burial has occurred in 23 years of inspection history. • Short sections of mattress (<4m) occur at the Spar PLEM.					
Spanning Status	10 relatively stable and persistent spans. No FishSAFE spans (>10m length and >0.8m high) present.					

Quantitative CA Summary Data for Decommissioning of Brent Pipelines					
Shell P/L No.	**N0303**				
Decommissioning option	**1**	**4**	**5**	**6**	**7**
Description	**Leave *in situ* with no further remediation**	**Trench & backfill whole length**	**Rock dump whole length**	**Recover whole length by cut & lift**	**Recover whole length by reverse S lay (single joint)**
Total steel (t)	1071				
Total concrete (t)	1085				
Total protective coatings (t)	62				
Total weight of pipeline excluding anodes (t)	2218				
Total length recovered (m)	0	270	170	4600	4600
Total length left in field (m)	4,600	4,330	4,430		
Steel recovered (t)	0	63	40	1,071	1,071
Concrete recovered (t)	0	64	40	1,085	1,085
Protective coatings & plastics recovered (t)	0	4	2	62	62
Total weight of pipeline recovered (t)	0	130	82	2,218	2,218
Weight of steel left in field (t)	1,071	1,008	1,031	0	0
Weight of concrete left in field (t)	1,085	1,022	1,045	0	0
Protective coatings & plastics left in field (t)	62	59	60	0	0
Total weight of pipeline left in field approx. (t)	2,218	2,088	2,136	0	0
Concrete mats recovered (t)	0	91	0	91	91
Concrete mats left in field (t)	91	0	91	0	0
Burial Status	Rigid steel pipeline exposed on the seabed with short burial under N0404 and N1141 crossings at Brent C. • No reduction in exposure by natural burial has occurred in 23 years of inspection history. • Mattress cover over N1845 and N1141 crossings. 166m of continuous mattress cover at Brent B.				
Spanning Status	Numerous early spans appear and become naturally filled. 6 relatively stable and persistent spans are present. • No FishSAFE spans (>10m length and >0.8m high) present.				

Quantitative CA Summary Data for Decommissioning of Brent Pipelines					
Shell P/L No.	**N0304**				
Decommissioning option	**1**	**4**	**5**	**6**	**7**
Description	**Leave *in situ* with no further remediation**	**Trench & backfill whole length**	**Rock dump whole length**	**Recover whole length by cut & lift**	**Recover whole length by reverse S lay (single joint)**
Total steel (t)	703				
Total concrete (t)	658				
Total protective coatings (t)	46				
Total weight of pipeline excluding anodes (t)	1407				
Total length recovered (m)	0	115	115	4000	4000
Total length left in field (m)	0	3,885	3,885		
Steel recovered (t)	0	20	20	703	703
Concrete recovered (t)	0	19	19	658	658
Protective coatings & plastics recovered (t)	0	1	1	46	46
Total weight of pipeline recovered (t)	0	40	40	1,407	1,407
Weight of steel left in field (t)	703	683	683	0	0
Weight of concrete left in field (t)	658	639	639	0	0
Protective coatings & plastics left in field (t)	46	44	44	0	0
Total weight of pipeline left in field approx. (t)	1,407	1,367	1,367	0	0
Concrete mats recovered (t)	0	0	0	0	0
Concrete mats left in field (t)	0	0	0	0	0
Burial Status	Rigid steel pipeline exposed on the seabed. • No reduction in exposure by natural burial has occurred in 4 years of inspection history.				
Spanning Status	Numerous early spans become progressively naturally filled. 6 relatively stable and persistent spans are present. No FishSAFE spans (>10m length and >0.8m high) present.				

Quantitative CA Summary Data for Decommissioning of Brent Pipelines					
Shell P/L No.	**0401**				
Decommissioning option	**1**	**4**	**5**	**6**	**7**
Description	**Leave *in situ* with no further N remediation**	**Trench & backfill whole length**	**Rock dump whole length**	**Recover whole length by cut & lift**	**Recover whole length by reverse S lay (single joint)**
Total steel (t)	1,132				
Total concrete (t)	1,075				
Total protective coatings (t)	60				
Total weight of pipeline excluding anodes (t)	2,267				
Total length recovered (m)	0	50	50	3000	3000
Total length left in field (m)	0	2,950	2,950		
Steel recovered (t)	0	19	19	1,088	1,132
Concrete recovered (t)	0	18	18	1,034	1,075
Protective coatings & plastics recovered (t)	0	1	1	58	60
Total weight of pipeline recovered (t)	0	38	38	2,122	2,207
Weight of steel left in field (t)	1,132	1,113	1,113	43	43
Weight of concrete left in field (t)	1,075	1,057	1,057	41	41
Protective coatings & plastics left in field (t)	60	59	59	2	2
Total weight of pipeline left in field approx. (t)	2,267	2,229	2,229	87	87
Concrete mats recovered (t)	0	0	0	0	0
Concrete mats left in field (t)	0	0	0	0	0
Burial Status	Rigid steel pipeline exposed on the seabed. No reduction in exposure by natural burial has occurred in 23 years of inspection history. Rock dumped at Flare location over at least 67m length.				
Spanning Status	Numerous stable and persistent spans are present throughout the line. • No FishSAFE spans (>10m length and >0.8m high) present				

Quantitative CA Summary Data for Decommissioning of Brent Pipelines					
Shell P/L No.	**N0402**				
Decommissioning option	**1**	**4**	**5**	**6**	**7**
Description	**Leave *in situ* with no further remediation**	**Trench & backfill whole length**	**Rock dump whole length**	**Recover whole length by cut & lift**	**Recover whole length by reverse S lay (single joint)**
Total steel (t)	1,259				
Total concrete (t)	1,171				
Total protective coatings (t)	53				
Total weight of pipeline excluding anodes (t)	2,483				
Total length recovered (m)	0	50	50	2600	2600
Total length left in field (m)	0	2,550	2,550		
Steel recovered (t)	0	24	24	1,203	1,259
Concrete recovered (t)	0	23	23	1,119	1,171
Protective coatings & plastics recovered (t)	0	1	1	50	53
Total weight of pipeline recovered (t)	0	48	48	2,373	2,483
Weight of steel left in field (t)	1,259	1,235	1,235	56	56
Weight of concrete left in field (t)	1,171	1,149	1,149	52	52
Protective coatings & plastics left in field (t)	53	52	52	2	2
Total weight of pipeline left in field (t)	2,483	2,435	2,435	110	110
Concrete mats recovered (t)	0	0	0	0	0
Concrete mats left in field (t)	0	0	0	0	0
Burial Status	Rigid steel pipeline exposed on the seabed. • No reduction in exposure by natural burial has occurred in 23 years of inspection history. Rock dumped at Flare location over at least 92m length.				
Spanning Status	Numerous stable and persistent spans are present. No FishSAFE spans (>10m length and >0.8m high) present.				

Quantitative CA Summary Data for Decommissioning of Brent Pipelines					
Shell P/L No.	**N0403**				
Decommissioning option	**1**	**4**	**5**	**6**	**7**
Description	**Leave *in situ* with no further remediation**	**Trench & backfill whole length**	**Rock dump whole length**	**Recover whole length by cut & lift**	**Recover whole length by reverse S lay (single joint)**
Total steel (t)	1,114				
Total concrete (t)	1,032				
Total protective coatings (t)	18				
Total weight of pipeline excluding anodes (t)	2,164				
Total length recovered (m)	0	110	110	2300	2300
Total length left in field (m)	0	2,190	2,190		
Steel recovered (t)	0	53	53	1,045	1,045
Concrete recovered (t)	0	49	49	968	968
Protective coatings & plastics recovered (t)	0	1	1	17	17
Total weight of pipeline recovered (t)	0	103	103	2,030	2,030
Weight of steel left in field (t)	1,114	1,060	1,060	69	69
Weight of concrete left in field (t)	1,032	982	982	64	64
Protective coatings & plastics left in field (t)	18	18	18	1	1
Total weight of pipeline left in field approx. (t)	2,164	2,060	2,060	134	134
Concrete mats recovered (t)	0	275	0	275	275
Concrete mats left in field (t)	275	0	275	0	0
Burial Status	Rigid steel pipeline exposed on the seabed. No reduction in exposure by natural burial has occurred in 23 years of inspection history. 200m of concrete mattress covers the pipeline in the approach to Brent A.				
Spanning Status	At least 11 stable and persistent spans are present. • No FishSAFE spans (>10m length and >0.8m high) present.				

Quantitative CA Summary Data for Decommissioning of Brent Pipelines					
Shell P/L No.	**N0404**				
Decommissioning option	**1**	**4**	**5**	**6**	**7**
Description	**Leave *in situ* with no further remediation**	**Trench & backfill whole length**	**Rock dump whole length**	**Recover whole length by cut & lift**	**Recover whole length by reverse S lay (single joint)**
Total steel (t)	1,571				
Total concrete (t)	1,465				
Total protective coatings (t)	74				
Total weight of pipeline excluding anodes (t)	3,110				
Total length recovered (m)	0	125	125	4400	4400
Total length left in field (m)	0	4,275	4,275	0	0
Steel recovered (t)	0	45	45	1,571	1,571
Concrete recovered (t)	0	42	42	1,465	1,465
Protective coatings & plastics recovered (t)	0	2	2	74	74
Total weight of pipeline recovered (t)	0	88	88	3,110	3,110
Weight of steel left in field (t)	1,571	1,526	1,526	0	0
Weight of concrete left in field (t)	1,465	1,423	1,423	0	0
Protective coatings & plastics left in field (t)	74	72	72	0	0
Total weight of pipeline left in field approx. (t)	3,110	3,022	3,022	0	0
Concrete mats recovered (t)	0	0	0	0	0
Concrete mats left in field (t)	0	0	0	0	0
Burial Status	Rigid steel pipeline exposed on the seabed. No reduction in exposure by natural burial has occurred in 23 years of inspection history. 3 short sections of concrete mattresses				
Spanning Status	Numerous stable and persistent spans are present. • No FishSAFE spans (>10m length and >0.8m high) present.				

Quantitative CA Summary Data for Decommissioning of Brent Pipelines					
Shell P/L No.	**N0405**				
Decommissioning option	**1**	**4**	**5**	**6**	**7**
Description	**Leave *in situ* with no further remediation**	**Trench & backfill whole length**	**Rock dump whole length**	**Recover whole length by cut & lift**	**Recover whole length by reverse S lay (single joint)**
Total steel (t)	978				
Total concrete (t)	991				
Total protective coatings (t)	57				
Total weight of pipeline excluding anodes (t)	2,025				
Total length recovered (m)	0	140	140	4,200	4,200
Total length left in field (m)	0	4,060	4,060		
Steel recovered (t)	0	33	33	978	978
Concrete recovered (t)	0	33	33	991	991
Protective coatings & plastics recovered (t)	0	2	2	57	57
Total weight of pipeline recovered (t)	0	68	68	2,025	2,025
Weight of steel left in field (t)	978	945	945	0	0
Weight of concrete left in field (t)	991	958	958	0	0
Protective coatings & plastics left in field (t)	57	55	55	0	0
Total weight of pipeline left in field approx. (t)	2,025	1,958	1,958	0	0
Concrete mats recovered (t)	0	0	0	0	0
Concrete mats left in field (t)	0	0	0	0	0
Burial Status	Rigid steel pipeline exposed on the seabed. • No reduction in exposure by natural burial has occurred in 23 years of inspection history.				
Spanning Status	5 stable and persistent spans. Several of the early stable spans have become infilled. • No FishSAFE spans (>10m length and >0.8m high).				

Quantitative CA Summary Data for Decommissioning of Brent Pipelines					
Shell P/L No.	**N0501**				
Decommissioning option	**1**	**6**	**7**	**8**	**9**
Description	**Leave *in situ* with no further remediation**	**Recover whole length by cut & lift**	**Recover whole length by reverse S lay (single joint)**	**Trench & backfill shallow-trenched sections + isolated rock dump**	**Rock dump all shallow-trenched sections**
Total steel (t)	12,819				
Total concrete (t)	11,983				
Total protective coatings (t)	728				
Total weight of pipeline excluding anodes (t)	25,529				
Total length recovered (m)	0	~29,000	~29,000	150	150
Total length left in field (m)	0	~7,000	~7,000	35,750	35,750
Steel recovered (t)	0	10,214	10,214	54	54
Concrete recovered (t)	0	9,547	9,547	50	50
Protective coatings & plastics recovered (t)	0	580	580	3	3
Total weight of pipeline recovered (t)	0	20,341	20,341	107	107
Weight of steel left in field (t)	12,819	2,605	2,605	12,765	12,765
Weight of concrete left in field (t)	11,983	2,435	2,435	11,932	11,932
Protective coatings & plastics left in field (t)	728	148	148	725	725
Total weight of pipeline left in field approx. (t)	25,529	5,188	5,188	25,422	25,422
Concrete mats recovered (t)	0	171	171	171	0
Concrete mats left in field (t)	171	0	0	0	171
Burial Status	Rigid steel pipeline within a trench extending for the majority of the line. Mostly exposed in 1990 with a high frequency of spanning throughout and occasional short burials. The extent of burial has increased over time.				
Spanning Status	The frequency of spanning has reduced with time and natural backfill. Numerous spans have been stable and persistent through to 2010. FishSAFE spans (>10m long, >0.8 m high) occur at 2 locations (18m and 15 m long).				

Quantitative CA Summary Data for Decommissioning of Brent Pipelines				
Shell P/L No.	**N0601**			
Decommissioning option	**2**	**3**	**5**	**6**
Description	**Leave tied-in at platforms, trench & backfill non-platform end**	**Leave tied-in at platforms & rock dump non-platform end**	**Rock dump whole length**	**Recover whole length by cut & lift**
Total steel (t)	49			
Total concrete (t)	68			
Total protective coatings (t)	4			
Total weight of pipeline excl, anodes (t)	121			
Total length recovered (m)	25	25	100	400
Total length left in field (m)	375	375	300	0
Steel recovered (t)	3	3	12	49
Concrete recovered (t)	4	4	17	68
Protective coatings & plastics recovered (t)			1	4
Total weight of pipeline recovered (t)	8	8	30	121
Weight of steel left in field (t)	46	46	37	0
Weight of concrete left in field (t)	64	64	51	0
Protective coatings & plastics left in field (t)	3	3	3	0
Total weight of pipeline left in field (t)	113	113	91	0
Concrete mats recovered (t)	0	0	0	30
Concrete mats left in field (t)	30	30	30	0
Burial Status	Rigid steel pipeline exposed on the seabed with two natural short burials during the 23 year inspection history. Rock dump covers the pipe at the SSIV. Mattresses cover the 16” Brent A to Brent Spar PLEM, Brent A to SSIV control umbilical and NLGP SSIV control umbilical crossings.			
Spanning Status	Between the Brent A SSIV and Brent A only 5 spans have been observed. These are mostly stable and persistent. • No FishSAFE spans (>10m length and >0.8m high)			

	Quantitative CA Summary Data for Decommissioning of Brent Pipelines				
Shell P/L No.	**N9903A**				
Decommissioning option	**1**	**4**	**5**	**6**	**7**
Description	**Leave *in situ* with no further remediation**	**Trench & backfill whole length**	**Rock dump whole length**	**Recover whole length by cut & lift**	**Whole length by reverse S-lay**
Total steel (t)	396				
Total concrete (t)	401				
Total protective coatings (t)	23				
Total weight of pipeline excluding anodes (t)	820				
Total length recovered (m)				1,700	1,700
Total length left in field (m)	1,700	1,700	1,700		
Steel recovered (t)	0	0	0	396	396
Concrete recovered (t)	0	0	0	401	401
Protective coatings & plastics recovered (t)	0	0	0	23	23
Total weight of pipeline recovered (t)	0	0	0	820	820
Weight of steel left in field (t)	396	396	396	0	0
Weight of concrete left in field (t)	401	401	401	0	0
Protective coatings & plastics left in field (t)	23	23	23	0	0
Total weight of pipeline left in field approx. (t)	820	820	820	0	0
Concrete mats recovered (t)	0	0	0	0	0
Concrete mats left in field (t)	0	0	0	0	0
Burial Status	On seabed. Cut at locations of Penguins lines.				
Spanning Status	Intermittent spans. No FishSAFE spans (>10m length and >0.8m high) present.				

	Quantitative CA Summary Data for Decommissioning of Brent Pipelines				
Shell P/L No.	**N9903B**				
Decommissioning option	**1**	**4**	**5**	**6**	**7**
Description	**Leave *in situ* with no further remediation**	**Trench & backfill whole length**	**Rock dump whole length**	**Recover whole length by cut & lift**	**Recover whole length by reverse S-lay**
Total steel (t)	675				
Total concrete (t)	684				
Total protective coatings (t)	39				
Total weight of pipeline excluding anodes (t)	1,398				
Total length recovered (m)				2900	2,900
Total length left in field (m)	2,900	2,900	2,900		
Steel recovered (t)	0	0	0	675	675
Concrete recovered (t)	0	0	0	684	684
Protective coatings & plastics recovered (t)	0	0	0	39	39
Total weight of pipeline recovered (t)	0	0	0	1,398	1,398
Weight of steel left in field (t)	675	675	675	0	0
Weight of concrete left in field (t)	684	684	684	0	0
Protective coatings & plastics left in field (t)	39	39	39	0	0
Total weight of pipeline left in field approx. (t)	1,398	1,398	1,398	0	0
Concrete mats recovered (t)	0	0	0	0	0
Concrete mats left in field (t)	0	0	0	0	0
Burial Status	On seabed. Trenched and buried over three short sections. Cut at locations of Penguins lines.				
Spanning Status	Intermittent spans. No FishSAFE spans (>10m length and >0.8m high) present.				

APPENDIX 5:
BRENT FIELD DEBRIS SURVEY FINDINGS

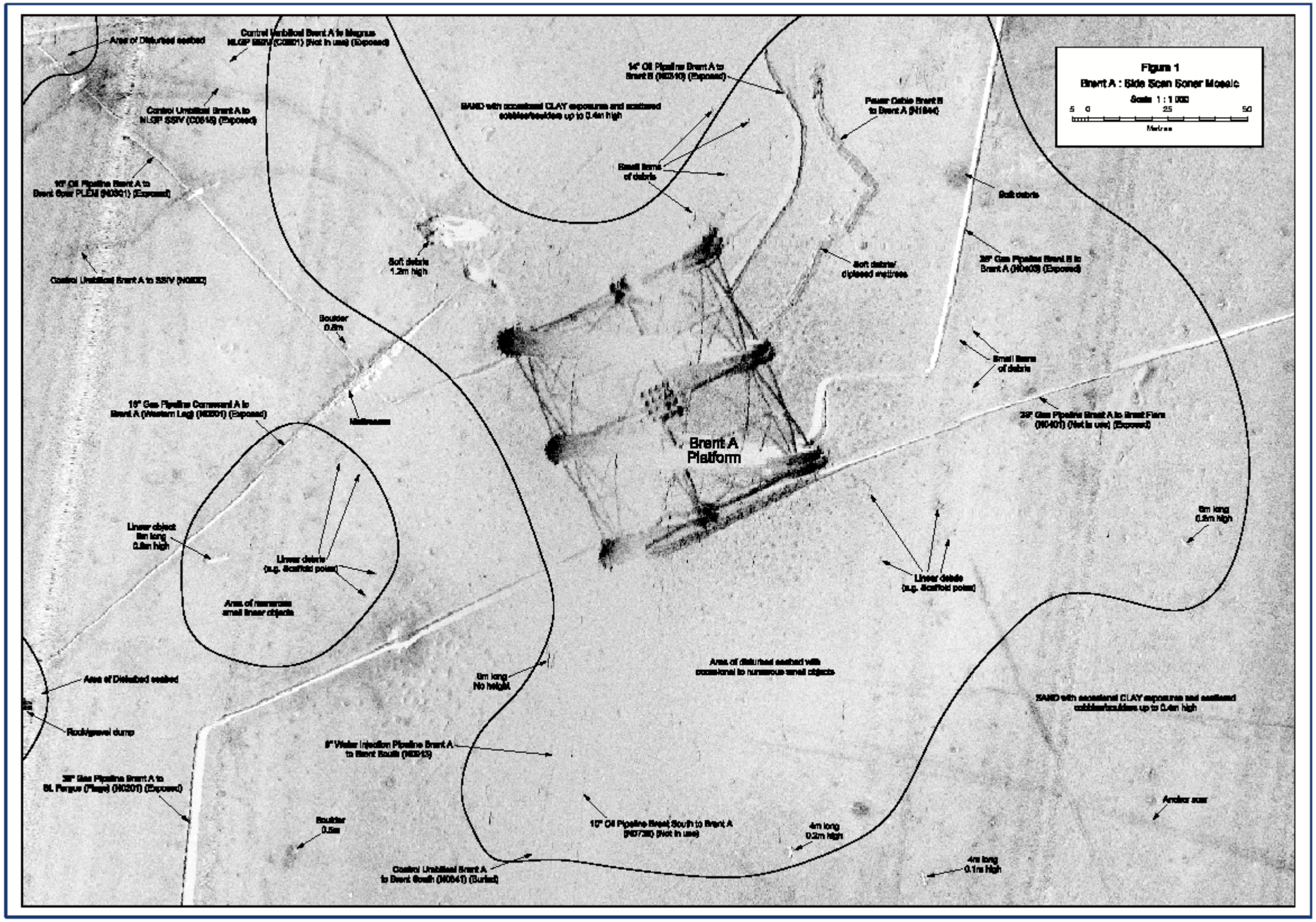


Figure 1
Brent A : Side Scan Sonar Mosaic
Scale 1 : 1 000
5 0 25 50
Metres
Area of Disturbed seabed
Control Umbilical Brent A to Magnus NLGP SSIV (C0801) (Not in use) (Exposed)
Control Umbilical Brent A to NLGP SSIV (C0545) (Exposed)
14" Oil Pipeline Brent A to Brent B (N0310) (Exposed)
SAND with occasional CLAY exposures and scattered cobbles/boulders up to 0.4m high
Power Cable Brent B to Brent A (N1844)
Small items of debris
Soft debris
10" Oil Pipeline Brent A to Brent Spar PLEM (N0301) (Exposed)
Control Umbilical Brent A to SSIV (N0302)
Soft debris 1.2m high
Soft debris/ displaced mattress
36" Gas Pipeline Brent B to Brent A (N0403) (Exposed)
Boulder 0.8m
Small items of debris
16" Gas Pipeline Cormorant A to Brent A (Western Leg) (N0501) (Exposed)
Mattresses
Brent A Platform
36" Gas Pipeline Brent A to Brent Flare (N0401) (Not in use) (Exposed)
Linear object 8m long 0.8m high
Linear debris (e.g. scaffold poles)
Area of numerous small linear objects
8m long 0.8m high
Linear debris (e.g. scaffold poles)
Area of Disturbed seabed
8m long No height
Area of disturbed seabed with occasional to numerous small objects
SAND with occasional CLAY exposures and scattered cobbles/boulders up to 0.4m high
Rock/gravel dump
8" Water Injection Pipeline Brent A to Brent South (N0515)
36" Gas Pipeline Brent A to St. Fergus (Flags) (N0201) (Exposed)
Anchor scar
Boulder 0.5m
12" Oil Pipeline Brent South to Brent A (N0738) (Not in use)
4m long 0.2m high
Control Umbilical Brent A to Brent South (N0541) (Buried)
4m long 0.1m high

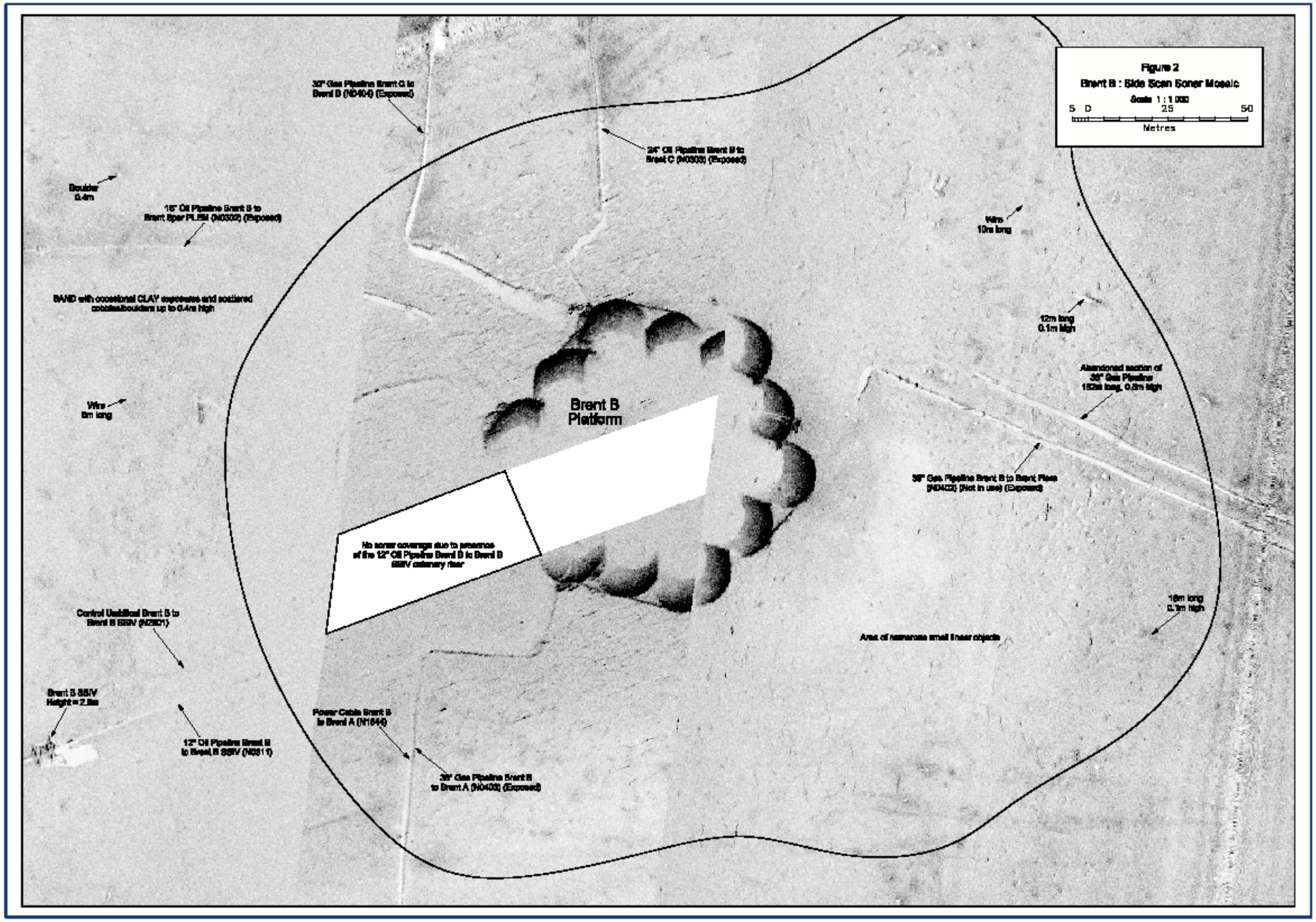


Figure 2
Brent B : Side Scan Sonar Mosaic
Scale 1 : 1 000
5 0 25 50
Metres
30" Gas Pipeline Brent C to Brent B (N0404) (Exposed)
24" Oil Pipeline Brent B to Brent C (N0303) (Exposed)
Boulder 0.4m
16" Oil Pipeline Brent B to Brent Spar PLEM (N0302) (Exposed)
SAND with occasional CLAY exposures and scattered cobbles/boulders up to 0.4m high
Wire 8m long
Brent B Platform
No sonar coverage due to presence of the 12" Oil Pipeline Brent B to Brent B SSIV catenary riser
Wire 10m long
12m long 0.1m high
Abandoned section of 30" Gas Pipeline 182m long, 0.2m high
30" Gas Pipeline Brent B to Brent Flare (N0402) (Not in use) (Exposed)
16m long 0.1m high
Area of numerous small linear objects
Control Umbilical Brent B to Brent B SSIV (N2801)
Brent B SSIV Height = 2.8m
12" Oil Pipeline Brent B to Brent B SSIV (N2811)
Power Cable Brent B to Brent A (N1644)
30" Gas Pipeline Brent B to Brent A (N0403) (Exposed)

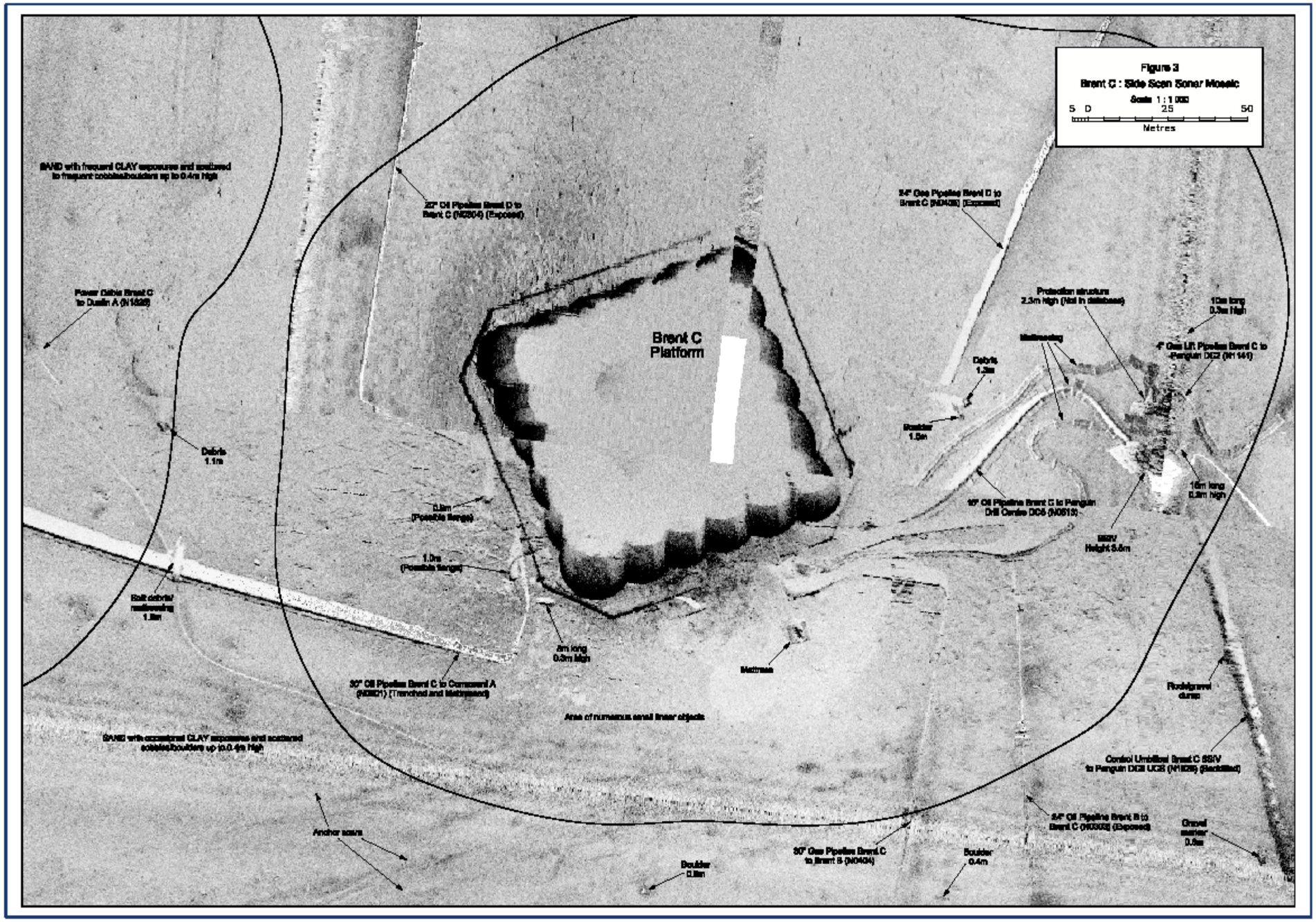


Figure 3
Brent C : Side Scan Sonar Mosaic
Scale 1 : 1 000
5 0 25 50
Metres
SAND with frequent CLAY exposures and scattered to frequent cobbles/boulders up to 0.4m high
22" Oil Pipeline Brent D to Brent C (NI2504) (Exposed)
24" Gas Pipeline Brent C to Brent C (NI0426) (Exposed)
Power Cable Brent C to Dunlin A (N1528)
Brent C Platform
Protection structure 2.3m high (Not in database)
10m long 0.3m High
Mattressing
4" Gas Lift Pipeline Brent C to Penguin DC2 (NI1441)
Debris 1.2m
Boulder 1.5m
Debris 1.1m
0.8m (Possible Range)
1.0m (Possible Range)
16" Oil Pipeline Brent C to Penguin Drill Centre DC5 (NI0513)
SSIV Height 5.8m
16m long 0.3m high
Rock debris/ mattressing 1.8m
2m long 0.3m high
Mattress
30" Oil Pipeline Brent C to Cormorant A (NI0501) (Trenched and Mattressed)
Area of numerous small linear objects
Rockfill/gravel dumps
SAND with occasional CLAY exposures and scattered cobbles/boulders up to 0.4m high
Control Umbilical Brent C SSIV to Penguin DC2 UC2E (NI1256) (Backfilled)
Anchor scars
24" Oil Pipeline Brent B to Brent C (NI0503) (Exposed)
Gravel berms 0.5m
30" Gas Pipeline Brent C to Brent B (NI0404)
Boulder 0.4m
Boulder 0.8m

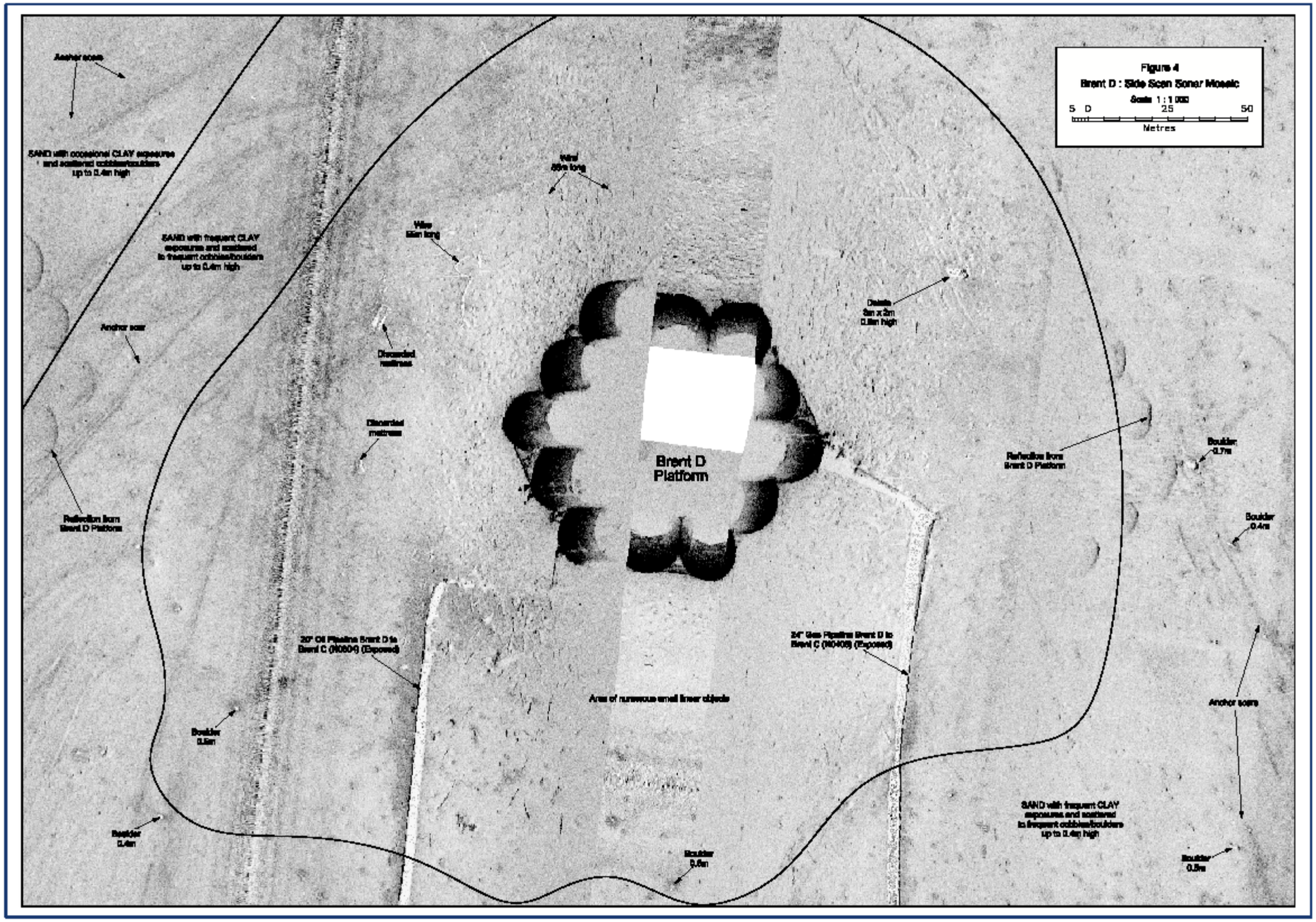


Figure 4
Brent D : Side Scan Sonar Mosaic
Scale 1 : 1 000
5 0 25 50
Metres
Anchor scars
SAND with occasional CLAY exposures and scattered cobbles/boulders up to 0.4m high
SAND with frequent CLAY exposures and scattered to frequent cobbles/boulders up to 0.4m high
Wire 40m long
Wire 50m long
Anchor scar
Discarded mattress
Discarded mattress
Debris 5m x 3m 0.8m high
Brent D Platform
Reflection from Brent D Platform
Boulder 0.7m
Reflection from Brent D Platform
Boulder 0.4m
20" Oil Pipeline Brent D to Brent C (M0804) (Exposed)
24" Gas Pipeline Brent D to Brent C (M0405) (Exposed)
Area of numerous small linear objects
Anchor scars
Boulder 0.8m
Boulder 0.6m
SAND with frequent CLAY exposures and scattered to frequent cobbles/boulders up to 0.4m high
Boulder 0.6m

APPENDIX 6:

CUMULATIVE IMPACT MATRICES OF PROPOSED PROGRAMME OF WORK FOR THE BRENT FIELD DECOMMISSIONING

Introduction

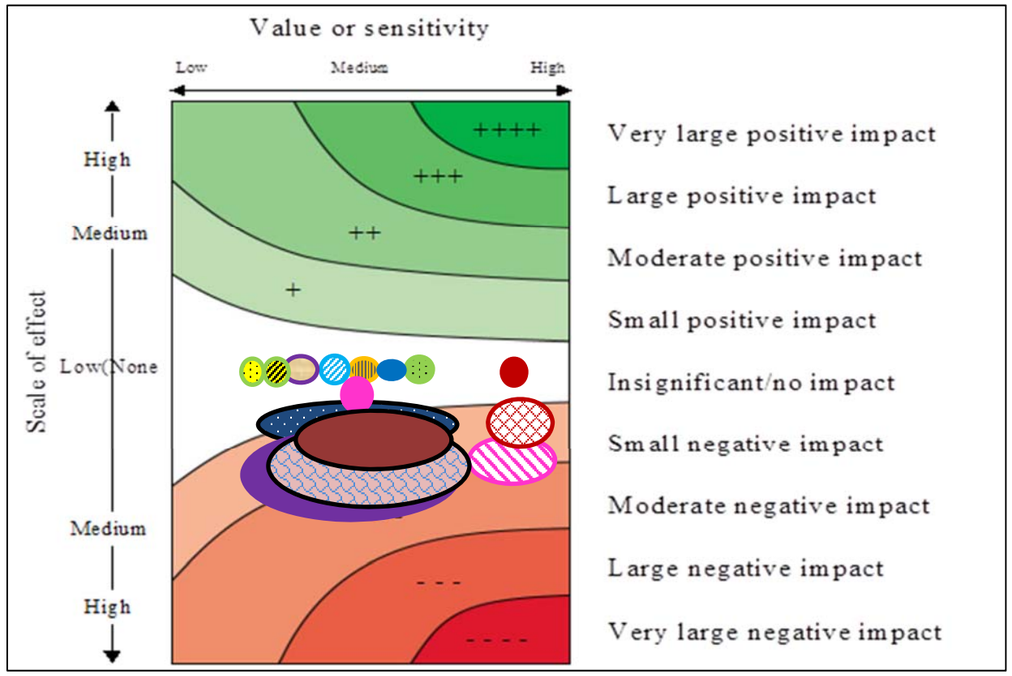
This Appendix presents the cumulative environmental impacts by environmental category. The estimated impacts from Appendix 1 are combined for each decommissioning option, and placed on a single matrix, one matrix for each of the twelve environmental categories listed in the below table. This shows pictorially how the range of impacts for a single environmental category differs by decommissioning option.

These figures enable the viewer to see the results in a broader perspective, as well as facilitating quick identification of significant impacts (positive or negative). A detailed discussion and explanation surrounding these cumulative matrices is provided in Section 15 of the ES.

Category	Description
Onshore Impacts	Onshore Impacts assess onshore impacts occurring from operations as a result of the decommissioning project such as traffic, noise, odour, dust, light and visual impacts. Coastal impacts adjacent to and resulting from, the onshore site are also included. Impacts that relate to both 'Physical' and 'Onshore Impacts' are covered under 'Onshore Impacts'. Waste management impacts onshore are assessed under 'Waste'.
Resource Use	Resource Use covers the use of materials (e.g. grillage or steel material used on platform upgrades to facilitate decommissioning). Energy use and air emissions are covered under 'Energy and Emissions'.
Hazardous Substances	Hazardous Substances covers the assessment of the handling and removal of hazardous materials present at the facilities (e.g. hydrocarbons, chemicals, asbestos, Naturally Occurring Radioactive Material NORM), or the use of hazardous materials as part of the decommissioning process (e.g. sodium nitrate). Impacts resulting from the disturbance of drill cuttings (seabed and cell top) are covered under 'Marine'. Impacts from recovering cell sediment (Options 1 and 2) are captured within other matrices ('Onshore', 'Waste management', 'Environmental risk of accidents').
Waste	The waste assessment is based on the non-hazardous material inventories for the Brent Field, and includes materials such as concrete and steel. Any hazardous materials encountered during decommissioning of the topsides are covered under 'Hazardous Substances'. Wastewater produced in recovery of cell sediments is covered under 'Marine'. Wastewater onshore is captured within 'Onshore Impacts'. Long-term waste impacts (e.g. landfill) are covered under 'Legacy'.
Physical	Physical impacts cover the offshore activities related to the decommissioning activities and relate to physical changes to the structure or substructure of the seabed as a result of the decommissioning project such as anchor pits and dredging activities. Impacts that relate to both the 'Physical' and 'Onshore Impacts' are covered under 'Onshore Impacts'. Impacts to the marine biological environment (e.g. biota, and fish) are covered under 'Marine'. Long-term impacts such as habitat change (e.g. due to rock dump) are covered under legacy.
Marine (includes underwater noise)	Marine is an assessment of impacts to the marine biological environment including benthic organisms, fish, shellfish, plankton, seabirds and marine mammals. Long-term impacts to the marine environment are assessed under 'Legacy' impacts. 'Underwater Noise' impacts on marine mammals and fish (from e.g. cutting of structures in the sea) were assessed individually and assessment results have been incorporated within the 'Marine' impacts matrices. Onshore noise nuisance is covered within 'Onshore' impacts.
Environmental Risk from Accidents	Environmental Risk from Accidents qualitatively assesses the risk to the environment from potential accidents during the decommissioning activities. The consequences from such accidents are expected to be reversible, usually delaying the schedule of the decommissioning activities. However, some failures will have the potential to impact the environment through operations (e.g. lifting) resulting in spillages of oil or chemicals (from vessels or broken pipelines) or misplaced disposal (dropped module). This EIA is not an environmental risk assessment, and considers environmental risks from

Category	Description
	accidents only in a broad sense.
Employment	Employment assesses potential impacts to employment resulting from decommissioning activities to both onshore and offshore workforce as well as from vessels activity.
Legacy	Legacy assesses the long-term (legacy) impacts (physical and chemical) of all decommissioning activities and of leaving structures *in situ* in the sea (to eventually degrade over hundreds of years). This is an all-encompassing assessment which looks at overall long-term impacts to all environmental categories.
Fisheries	The fisheries assessment of impacts to the fishing industry as a result of decommissioning activities considers operations such as increased marine operations and traffic affecting fishing vessels. The current state of the commercial fishing industry in the area is used as the environmental baseline. Long-term impacts as a result of leaving structures *in situ* are assessed under 'Legacy'.
Shipping	Impacts to shipping and shipping lanes resulting from operational decommissioning activities are assessed in this category. Proximity of shipping routes to the Brent platforms and ship frequency is considered, as well as projected use of decommissioning vessels. Long-term impacts to shipping as a result of leaving structures *in situ* are assessed under 'Legacy'.
Energy and Emissions (E&E)	Energy and Emissions estimates the energy use and gaseous emissions (CO_2, NO_x, SO_x) associated with the various decommissioning options. This comprises E&E from preparatory work through to material removal, offshore transport, onshore demolition, onshore transport, and the recycling of metals and other materials. In addition, the E&E associated with the replacement of 'lost' materials (materials which are either left *in situ* or disposed of to landfill and thus not recycled) is taken into account. See Section 4 for further detail.

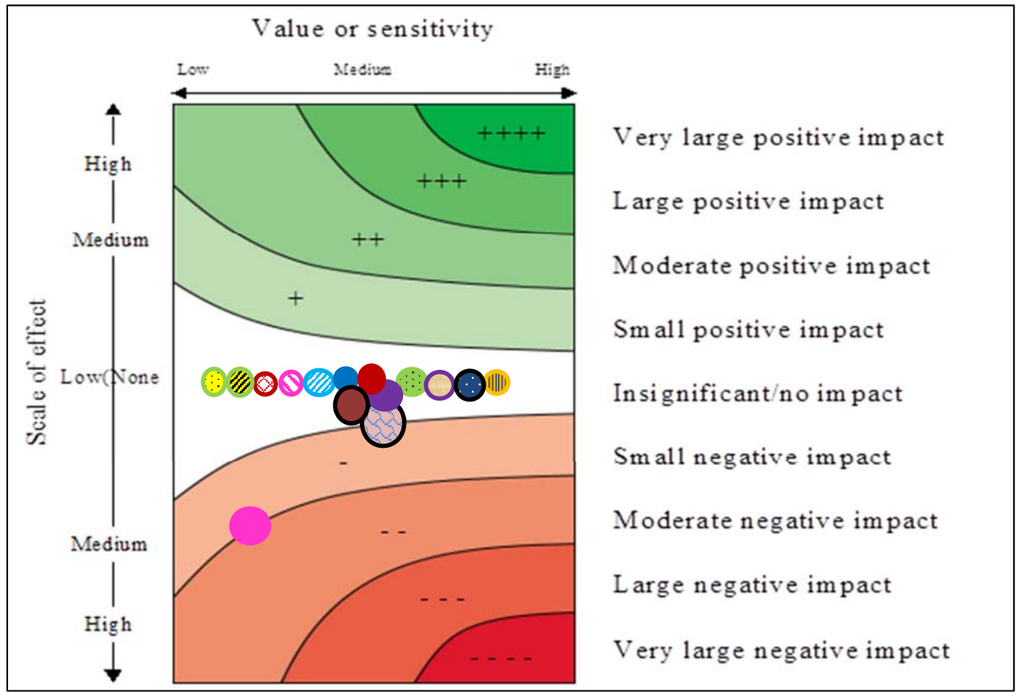
Onshore Impacts



Note: some impact points have been moved slightly on the x-axis to facilitate visibility (without changing the impact).

Topsides Option 1: Complete removal	
Brent A Upper Jacket Option 1: Complete removal	
Brent A Jacket Footings Option 3: Leave *in situ*	
GBS Option 2: Leave *in situ*	
GBS Attic Oil Option 1: Complete removal	
GBS Cell Contents Option 5: Leave *in situ*	
GBS Drilling Legs Option 5: Leave *in situ*	
GBS Minicell Annulus Option 5: Leave *in situ*	
Seabed Drill Cuttings Option 1: Leave *in situ*	
Brent B and D Cell Top Drill Cuttings Option 1: Partial removal by water jetting	
Brent C Cell Top Drill Cuttings Option 3: Dredge and transport slurry to shore for treatment	
Tri-cell Drill Cuttings Option 1: Leave *in situ*	
Pipelines: Proposed Programme of works	
Subsea Structures and Debris Option 1: Complete removal	
Wells Option 1: Plugging and Abandonment	

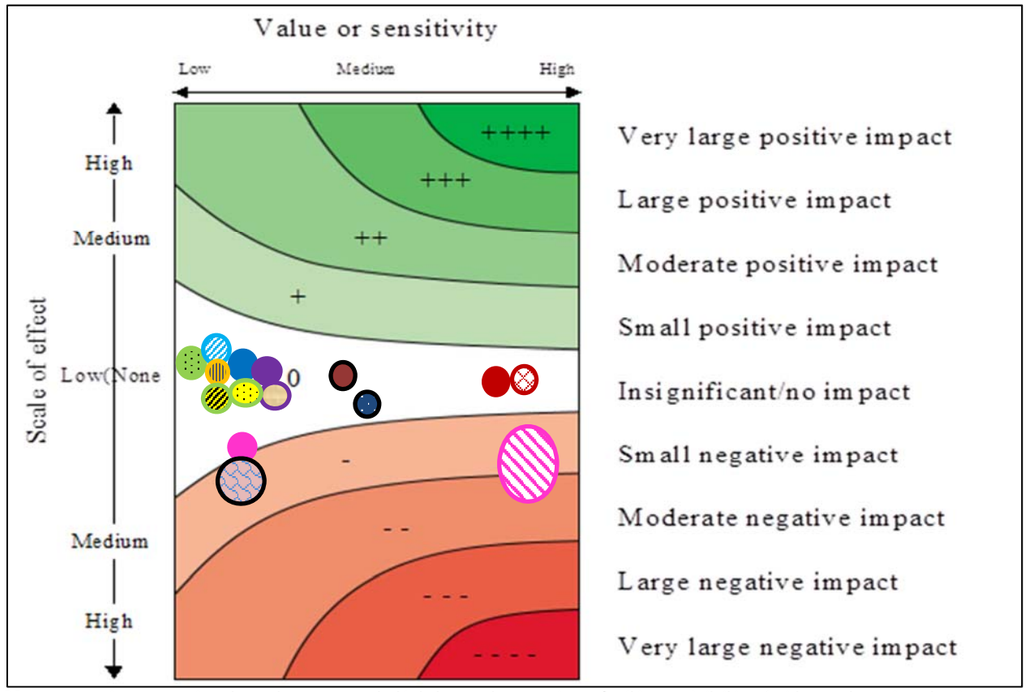
Resource Use



Note: some impact points have been moved slightly on the x-axis to facilitate visibility (without changing the impact).

Topsides Option 1: Complete removal	
Brent A Upper Jacket Option 1: Complete removal	
Brent A Jacket Footings Option 3: Leave *in situ*	
GBS Option 2: Leave *in situ*	
GBS Attic Oil Option 1: Complete removal	
GBS Cell Contents Option 5: Leave *in situ*	
GBS Drilling Legs Option 5: Leave *in situ*	
GBS Minicell Annulus Option 5: Leave *in situ*	
Seabed Drill Cuttings Option 1: Leave *in situ*	
Brent B and D Cell Top Drill Cuttings Option 1: Partial removal by water jetting	
Brent C Cell Top Drill Cuttings Option 3: Dredge and transport slurry to shore for treatment	
Tri-cell Drill Cuttings Option 1: Leave *in situ*	
Pipelines: Proposed Programme of works	
Subsea Structures and Debris Option 1: Complete removal	
Wells Option 1: Plugging and Abandonment	

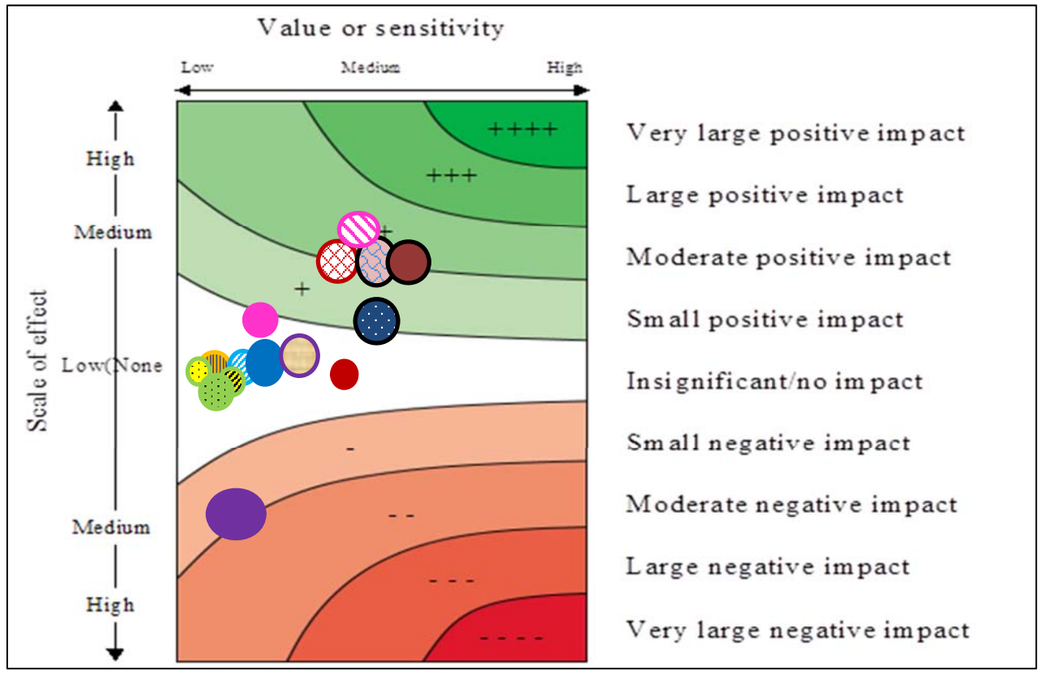
Hazardous Substances



Note: some impact points have been moved slightly on the x-axis to facilitate visibility (without changing the impact)

Topsides Option 1: Complete removal	
Brent A Upper Jacket Option 1: Complete removal	
Brent A Jacket Footings Option 3: Leave *in situ*	
GBS Option 2: Leave *in situ*	
GBS Attic Oil Option 1: Complete removal	
GBS Cell Contents Option 5: Leave *in situ*	
GBS Drilling Legs Option 5: Leave *in situ*	
GBS Minicell Annulus Option 5: Leave *in situ*	
Seabed Drill Cuttings Option 1: Leave *in situ*	
Brent B and D Cell Top Drill Cuttings Option 1: Partial removal by water jetting	
Brent C Cell Top Drill Cuttings Option 3: Dredge and transport slurry to shore for treatment	
Tri-cell Drill Cuttings Option 1: Leave *in situ*	
Pipelines: Proposed Programme of works	
Subsea Structures and Debris Option 1: Complete removal	
Wells Option 1: Plugging and Abandonment	

Waste



Note: some impact points have been moved slightly on the x-axis to facilitate visibility (without changing the impact).

Topsides Option 1: Complete removal	
Brent A Upper Jacket Option 1: Complete removal	
Brent A Jacket Footings Option 3: Leave *in situ*	
GBS Option 2: Leave *in situ*	
GBS Attic Oil Option 1: Complete removal	
GBS Cell Contents Option 5: Leave *in situ*	
GBS Drilling Legs Option 5: Leave *in situ*	
GBS Minicell Annulus Option 5: Leave *in situ*	
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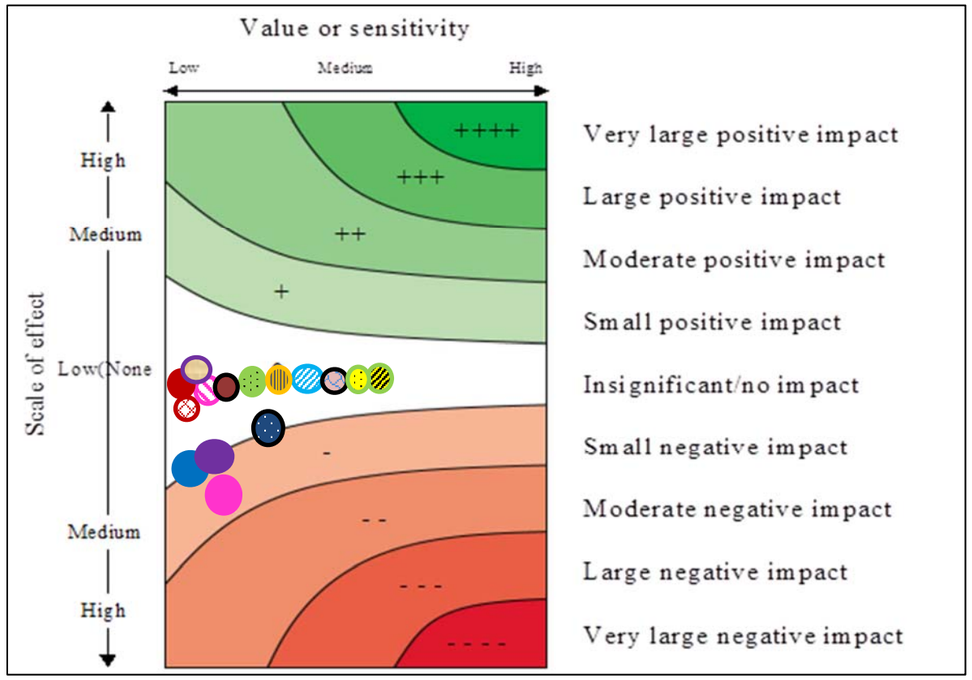
Physical



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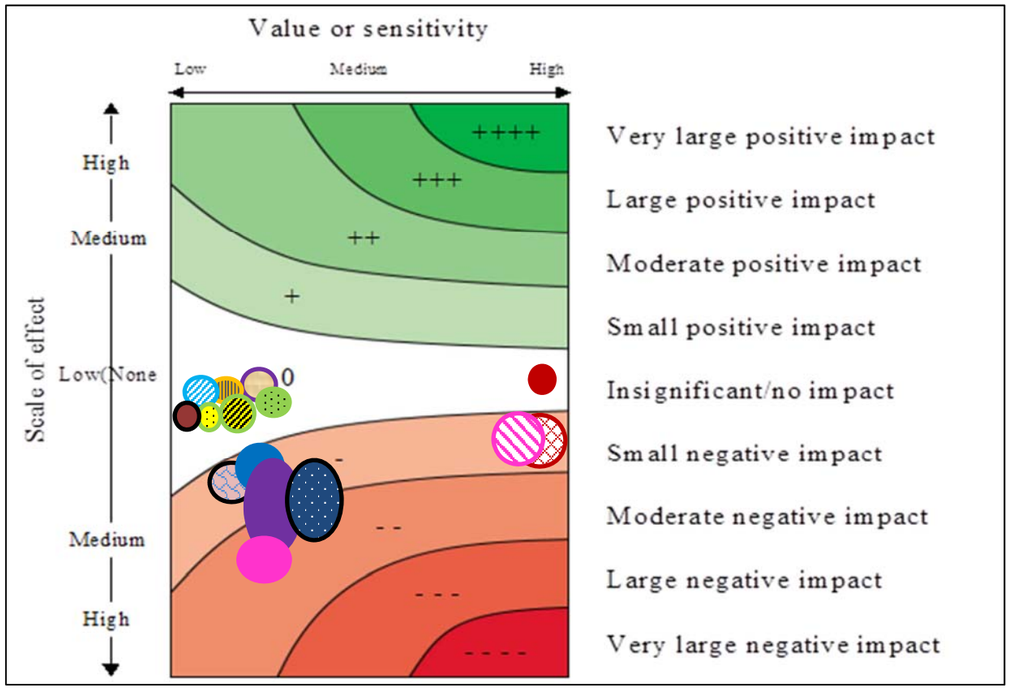
Marine



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Brent A Jacket Footings Option 3: Leave *in situ*	
GBS Option 2: Leave *in situ*	
GBS Attic Oil Option 1: Complete removal	
GBS Cell Contents Option 5: Leave *in situ*	
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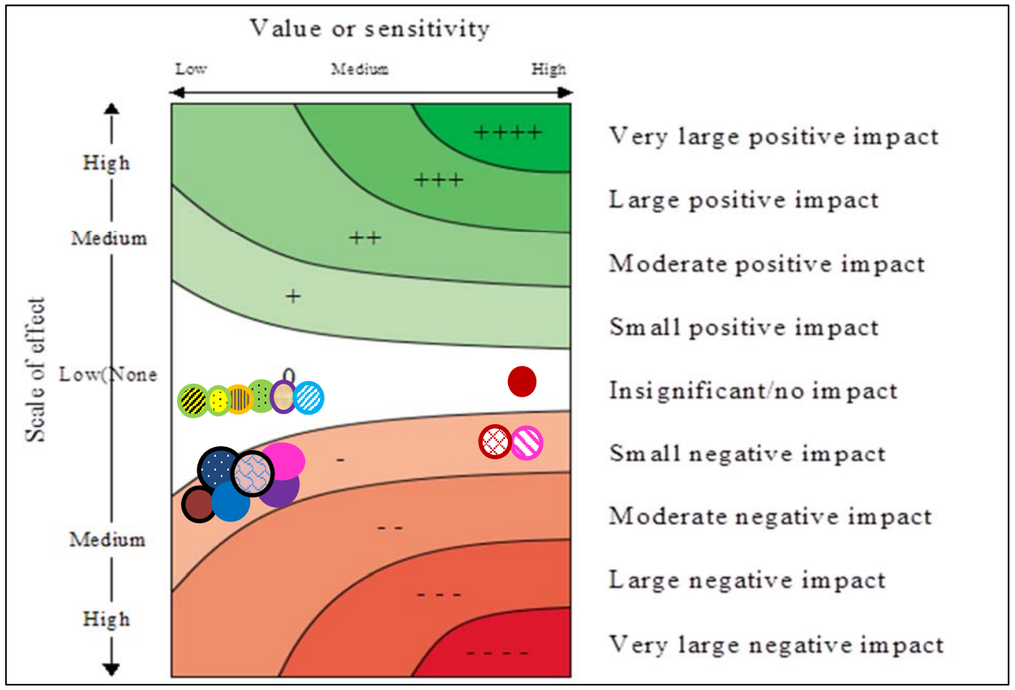
Underwater Noise



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GBS Attic Oil Option 1: Complete removal	
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GBS Drilling Legs Option 5: Leave *in situ*	
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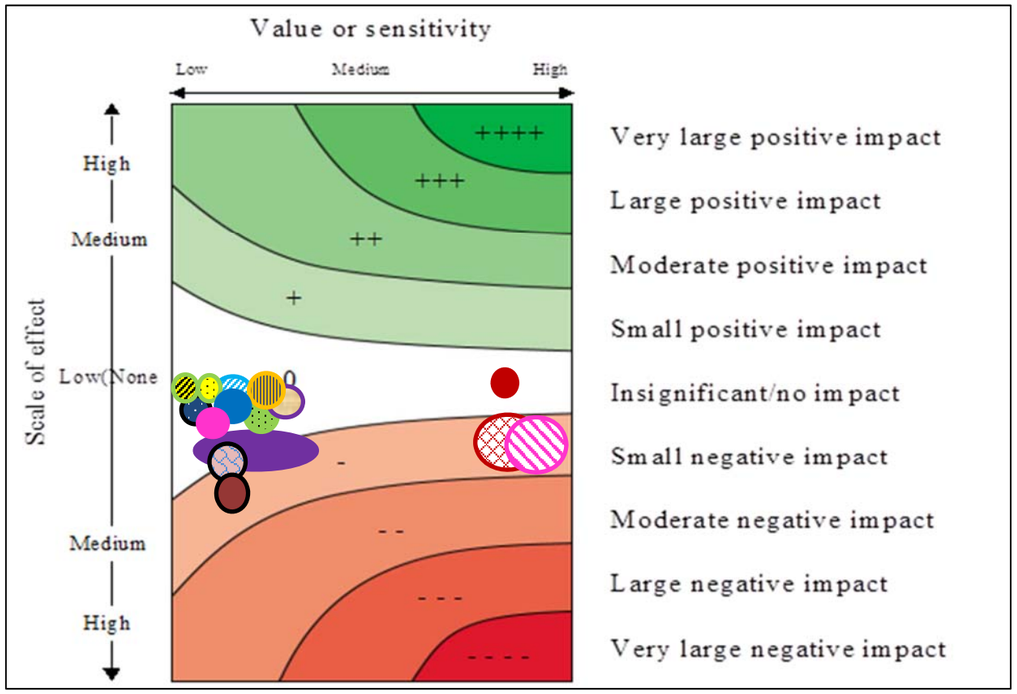
Environmental Risk from Accidents



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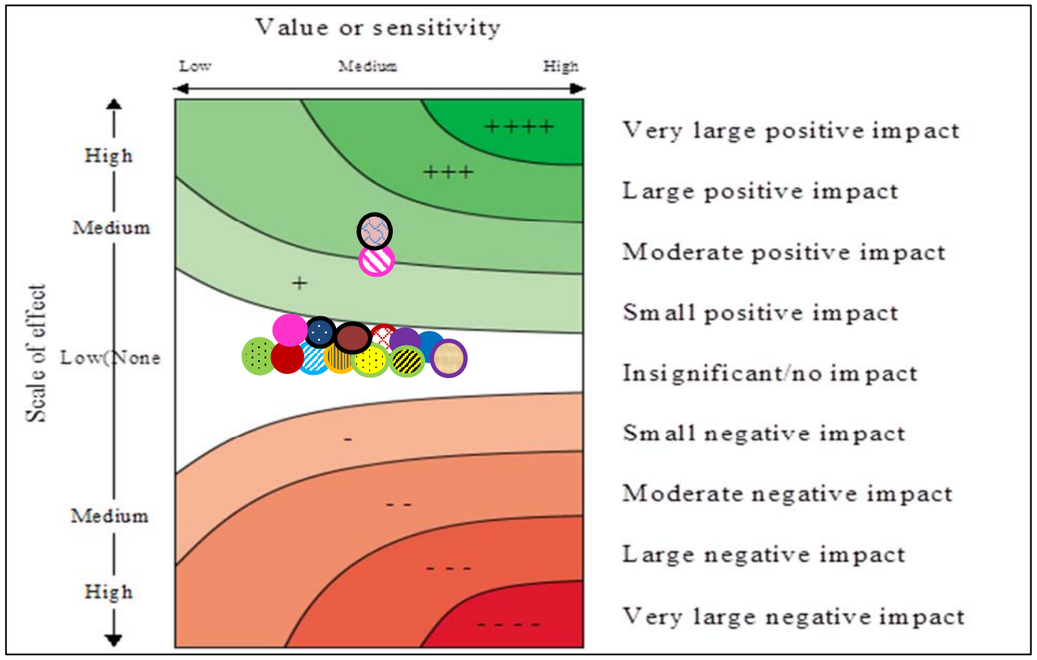
Employment



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GBS Drilling Legs Option 5: Leave *in situ*	
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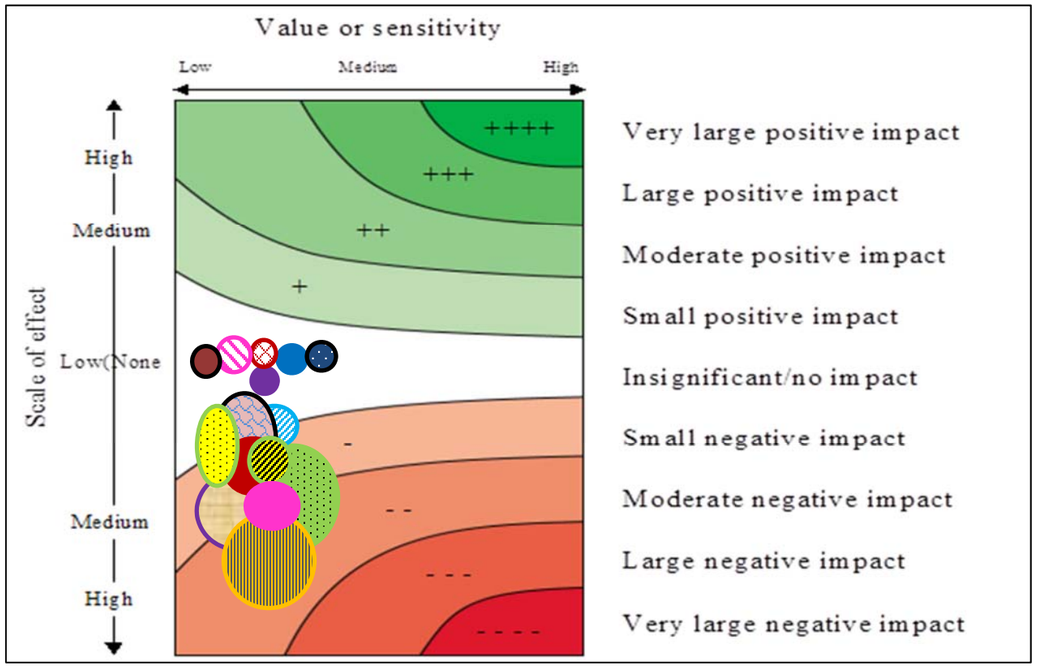
Legacy



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GBS Minicell Annulus Option 5: Leave *in situ*	
Drill Cuttings Option 1: Leave *in situ*	
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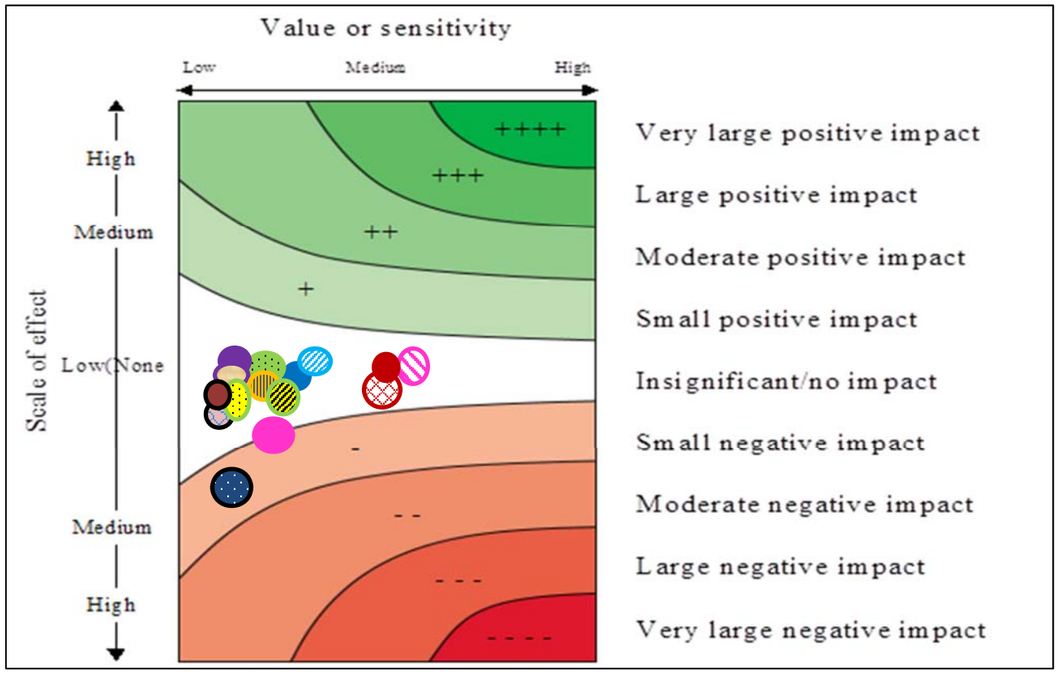
Fisheries



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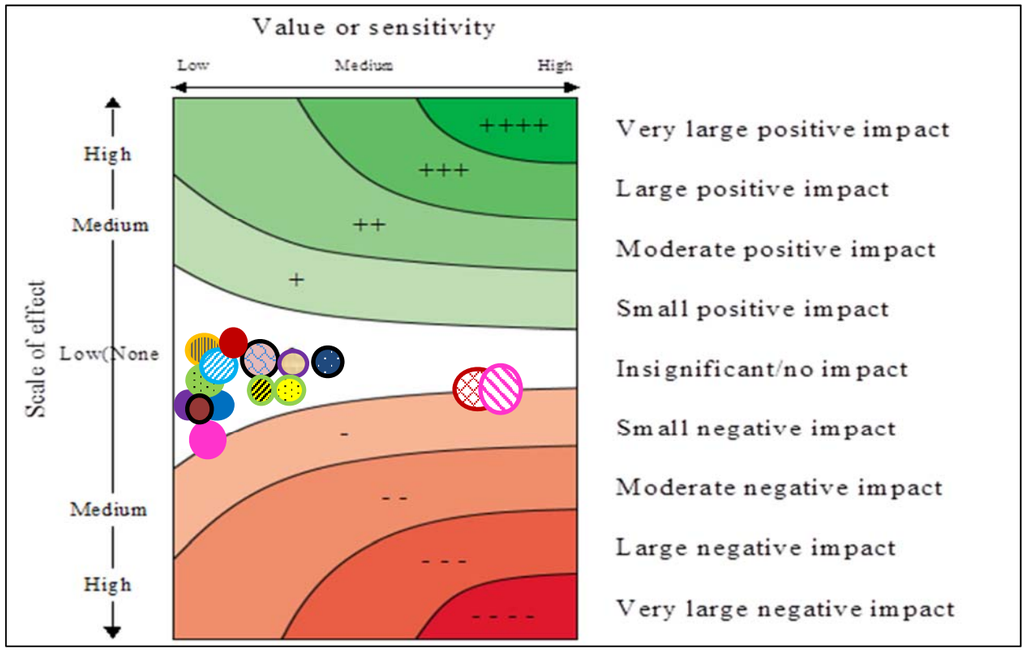
Shipping



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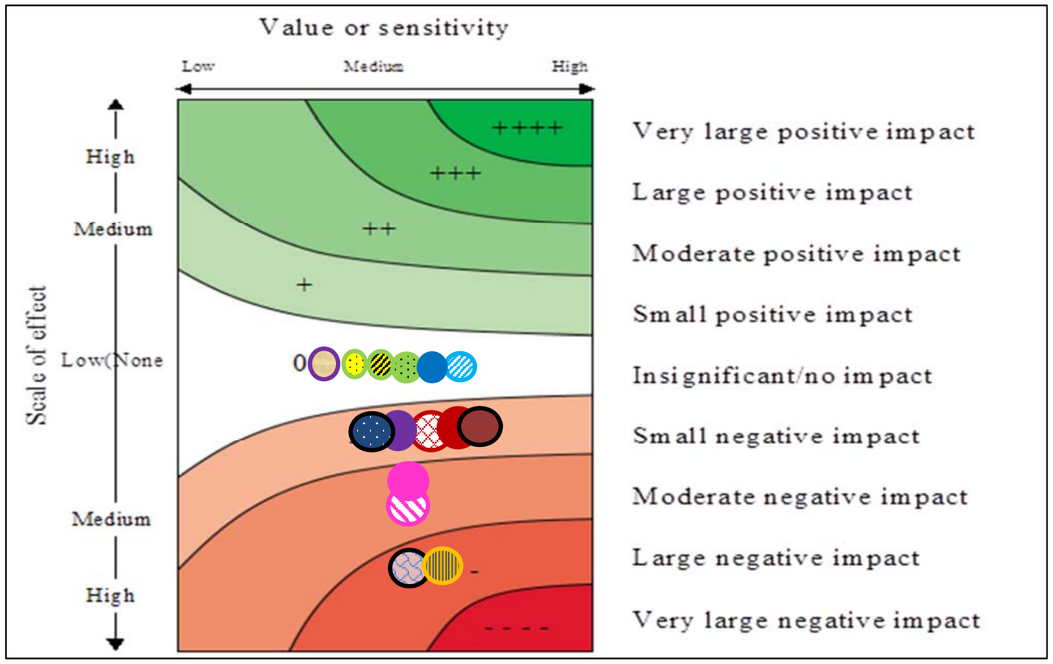
Energy and Emissions



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- For details refer to: DNV GL, *Energy and Emissions Report for the Brent Field Decommissioning EIA*, Rev 5, DNV GL Report No: 187KVXJ-13, December 2016

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