Leman F & G Decommissioning Programmes

Shell Report Number LDFG-PT-S-AA-8203-00001

Draft Revision, July 2023

Issued for Public Consultation

Distribution List (for Statutory and Public Consultation)

Name	Company/Organisation	No of Hard Copies
John Riche	ExxonMobil	1
Fiona Livingston	Offshore Petroleum Regulator for the Environment and Decommissioning (OPRED)	1
Steven Alexander	Scottish Fishermen's Federation	1
Ian Rowe	The National Federation of Fishermen's Organisation	1
Richard James	Northern Irish Fish Producers Organisation	1
Alex Riddell	Global Marine Group	1

HOLDS

Number	Description of HOLD	Page
1	CLEARED	
2	CLEARED	
3	CLEARED	
4	CLEARED	
5	CLEARED	
6	CLEARED	
7	CLEARED	
8	CLEARED	
9	Update Table 5.1 following public consultation	55
10	Partner Letters of Support to be added to approval revision	61
11	CLEARED	
12	CLEARED	

Terms and Abbreviations

Term	Explanation
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
CA	Comparative Assessment
CFC	Chlorofluorocarbons
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CH_4	Methane
CMID	Common Marine Inspection Document
CoP	Cessation of Production
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CPF	Central Processing Facility
DECC	Department of Energy and Climate Change (now DESNZ)
DESNZ	Department for Energy Security and Net Zero
DOB	Depth-of-Burial
DP	Decommissioning Programme(s)
E&A	Exploration and Appraisal (well)
EA	Environmental Appraisal
ENVID	Environmental Impact Identification
EPS	European Protected Species
ESD	Emergency Shut Down
EU	European Union
EUNIS	European Nature Information System
FRT	Field Response Team
FSM	Field Signature Method
GHG	Greenhouse Gases
GMAS	Global Maritime Assurance System
HazMat	Hazardous Material
HLV	Heavy Lift Vessel
HSE	Health and Safety Executive
HSSE&SP	Health, Safety, Security, Environment and Social Performance
ICC	Installation Control Centre
ICES	International Council for the Exploration of the Sea

Term	Explanation
IHM	Inventory of Hazardous Material(s)
IPCC	Intergovernmental Panel on Climate Change
JNCC	Joint Nature Conservation Committee
MARPOL	International Convention for the Prevention of Pollution from Ships
MCAA	Marine and Coastal Access Act
MCZ	Marine Conservation Zone
MoD	Ministry of Defence
NFFO	National Federation of Fisheries Organisations
NORM	Naturally Occurring Radioactive Material
NOx	Nitrous Oxide
NSTA	North Sea Transition Authority
NUI	Normally Unattended Installation
OBM	Oil Based Mud
ODU	Offshore Decommissioning Unit (OPRED)
OEUK	Offshore Energies UK (formerly OGUK – Oil and Gas UK)
OPEP	Oil Pollution Emergency Plan
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
OSPAR	Oslo and Paris Convention (for the Protection of the Marine Environment of the North-East Atlantic)
P&A	Plug and Abandonment (Wells)
P&L	Plug and Lubricate (Wells)
PETS	Portal Environmental Tracking System
PLEM	PipeLine End Manifold
PON	Petroleum Operations Notice(s)
PPF	PolyPropylene Fibres
PWA	Pipeline Works Authorisation
PWR	Preparatory Works Request
SAC	Special Area of Conservation
SCAP	Supply Chain Action Plan
SEE	Shipboard Energy Efficiency
SFF	Scottish Fishermen's Federation
SLV	Single Lift Vessel
SNS	Southern North Sea

Term	Explanation
SO_2	Sulphur Dioxide
SOSI	Seabird Oil Sensitivity Index
SPA	Special Protected Area
SPU	Polyurea Elastic Waterproof Coating
SSIV	SubSea Isolation Valve
Te	Metric Tonne
TUTU	Topsides Umbilical Termination Unit
UKCS	United Kingdom Continental Shelf
UOS	Unplanned Overnight Shelter
VOCs	Volatile Organic Compounds
WBM	Water Based Mud
WBS	Work Breakdown Structure
WGS84	World Geodetic System 1984
WMP	Waste Management Plan

Figures and Tables

List of Figures

List of Tables

Appendices

List of Appendices	Description	Page
1	Public Notice	71
2	Depth of Burial Charts	72

1 EXECUTIVE SUMMARY

1.1 Combined Decommissioning Programmes

This document contains two decommissioning programme(s) for (1) the Leman F and G installations, and (2) the Leman F and G pipelines / cables.

The pipelines and installations included in these Decommissioning Programmes do not cover the full scope of the Leman Installation and Pipeline Section 29 notices. Those pipelines and installations that remain on the Section 29 notices will be the subject of separate Programmes to be submitted at a later date.

The owners of the installations are Shell U.K. Limited, registered number 00140141 (Shell, the operator), and Esso Exploration and Production UK Limited, registered number 00207426 (Exxon). Shell has prepared these Programmes in accordance with Section 29 of the Petroleum Act, and Exxon confirms that it supports the proposals described in it. A letter of support from Exxon will be provided in Section 8 of the final approval revision of this document.

Throughout this document the terms “owners”, “we” and “our” refer to the co-venturers as noted above.

1.2 Requirement for Decommissioning Programmes

These draft DPs are submitted for statutory and public consultation in compliance with relevant legislation and guidelines from the Offshore Petroleum Regulator for the Environment and Decommissioning (OPRED), part of the Department for Energy Security and Net Zero (DESNZ). They describe the principles of the decommissioning activities in compliance with national and international regulations, whilst also presenting an assessment of the environmental impacts of the proposed programmes.

Note that whilst this document contains two Decommissioning Programmes, relevant to the two Leman Section 29 Notices (Leman Installations and Leman Pipelines), Shell has split the contents of this document to outline Leman F and G installations and pipelines separately, for ease of reading.

Leman F Installation(s):

In accordance with the Petroleum Act 1998, the Section 29 notice holders of the Leman F installations (see Table 1.2) are applying to OPRED to obtain approval for decommissioning the installations detailed in Section 2.1.1 and 2.1.2 of these programmes. (See also Section 8 - Partner Letter(s) of Support).

Leman G Installation(s):

In accordance with the Petroleum Act 1998, the Section 29 notice holders of the Leman G installations (see Table 1.4) are applying to OPRED to obtain approval for decommissioning the installations detailed in Section 2.2.1 and 2.2.2 of these programmes. (See also Section 8 - Partner Letter(s) of Support).

Leman F Pipeline(s):

In accordance with the Petroleum Act 1998, the Section 29 notice holders of the Leman F pipelines (see Table 1.6) are applying to OPRED to obtain approval for decommissioning the pipelines detailed in Section 2.1.3 of these programmes. (See also Section 8 – Partner Letter(s) of Support).

Leman G Pipeline(s):

In accordance with the Petroleum Act 1998, the Section 29 notice holders of the Leman G pipelines (see Table 1.8) are applying to OPRED to obtain approval for decommissioning the pipelines detailed in Section 2.2.3 of these programmes. (See also Section 8 – Partner Letter(s) of Support).

In conjunction with public, stakeholder and regulatory consultation, the decommissioning programmes are submitted in compliance with national and international regulations and OPRED guidelines. The schedule outlined in this document is for a 6-year decommissioning project plan due to begin in 2023.

1.3 Introduction

The Leman Gas Field was discovered in December 1965, with production from Leman commencing in 1968. Operation of the Leman Field is split between Shell and Perenco.

Both platforms are NUIs, meaning maintenance or well service visits are carried out via walk-to-work vessels. Whilst overnight stays are not planned, an Unplanned Overnight Shelter is provided on both platforms.

Both facilities are controlled by the Installation Control Centre at Bacton and served by a Field Response Team sourced from the Leman Complex and/or onshore personnel.

Leman F stands in 35m water depth, approximately 73km north-east of Lowestoft and 48km from Bacton in Block 49/26. Leman G stands in 20m water depth, approximately 75km north-east of Lowestoft and 51km from Bacton in Block 49/26.

Production from Leman G is exported to Leman F via the 2.7km, 14" carbon steel gas export pipeline PL364. Production from both Leman G and Leman F is then exported to the Leman A Complex via the 4.8km, 20" carbon steel gas export pipeline PL363. At the Leman A Complex, water is removed and the gas is compressed together with the gas produced by the other Leman platforms and the Corvette Pipeline User Group platforms, before it is exported to Bacton.

Power is provided via cables from Leman AK to Leman F (PL5148), and from Leman F to Leman G (PL5147).

Leman F and G are two satellite NUIs in late-life which contribute only a small percentage of the overall production from Shell's Leman assets. Shell has submitted a Cessation of Production (CoP) Report to the North Sea Transition Authority (NSTA) seeking approval to cease production from Leman F and G no earlier than 31 December 2022. The NSTA issued a letter of no objection to these proposals on 29 March 2022.

1.4 Overview of Installations and Pipelines Being Decommissioned

1.4.1 Leman F Installation

Table 1.1: Leman F Installation Being Decommissioned			
Field(s)	Leman F	**Production Type**	Gas
Water Depth (m)	35	**UKCS block**	49/26
Distance to median (km)	69	**Distance from nearest UK coastline (km)**	48
Surface Installation(s)			
Number	Type	Topsides Weight (Te)	Jacket Weight (Te)
1	Fixed steel jacket with topsides	2174	~1000 (plus 6 piles totalling an additional 930Te)
Subsea Installation(s)		**Number of Wells**	
Number	Type	Platform	Subsea
0	N/A	14	0
Drill Cuttings pile(s)			
Number of Piles	0	Total Estimated volume (m^3)	N/A

Table 1.2: Leman F Installation Section 29 Notice Holders Summary		
S29 Notice Holder	**Registration Number**	**Equity Interest**
Shell U.K. Limited	00140141	50%
Esso Exploration and Production UK Limited	00207426	50%

1.4.2 Leman G Installation

Table 1.3: Leman G Installation Being Decommissioned			
Field(s)	Leman G	**Production Type**	Gas
Water Depth (m)	22	**UKCS block**	49/26
Distance to median (km)	66	**Distance from nearest UK coastline (km)**	51
Surface Installation(s)			
Number	Type	Topsides Weight (Te)	Jacket Weight (Te)
1	Fixed steel jacket with topsides	2054	~1100 (plus 6 piles totalling an additional 888Te)
Subsea Installation(s)		**Number of Wells**	
Number	Type	Platform	Subsea
0	N/A	12	0
Drill Cuttings pile(s)			
Number of Piles	0	Total Estimated volume (m^3)	N/A

Table 1.4: Leman G Installation Section 29 Notice Holders Summary		
S29 Notice Holder	**Registration Number**	**Equity Interest**
Shell U.K. Limited	00140141	50%
Esso Exploration and Production UK Limited	00207426	50%

1.4.3 Leman F Pipelines

Table 1.5: Leman F Pipelines Being Decommissioned	
Number and total length (km) of Pipeline(s) **Full details given in Table 2.3**	2 9.6km

Table 1.6: Leman F Pipelines Section 29 Notice Holders Summary		
S29 Notice Holder	**Registration Number**	**Equity Interest**
Shell U.K. Limited	00140141	50%
Esso Exploration and Production UK Limited	00207426	50%

1.4.1 Leman G Pipelines

Table 1.7: Leman G Pipelines Being Decommissioned	
Number and total length (km) of Pipeline(s) **Full details given in Table 2.9**	2 5.4km

Table 1.8: Leman G Pipelines Section 29 Notice Holders Summary		
S29 Notice Holder	**Registration Number**	**Equity Interest**
Shell U.K. Limited	00140141	50%
Esso Exploration and Production UK Limited	00207426	50%

1.5 Summary of Proposed Decommissioning Programmes

Table 1.9: Summary of Decommissioning Programmes		
Selected Option	**Reason for Selection**	**Proposed Decommissioning Solution**
1. Topsides		
Complete removal for re-use, recycling or disposal	Allows the jacket to be removed and will maximise potential for re-use or recycling of materials	Both topsides will be removed and recovered to shore. Topsides process equipment will be drained, flushed, purged and vented offshore prior to preparation for removal. Where required, further cleaning will be carried out at the dismantling / disposal site for re-use or recycling, as appropriate.
2. Substructures (Jackets)		
Complete removal for recycling or disposal	To comply with the OSPAR requirement to leave a clear seabed, removes a potential obstruction to fishing operation and maximises the potential for recycling of materials.	The leg piles will be cut to a target depth of at least 3m below the mean seabed level. As the seabed around Leman G is expected to vary significantly over time, Shell will investigate the opportunities to perform deeper internal cuts of the piles, subject to surveys to verify the piles are free of internal blockages. Cutting of the piles is anticipated to be executed by internal cutting equipment. However, if this proves unfeasible it would be necessary to excavate the seabed around the piles to enable external cutting. Where required, cleaning will be carried out at the dismantling site for recycling, as appropriate. The base case is for the conductors to be cut-and-proven during the well abandonment activities and removed during the facilities removal campaign; however Shell will assess alternative options for removal based on structural integrity, project efficiency and vessel capability

Table 1.9: Summary of Decommissioning Programmes		
Selected Option	**Reason for Selection**	**Proposed Decommissioning Solution**
3. Subsea Installation(s)		
N/A	N/A	N/A
4. Pipelines, Flowlines & Umbilicals		
Production pipelines PL363 and PL364 Surface-laid ends will be removed and recovered for recycling / disposal, including any associated mattresses and grout bags. Remaining length of buried pipeline will be decommissioned *in situ*. The mattresses at PL5148's crossing of PL363, and PL5147's crossing of PL364 are buried and will also be decommissioned *in situ*	Leaves a clear seabed with remaining pipeline buried, minimises disturbance of seabed within Special Area of Conservation	The surface-laid tie-in spools at Leman A, Leman F and Leman G will be removed. The contractor will select the optimal methodology for removal subject to tender. Riser sections of each pipeline will remain within their respective caissons and will be recovered with the jacket for recycling / disposal The cut pipeline ends will be remediated by placing up to 100 tonnes of rock over the pipeline ends where required to minimise the snagging risk Cut points will be fully defined during detailed engineering but include the surface-laid sections of each pipe on approach to the platforms, noting that these areas contain many of the exposures noted during recent surveys. Estimated lengths of each line to be removed are as follows: • PL363 at Leman A: ~60m • PL363 at Leman F: ~75m • PL364 at Leman F: ~60m • PL364 at Leman G: ~40m
Power cables PL5147 and PL5148 Surface-laid ends will be removed and recovered for recycling / disposal, including any associated mattresses and grout bags. Remaining length of buried cables will be decommissioned *in situ*	Leaves a clear seabed with remaining cable buried, minimises disturbance of seabed within Special Area of Conservation	The surface-laid tie-in sections of cable at Leman A, Leman F and Leman G will be removed. The contractor will select the optimal methodology for removal subject to tender. Riser sections of each cable will remain within their respective caissons and will be recovered

Table 1.9: Summary of Decommissioning Programmes		
Selected Option	**Reason for Selection**	**Proposed Decommissioning Solution**
		with the jacket for recycling / disposal The cut cable ends will be remediated by placing up to 100 tonnes of rock over the pipeline ends where required to minimise the snagging risk Cut points will be fully defined during detailed engineering but include the surface-laid sections of each cable on approach to the platforms, noting that these areas contain many of the exposures noted during recent surveys. Estimated lengths of each line to be removed are as follows: • PL5148 at Leman A: ~80m • PL5148 at Leman F: ~40m • PL5147 at Leman F: ~50m • PL5147 at Leman G: ~25m
LinkLok Stabilisation Mattresses Supporting tie-in spools for PL363 and PL364 at Leman AK, Leman F and Leman G	Leaves a clear seabed	Whilst the mattresses are currently buried, it is expected that the removal of the tie-in spools, installed on top of the mattresses, will uncover the mattresses and leave them exposed. Exposed mattresses will be recovered for recycling / disposal
5. Wells		
Wells will be decommissioned in accordance with Offshore Energy UK Well Decommissioning Guidelines (Issue 7, 2022).	Meets NSTA and HSE regulatory requirements	Permit submissions under the relevant regulations will be submitted in support of works to be executed Well casings and conductors will be cut a minimum of 3m below mean seabed level and returned onshore for recycling / disposal. As the seabed around Leman G is expected to vary significantly over time, Shell will investigate the

Table 1.9: Summary of Decommissioning Programmes		
Selected Option	**Reason for Selection**	**Proposed Decommissioning Solution**
		opportunities to perform deeper internal cuts of the conductors
6. Drill Cuttings		
N/A	Whilst there are seabed features adjacent to the Leman F and Leman G platforms, chemical analysis indicates that contaminant levels are below OSPAR thresholds. Therefore, nothing is present that would constitute an oil-based mud cuttings piles within the definition in OSPAR Recommendation 2006/5.	N/A
7. Interdependencies		
Sections of PL363 and PL5148 are located within the 500m safety zone at the Leman AK Platform, which will continue to operate for some years to come. Decommissioning solutions presented within these Programmes for the sections of PL5148 and PL363 within the Leman AK 500m safety zone, including the LinkLok mattresses located underneath PL363, will be executed only when Leman AK is taken out of service. Note that the riser sections of PL363 and PL5148 will remain within their respective caissons at Leman AK. The removal solution for these riser sections of PL363 and PL5148 will be determined only when removal of Leman AK is being considered, however Shell confirms that these sections will be fully removed. There are no crossings associated with third-party pipelines, umbilicals or cables associated with the Leman F & G pipelines and cables.		

1.6 Field Location Including Field Layout and Adjacent Facilities

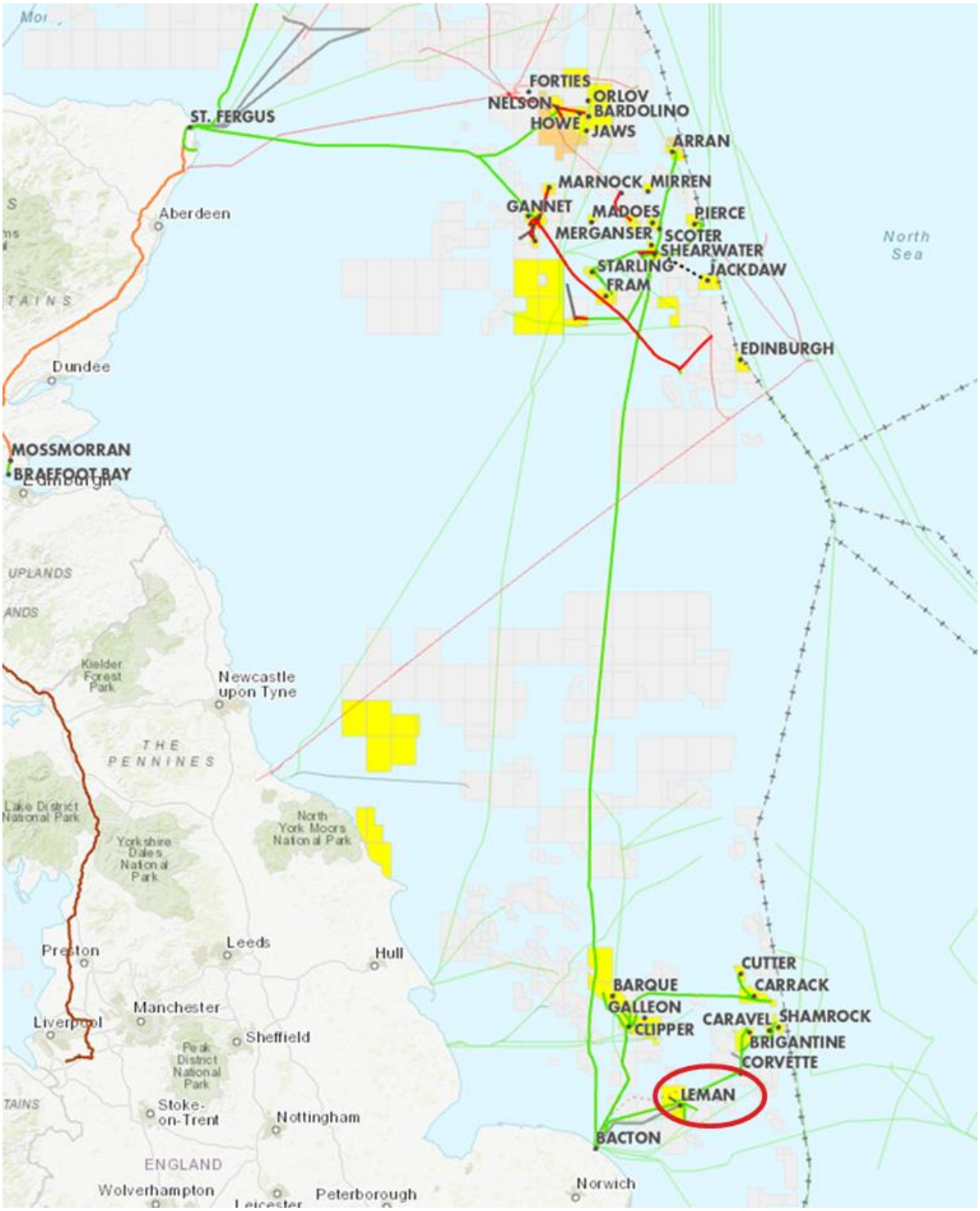

Figure 1.1: Field Location in UKCS

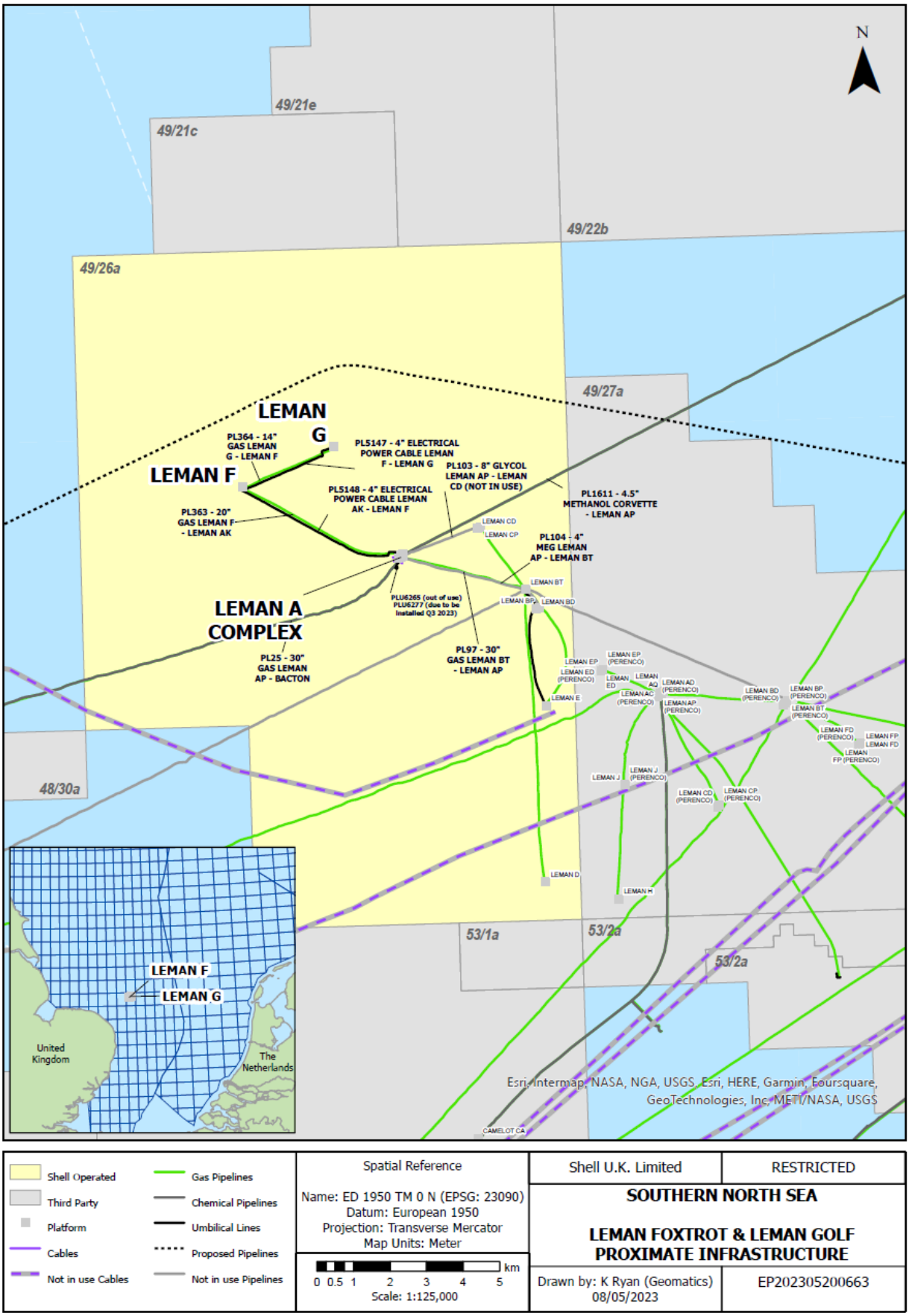

Figure 1.2: Field Layout

Table 1.10: Adjacent Facilities					
Owner	**Name**	**Type**	**Distance/Direction**	**Information**	**Status**
Shell U.K. Limited	Leman A Complex	Bridge-linked platforms	4.7km SE of Leman F 3.5km SSE of Leman G	Production from Leman F and G is exported to Leman AK via PL363 and PL364 Power is provided from Leman AK via PL5148 and PL5147	Active
Shell U.K. Limited	PL1611	Pipeline	4.7km SE of Leman F 3.5km SSE of Leman G	Transports chemicals between Corvette and Leman AP Tied-back to the Leman A Complex adjacent to PL363 and PL5148	Active
Shell U.K. Limited	PL103	Pipeline	4.7km SE of Leman F 3.5km SSE of Leman G	Transports chemicals between Leman CD and Leman AP Tied-back to the Leman A Complex adjacent to PL363 and PL5148	Out of use
Shell U.K. Limited	PL104	Pipeline	4.7km SE of Leman F 3.5km SSE of Leman G	Transports chemicals between Leman BT and Leman AP Tied-back to the Leman A Complex adjacent to PL363 and PL5148	Out of use
Shell U.K. Limited	PL97	Pipeline	4.7km SE of Leman F 3.5km SSE of Leman G	Transports gas between Leman BT and Leman AP Tied-back to the Leman A Complex adjacent to PL363 and PL5148	Active

Table 1.10: Adjacent Facilities					
Owner	**Name**	**Type**	**Distance/Direction**	**Information**	**Status**
Shell U.K. Limited	PLU6265	Umbilical	4.7km SE of Leman F 3.5km SSE of Leman G	Provided controls from Leman AP to the PL25 SSIV Tied-back to the Leman A Complex adjacent to PL363 and PL5148	Out of use
Shell U.K. Limited	PLU6277	Umbilical	4.7km SE of Leman F 3.5km SSE of Leman G	Provides controls from Leman AP to the PL25 SSIV Tied-back to the Leman A Complex adjacent to PL363 and PL5148	Active
Shell U.K. Limited	PL25	Pipeline	4.7km SE of Leman F 3.5km SSE of Leman G	Gas export pipeline from Leman AP to Bacton Tied-back to the Leman A Complex adjacent to PL363 and PL5148	Active
Impacts of Decommissioning Proposals					
PL363 and PL5148 will be disconnected at the base of their respective risers at Leman AK. The riser sections will remain in situ and will be removed with the Leman AK jacket when the latter is decommissioned.					

1.7 Industrial Implications

The Leman F & G Decommissioning Project is aiming to identify safe, efficient and cost-effective methods and procedures for various aspects of decommissioning the Leman F and G Fields.

Initiatives for a portfolio-based approach are ongoing to explore decommissioning execution solutions, including:

- Market Engagements with supply chain companies to identify market capabilities and get market input on the best possible Contracting and Execution Strategies.
- Participation in industry workgroups, events, seminars and conferences.
- Inclusion of trade organisations and enterprise bodies in supply chain consultations.
- Exploring multi-field and potentially multi-operator combined work scopes.

All procurement will be carried out in accordance with the company standards for contract and procurement. Furthermore, in accordance with the North Sea Transition Authority's Supply Chain Action Plans Guidance, Shell is developing a Supply Chain Action Plan (SCAP) to be submitted in support of these Decommissioning Programmes. The first draft of the SCAP will be issued to the NSTA in support of the public consultation revision of these programmes. The final approval revision of the SCAP will be issued to the NSTA in support of the final approval revision of these programmes.

2 Description of Items to be decommissioned

2.1 Leman F

2.1.1 Leman F Installation: Surface Facilities (Topsides and Jackets)

Table 2.1: Surface Facilities Information									
Name	Facility Type	Location		Topsides/Facilities		Jacket (if applicable)			
				Weight (Te)	# of modules	Weight (Te)	# of legs	# of piles	Weight of piles (Te)
Leman F Platform	Fixed steel jacket	WGS84 Decimal	53.108032 02.065629	2174	1	1000	6	6	930
		WGS84 Decimal Minute	53^0 06.482'N 02^0 03.938'E						

2.1.2 Leman F Installations: Subsea including Stabilisation Features

Table 2.2: Subsea Installation and Stabilisation Features				
Subsea installations including Stabilisation Features	Number	Size/Weight (Te)	Location	Comments/Status
N/A	N/A	N/A	N/A	Stabilisation features are recorded in Section 2.1.3 for Pipelines

2.1.3 Leman F: Pipelines Including Stabilisation Features

Table 2.3: Leman F Pipeline and Cable Information									
Description	Pipeline Number (as per PWA)	Diameter (inches)	Length (km)	Description of Component Parts	Product Conveyed	From – To End Points	Burial Status	Pipeline Status	Current Content
Leman F Production Pipeline	PL363	20	4.8	Concrete coated steel	Gas	Leman F Topsides to Leman AK Topsides	Trenched and buried	Operational	Hydrocarbon
Leman F Power Cable	PL5148	4	4.8	Armour-wired power cable	Power	Leman AK Topsides to Leman F Topsides	Trenched and buried	Operational	N/A

Table 2.4: Leman F Subsea Pipeline Stabilisation Features				
Stabilisation Feature	**Total Number**	**Weight (Te)**	**Location(s)**	**Exposed/Buried/Condition**
Concrete mattresses Linklok stabilisation mattresses 10m x 2.5m x 0.15m	32	11.4 tonnes each	14.5 at PL363 tie-in to Leman AK 15.5 at PL363 tie-in to Leman F 2 at PL5148 crossing of PL363	All mattresses are buried
Bitumen mattresses 5m x 2m x 0.2m	9	6 tonnes each	6 at PL5148 tie-in to Leman AK 3 at PL5148 crossing of PL363	All mattresses are buried
Frond Mats 5m x 5m x 0.5m	8	8 tonnes each	2 at PL363 tie-in to Leman F 2 at PL363 tie-in to Leman AK 2 at PL5148 crossing of PL363 2 over PL5148 tie-in to Leman AK	All mattresses are buried
Grout supports	4	7.9 tonnes total	FB75 and SS50 at PL363 tie-in to Leman F	All grout supports are buried

Table 2.4: Leman F Subsea Pipeline Stabilisation Features				
Stabilisation Feature	**Total Number**	**Weight (Te)**	**Location(s)**	**Exposed/Buried/Condition**
1x FB75 type - 0.75m x 1.5m x 1.5m, 2 tonnes 3 x SS50 type – 0.5m x 1.3m x 2.3m, 1.8 tonnes			SS50 at PL363 tie-in to Leman AK	
Grout bags	12	500kg each	Supporting PL363 tie-in at Leman AK	All grout bags are buried
Grout bags	225	25kg each	Estimated numbers at the following locations PL363 - 25 bags supporting riser at Leman F - 25 bags at pipeline tie-in flange at Leman F - 25 bags at grout support below tie-in spool at Leman F - 25 bags supporting riser at Leman A - 25 bags at pipeline tie-in flange at Leman A - 25 bags at grout supports below tie-in spool at Leman A PL5148 - 25 bags supporting riser at Leman F - 25 bags at crossing over PL363 - 25 bags supporting riser at Leman A	All grout bags are buried
Rock Dump	n/a			

2.1.4 Leman F Field Wells

Table 2.5: Leman F Well Information				
Shell No	**DTI No**	**Designation**	**Status**	**Category of Well**
Leman F Wells				
F01	49/26-F10	Gas producer	Plugged	PL 43m3
F02	49/26-F7Z	Gas producer	Completed (Shut in)	PL 3-3-3
F03	49/26-F11	Gas producer	Plugged	PL 4-3-3
F04	49/26-F17	Gas producer	Completed (Shut in)	PL 4-3-3
F05	46/26-F13	Gas producer	Plugged	PL 3-3-3
F06	46/26-F12	Gas producer	Completed (Shut in)	PL 4-3-3
F07	46/26-F6	Gas producer	Plugged	PL 3-3-3
F08	46/26-F1	Gas producer	Completed (Operating)	PL 4-3-3
F09	46/26-F4	Gas producer	Completed (Operating)	PL 3-3-3
F10	46/26-F9	Gas producer	Plugged	PL 4-3-3
F11	46/26-F15	Gas producer	Completed (Shut in)	PL 4-3-3
F12	49/26-F3	Gas producer	Completed (Shut in)	PL 3-3-3
F13	49/26-F16Z	Gas producer	Completed (Shut in)	PL 4-3-3
F15	49/26-F14	Gas producer	Completed (Operating)	PL 3-3-3

For details of well categorisation, see OEUK Guidelines for the Suspension or Abandonment of Wells, Issue 7, November 2022.

2.1.5 Leman F Drill Cuttings

Whilst there are seabed features to the east-southeast of the Leman F Platform, chemical analysis indicates that contaminant levels are below OSPAR thresholds. Therefore, nothing is present that would constitute an oil-based mud cuttings piles within the definition in OSPAR Recommendation 2006/5.

Refer to Section 2.2.6 of the Environmental Appraisal [3] for further details.

2.1.6 Leman F Inventory Estimates

The total inventory of installation and pipeline materials at the Leman F Field is 6958 tonnes. 4827 tonnes of this total relates to installations, with the remaining 2158 tonnes relating to pipelines, cables, mattresses and grout bags.

The following charts indicate the estimated inventory of material for the Leman F installations and pipelines. Please refer to Sections 2.7.2 and 2.7.3 of the Environmental Appraisal for further information on potential hazardous wastes. Material inventory excludes rock cover.

Table 2.6: Leman F Material Inventory		
Material	**Weight (Te)**	**% of total**
Installations		
Carbon Steel	4543	94.1%
Stainless Steel	25	0.5%
Non-Ferrous Metal	119	2.5%
Concrete	0	-
Plastics	32	0.7%
Haz Mat/NORM*	3	0.1%
Other Non-Hazardous	106	2.2%
Installations Total	4827	100%
Pipelines		
Carbon Steel	1099	50.9%
Stainless Steel	0	-
Non-Ferrous Metal	12	0.6%
Concrete	966	44.8%
Plastics	80	3.7%
Haz Mat/NORM*	0	-
Other Non-Hazardous	0	-
Pipelines Total	2158	100%

*Note that the estimated volume of 'Haz Mat / NORM' refers to and includes hazardous elements such as radioactive sources for level transmitters and operational chemicals. Per Table 3.1 there is no history of NORM onboard Leman F and none is anticipated during decommissioning activities.

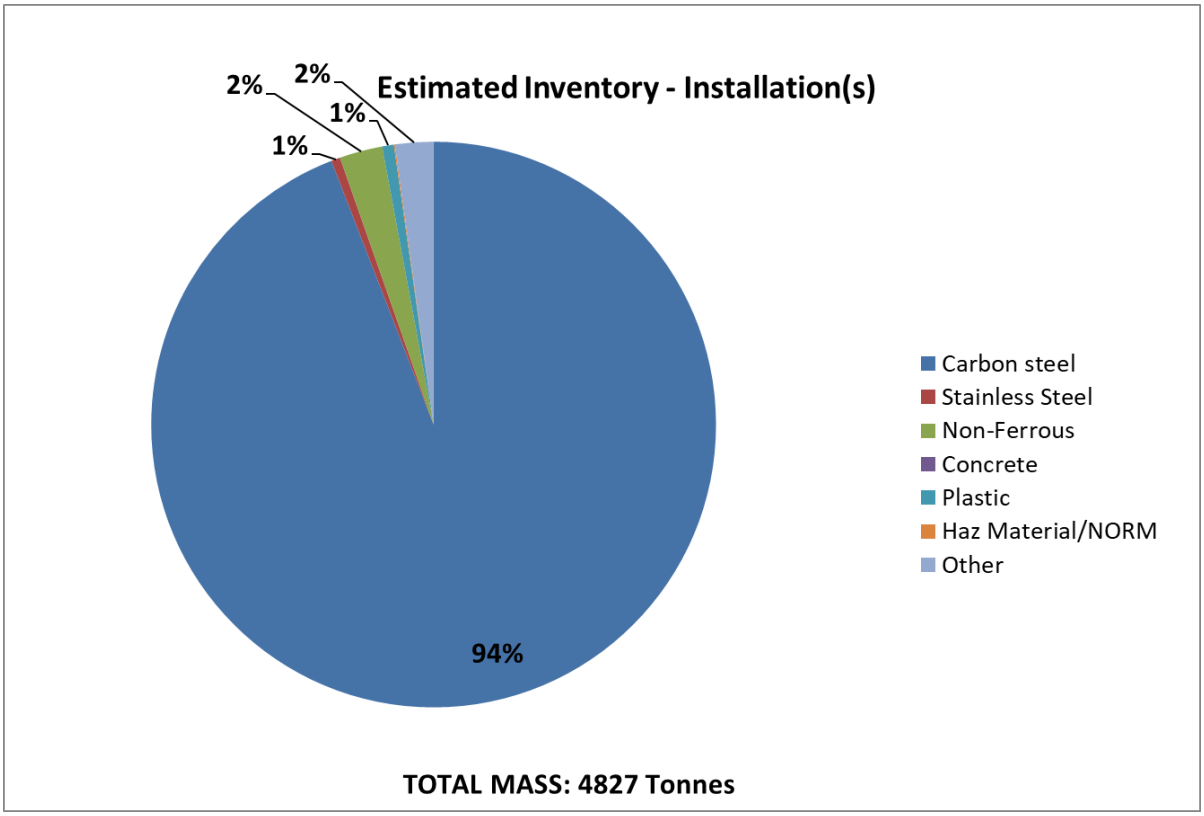

Figure 2.1: Estimated Inventories (Leman F Installations)

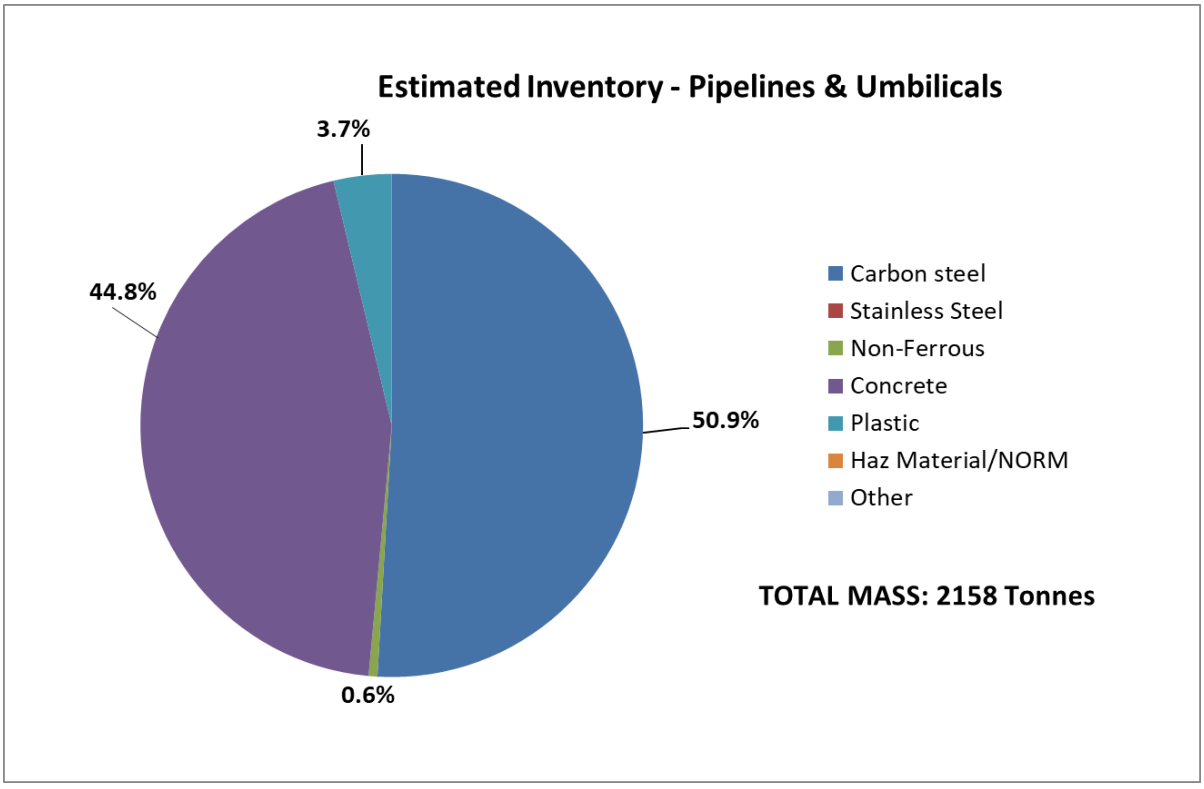

Figure 2.2: Estimated Inventories (Leman F Pipelines) (excluding rock cover)

2.2 Leman G

2.2.1 Leman G Installation: Surface Facilities (Topsides and Jackets)

Table 2.7: Surface Facilities Information									
Name	Facility Type	Location		Topsides/Facilities		Jacket (if applicable)			
				Weight (Te)	# of modules	Weight (Te)	# of legs	# of piles	Weight of piles (Te)
Leman G Platform	Fixed steel jacket	WGS84 Decimal	53.117303 02.103179	2054	1	1100	6	6	888
		WGS84 Decimal Minute	53^0 06.482'N 02^0 03.938'E						

2.2.2 Leman G Installations: Subsea including Stabilisation Features

Table 2.8: Subsea Installation and Stabilisation Features				
Subsea installations including Stabilisation Features	Number	Size/Weight (Te)	Location	Comments/Status
N/A	N/A	N/A	N/A	Stabilisation features are recorded in Section 2.2.3 for Pipelines

2.2.3 Leman G: Pipelines including Stabilisation Features

Table 2.9: Leman G Pipeline and Cable Information									
Description	Pipeline Number (as per PWA)	Diameter (inches)	Length (km)	Description of Component Parts	Product Conveyed	From – To End Points	Burial Status	Pipeline Status	Current Content
Leman G Production Pipeline	PL364	14	2.7	Concrete coated steel	Gas	Leman G Topsides to Leman F Topsides	Trenched and buried	Operational	Hydrocarbon
Leman G Power Cable	PL5147	4	2.7	Armour-wired power cable	Power	Leman F Topsides to Leman G Topsides	Trenched and buried	Operational	N/A

Table 2.10: Leman G Subsea Pipeline Stabilisation Features				
Stabilisation Feature	**Total Number**	**Weight (Te)**	**Location(s)**	**Exposed/Buried/Condition**
Concrete mattresses Linklok stabilisation mattresses 10m x 2.5m x 0.15m	21	11.4 tonnes each	8 at PL364 tie-in to Leman F 11 at PL364 tie-in to Leman G 2 at PL5147 crossing of PL364	All mattresses are buried
Bitumen mattresses 5m x 2m x 0.2m	4	6 tonnes each	1 at PL5147 tie-in to Leman G 3 at PL5147 crossing of PL364	All mattresses are buried
Frond Mats 5m x 5m x 0.5m	6	8 tonnes each	1 at PL364 tie-in to Leman F 2 at PL5147 crossing of PL364 3 over PL5147 tie-in to Leman G	All mattresses are buried
Frond Mats	3	10 tonnes each	1 at PL364 tie-in to Leman F	All mattresses are buried

Table 2.10: Leman G Subsea Pipeline Stabilisation Features				
Stabilisation Feature	**Total Number**	**Weight (Te)**	**Location(s)**	**Exposed/Buried/Condition**
7.5m x 5m x 0.5m			2 at PL364 tie-in to Leman G	
Grout supports 1x FA50 type - 0.5m x 2m x 1.5m, 1.6 tonnes 2x SS50 type – 0.5m x 1.3m x 2.3m, 1.8 tonnes 2x SS75 type - 0.75m x 1.4m x 2.5m, 2.8 tonnes	5	10.8 tonnes total	FA50 and SS50 at PL364 tie-in to Leman F SS75 at PL364 tie-in to Leman G	All grout supports are buried
Grout bags	235	25kg each	Estimated numbers at the following locations PL364 - 25 bags supporting riser at Leman G - 25 bags at pipeline tie-in flange at Leman G - 25 bags at grout support below tie-in spool at Leman G - 25 bags supporting riser at Leman F - 25 bags at pipeline tie-in flange at Leman F - 25 bags at grout supports below tie-in spool at Leman F PL5147 - 25 bags supporting riser at Leman G - 25 bags at crossing over PL364 - 25 bags supporting riser at Leman F	All grout bags are buried

Table 2.10: Leman G Subsea Pipeline Stabilisation Features				
Stabilisation Feature	**Total Number**	**Weight (Te)**	**Location(s)**	**Exposed/Buried/Condition**
			- 10 bags supporting rollerbridge crossing of PL363	
Cable support rollerbridge 3.2m x 2.2m x 2.3m	1	13.2 tonnes	Supports PL5147 crossing of PL363	Surface-laid and exposed
Rock Dump	n/a	100 tonnes	Scour infill at Leman G tie-in flange	

2.2.4 Leman G Wells

Table 2.11: Leman G Well Information				
Shell No	**DTI No**	**Designation**	**Status**	**Category of Well**
G01	49/26-G9	Gas producer	Completed (Shut in)	PL 4-3-3
G02	49/26-G7	Gas producer	Completed (Operating)	PL 3-3-3
G03	49/26-G8	Gas producer	Completed (Shut in)	PL 3-3-3
G04	49/26-G5	Gas producer	Completed (Operating)	PL 3-3-3
G05	49/26-G11	Gas producer	Completed (Shut in)	PL 4-3-3
G06	49/26-G1	Gas producer	Completed (Operating)	PL 4-3-3
G07	49/26-G2	Gas producer	Completed (Shut in)	PL 3-3-3
G08	49/26/G10	Gas producer	Completed (Shut in)	PL 3-3-3
G09	49/26-G12	Gas producer	Completed (Operating)	PL 3-3-3
G10	49/26-G4	Gas producer	Completed (Shut in)	PL 4-3-3
G11	46/26-G6	Gas producer	Completed (Shut in)	PL 3-3-3
G12	49/26-G3	Gas producer	Completed (Shut in)	PL 4-3-3

For details of well categorisation, see OEUK Guidelines for the Suspension or Abandonment of Wells, Issue 7, November 2022.

2.2.5 Leman G Drill Cuttings

Whilst there are seabed features to the northeast of the Leman G Platform, chemical analysis indicates that contaminant levels are below OSPAR thresholds. Therefore, nothing is present that would constitute an oil-based mud cuttings piles within the definition in OSPAR Recommendation 2006/5.

Refer to Section 2.2.6 of the Environmental Appraisal [3] for further details.

2.2.6 Leman G Inventory Estimates

The total inventory of installation and pipeline materials at the Leman G Field is 5412 tonnes. 4263 tonnes of this total relates to installations, with the remaining 1149 tonnes relating to pipelines, cables, mattresses and grout bags.

The following charts indicate the estimated inventory of material for the Leman G installations and pipelines. Please refer to Sections 2.7.2 and 2.7.3 of the Environmental Appraisal for further information on potential hazardous wastes. Material inventory excludes rock cover.

Table 2.12: Leman G Material Inventory		
Material	**Weight (Te)**	**% of total**
Installations		
Carbon Steel	3986	93.5%
Stainless Steel	21	0.5%
Non-Ferrous Metal	123	2.9%
Concrete	0	-
Plastics	34	0.8%
Haz Mat/NORM*	3	0.1%
Other Non-Hazardous	95	2.2%
Installations Total	4263	100%
Pipelines		
Carbon Steel	330	28.8%
Stainless Steel	0	-
Non-Ferrous Metal	5	0.4%
Concrete	768	66.9%
Plastics	45	3.9%
Haz Mat/NORM*	0	-
Other Non-Hazardous	0	-
Pipelines Total	1149	100%

*Note that the estimated volume of 'Haz Mat / NORM' refers to and includes hazardous elements such as radioactive sources for level transmitters and operational chemicals. Per Table 3.1 there is no history of NORM onboard Leman F and none is anticipated during decommissioning activities.

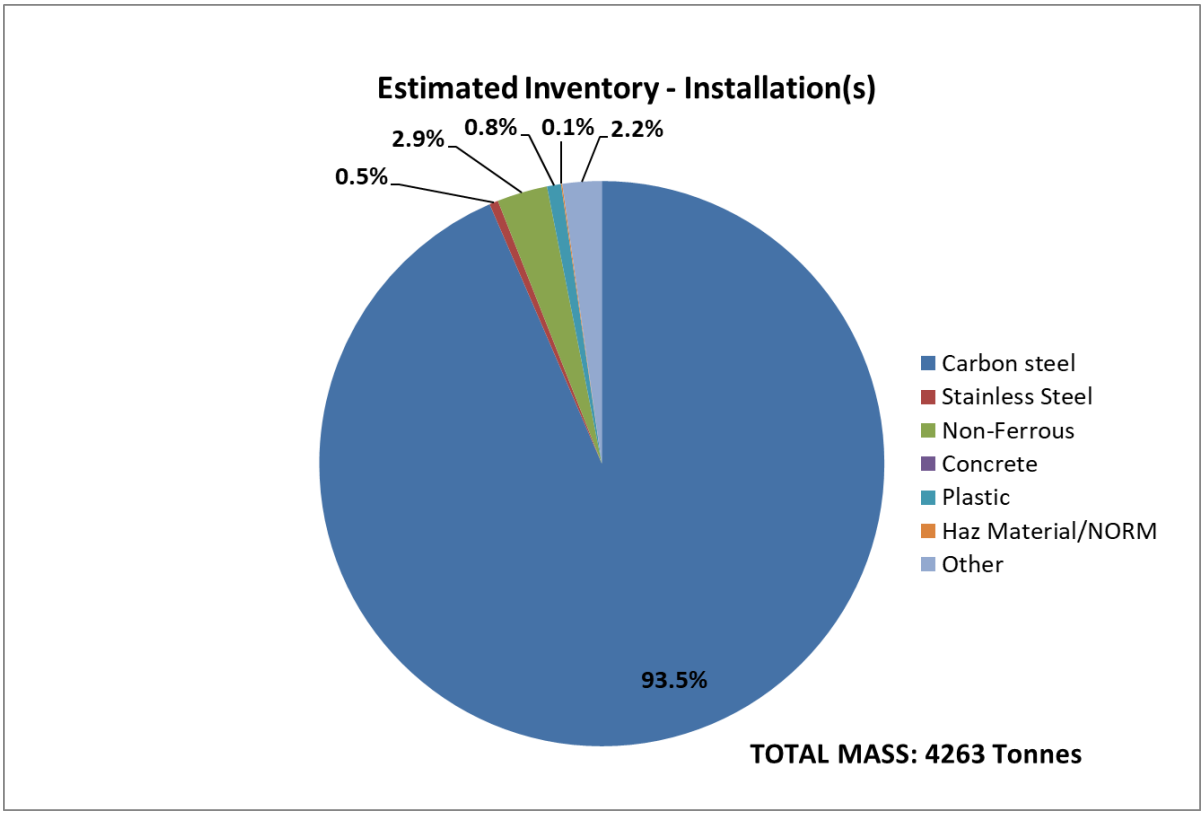

Figure 2.3: Estimated Inventories (Leman G Installations)

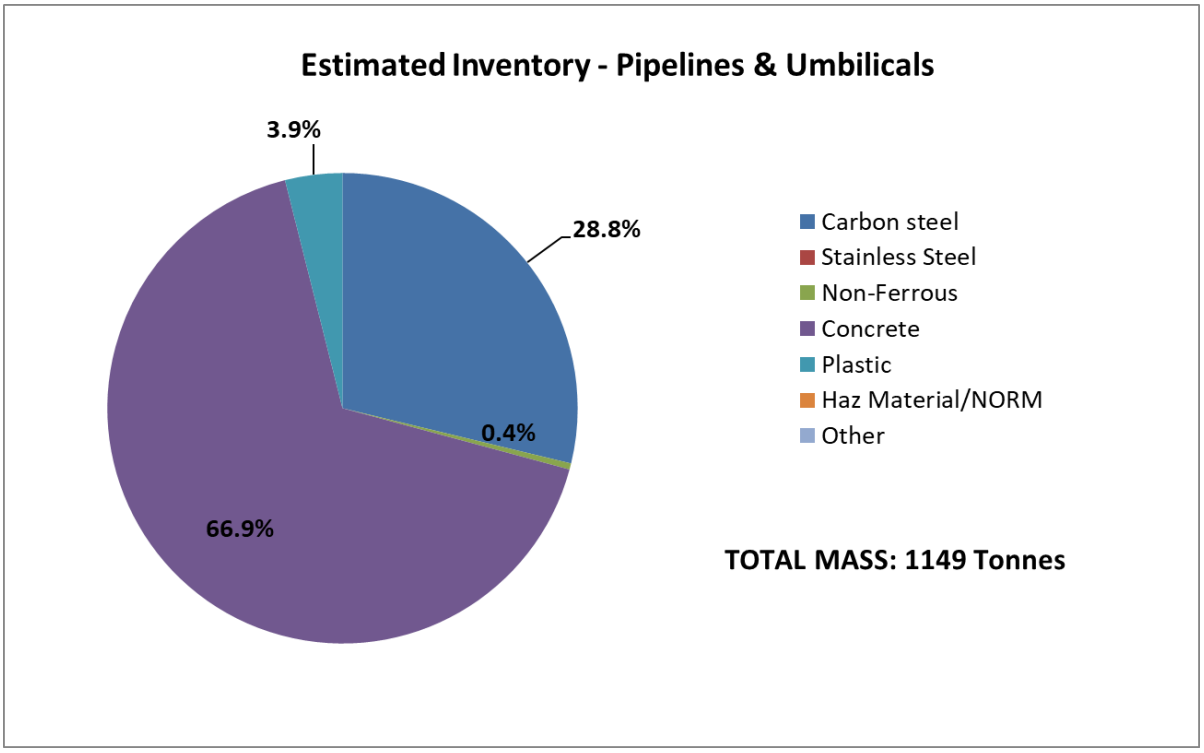

Figure 2.4: Estimated Inventories (Leman G Pipelines) (excluding rock cover)

3 REMOVAL AND DISPOSAL METHODS

The Leman F & G Decommissioning Project will implement Shell's HSSE & SP Control Framework, supporting a waste management hierarchy that optimises the re-use and recycling of waste and aims to minimise waste disposal in accordance with the EU Waste Framework Directive. The risks associated with waste will be assessed before removal to shore and opportunities to re-use the waste for the same or other purposes or, failing that, to recycle or recover materials will be identified. Waste will be characterised, classified, segregated, stored and transported according to appropriate regulatory requirements.

When removed from its offshore location, the equipment will be transported to a decommissioning contractor's onshore yard, where different types of material will be segregated with a view to optimising re-use and recycling.

The decommissioning contractor for topsides, subsea and/or the jacket may look for opportunities to re-use equipment, machinery or component parts, either as spares or for them to be refurbished through their normal channels. It is anticipated there may be limited commercial interest given the age of the assets.

The decommissioning contractor's established arrangements with recycling companies will facilitate optimisation of the quantity of materials that can be sent for recycling. An active project Waste Management Plan (WMP) will be implemented that tracks waste materials through to the recycling end points.

Materials for which no re-use or recycling options are available will be tracked through to disposal in landfill.

3.1 Topsides

Following preparatory works on the topsides, pipeline and cable risers will be disconnected, allowing for release of the topsides. The Leman F and G topsides are likely to be cut underneath the topsides and then removed and transported in single lifts to the selected dismantling yard. Whilst piece-small is not the anticipated removal method for Leman F & G topsides, it is retained as an option pending completion of detailed engineering and commercial tendering. The location and timing of the cuts to separate jackets and topsides are subject to detailed engineering following commercial tenders.

Topsides Description:

Leman F and G are Normally Unattended Installations (NUIs), installed in January 1987 and tied-back to the Leman A Complex via subsea pipelines. Power is provided from Leman A via subsea cables. During operation, maintenance and well service visits are carried out via walk-to-work vessels. Whilst overnight stays are not planned, an Unplanned Overnight Shelter (UOS) is provided on both platforms.

Both facilities are controlled by the Installation Control Centre (ICC) at Bacton and served by a Field Response Team (FRT) sourced from the Leman Complex and/or onshore personnel. The helidecks on both Leman F and G are not in service and will no longer be used.

Gas is produced on Leman F from 14 wells, and on Leman G from 12 wells. From each wellhead, the reservoir fluids pass through individual flowlines to either the main flowline or the production manifold via sand separators and choke valves. Gas is exported from Leman G to Leman F via a double-acting, hydraulically powered Emergency Shutdown (ESD) valve. Production flow from Leman F is routed through the Process Gas Header where it is joined by gas from Leman G and then exported to Leman A through a double-acting, hydraulically powered Emergency Shutdown (ESD) valve.

Figure 3.1 to Figure 3.4 provide elevations of both Leman F and Leman G from east and west perspectives.

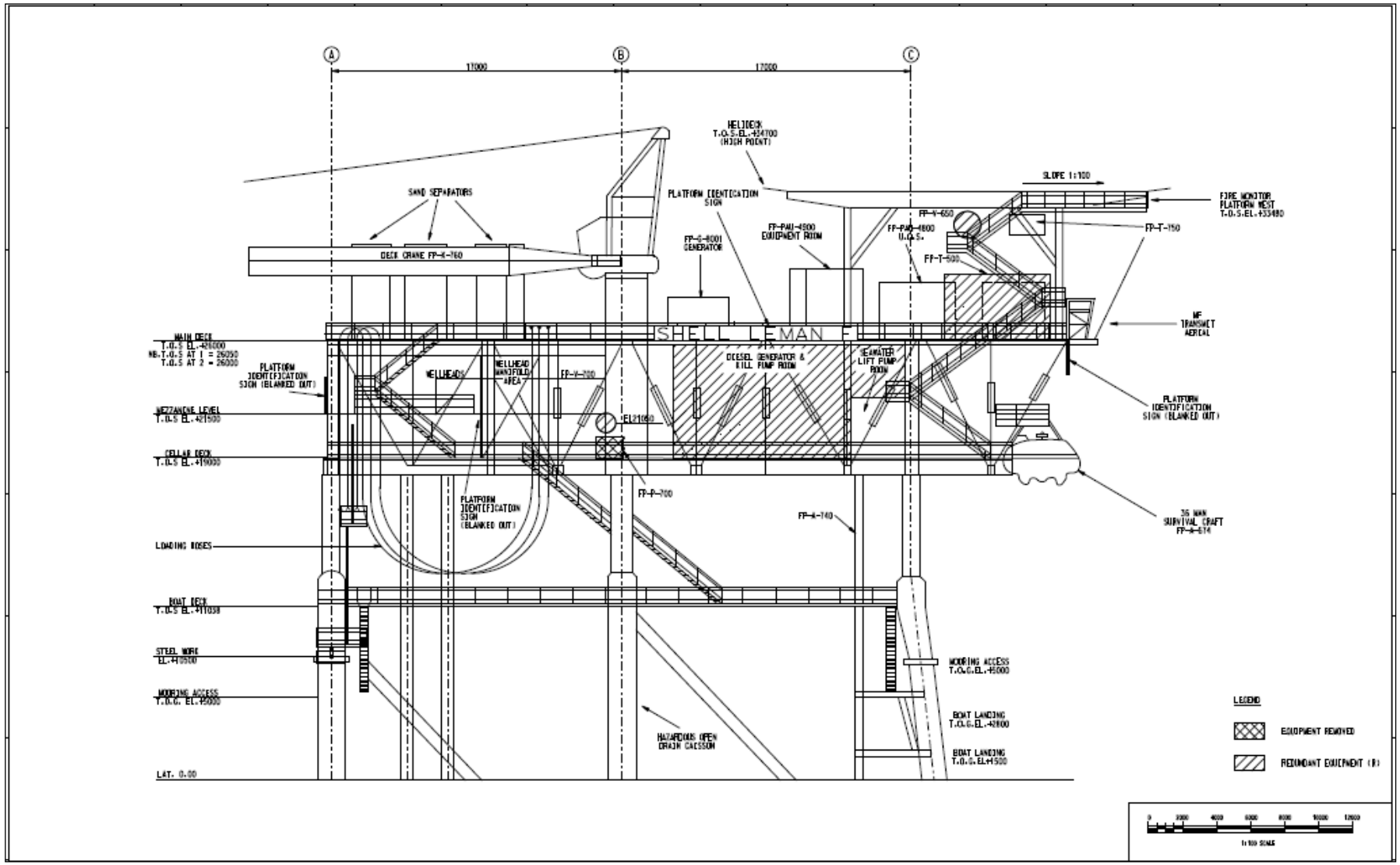

Figure 3.1: Leman F Topsides – West Elevation

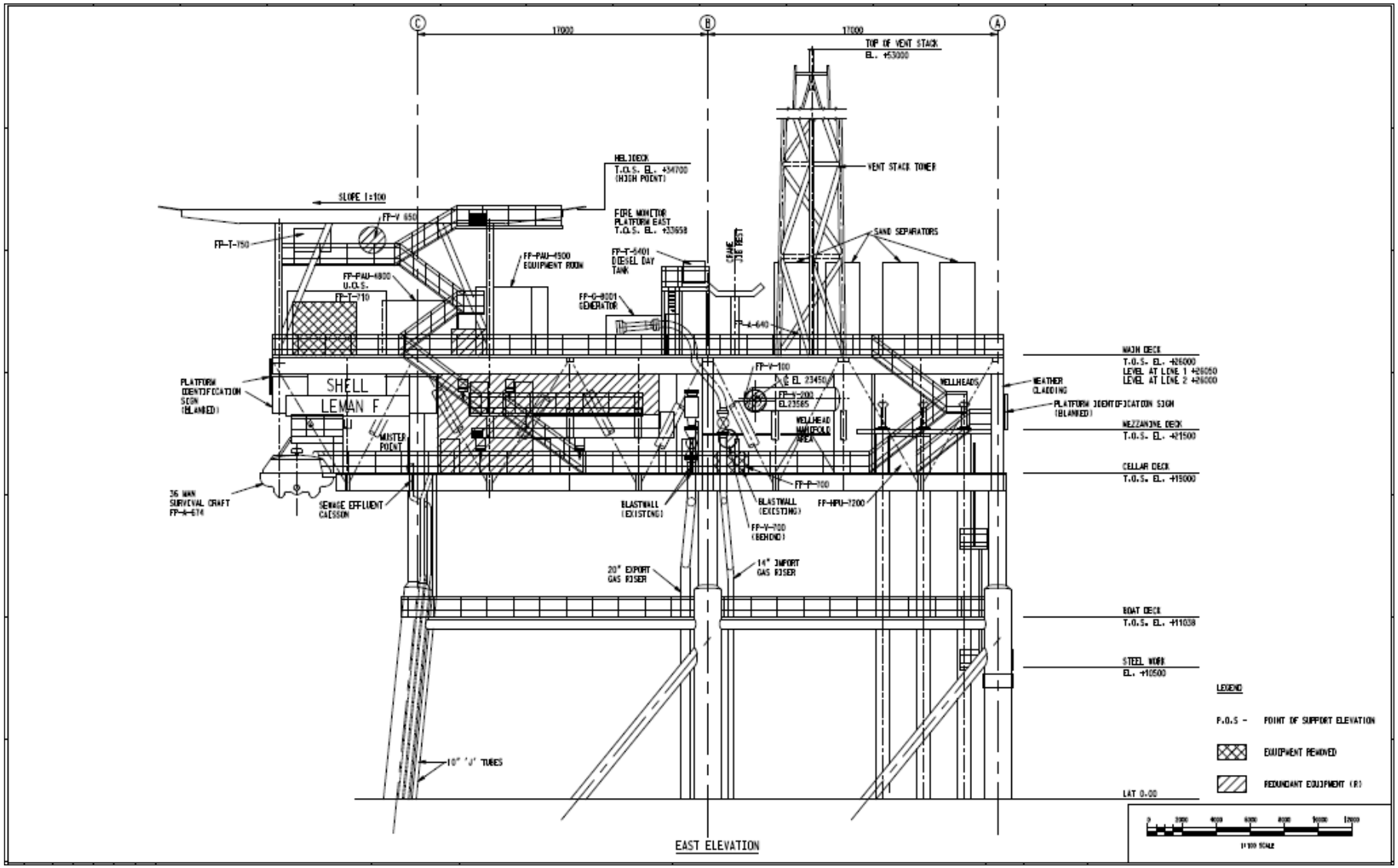

Figure 3.2: Leman F Topsides – East Elevation

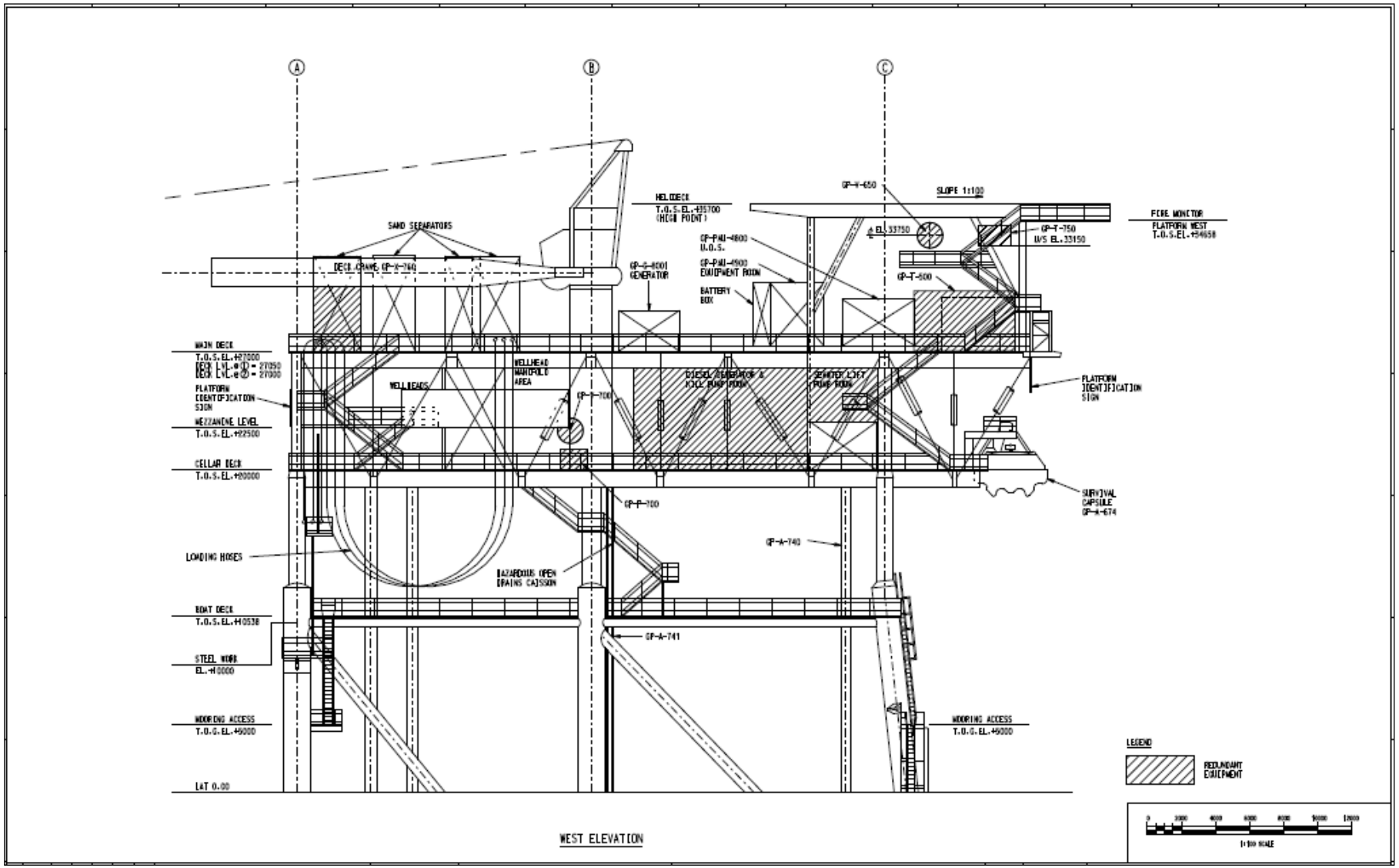

Figure 3.3: Leman G Topsides – West Elevation

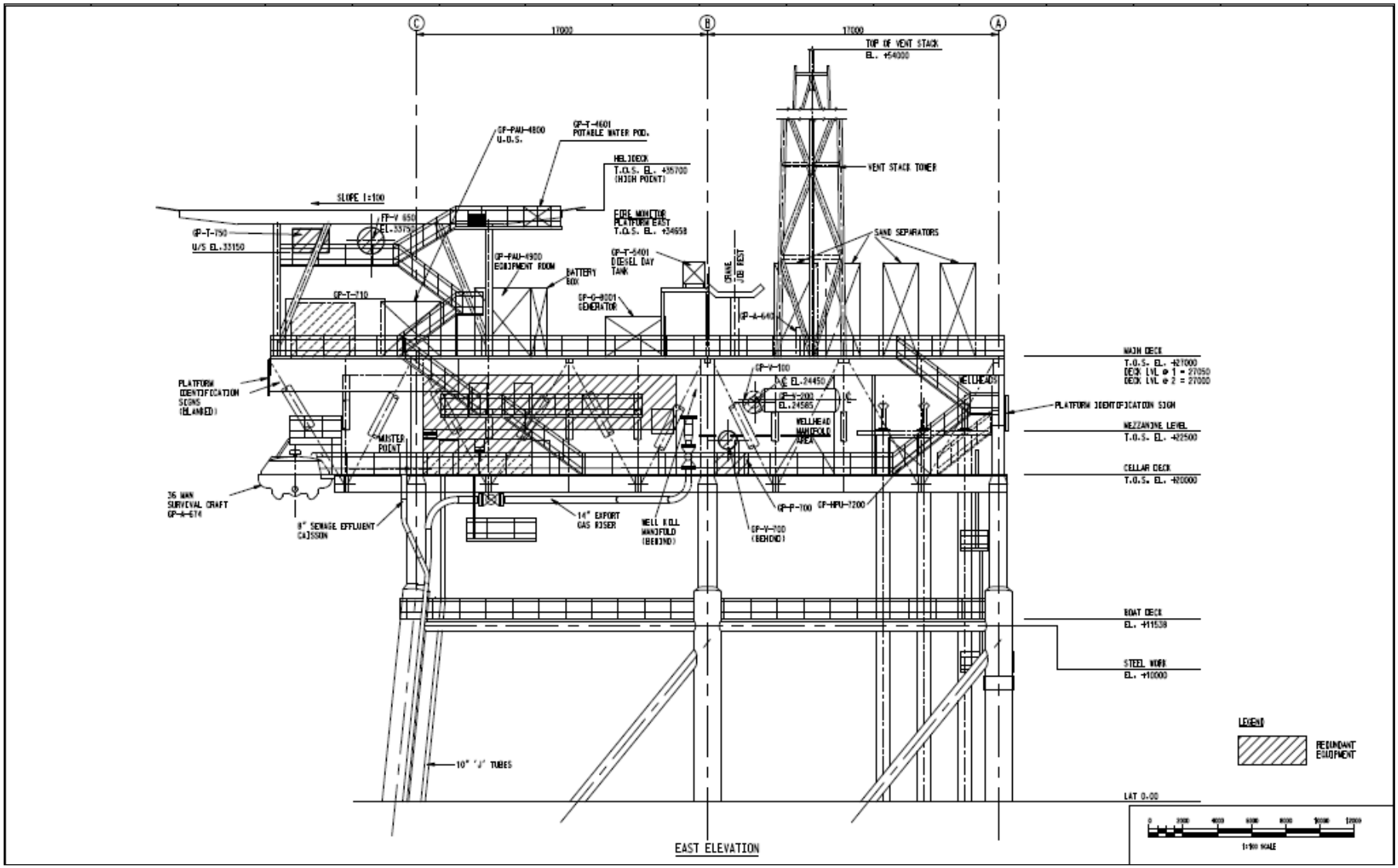

Figure 3.4: Leman G Topsides – East Elevation

Preparation/Cleaning:

Table 3.1: Topsides Cleaning Considerations		
Pipeline or Group	**Recommended Option**	**Justification**
Onboard hydrocarbons	Process fluids, fuels and lubricants	Depressurised from Leman A before remaining onboard hydrocarbons are drained and transported ashore for re-use/disposal Some venting of topsides hydrocarbon inventory is possible.
Original paint coating	Lead-based paint	May give off dust if flame-cutting or grinding/blasting is used so appropriate safety measures will be taken. This scope refers to topsides disconnection scopes, e.g. leg cutting only
Asbestos and Ceramic Fibre	None identified (subject to IHM confirmation)	No known asbestos within the Leman F and G infrastructure, however if identified appropriate control and management will be enforced
Other hazardous materials	Batteries	Transported ashore for re-use/disposal by appropriate methods
	NORM, LSA Scale	No NORM has been reported during operation of Leman F and G and none is expected during decommissioning. Nevertheless, all recovered material will be monitored for NORM contamination and, if encountered, managed in accordance with the 2016 Environmental Permitting Regs and applicable local regulations at the dismantling location(s).
	Radioactive sources	There are 14 Cobalt-60 radioactive sources (8-off on Leman F, 6-off on Leman G) associated with level control instruments. These sources will be removed following CoP by competent specialist contractors and transported to shore for disposal.
	Sand separators	Following CoP, the sand separators on both Leman F and Leman G will be emptied, with the contents sampled for hazardous elements. The removed contents will be segregated and transported onshore for treatment and disposal.

Removal Methods:

Table 3.2: Topsides Removal Methods	
1) HLV (semi-submersible crane vessel) ☑ 2) SLV ☑ 3) Piece small ☑ 4) Other ☐	
Method	**Description**
Single lift removal by SLV/HLV	The Leman F and Leman G topsides are likely to be lifted in a single lift and transported to a yard onshore for further cleaning, dismantlement, re-use, recycling and / or disposal as appropriate. An SLV or other construction vessel is the minimum required, though an HLV may be used if also selected for jacket removal, depending on market availability and commercial suitability. Whilst piece small is not the anticipated removal method for Leman F & G topsides, it is retained as an option pending completion of detailed engineering and commercial tendering. If a non-UK yard is selected for dismantlement, all necessary transfrontier shipment of waste permits shall be in place prior to removing each topsides. If the topsides and jackets are lifted in separate campaigns, Shell will engage with OPRED and the Lighthouse Board to discuss the appropriate means of ensuring the safety of other users of the sea. Options include affixing a NAVAID to the jacket or deploying a guard vessel, until jacket removal.

3.2 Jacket

Both jackets at Leman F and Leman G are template type structures of which the foundation comprises 6-leg piles of 54” diameter. For both jackets, the two jacket legs at the south end of the Installation have a double batter of 1-in-8; the remaining legs at central and north ends have a single batter of 1-in-8. Subsurface corrosion protection is provided by cathodic protection using sacrificial anodes.

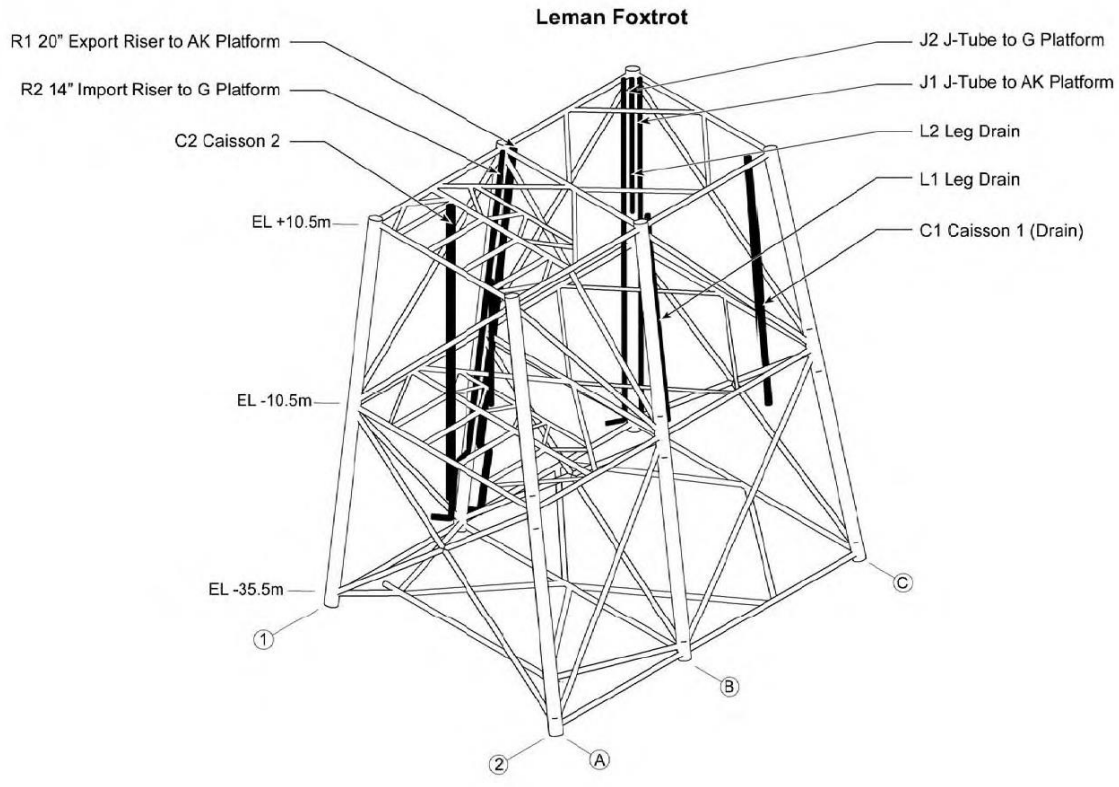

Figure 3.5: Leman F Jacket Elevation

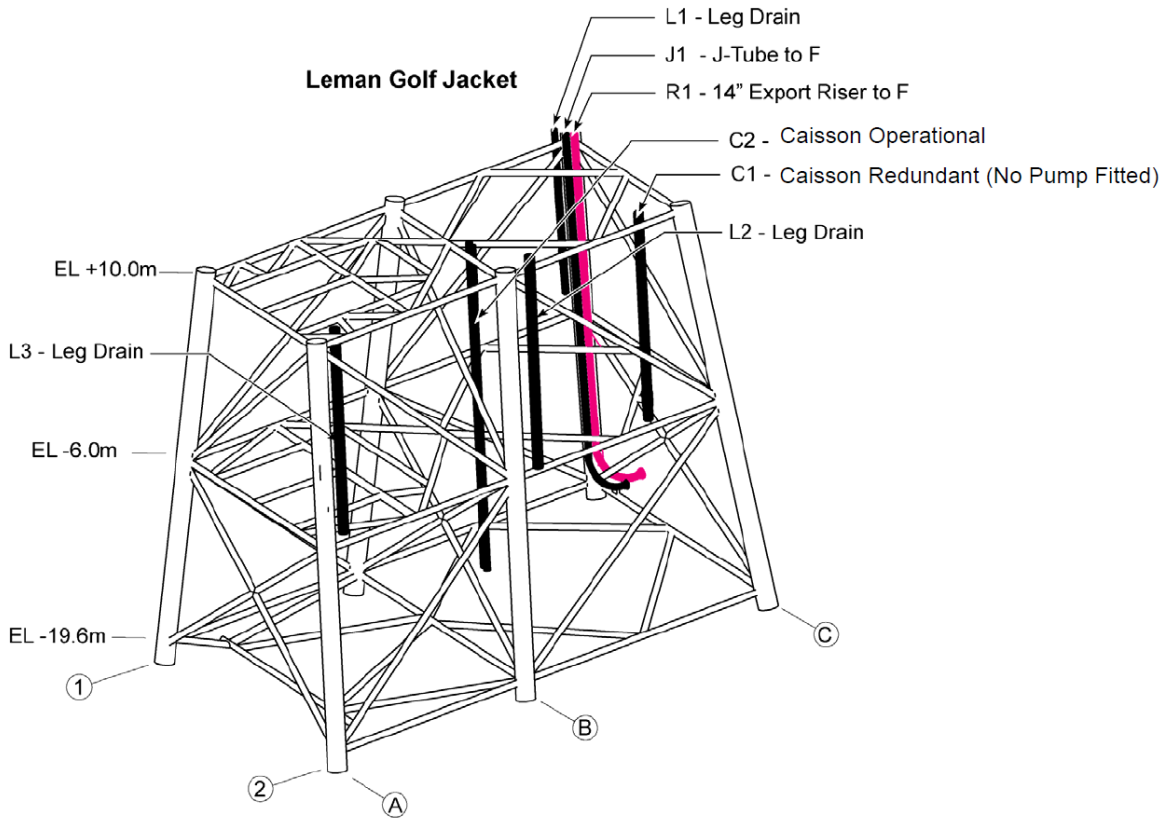

Figure 3.6: Leman G Jacket Elevation

Table 3.3: Jacket Removal Methods	
1) HLV (semi-submersible crane vessel) ☑ 2) SLV ☑ 3) Piece small ☑ 4) Other ☐	
Method	**Description**
Single lift removal by SLV/HLV	The leg piles will be cut to a target depth of at least 3m below the mean seabed level. As the seabed around Leman G is expected to vary significantly over time, Shell will investigate the opportunities to perform deeper internal cuts of the piles, subject to surveys to verify the piles are free of internal blockages. Cutting of the piles is anticipated to be executed by internal cutting equipment. However, if this proves unfeasible it would be necessary to excavate the seabed around the piles to enable external cutting. The jacket will be lifted, then transported to an onshore recycling yard for further cleaning, dismantling, recycling and / or disposal, as appropriate. The removal contractor, subject to commercial tendering, may elect to remove the jacket in a single lift, or cut into sections for multiple lifts. If the topsides and jackets are lifted in separate campaigns, or individual sections of the jackets are lifted in separate campaigns, Shell will engage with OPRED and the Lighthouse Board to discuss the appropriate means of ensuring the safety of other users of the sea. Options include affixing a NAVAID to the jacket or deploying a guard vessel, until full jacket removal. If a non-UK yard is selected for dismantlement, all necessary transfrontier shipment of waste permits shall be in place prior to removing each jacket.

3.3 Subsea Installations and Stabilisation Features

There are no subsea installations associated with Leman F or Leman G. Seabed stabilisation features are recorded within the pipelines section.

3.4 Pipelines

Risers and topsides sections of the Leman F and G pipelines and cables are to be fully removed and returned to shore for recycling and / or disposal. It is anticipated that riser sections of pipelines PL363 and PL364, and of cables PL5147 and PL5148, will be secured within their caissons and lifted with the jackets. However, this is subject to confirmation of jacket and caisson integrity, and will depend on the removal methodology for each jacket.

A comparative assessment review of the decommissioning options for the Leman F and G pipelines and cables was performed in accordance with the Shell U.K. Guidelines. At this review, the following options for decommissioning were considered.

The following options were considered during the comparative assessment for the pipelines and cables:

1) Total removal by cut-and-lift
2) Total removal by reverse reeling
3) Decommission *in situ* with surface-laid tie-ins removed and ends remediated; with areas of insufficient depth-of-cover mitigated with rock cover
4) Decommission in situ with surface-laid tie-ins removed and ends remediated; with areas of insufficient depth-of-cover removed by cut-and-lift
5) Decommission *in situ* with surface-laid tie-ins removed and ends remediated; with areas of insufficient depth-of-cover remediated by re-trenching
6) Decommission in situ with surface-laid tie-ins removed and ends remediated

The following options were considered during the comparative assessment for the mattresses:

a) Disconnect the tie-in spools at the pipeline tie-in flange, remove the tie-in spools and decommission all LinkLok mattresses *in situ*
b) Blanket rock cover the tie-in spools and associated LinkLok mattresses without disconnecting from the main pipeline routes, decommissioning all infrastructure *in situ*
c) Disconnect the tie-in spools at the pipeline tie-in flange and remove both the tie-in spools and all LinkLok mattresses supporting the tie-ins

Table 3.4: Pipeline or Pipeline Groups Decommissioning Options

Pipeline / group (as per PWA)	Condition of line/group	Whole or part of pipeline/group	Decommissioning options considered
Leman F and G pipelines PL363 PL364	Trenched and buried	Part Riser section and surface-laid tie-in spools will be fully removed	1, 3, 4, 5, 6
Leman F and G cables PL5147 PL5148	Trenched and buried	Part Riser section and surface-laid tie-in spools will be fully removed	2, 3, 4, 5, 6

Table 3.4: Pipeline or Pipeline Groups Decommissioning Options			
Pipeline / group (as per PWA)	**Condition of line/group**	**Whole or part of pipeline/group**	**Decommissioning options considered**
LinkLok stabilisation mattresses	Buried	Whole	a, b, c

Comparative Assessment Method:

Decommissioning options were assessed in line with the requirements of the OPRED Guidance Notes and largely adopting the guidance provided in Appendix A of the Offshore Energies UK (OEUK) Guidelines for Comparative Assessment in Decommissioning Programmes, Issue 1, as required.

An internal screening workshop was held to ensure the required information was available for the CA and that relevant studies were available. Further, at the internal screening workshop, non-credible options were de-selected.

A CA workshop was held with relevant external stakeholders and consultants to ensure a robust assessment was completed. At this workshop, options were scored according to pre-agreed qualitative and quantitative scales provided in the Terms of Reference.

Outcome of Comparative Assessment:

The results of the CA workshop have been issued to attendees at the workshop and stakeholders who chose not to attend, with feedback sought prior to the final recommendations being issued as part of the Comparative Assessment Report in support of this document.

Table 3.5: Outcomes of Comparative Assessment		
Pipeline or Group	**Recommended Option**	**Justification**
Leman F and G pipelines PL363 PL364	Option 6 Decommission in situ with surface-laid tie-ins removed and ends remediated	The CA concluded that this was the preferred option as it imposes the least environmental impact within the Special Areas of Conservation present. Decommissioning *in situ* also imposes the lowest safety risk and cost.
Leman F and G cables PL5147 PL5148	Option 6 Decommission in situ with surface-laid tie-ins removed and ends remediated	The CA concluded that this was the preferred option as it imposes the least environmental impact within the Special Areas of Conservation present. Decommissioning *in situ* also imposes the lowest safety risk and cost.

Table 3.5: Outcomes of Comparative Assessment		
LinkLok stabilisation mattresses	Option c	The CA concluded that activity to remove the tie-in spools is likely to also uncover the mattresses, leaving them exposed. Although the integrity of the mattresses is uncertain, there are no known impediments which would prevent removal should they be uncovered whilst deburying and then removing the tie-in spools. In the event that practical difficulties mean full removal is no longer an ALARP solution, OPRED will be engaged to discuss mitigation options.

3.5 Pipeline Stabilisation Feature(s)

Table 3.6: Pipeline Stabilisation Features			
Stabilisation feature(s)	**Number**	**Option**	**Disposal Route (if applicable)**
Concrete mattresses Linklok stabilisation mattresses 10m x 2.5m x 0.15m	53	Full recovery of exposed mattresses. Note that whilst the LinkLok mattresses are currently buried, it is expected that the removal of pipeline tie-in spools installed on top of the mattresses will also uncover the mattresses and leave them exposed for recovery. Mattresses which are buried at the pipeline / cable crossings will be decommissioned *in situ* It is intended that the mattresses will be recovered to shore, however in the event of practical difficulties during the removal execution, OPRED will be consulted to discuss alternative methods of decommissioning.	Recover to shore for recycling / disposal[1,2]

Table 3.6: Pipeline Stabilisation Features			
Stabilisation feature(s)	**Number**	**Option**	**Disposal Route (if applicable)**
Bitumen mattresses 5m x 2m x 0.2m	13	Full recovery of exposed mattresses Mattresses which are buried at the pipeline / cable crossings will be decommissioned *in situ* It is intended that any exposed mattresses will be recovered to shore, however in the event of practical difficulties during the removal execution, OPRED will be consulted to discuss alternative methods of decommissioning.	Recover to shore for recycling / disposal[1,2]
Frond mattresses 5m x 5m x 0.5m	17	Full recovery It is intended that any exposed mattresses will be recovered to shore, however in the event of practical difficulties during the removal execution, OPRED will be consulted to discuss alternative methods of decommissioning.	Recover to shore for recycling / disposal[1, 2]
Cable support rollerbridge	1	Full recovery	Recover to shore for recycling / disposal [1,2]
Grout supports	9	Full recovery Note that whilst the grout supports are currently buried, it is expected that the removal of pipeline tie-in spools installed on top of the supports will also uncover the supports and leave them exposed for recovery. It is intended that the grout supports will be recovered to shore, however in the event of practical difficulties during the removal execution, OPRED will be consulted to discuss alternative methods of decommissioning.	Recover to shore for recycling / disposal[1,2]

Table 3.6: Pipeline Stabilisation Features			
Stabilisation feature(s)	**Number**	**Option**	**Disposal Route (if applicable)**
Grout bags	472[3]	Full recovery It is intended that exposed grout bags will be recovered to shore, however in the event of practical difficulties during the removal execution, OPRED will be consulted to discuss alternative methods of decommissioning.	Recover to shore for recycling / disposal[1,2]
Rock Dump (Te)	100 Te[4]	To remain in place	n/a

Notes

1. In the event of practical difficulties (e.g. poor integrity or fully covered with rock), OPRED will be consulted.
2. Whilst all mattresses, supports and grout bags are currently buried, it is expected that scope to remove other items within these Programmes will uncover some of the mattresses, supports and grout bags at the platform tie-in locations. Any mattresses, supports and grout bags exposed by other activities will be recovered to shore for recycling / disposal.
3. The number of grout bags is estimated.
4. This is the existing rock that is estimated as being present at time of CoP.

3.6 Wells

Table 3.7: Well Plug and Abandonment
The wells which remain to be abandoned, as listed in Sections 2.1.4 and 2.2.4 (**Table 2.5** and **Table 2.11**) will be decommissioned in accordance with OEUK Guidelines for the suspension and abandonment of wells. A PON5/Portal Environmental Tracking System (PETS)/Marine Licence application will be submitted in support of any such work that is to be carried out.

3.7 Drill Cuttings

Leman F and Leman G wells were drilled from 1986 onwards, and were drilled using a mix of water- and oil-based muds. Whilst records of waste disposal are not available, Shell has assumed a reasonable worst-case that the drilling muds were discharged to sea at this time. Over time, seabed currents have dispersed any cuttings which may have accumulated at either platform. Whilst seabed features are present at both platforms, there is nothing to indicate the presence of any remaining piles.

Chemical analysis from the most recent environmental survey (Gardline, 2021) indicates that there is nothing present at Leman F or Leman G which would constitute a drill cuttings pile in the definition of OSPAR Recommendation 2006/5.

Refer to Section 5.3.3.9 of the Environmental Appraisal [3] for further details.

Table 3.8: Drill Cuttings Decommissioning Options	
How many drill cuttings piles are present?	0
Tick options examined: ☐Remove and re-inject ☐Leave in place ☐Cover ☐Relocate on seabed ☐Remove and treat onshore ☐Remove and treat offshore ☐Other	
Review of Pile characteristics	N/A
How has the cuttings pile been screened? Actual samples taken?	N/A
Dates of sampling	N/A
Sampling included in pre-decommissioning survey?	N/A
Does it fall below both OSPAR thresholds?	N/A
Will the drill cuttings pile have to be displaced in order to remove the jacket?	N/A
What quantity (m^3) would have to be displaced/removed?	N/A
Will the drill cuttings pile have to be displaced in order to remove any pipelines?	N/A
What quantity (m^3) would have to be displaced/removed?	N/A
Have you carried out a Comparative Assessment of options for the Cuttings Pile?	N/A

3.8 Waste Streams

Table 3.9: Waste Stream Management Methods	
Waste Stream	**Removal and Disposal Method**
Bulk Liquids	Removed from vessels and transported to shore. Vessels, pipework and sumps will be drained prior to removal to shore and shipped in accordance with maritime transportation guidelines. Further cleaning and decontamination will take place onshore prior to recycling / re-use. Pipelines will be flushed of bulk hydrocarbons and left filled with seawater. The base case is for effluent from the flushing scope to be bullheaded back into the Leman reservoir via donor well(s) at Leman F and/or Leman G. If, during detailed engineering, it becomes apparent that bullheading is not a feasible option, alternative disposal options will be considered in accordance with relevant regulations and guidance.
Marine growth	Marine growth that remains attached to the jacket, tie-in spools or mattresses after load-in to the dismantling yard will be removed onshore. It will be disposed of in accordance with the regulations in force at the dismantling yard following the site operator's licenses and procedures
NORM/LSA Scale	There is no historical evidence of NORM at Leman F or G and none is anticipated during decommissioning. Regardless, all recovered material will be monitored for NORM contamination and, where encountered, managed in accordance with the 2016 Environmental Permitting Regs. There are low-level radioactive sources within level transmitter instruments on Leman F and G, that will be recovered to shore and disposed of under appropriate permits.
Asbestos	There is no record of asbestos on either Leman F or G, however if identified appropriate control and management will be enforced
Other hazardous wastes	Shell has completed a Hazardous Material Inventory survey. This survey will inform the scopes for removal, dismantling, recovery, recycling and disposal of all infrastructure recovered from Leman F and G.
Onshore Dismantling sites	Selection of (an) onshore dismantling site(s) will be made on the basis of a commercial tender, taking into account Health, Safety, Security, Environmental and Social Performance criteria. Screening, followed by site audits where necessary, will be performed and Shell U.K. will only consider sites that are licensed to receive the types and quantities of materials identified in the Materials Inventories for Leman F and G. Candidate sites must demonstrate the capability to manage waste streams and disposal through the deconstruction process. The dismantling site operator will have established arrangements with facilities that recycle steel, copper, aluminium and other materials.

The Waste Management Strategy for the Leman F and G Decommissioning Project is based on the waste hierarchy (avoid, re-use, recycle, recover energy, dispose) underpinned by the commitment to comply with legal requirements.

The material to be removed during decommissioning activities is shown in Table 3.10.

Table 3.10: Inventory Disposition

	Total Inventory Tonnage	Planned tonnage to shore	Planned left *in situ*
Leman Foxtrot			
Installations	4827	4306	521
Pipelines	2158	566	1592
Leman Golf			
Installations	4263	3800	463
Pipelines	1149	402	746
Total			
Installations	9090	8106	984
Pipelines	3307	968	2338
Total	**12397**	**9074**	**3322**

Note that the planned installations tonnage to be left in situ refers to the lower sections of the platform piles, remaining in situ following severing at 3m below mean seabed level. Shell is investigating the potential to perform deeper cuts of the piles at Leman G which would decrease the volume noted above to be decommissioned *in situ*.

Of the total materials estimated in the Leman F and G Decommissioning Programmes scope, approximately 73% of the inventory tonnage is planned to be recovered. The remaining 27% of the inventory tonnage is proposed to be decommissioned in situ.

In addition to the above, marine growth is expected to be recovered with the Leman F and G jackets. A third-party study to estimate the marine growth on each jacket provided ranges of 468 to 1610 tonnes (mass in air) for the Leman F jacket, and 329 to 1116 tonnes (mass in air) for the Leman G jacket. Most of this weight represents water with the marine growth expected to dry out during transit and once received onshore, so a much smaller dry weight of biological waste will require disposal. It is likely that marine growth will be disposed of to landfill. Social impacts of the marine growth, such as odour pollution, will be considered during selection of the dismantling contractor and disposal sites will be appropriately permitted / licensed in accordance with local regulations. Further definition of the marine growth present on each jacket will be carried out during detailed engineering and preparations for removal.

The Leman F and G Decommissioning Project will target the maximum possible re-use or recycle of materials arising from the decommissioning works and recovered to shore.

4 ENVIRONMENTAL APPRAISAL OVERVIEW

4.1 Environmental Sensitivities (Summary)

Table 4.1 summarises the environmental receptors assessed within the Leman F and G Environmental Appraisal. For full details, please refer to the appropriate sections within the EA itself, ref LDFG-XOD-E-HE-7180-00001.

Table 4.1: Environmental Sensitivities

Environmental Receptor	Main Features
Conservation interests	Both Leman F and Leman G are located within two protected areas: the North Norfolk Sandbanks and Saturn Reef SAC and the Southern North Sea SAC. The North Norfolk sandbanks are the most extensive example of the offshore linear ridge sandbank type in UK waters. They are a representative functioning example of the Annex I habitat 'Sandbanks which are slightly covered by seawater all the time'. The Southern North Sea SAC has been identified as an area of importance for harbour porpoise, an Annex II species. Other conservation sites that lie within 40 km of Leman platforms are the Haisborough, Hammond and Winterton SAC (10 km SSW), Greater Wash Special Protection Area (SPA) (29 km WSW) and Cromer Shoal Chalk Beds Marine Conservation Zone (MCZ) (41 km WSW). The most recent Gardline (2021) habitat assessment survey identified the presence of exposed or subcropping peat and clay largely corresponded with *S. spinulosa* reefiness, most notably 1 – 1.5 km SE of Leman F, where both were noted in highest density. This suggests that these relatively soft and stable clay and peat outcrop features provide an anchor point from which *S. spinulosa* can establish a reef, fed by a supply of nearby sand for tube building (Gardline, 2021 [4]). The UK Biodiversity Action Plan (UKBAP) listed priority habitat 'peat and clay exposures with piddocks' has been documented within the broader Leman field, in particular within the Leman A area in a survey carried out in 2019. Patches of peat outcrops and peat clasts were also recorded at Leman F in a survey carried out in 2020. However, no piddocks (clam-like shellfish) or piddock bores were recorded, with the area unlikely to classify as the UKBAP priority habitat.
Seabed	The seabed around the Leman installations is considered to be made up of largely EUNIS 'Circalittoral mixed sediment' (A5.44) and 'Circalittoral find sand' (A5.25). EUNIS 'Infralittoral fine sand' (A5.23) was found at the shallower stations within the survey area and where *S. spinulosa* reef were located, EUNIS A5.61 (Sublittoral polychaete worm reefs on sediment) was present. Sediment particle mean diameter identified composed of moderate to well sorted medium sand to gravelly sand.

Table 4.1: Environmental Sensitivities	
Environmental Receptor	**Main Features**
	In the Leman G area, the amphipod crustacean was the most abundant and most dominant taxon recorded. The next most abundant taxa were polychaetes and amphipods. The remaining most abundant species identified in the survey included additional polychaetes, urchin, bivalve, crustacean and four amphipods. At Leman F, the most abundant taxon overall were annelids. More than half of the dominant taxa reported within the current survey comprised polychaetes. The annelids found are typically an opportunistic order of bristle worms and are commonly found in the North Sea in a range of sediment types. Actiniaria were highly abundant throughout the survey; their presence being indicative of a shift to coarser sediments allowing for attachment of these taxa (Fugro, 2020b). The polychaetes found at Leman G, were also present in significant numbers at Leman F . Benthic epifauna are sparse along the pipelines connecting the three Leman platforms with Arthropoda, namely Crustacea, being the most abundant taxonomic group. Annelida, was the second most abundant taxonomic group [5]. These results are to be expected considering the sediment type. Within areas of *S. spinulosa* reef formations epifauna were observed in larger numbers, with crabs, anemone and hydroids being present. Overall, the epifauna observed was typical of background conditions for SNS.
Fish	Leman F and Leman G are located in an area of high intensity spawning for plaice in the winter months; cod, lemon sole, mackerel, Norway lobster, sprat, whiting and sandeels also use the area for spawning throughout the year. The following species have nursery grounds near the project area: herring, lemon sole, mackerel, Norway lobster, sandeels, sprat, tope shark, and whiting. Aires *et al.* (2014) provides modelled spatial representations of the predicted distribution of juvenile fish (less than one year old). The modelling indicates the presence of multiple juvenile species in Block 49/26 including: anglerfish, blue whiting, European hake, haddock, herring, mackerel, Norway Pout, plaice, sprat and whiting. The probability of juvenile aggregations across the project area is low for all species (<0.15).
Fisheries	The Southern North Sea sector provides a relatively low contribution to the commercial fishery compared to areas such as the northern North Sea and west of Scotland . In addition, there are fewer key ports located along the east coast of England. The Leman NUIs are situated within ICES Block 35F2 which is an area of moderate fishing activity (targeted by both UK and international vessels), with low activity in the immediate area of Leman F and G. The most frequently used gear type in ICES Rectangle 35F2 is trawls, specifically beam trawls. Both shellfish and demersal species are targeted however demersal value far exceeds that of shellfish,

Table 4.1: Environmental Sensitivities	
Environmental Receptor	**Main Features**
	comprising 3% and 97% respectively of the average landings value from 2016 to 2020, with the dominant species caught including plaice, turbot and sole. Pelagic species have only recorded landings and therefore value within the years 2017 and 2020, however these values are still negligible accounting for <0.01% of the average landings value from 2016 to 2020. Trawling intensity across pipelines is very low; between 0 – 12 trawl passes across the ICES sub-blocks associated with the Leman pipelines per year on average (between 2007 – 2015). AIS vessel tracking data also shows that trawling activity in the vicinity of the Leman pipelines is negligible.
Marine Mammals	Harbour porpoise have been observed and are commonly seen throughout the year within the vicinity of the Leman F and G platforms in variable densities. These sightings peak in the summer months. The density of harbour porpoise in the project area is estimated to be 0.888 animals/km^2. Harbour porpoise are Annex II listed species and European Protected Species (EPS). No other cetacean species are likely to be observed in the Leman area. Both grey and harbour seal densities are low (0.4 individuals per 25 km^2) across the Leman area due to its distance from shore. Both seal species are Annex II protected species.
Birds	The area surrounding Leman F and G is used by the following species throughout year: sooty shearwater, Manx shearwater, northern gannet, pomarine skua, Arctic skua, great skua, black-legged kittiwake, little gull, great black-backed gull, common gull, lesser black-backed gull, herring gull, sandwich tern, common tern, Arctic tern, guillemot, razorbill and Atlantic puffin. In recent years, there has been an increase in the number of seabirds utilising offshore installations for nesting. Opportunistic species such as kittiwake and herring gull are utilising artificial nest locations and rearing chicks. In some instances, colonies of several hundred birds have established and return each year. Currently there are no birds using the NUI's for nesting, however this situation will be monitored moving forward. The Seabird Oil Sensitivity Index (SOSI) identifies areas at sea where seabirds are likely to be most sensitive to surface pollution. Seabird sensitivity to oil within Block 49/26 varies throughout the year, from low in the summer months (May-September) to extremely high in January and February.
Onshore Communities	Per the Environmental Appraisal scoping, there are no Onshore Communities sensitivities identified that would be impacted by the Leman F & G Decommissioning scope.
Other Users of the Sea	Shipping activity within Block 49/26 is considered to be high overall (OGA, 2016). Although within the immediate Leman area, fishing

Table 4.1: Environmental Sensitivities	
Environmental Receptor	**Main Features**
	activity is relatively low. There are multiple surface installations within 40 km of Leman F and Leman G; the closest to both being Leman AD1 platform operated by Shell (3 km ESE from Leman F and 5 km ESE from Leman G). The nearest active cable is located 22 km ENE of the Leman platforms. There are some historic cables in the vicinity of the project location – though disused, sections of these cables may remain on the seabed. Block 49/26 does not lie within training ranges that are areas of concern to the MoD (OGA, 2019). There are no renewable energy sites within 40 km of the project area. The nearest wreck is located approximately 4 km ENE of the project area and is classified as non-dangerous.
Atmosphere	On a global scale, concern regarding atmospheric emission of greenhouse gasses (GHGs) (including water vapour, carbon dioxide (CO_2), methane (CH_4), nitrous oxides (NO_x), ozone (O_3), chlorofluorocarbons (CFCs)) and volatile organic compounds (VOCs) is focused on the impact they have on global climate change. The Intergovernmental Panel on Climate Change (IPCC) in its sixth assessment report (AR6) states that it is unequivocal that the increase of CO_2, CH_4 and NO_x in the atmosphere over the industrial era is the result of human activities. Human influence is the principal driver of many changes observed across the atmosphere, ocean, cryosphere and biosphere. Climate change estimates in the AR6 report state that each of the last four decades have been successively warmer than any decade that preceded it since 1850. IPCC (2021) reports a 47% increase in CO_2 concentrations since 1750 which far exceeds the natural multi-millennial changes between glacial and interglacial periods over at least the past 800,000 years, and states that fossil fuel combustion is the primary contributor to the observed climate change. The main sources of atmospheric emissions during the scope of these Programmes are vessel activity and venting. Impacts on local air quality and global warming due to vessel use in the Leman area are not expected to be detectable above current background levels due to the limited number of vessels and time spent on decommissioning activities. Whilst the Leman F and Leman G pipelines (PL363 and PL364) will be depressurised back to the Leman A Platform, the remaining pipeline inventory at atmospheric pressure may be vented to atmosphere.

4.2 Potential Environmental Impacts and their Management

Environmental Impact Assessment Summary

An ENVironmental Impact IDentifcation (ENVID) has been undertaken for the project with the anticipated impacts highlighted in Table 4.2 below. The Environmental Appraisal (EA) covers these potential impacts where appropriate. Decommissioning of Leman F & G is not anticipated to give rise to any major or moderately significant environmental impacts.

Table 4.2: Environmental Impact Management

Activity	Main Impacts	Management of the Impacts
Topsides and Jacket Removal	**Emissions to Air** Emissions of CO_2, NOx, N_2O, VOCs CO and SO_2 associated with vessel operations will contribute to a reduction in air quality	Minimisation of emissions from vessels will form part of the selection criteria when tendering and selecting execution vessels Vessels will be required to have a Shipboard Energy Efficiency Management Plan (SEE) in place Execution will be optimised to minimise the number of mobilisations and demobilisations, where possible. Shell will investigate opportunities to incorporate scope, including post-decommissioning surveys, within wider SNS campaigns
	Physical presence (seabed) Potential for infrastructure decommissioned *in situ* to interact with demersal fishing gear (e.g. platform piles and conductor sections beneath the seabed)	Leman subsea infrastructure is marked on Admiralty Charts and the FishSAFE system. Post-decommissioning surveys will identify any oil-and-gas related debris for recovery, and evaluate any potential snagging risks which require mitigation A post-decommissioning risk-based monitoring regime will be agreed with OPRED. During such monitoring, the status of infrastructure decommissioned *in situ* will be reviewed and any necessary remedial action undertaken to ensure it does not pose a risk to other sea users.
	Seabed Disturbance Some localised disturbance will occur during the removal of the Leman F and G jackets, particularly during pile cutting	Internal cutting tools will be used to cut the platform piles where possible. External cutting, requiring additional dredging activities to provide tool access, will only be deployed where internal cutting to the required depth is not feasible. Vessels used in lifting activities will be equipped with Dynamic Positioning rather than deploying anchors

Table 4.2: Environmental Impact Management		
Activity	**Main Impacts**	**Management of the Impacts**
		Post-decommissioning debris clearance surveys and monitoring shall be carried out using non-intrusive methodologies such as side-scan sonar
	Nesting Birds Potential for opportunistic species such as kittiwake and herring gull to colonise the Leman F & G NUIs	Appropriate surveys will be undertaken, including a survey one-year prior to any lifting activities, to identify whether any nesting is taking place on Leman F & G. Technological opportunities will be explored to assist evidence gathering Shell will develop a Bird Management Plan
	Accidental Events Reviewed against the Leman OPEP, the potential sources of accidental release associated with the Leman F & G decommissioning scope are failures of diesel storage tanks on infield vessels	Preventing / minimising probability of an event: Each vessel utilised in the decommissioning scope will be subject to vessel assurance per Shell's GMAS verification Reducing consequences: A tiered system of responses is identified in the Leman OPEP including mobilisation of the Onshore Emergency Response Team, aerial surveillance or the mobilisation of Offshore Mechanical Containment and Recovery, as appropriate
Decommissioning pipelines, including stabilisation features	**Emissions to Air** Emissions of CO_2, NOx, CO and SO_2 associated with vessel operations will contribute to a reduction in air quality	Minimisation of emissions from vessels will form part of the selection criteria when tendering and selecting execution vessels Vessels will be required to have a Shipboard Energy Efficiency Management Plan (SEE) in place Execution will be optimised to minimise the number of mobilisations and demobilisations, where possible Shell will investigate opportunities to incorporate scope, including post-decommissioning surveys, within wider SNS campaigns
	Physical presence (seabed) Potential for infrastructure decommissioned *in situ* to interact with demersal fishing gear (e.g. buried pipeline and cable sections decommissioned *in situ*)	Leman subsea infrastructure is marked on Admiralty Charts and the FishSAFE system Post-decommissioning surveys will identify any oil-and-gas related debris for recovery, and evaluate any potential snagging risks which require mitigation

Table 4.2: Environmental Impact Management		
Activity	**Main Impacts**	**Management of the Impacts**
		A post-decommissioning risk-based monitoring regime will be agreed with OPRED. During such monitoring, the status of infrastructure decommissioned *in situ* will be reviewed and any necessary remedial action undertaken to ensure it does not pose a risk to other sea users.
	Seabed Disturbance Some localised disturbance will occur during the removal of the Leman F and G pipeline spools and ends, cable ends and stabilisation materials. Further localised disturbance may occur where rock-placement is required	Cutting and lifting operations will be carefully controlled and monitored to ensure accurate placement of cutting and lifting equipment and minimise any impact on seabed sediment Rock mass, where required to protect the cut ends of pipelines and cables, will be carefully placed over the designated areas of the pipelines with minimal spread over adjacent sediment, minimising seabed disturbance with the conservation objectives of the North Norfolk Sandbanks and Saturn Reef SAC and Southern North Sea SAC in mind Survey data collected in the area will be reviewed for potential sensitive seabed habitats (in particular the location of areas of *S.Spinulosa*) prior to the commencement of operations Post-decommissioning debris clearance surveys and monitoring shall be carried out using non-intrusive methodologies such as side-scan sonar
	Accidental Events Reviewed against the Leman OPEP, the potential sources of accidental release associated with the Leman F & G decommissioning scope are failures of diesel storage tanks on infield vessels	Preventing / minimising probability of an event: Each vessel utilised in the decommissioning scope will be subject to vessel assurance per Shell's GMAS verification Reducing consequences: A tiered system of responses is identified in the Leman OPEP including mobilisation of the Onshore Emergency Response Team, aerial surveillance or the mobilisation of Offshore Mechanical Containment and Recovery, as appropriate

Table 4.2: Environmental Impact Management		
Activity	**Main Impacts**	**Management of the Impacts**
Common to all scopes	**Waste Generation:** Recovered material will be classed as waste	A waste inventory has been compiled and will form the basis of an active Waste Management Plan. Only licensed facilities with sufficient management systems for waste, safety and environment (including communities) will be selected. Only licensed waste management contractors will be contracted to handle, store, recycle and dispose of all waste generated by the decommissioning activities. The fate of all waste materials will be tracked in accordance with Shell's Waste Control Framework – i.e. up to the point where materials can no longer be traced as Shell's waste. Typically this will be the point at which the waste is delivered to a smelter or similar recycling facility or, where recycling / re-use is not possible, at the point of disposal.

5 INTERESTED PARTY CONSULTATIONS

Pre-Engagement Summary

Pre-engagement with stakeholders commenced in 2020 with Shell hosting discussions with statutory advisors and regulatory bodies. These covered the emerging decommissioning plans and the scope of the pre-decommissioning environmental baseline survey. Ongoing introductory engagements and meetings with statutory consultees were progressed. Other meetings have taken place, as required, with regulatory authorities and other stakeholders (e.g. NSTA, JNCC, CEFAS, OPRED Environmental Management Team and the NFFO)

HOLD 9 – table will be populated following public consultation.

Table 5.1: Summary of Stakeholder Comments		
Points raised during statutory and public consultations		
Stakeholder	**Comment**	**Response**
Informal Stakeholder Consultations		
Statutory Consultations		
National Federation of Fishermen's Organisations		
Scottish Fishermen's Federation (SFF)		
Northern Ireland Fish Producers Organisation (NIFPO)		
Global Marine Systems Limited (GMS)		
Public		

6 PROGRAMME MANAGEMENT

6.1 Project Management and Verification

A Project Management team has been appointed to manage suitable (sub)contractors for the disconnection and removal activities. Standard Shell procedures for operational control, hazard identification and hazard management will be used. Where possible the work will be co-ordinated with other decommissioning operations in the Southern North Sea to secure schedule and cost efficiencies. This may lead to Leman F & G decommissioning scopes being executed in several phases over an extended time. There may be significant periods of inactivity following a phase of work. If it is determined by OPRED ODU that pipeline monitoring is required during a prolonged decommissioning execution period, the results of any such surveys will be submitted to OPRED ODU. Regular Progress Reports, and a final Close Out Report, will be submitted to OPRED.

The process of consents and the consultations required as part of this process have commenced and will be fully managed and monitored throughout the project life-cycle.

In the event of any changes to the detail of the offshore removal programme being required, these would be discussed and agreed with OPRED in advance.

The United Kingdom Hydrographic Office will be notified of any scope with implications for navigation around the Leman F & G facilities, per the requirements of the OPRED Guidance Notes.

6.2 Post-Decommissioning Debris Clearance and Verification

A post-decommissioning debris survey will be carried out within the 500m safety zones centred on the Leman F and G platforms, as well as a 100m corridor along each existing pipeline and cable route (50m either side).

Any significant oil and gas related seabed debris will be recovered for onshore recycling or disposal in line with existing disposal methods.

Verification of seabed clearance will be obtained and submitted to OPRED ODU. Confirmation of seabed clearance will also be submitted to the Seabed Data Centre (Offshore Installations) at the United Kingdom Hydrographics Office. The means by which seabed clearance is verified will be discussed and agreed with OPRED, however it is assumed that, in line with OPRED's policy, non-intrusive methods such as side-scan sonar and multi-beam echo surveys will be used as the Leman F and G facilities are located within environmentally sensitive areas.

6.3 Schedule

An indicative schedule for the scope of these programmes is provided in Figure 6.1.

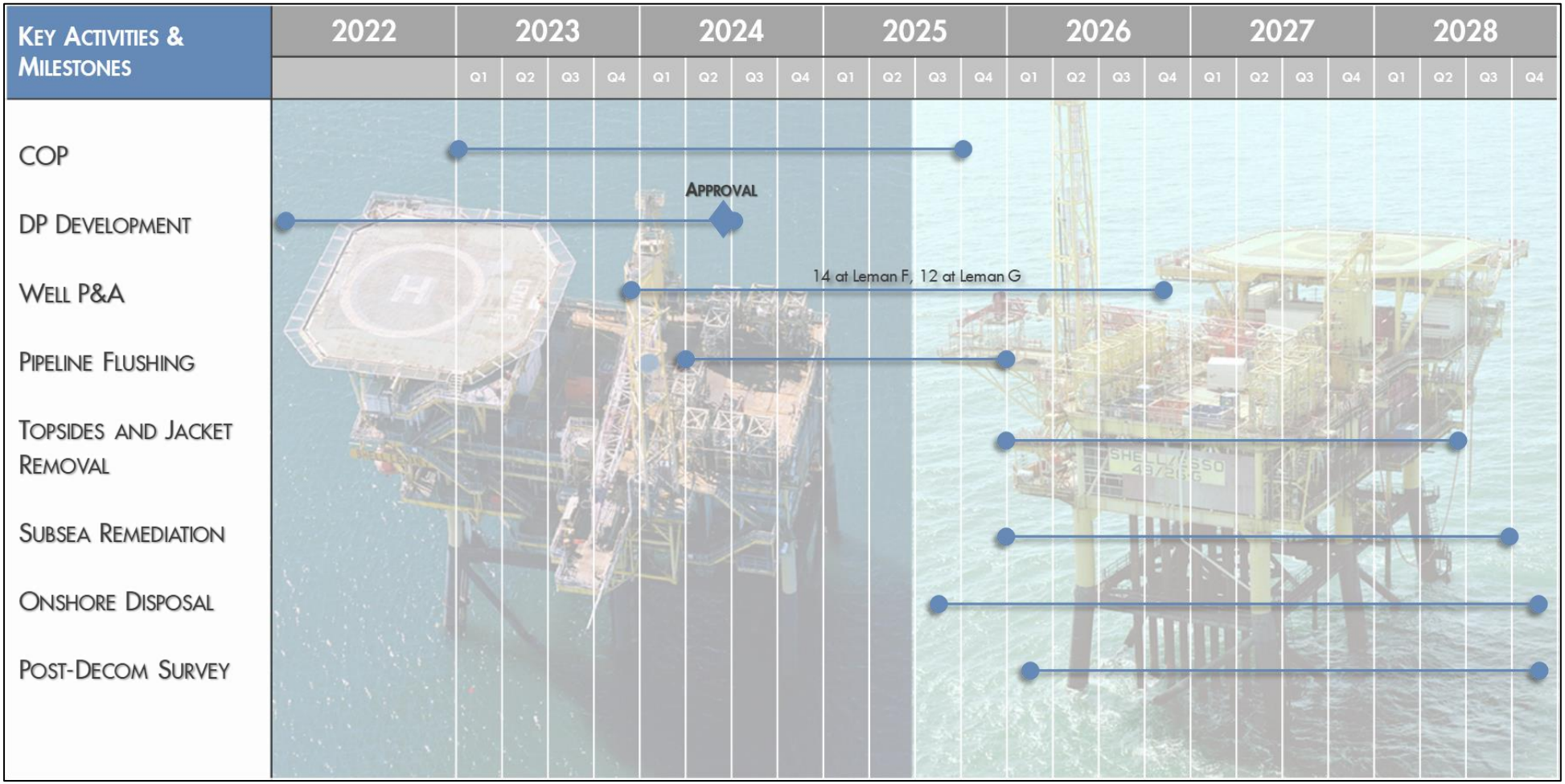

Figure 6.1: Project Plan

Note – as execution dates are uncertain, windows are provided for each activity.

6.4 Costs

A separate version of this document will be provided to OPRED 'commercial – in confidence' at public consultation, providing the estimated costs of the Leman F & G Decommissioning Project using the format shown in Table 6.1.

Table 6.1: Provisional Decommissioning Programmes - Costs

OGUK WBS	Item	Estimated Cost (£m)
1.0	Operator PM	
2.0	Facility running/owner costs	
3.0	Wells abandonment	
4.0	Facilities/pipelines making safe	
5.0	Topsides preparation	
6.0	Topsides removal	
7.0	Substructure removal	
8.0	Topsides and substructure onshore recycling	
9.0	Subsea Infrastructure	
10.0	Site Remediation	
11.0	Monitoring	

6.5 Close Out

In accordance with the OPRED Guidelines, a Close Out Report will be submitted to OPRED within 12 months of completion of the offshore decommissioning scope including debris removal, verification of seabed clearance and the first post-decommissioning environmental and pipeline surveys. The report will detail the outcomes of as-left surveys as well as explain any major variances from these programmes.

6.6 Post-Decommissioning Monitoring and Evaluation

A post-decommissioning environmental seabed survey centred on the sites of the former installations and pipeline / cable corridors will be carried out. The survey will focus on any chemical and physical disturbances of the decommissioning activities compared with the pre-decommissioning data. Results of this survey will be forwarded to OPRED.

The former 500m zones centred on the Leman F and G platforms, and the Leman F & G pipeline routes will be the subject of geophysical surveys when decommissioning activity has concluded. A summary of these surveys will be shared with OPRED and will inform the agreement of a post-monitoring survey regime.

The parties to the approved Decommissioning Programmes will be the contact points for any third-party claims arising from damage caused by any remaining infrastructure under the approved Leman F & G Decommissioning Programmes. All the pipelines which are proposed to be decommissioned in situ remain the property and responsibility of the owners, even if they were to exit the UKCS.

7 SUPPORTING DOCUMENTS

Table 7.1: Supporting Documents		
Ref	Document Number	Title
[1]	Chapter 17	The Petroleum Act 1998
[2]	N/A	OPRED Guidance Notes - Decommissioning of Offshore Oil and Gas Installations and Pipelines November 2018
[3]	N/A	Oil and Gas UK Guidelines for Comparative Assessment in Decommissioning Programmes, Issue 1 October 2015
[4]	Gardline Report 11594 Vol 1	Pipeline Pre-decommissioning & Habitat Assessment: Leman Alpha to Leman Foxtrot & Leman Foxtrot to Leman Golf. Debris Clearance and Environmental Habitat Assessment
[5]	ED-2021-003	Gardline Pipeline pre-decommissioning & Habitat Assessment: Leman Alpha to Leman Foxtrot & Leman Foxtrot to Leman Golf. Habitat Assessment Report

These documents are available as follows:

1. At the Shell website at https://www.shell.co.uk/sustainability/decommissioning.html
2. Electronic copies may be requested by emailing SUKEP-Shell-Decommissioning-Correspondence@shell.com or writing to Decommissioning Business Opportunity Manager, Decommissioning Strategy, Shell U.K. Limited, 1 Altens Farm Road, Nigg, Aberdeen, AB12 3FY.

8 PARTNER LETTERS OF SUPPORT

Letters from the field partner Esso Exploration and Production UK Limited (Registered number 00207426) will be provided with the final submission of the Decommissioning Programmes when called for by the Secretary of State. (HOLD 10)

APPENDIX 1 – PUBLIC NOTICE

The Petroleum Act 1998

Leman F & G Decommissioning Programmes

On 12 July 2023, Shell U.K. Limited submitted, for the consideration of the Secretary of State for Energy Security and Net Zero, the draft Decommissioning Programmes for the Leman F & G facilities in accordance with the provisions of the Petroleum Act 1998. It is a requirement of the Act that interested parties be consulted on such decommissioning proposals.

Leman F & G are two Normally Unattended Installations tied-back to the Leman Alpha Complex, located in Block 49/26 of the Southern North Sea. The platforms are 48km and 51km from the nearest UK coastline respectively. The facilities covered by the Decommissioning Programmes are:

- Installations and subsea infrastructure associated with the Leman F Platform, comprising of the platform topsides, platform jacket, production pipeline, power cable and associated stabilisation features.
- Installations and subsea infrastructure associated with the Leman G Platform, comprising of the platform topsides, platform jacket, production pipeline, power cable and associated stabilisation features.

Shell U.K. Limited hereby gives notice that the Leman F & G Decommissioning Programmes can be viewed online at https://www.shell.co.uk/sustainability/decommissioning.html

Alternatively, a digital copy of the Programmes can be requested:

Contact: Business Opportunity Manager, Shell U.K. Limited

Email: SUKEP-Shell-Decommissioning-Correspondence@shell.com

Representations regarding the Leman F & G Decommissioning Programmes should be submitted in writing to Shell U.K. Limited for the attention of the Business Opportunity Manager at the above email address, where they should be received no later than the consultation closing date (11 August 2023) and should state the grounds upon which any representations are being made.

12 July 2023

Business Opportunity Manager

Shell U.K. Limited

The Silver Fin Building

455 Union Street, Aberdeen

AB11 6DB

APPENDIX 2 – DEPTH OF BURIAL CHARTS

Generally, there are two definitions for burial depth; depth of lowering and depth of cover, which are both illustrated in Figure 0-1 below. The depth of cover is the conventional definition of burial depth, which is the depth of backfill or rock on top of the pipeline or cable. The depth of lowering is the depth of the top of the pipeline or cable below the natural mean seabed level. The natural mean seabed level is identified ignoring any berms to the sides of the trench.

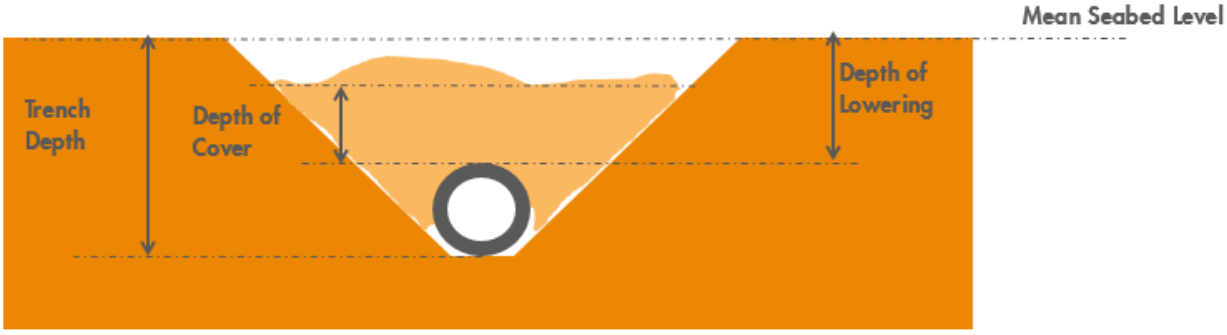

Figure 0-1 – Burial depth definition

Shell has contracted Xodus to supplement historical depth-of-cover survey results with data on fishing activity and seabed mobility to produce a risk assessment for decommissioning each line *in situ*.

The graphics below provide the following for each line:

- Depth-of-cover line graph providing the results from historical surveys
- Spannogram indicating where each line is buried, is exposed or is in freespan
- The output from the Xodus risk assessment.

A brief explanatory note is provided for each line.

On the completion of decommissioning activities, Shell will perform a depth-of-cover survey for the full length of each line being decommissioned *in situ*. The results of these surveys will be presented to OPRED in a similar linear graph format as part of the Close Out Report.

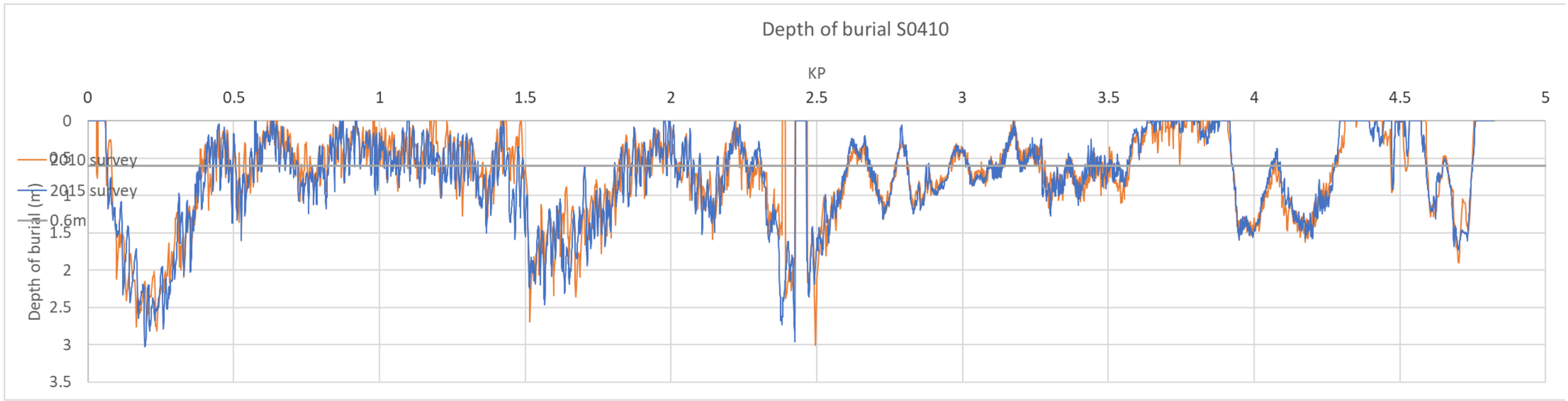

Figure 0-2 – Leman F Production Pipeline Depth of Cover (S0410 / PL363)

Figure 0-2 shows the survey results from the 2010 and 2015 depth-of-cover surveys for PL363. The orange line indicate the depth-of-cover results from the 2010 survey; the blue line the results from the 2015 survey.

Figure 0-3 shows the spanogram for PL363 – historical side-scan sonar survey results incorporating surveys in 2010, 2012, 2014, 2016, 2018 and 2020. A key is provided on the left of the drawing – where the pipeline is coloured green, the line is buried; where it is coloured red it is in freespan; and where it is coloured blue the line has been inspected but the result is uncertain. Note that the red indicates that the pipeline is in freespan but not that the span is of the height and length to be classified as recordable within the Kingfisher definition of a span.

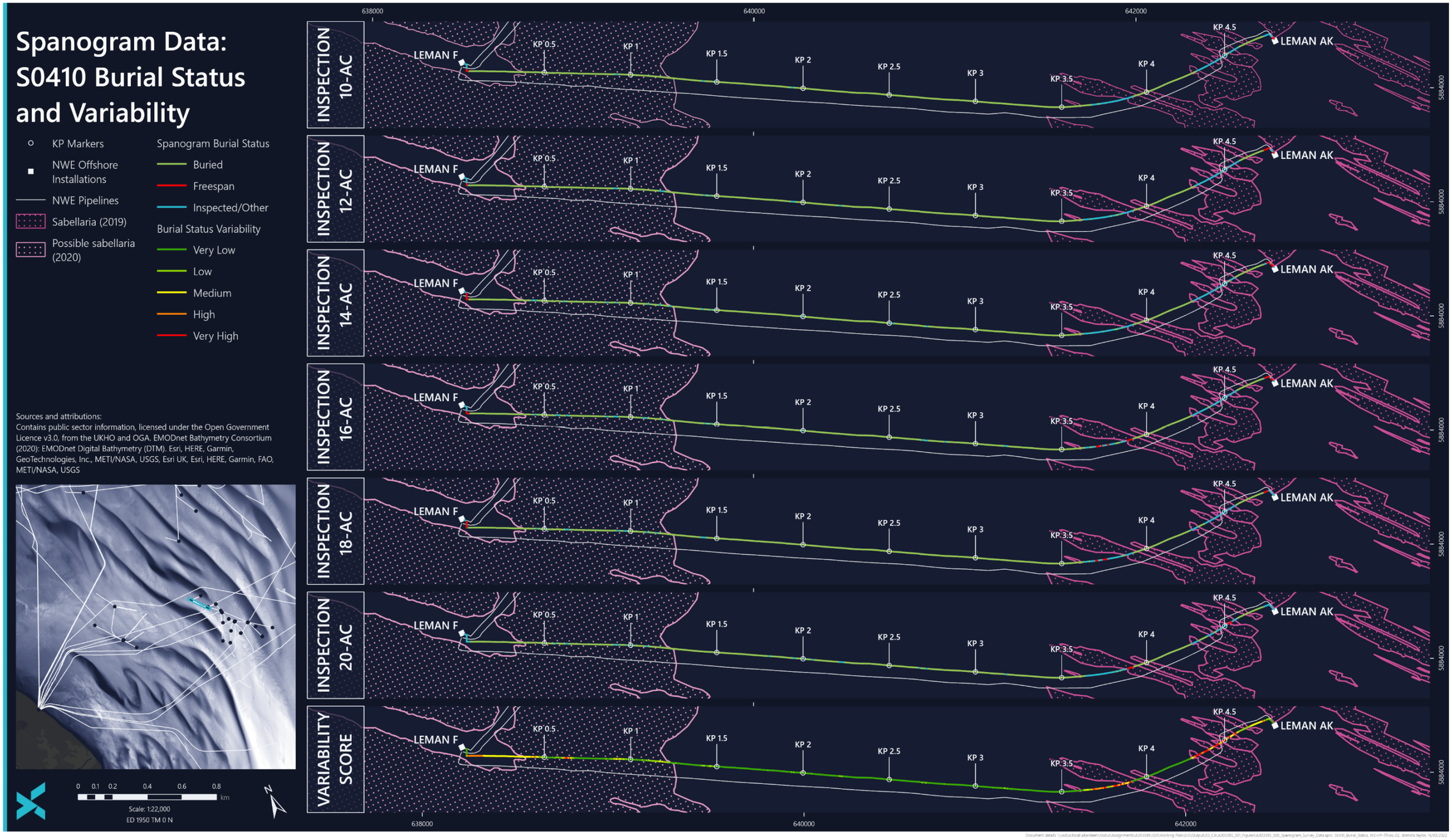

Figure 0-3 – Leman F Production Pipeline Historical Spanogram Results (S0410 / PL363)

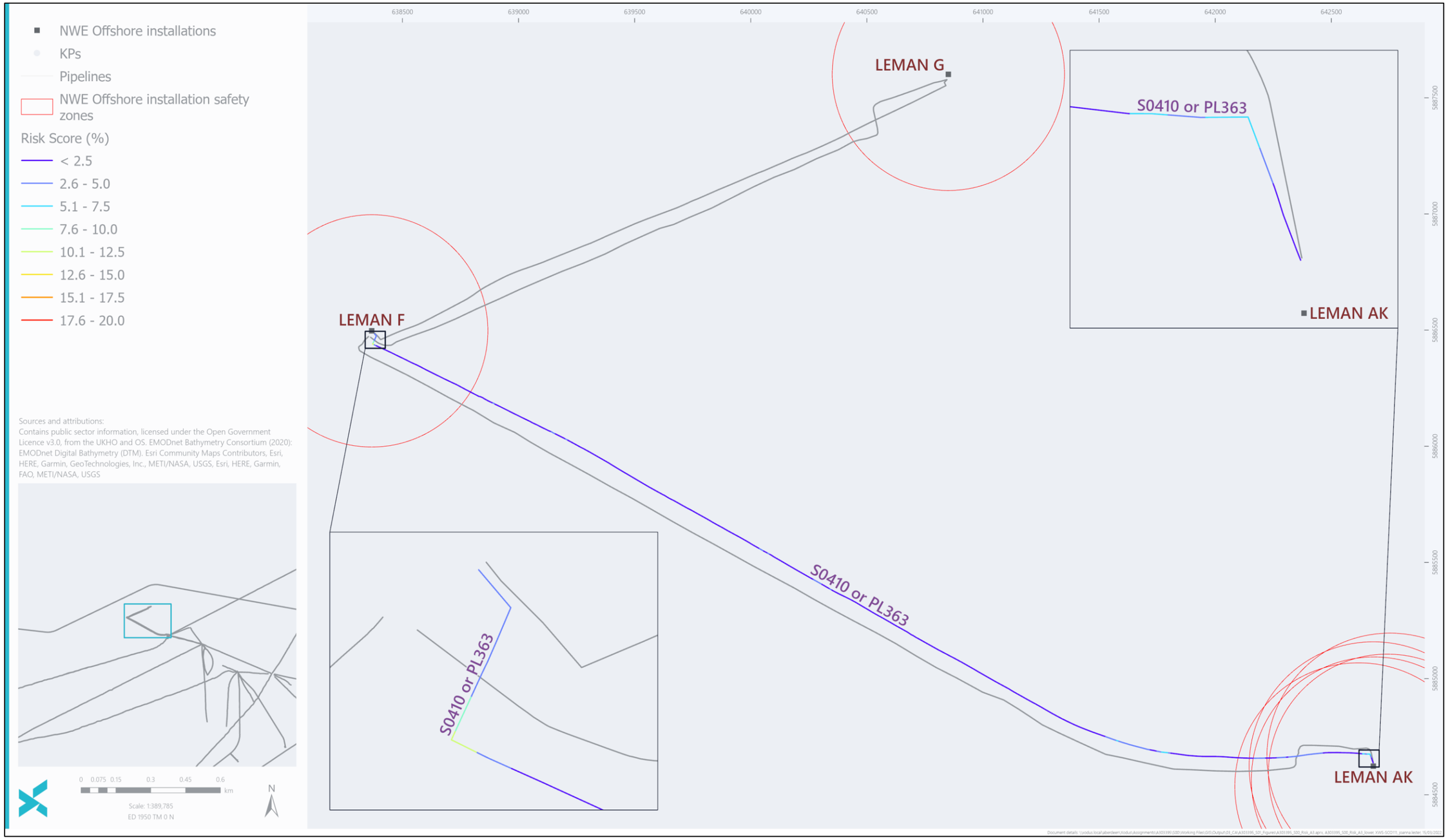

Figure 0-4 – Leman F Production Pipeline Risk Assessment (S0410 / PL363)

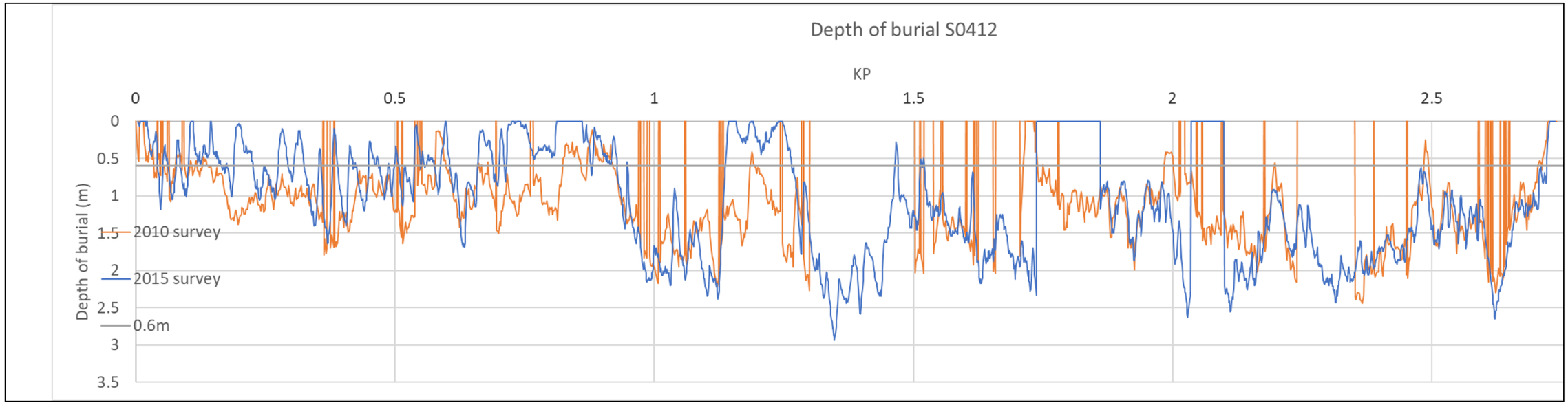

Figure 0-5 – Leman G Production Pipeline Depth of Cover (S0412 / PL364)

Figure 0-5 shows the survey results from the 2010 and 2015 depth-of-cover surveys for PL364. The orange line indicate the depth-of-cover results from the 2010 survey; the blue line the results from the 2015 survey.

Figure 0-6 shows the spanogram for PL364 – historical side-scan sonar survey results incorporating surveys in 2010, 2012, 2014, 2016, 2018 and 2020. A key is provided on the left of the drawing – where the pipeline is coloured green, the line is buried; where it is coloured red it is in freespan; and where it is coloured blue the line has been inspected but the result is uncertain. Note that the red indicates that the pipeline is in freespan but not that the span is of the height and length to be classified as recordable within the Kingfisher definition of a span.

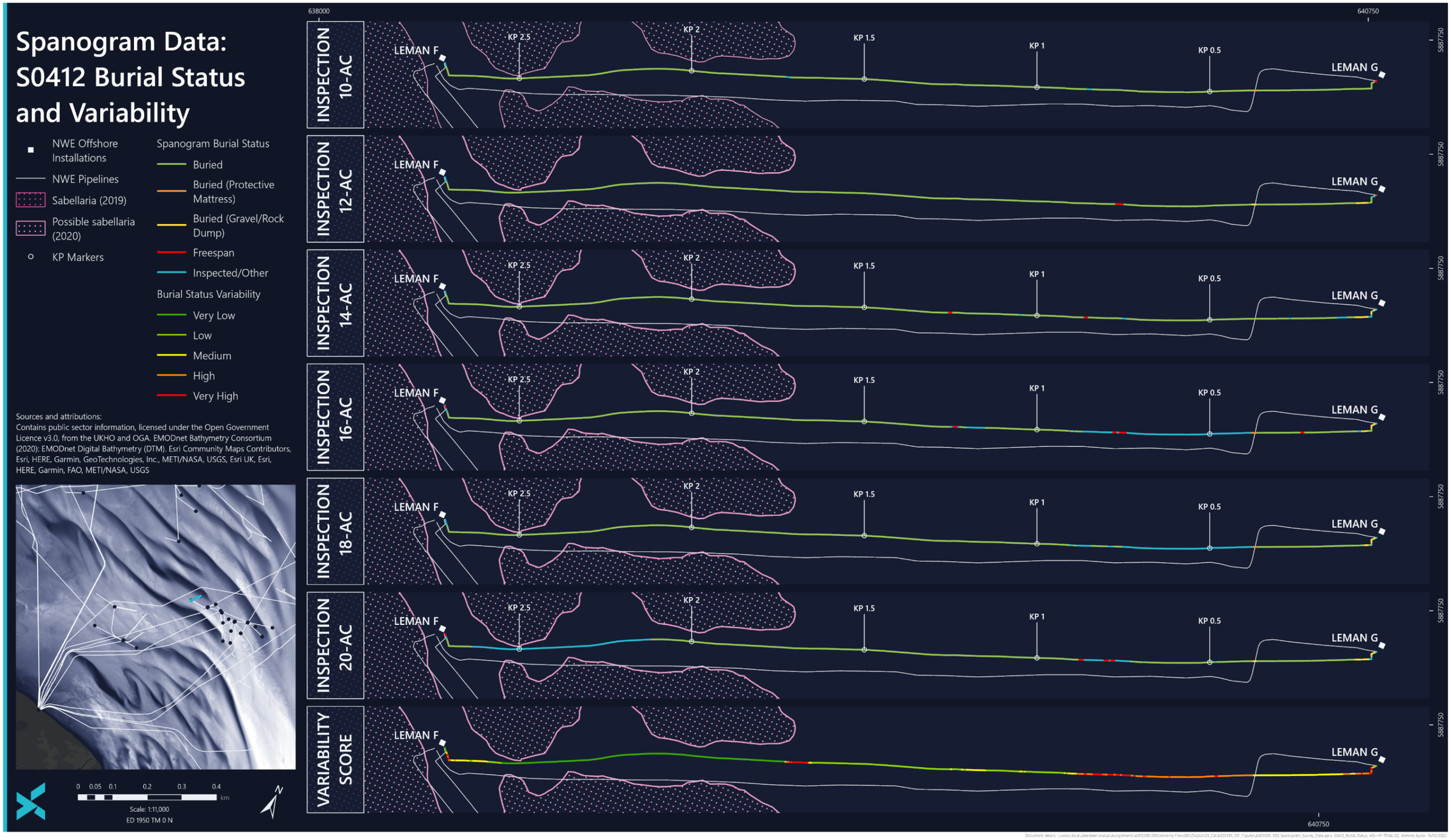

Figure 0-6 – Leman G Production Pipeline Historical Spanogram Results (S0412 / PL364)

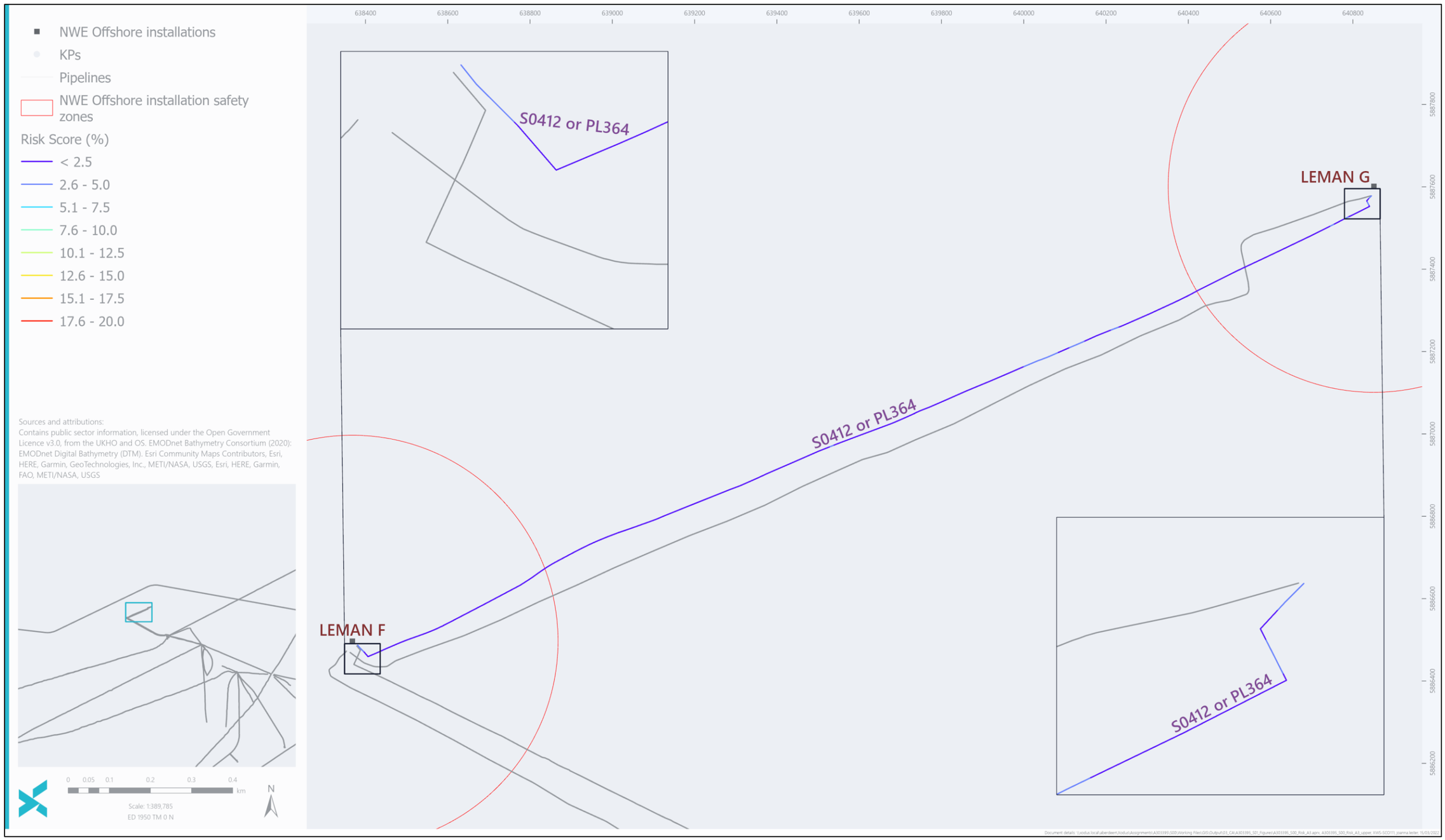

Figure 0-7 – Leman G Production Pipeline Risk Assessment (S0412 / PL364)

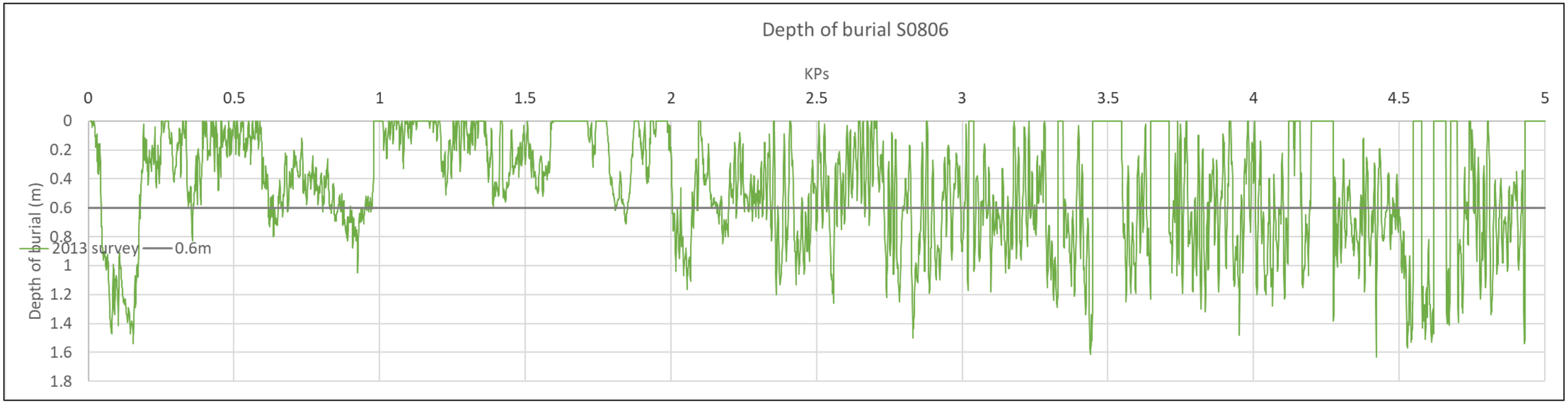

Figure 0-8 – Leman F Power Cable Depth of Cover (S0806 / PL5148)

Figure 0-8 shows the survey results from the 2013 depth-of-cover survey for PL5148. The green line indicate the depth-of-cover results.

Figure 0-9 shows the spanogram for PL5148 – historical side-scan sonar survey results incorporating surveys in 1995, 1996, 1997, 2002, 2013 and 2020. A key is provided on the left of the drawing – where the cable is coloured green, the line is buried; where it is coloured red it is in freespan; and where it is coloured blue the line has been inspected but the result is uncertain. Note that the red indicates that the cable is in freespan but not that the span is of the height and length to be classified as recordable within the Kingfisher definition of a span.

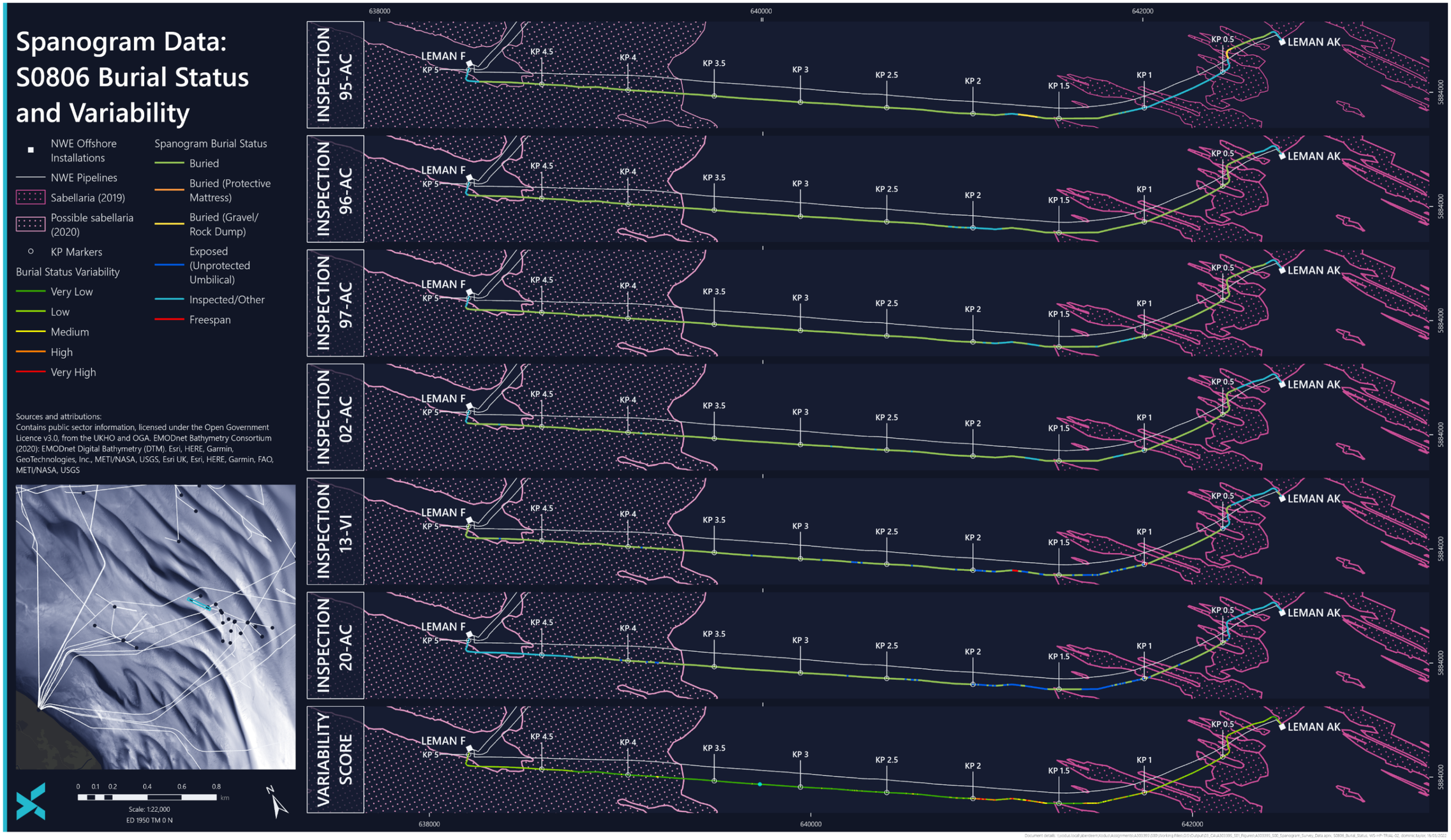

Figure 0-9 – Leman F Power Cable Historical Spanogram Results (S0806 / PL5148)

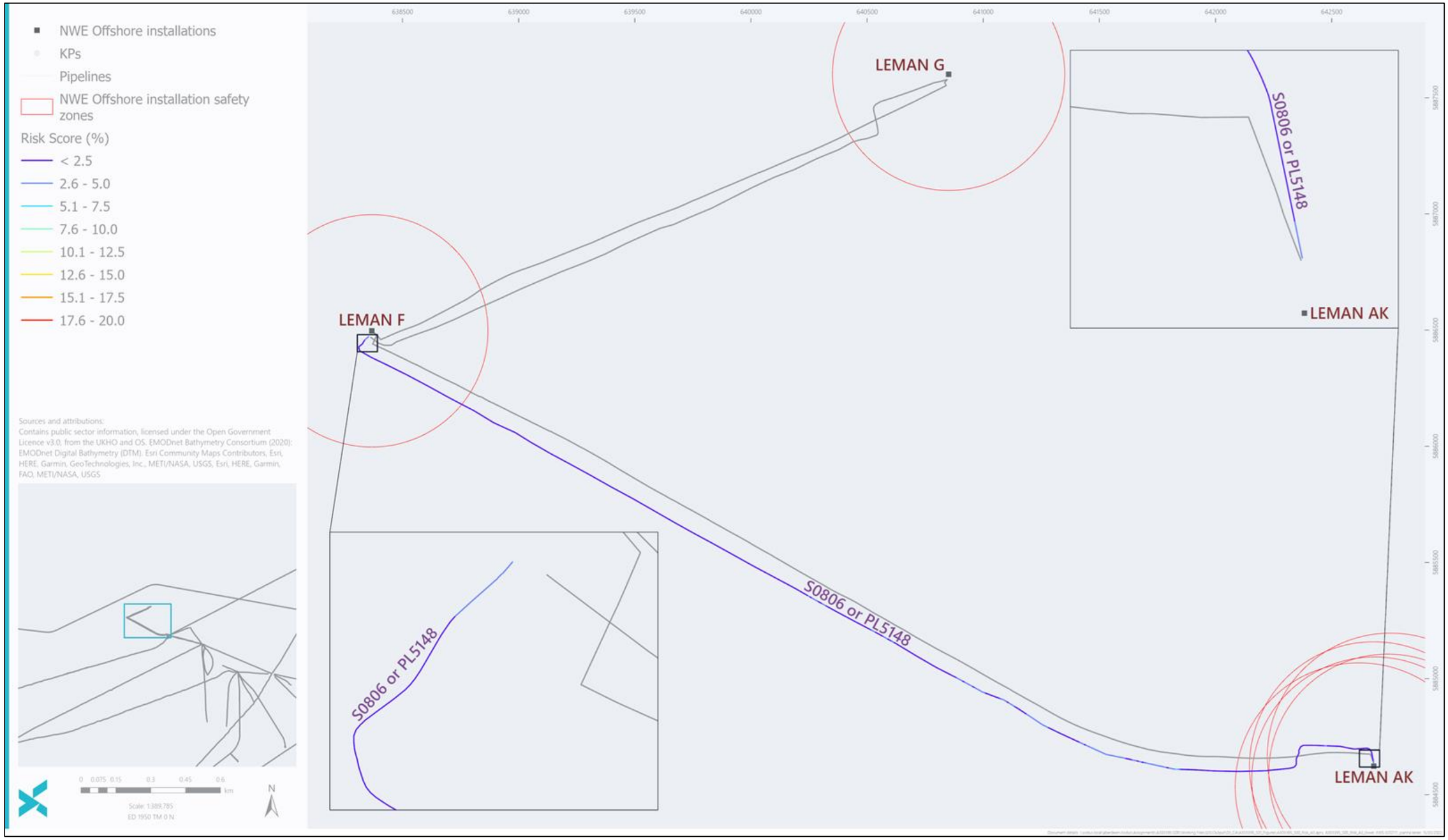

Figure 0-10 – Leman F Power Cable Risk Assessment (S0806/ PL5148)

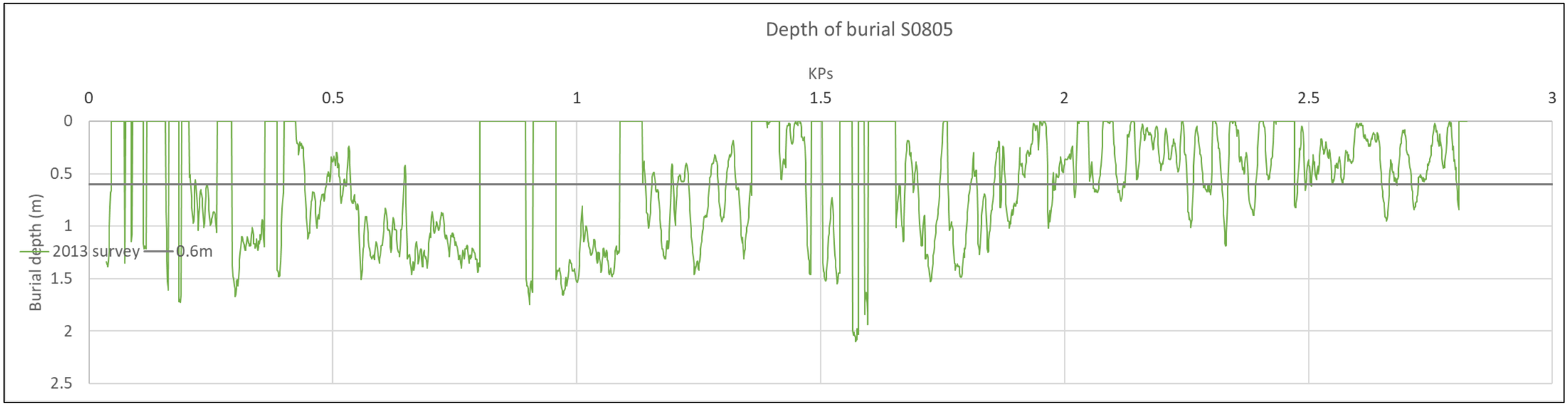

Figure 0-11 – Leman G Power Cable Depth of Cover (S0805 / PL5147)

Figure 0-11 shows the survey results from the 2013 depth-of-cover survey for PL5147. The green line indicate the depth-of-cover results from the survey.

Figure 0-12 shows the spanogram for PL5147 – historical side-scan sonar survey results incorporating surveys in 1995, 1996, 1997, 2002, 2013 and 2020. A key is provided on the left of the drawing – where the pipeline is coloured green, the line is buried; where it is coloured red it is in freespan; and where it is coloured blue the line has been inspected but the result is uncertain. Note that the red indicates that the pipeline is in freespan but not that the span is of the height and length to be classified as recordable within the Kingfisher definition of a span.

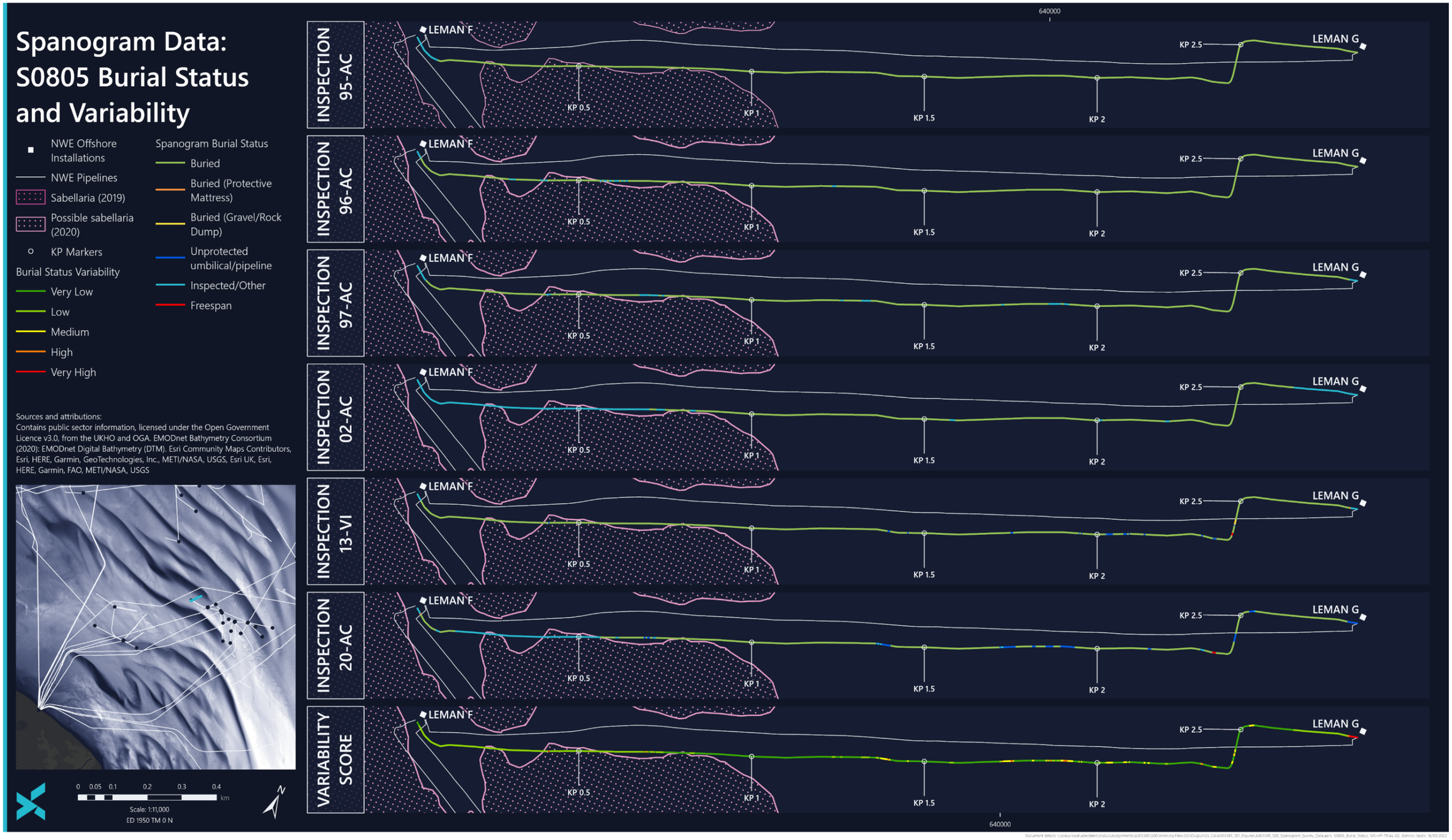

Figure 0-12 – Leman G Power Cable Historical Spanogram Results (S0805 / PL5147)

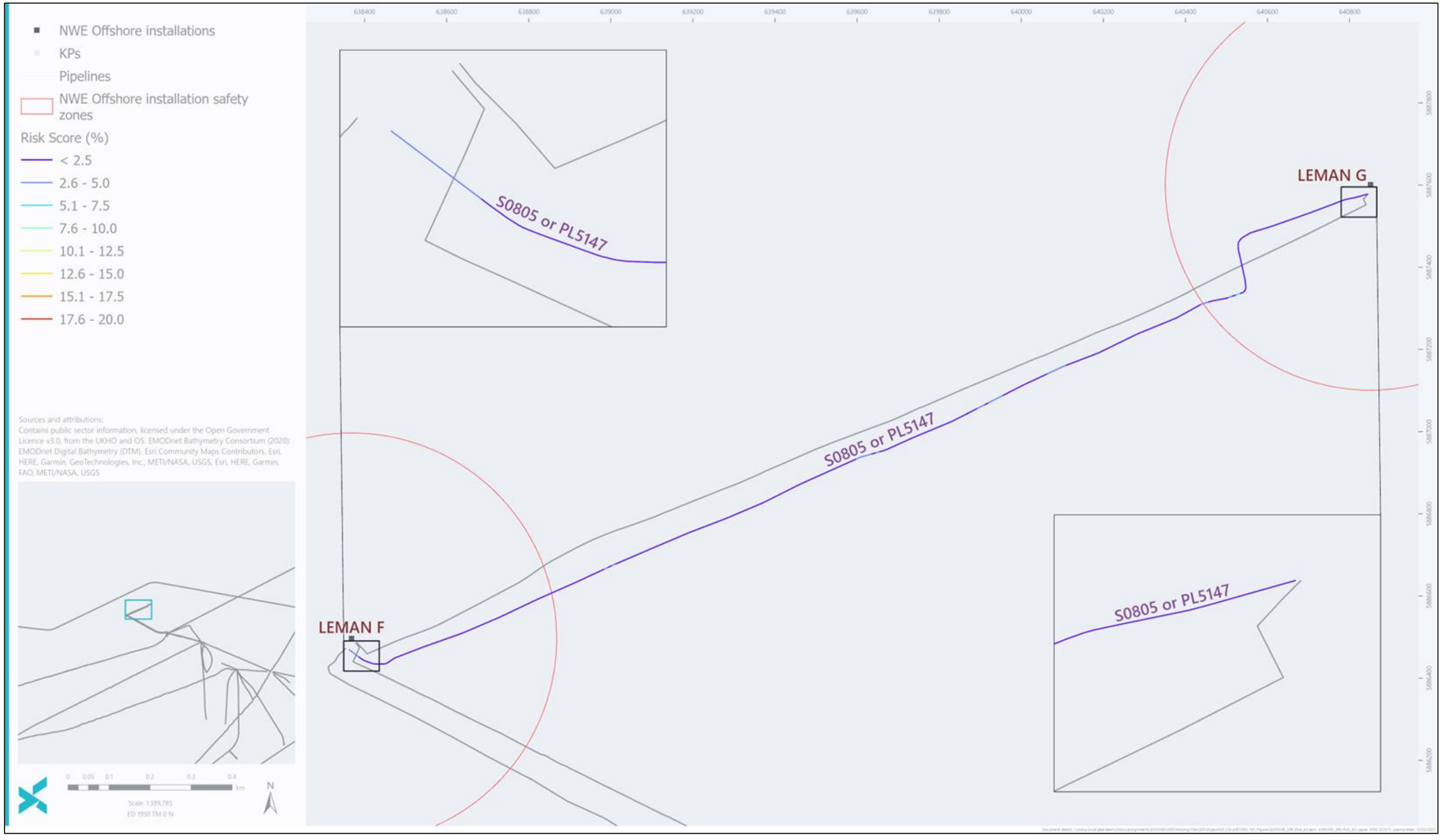

Figure 0-13 – Leman G Power Cable Risk Assessment (S0805 / PL5147)