



Dumping at Sea Annual Environmental Report (AER) 2025

Permit Register Number: S0026-02

Permit Holder: Aughinish Alumina Limited

Address: Aughinish Island
Askeaton
County Limerick

Location of Loading: Jetty and Cells at Aughinish
Alumina Limited

Location of Dumping: Jetty and Cells at Aughinish
Alumina Limited

Declaration

I, Matt Butler (Senior Environmental Engineer), confirm, by ticking the box below, that all the information provided in this report is truthful, accurate and complete to the best of my knowledge and belief.

In addition, I confirm that all monitoring and performance reporting and summarised herein is available for inspection by the EPA.

Tick here



Aughinish Alumina Ltd.

Dumping at Sea Permit
Register No. S0026-02

Annual Environmental Report 2025

February 2026

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1. Summary of Loading and Dumping at Sea Activities

This document comprises the Aughinish Alumina Limited (AAL) Annual Environmental Report (AER) for the purposes of the Dumping at Sea (DaS) permit.

The report covers the period from the 1st January 2025 to the 31st December 2025 and has been prepared in accordance with the requirements of the DaS permit and the Guidance note on the preparation and submission of the Annual Environmental Report for dumping at sea permit holders, issued by the EPA in January 2021.

1.1 Period of validity of the permit

AAL DaS permit S0026-02 was granted on 25th June 2025. As per Condition 3.1 of the DaS permit, all loading and dumping activities must be completed by the 31st December 2032.

The purpose of the dredging is to:

- Maintain design and navigational depths for shipping.
- To allow the full use of the length of the jetty structure and manoeuvring area.

Dredging is being progressed on a campaign basis on-site, to address sediment accumulation. As such AAL applied for a multi-annual DaS permit. The quantity of the dredged material is limited in accordance with Schedule A of the permit.

A Maritime Usage Licence (MUL) was also granted by the Maritime Area Regulatory Authority (MARA), in 2025.

1.2 Details of closed periods

There are no closed periods set out in the DaS permit.

1.3 Details of exclusion zones

There are no exclusion zones set out in the DaS permit.

The location of the dumping sites are set out by the coordinates specified in Schedule A: Limitations of the DaS permit.

1.4 Dates/period when permitted activities occurred during the previous calendar year

During this period one dredging campaign was undertaken:

- 23rd July to 06th August 2025

1.5 Quantity of dredged material dumped at sea

A total of 8,270.10 tonnes of material were dredged during 2025.

1.6 Location of loading

Dredging occurred at the outer berth (Dredge Area 'A') and cells area (Dredge Area 'B').

1.7 Location of dumping

Method of dredging employed is plough dredging with the assistance of a long reach excavator. Discharge of plough dredge is subsurface at the termination of each run.

1.8 Compliance summary

Dredging activities were in full compliance with all conditions and limits set out in the DaS permit.

1.9 Changes to the permit

There were no changes to the permit.

1.10 Other relevant information

In accordance with Condition 6.8 and Schedule D of the DaS permit the following items are required to be reported on an annual basis in the AER:

- Register/log of dumping activities
- OSPAR dumping report
- Reported incidents summary
- Complaints summary
- Monitoring summary
- Marine mammal monitoring report
- Accident prevention procedure
- Emergency response procedure
- Investigation of alternative re-uses summary
- Any other items specified by the Agency

2. OSPAR Dumping Report

The OSPAR dumping report for 2025 is included in ***Attachment 1*** of this AER.

3. Register/Log of Dumping Activities And Vessel Track Record Data

One campaign of plough dredging, assisted by a long reach excavator, was carried out under the DaS permit in 2025.

The campaign was from 23rd July to 06th August 2025, inclusive.

A register/log of dumping activities for the dredging campaign is included in **Attachment 2**.

This register/log also contains a record of the vessel locations during dredging activities. A full record of the vessel track log is available for inspection on site.

Schedule A.1 Quantity of Dredged Material to be Dumped at Sea, sets out the tonnage limits in the DaS permit. Tables 1 – 3 outlines how these limits were complied with during the 2025 dredging campaign.

Table 1: Quantities at Dumping Site E (off-Foynes Island):

	Maximum annual quantity (tonnes, wet weight)		Total maximum quantity over the duration of the permit tonnes wet weight	
	Limit	Annual total	Limit	Total over duration of permit
Dredged material	53,846	0	215,392	0

NOTE: Tractor Suction Hopper Dredging was not employed during the 2025 campaign and Dump Site E was not utilised.

Table 2: Quantities at Dumping Sites by Plough Dredging

	Dumping Sites	Maximum annual quantity (tonnes, wet weight)		Total maximum quantity over the duration of the permit tonnes, wet weight	
		Limit	Annual total	Limit	Total over duration of permit
Dredged material	Area A. Outer berth.	13,309	6,362.64	106,470	6,362.64
	Area B. The cells.	2,520	1,907.46	20,160	1,907.46
	Area C. Inner berth.	5,962	0	47,693	0
	Area D. Jetty approach arm.	7,920	0	63,360	0
	Total (Areas A-D)	29,710	8,270.10	237,683	8,270.10

Table 3: Combined Quantity of Dredged Material to be Dumped at Sea: Dumping Site E and Plough Dredging Sites (Areas A-D)

	Dumping sites	Maximum quantity per 21-day campaign (tonnes, wet weight)	Total per 21 day campaign
Dredged material	Dumping by Plough dredging (Areas A-D) and by trailing suction hopper dredger Area E	64,462	8,270.10

4. Reported Incidents and Complaints Summary

4.1 Incidents

There were no incidents reported for the 2025 reporting period.

4.2 Complaints

There were no complaints received for the 2025 reporting period.

5. Monitoring Summary

5.1 Bathymetry

One dredging campaign was undertaken in 2025. The outer berth (Dredge Area A) of the jetty and the cells area (Dredge Area B) were dredged on this occasion. Pre and post-dredging bathymetry surveys were undertaken for these areas for both campaigns as per Condition C.1.1 of the DaS permit.

The campaign was from 23rd July to 06th August 2025, inclusive.

Pre-dredge survey was completed on the 22nd July 2025 for the main berth (Dredge area A), and on the 01st August 2025 for the cells area (Dredge area B).

Post-dredge survey was completed on the 01st August 2025 for the main berth (Dredge area A), and on the 06th August 2025 for the cells area (Dredge area B).

The bathymetric reports for both dredging campaigns, are included in **Attachment 3**.

5.2 Turbidity Monitoring

As per Schedule C.1.2 of the permit, continuous turbidity monitoring was carried out at two monitoring locations during the dredging campaigns.

The continuous monitoring was carried out at the monitoring buoys illustrated in Figure 5.1.

The full report of the results of the continuous turbidity monitoring for the dredging campaign are included in **Attachment 4** of this AER. The turbidity results show that the dominant influence on turbidity levels in the area during the course of these monitoring periods are in fact the strong local tides.



Figure 1: Location of continuous monitoring buoys

5.3 Suspended Solids Monitoring

A programme of suspended solids monitoring was carried out at the agreed continuous monitoring buoy locations. Sampling was carried out by SSL International Marine Ltd. and analysis was carried out in the AAL environmental laboratory using a standard method. The suspended solids analysis results are included in **Attachment 5**.

5.4 Marine Mammal Monitoring

AAL contracted the Irish Whale and Dolphin Group (IWDG) to provide an experienced marine mammal observer (MMO) for the dredging campaign in 2025.

Survey activities took place on the 22nd July 2025, 01st August 2025 and 06th August 2025. Dredging operations occurred from the 23rd July to 06th August 2025, inclusive.

A qualified MMO carried out a minimum 30 minutes visual monitoring of a 500m exclusion zone for mitigation before commencement of activities. Seventeen pre-watches were carried out during this maintenance dredging project, amalgamating in 9 hours and 46 minutes of pre-watch effort.

There were two bottlenose dolphin (*Tursiops truncatus*) sightings during this project. The first sighting was of three animals, before dredging operations commenced at Dredge Site A on the 23/07/2025. The animals stayed outside of the 500m mitigation zone for the duration of the pre-watch. The closest distance they came to operations was 650m and no mitigation action was required. The second sighting, on the 24/07/2025, was of a group of approximately 12 animals travelling west, along the north of the Shannon Estuary. The closest distance the animals came to operations was 900m. Dredging operations were ongoing when the sighting occurred, and no mitigation action was required.

“It is the opinion of IWDG Consulting that it is highly unlikely that the dredging operations or geophysical surveys had any significant impact on marine mammals in the area during the project..”

The MMO report is included in **Attachment 6** of this AER.

5.5 Archaeology Monitoring

As per Schedule C.1.5 of the permit, archaeological monitoring occurred when the long reach excavator was in use. Monitoring was undertaken by a suitably qualified archaeologist under a licence issued by the Department of Housing, Local Government and Heritage (Licence no. 25E0712, 25R0317 & 25D0231).

Mizen Archaeology Ltd were engaged to monitor the dredging works at Aughinish, Co. Limerick. The works were carried out over the course 14 days in July and August 2025. An experienced underwater archaeologist monitored all dredging operations through constant visual inspection. A long reach excavator was used to move material, so it was accessible to the plough. Plough dredging was continued after the excavation was completed. The sediment consisted of a light greyish brown silt.

The archaeological monitoring did not identify any archaeological material.

6. Accident Prevention and Emergency Response

Accident prevention and emergency response procedures are developed and implemented by AAL and Shannon Foynes Port Company (SFPC). The following documentation is in place and a copy of all documents are available from the licensee.

- AAL Marine Emergency Plan
- AAL Accident Prevention Policy
- SFPC Shannon Estuary Marine Emergency Plan
- SFPC Accident Prevention Procedure
- SFPC Standard Operating Procedure EHS/021 – Reporting Procedures for SFPC Water Craft
- SFPC Standard Operating Procedure EHS/054 – Accident, Incident, Near Miss Reporting

7. Statement of Measures in Relation to Prevention of Environmental Damage and Remedial Action

As part of the application process, AAL conducted studies on the sediment characteristics and the nature of the materials to be dredged from a chemical and radiological perspective. Furthermore a faunal study was carried out. This information provided as part of the application process serves as a measure to ensure that the material dredged would not lead to potential environmental damage.

As per DaS Permit requirements, additional sediment characterisation will be completed in 2026. In line with sediment monitoring in 2026, a report will be completed on investigations into alternative re-use options for the dredged material.

All mitigation measures required as part of the DaS permit are undertaken to ensure the prevention of environmental damage. For example, turbidity, suspended solids monitoring and marine mammal monitoring. This as well as the appropriate notifications are important measures in preventing environmental damage.

Preventative measures and remedial action measures are outlined in the various AAL and SFPC marine emergency plans and accident prevention procedures and policies outlined in Section 6. These documents outline the procedures to be followed as well as the resource requirements from a personnel and equipment perspective.

Attachment 1

OSPAR Dumping Report

IMPORTANT: PLEASE READ.

Please follow these instructions for completion:

1. Co-ordinates to be submitted as decimal degrees in WGS84.
 2. Please allow **a separate cell for each coordinate**.
 3. Attach the following files:
 - (a) Charts showing **locations of dredging and location of sampling points** (in jpeg or pdf format)
 - (b) Tables indicating **locations and quantities dredged** (in word or excel format)
 - (c) Most recent sediment chemistry analysis (in excel material analysis spreadsheets from EPA), **including AER testing**.
 - (d) A shape file displaying the dredging areas.
 - (e) A shape file displaying the dumping locations.
- Thank you.

Additional comments		
Permit No.	50026-02	
Date of issue	2025	
Location of dredging (Port)	Aughinish Alumina Port Jetty	
Amount permitted (tonnes)	53,846	Annual permitted tonnage
Capital or maintenance?	Maintenance	
Outline coordinates for dredging area (Decimal degrees WGS84)	52°38.782' N, 9°03.701' W	Dumping site 'A' (Outer berth dredging site)
	52°38.803' N, 9°03.236' W	
	52°38.738' N, 9°03.229' W	
	52°38.717' N, 9°03.692' W	
	52°38.247' N, 9°03.506' W	Dumping site 'B' (Cells dredging site)
	52°38.284' N, 9°03.292' W	
	52°38.206' N, 9°03.256' W	
	52°38.170' N, 9°03.469' W	
Date of dredging (from - to)	23/07/2025 - 06/08/2025	
Method of dredging	Plough dredging	
Dumpsite Coordinates	N/A	A' - outer berth dredged during campaign. - silt being deposited at the dredging site 'B' - cells - silt being deposited at the dredging site

WASTES DUMPED

If permit relates to dredged sediments please complete section A. Otherwise, complete section B

A. DREDGED SEDIMENTS

(a) Specification of waste (e.g. mud, silt, sand etc.)	Silt	
(b) Derived from harbour, estuary or open water?	Estuary	at port jetty and cells area
(c) Total quantity of wastes dumped (tonnes)?	8270.1	tonnes
(d)	A baseline charaterisation report was produced in February 2024 by Hydro Survey. Sampling for the report was carred out on 11/04/2023. 4 locations were sampled for sediment charaterisation. Details of full analysis included in attached report.	
(e)	Please provide a map of the area dredged with chemical analysis sampling stations indicated . Please include details of quantities dredged from specific areas.	Please find map of dredge areas attached. Sampling station locations are included in Figure 1-1 of the Hydro Survey Characterisation Report attached.
(g)	What monitoring has taken place and by whom? Please attach report.	Hydro Survey report attached IDS Monitoring Ltd reports attached for both dredging campaigns. Aughinish Alumina Ltd laboratory results attached for both dredging campaigns.
(f) Other relevant information	Not applicable	

B. OTHER WASTES

(a) Specification of waste	Not applicable	
(b) Derived from harbour, estuary, open water or other (please specify)?	Not applicable	
(c) Total quantity of wastes dumped (tonnes)	Not applicable	
(d) Details of any chemical, toxicity and/or other testing carried out on this waste (reports to be attached as separate documents)	Not applicable	
(e)	Not applicable	
(f) What monitoring has taken place and by whom? Please attach report.	Not applicable	
Other relevant information	Not applicable	

C. DUMPING AREA :

Note: EACH INDIVIDUAL DUMPSITE REQUIRES SEPARATE ENTRY

Dumpsite A

(a) Location	Dumping Site 'A'	Outer berth dredging site
Co-ordinates (minimum of 4):		
Latitude (decimal degrees - WGS 84)	Longitude (decimal degrees - WGS 84)	
52°38.782' N	9°03.701' W	
52°38.803' N	9°03.236' W	
52°38.738' N	9°03.229' W	
52°38.717' N	9°03.692' W	
(b) Quantity of material dumped here	6362.64	tonnes
(c) Dates of Dumping (from/to)	23/07/2025 - 01/08/2025	
(d) Origin of material (eg berths, fairway etc)	Outer berth	
(e) Depth (metres)	13	

(f) Distance from coast (km)	0.9km	
(g) Tidal flows		
Direction (degrees)	East 84° West 276°	
Maximum speed (m/s knots)	5	knots
(h) Method of dumping (if more than one vessel involved, give the range of loads and discharge conditions)	Discharge of plough dredge subsurface at the termination of each run.	
(i) Vessel(s) load (tonnes)	12 Cubic Meters per full run or part of.	
(ii) Manner of discharge from vessel	Discharge from plough.	
(iii) Rate of discharge (te/day)	720 tonnes/day (average)	Varies
(iv) Speed of vessel while dumping (m/s or knots)	3 to 5	knots
(i) Other relevant information (e.g. residual water movements):	None	

Dumpsite 2

(a) Location	Dumping Site 'B'	Cells area dredging site
Co-ordinates (minimum of 4):		
Latitude (decimal degrees - WGS 84)	Longitude (decimal degrees - WGS 84)	
52°38.247' N	9°03.506' W	
52°38.284' N	9°03.292' W	
52°38.206' N	9°03.256' W	
52°38.170' N	9°03.469' W	
(b) Quantity of material dumped here	1907.46	tonnes
(c) Dates of Dumping (from/to)	01/08/2025 - 06/08/2025	
(d) Origin of material (eg berths, fairway etc)	Cells area	
(e) Depth (metres)	5	
(f) Distance from coast (km)	0.2	
(g) Tidal flows		
Direction (degrees)	East 133° West 313°	
Maximum speed (m/s knots)	4	knots
(h) Method of dumping (if more than one vessel involved, give the range of loads and discharge conditions)	Discharge of plough dredge subsurface at the termination of each run.	
(i) Vessel(s) load (tonnes)	12 Cubic Meters per full run or part of.	
(ii) Manner of discharge from vessel	Discharge from plough.	
(iii) Rate of discharge (te/day)	160 - 640 tonnes/day	Varies
(iv) Speed of vessel while dumping (m/s or knots)	2 to 4	knots
(i) Other relevant information (e.g. residual water movements):	N/A	

Dumpsite 3

(a) Location		
Co-ordinates (minimum of 4):		
Latitude (decimal degrees - WGS 84)	Longitude (decimal degrees - WGS 84)	
(b) Quantity of material dumped here		
(c) Dates of Dumping (from/to)		
(d) Origin of material (eg berths, fairway etc)		
(e) Depth (metres)		
(f) Distance from coast (km)		
(g) Tidal flows		
Direction (degrees)		
Maximum speed (m/s knots)		
(h) Method of dumping (if more than one vessel involved, give the range of loads and discharge conditions)		
(i) Vessel(s) load (tonnes)		
(ii) Manner of discharge from vessel		
(iii) Rate of discharge (te/day)		
(iv) Speed of vessel while dumping (m/s or knots)		
(i) Other relevant information (e.g. residual water movements):		

Attachment 2

Register/Log of Dumping Activities

Register of Loads Dumped at Sea

Permit: S0026-02 Name of vessel: "Fastnet Sound"

Type of spoil: Silt

Method of positioning: RTK/DGPS

Day No	Material source	Quantity on Board MT	Date	Quantity on Board MT per day	Departure		Ploughing Start (Local time)		Ploughing End (Local time)				Return		
					Position	Area	Time	Position	Time	Position	Time dredging (hr)	dredging (decimal)	Position	Place	Sig.
1	Aughinish	93.32	23/07/2025		Aughinish Jetty	Outer Berth -A	10:57	52°38.731'N,09°03.538'W	14:02	52°38.729'N,09°03.401'W	03:05	3.08	Aughinish Jetty	West Steps	RC
1	Aughinish	297.63	23/07/2025	390.95	Aughinish Jetty	Outer Berth -A	14:10	52°38.731'N,09°03.538'W		52°38.729'N,09°03.401'W	09:50	9.83	Aughinish Jetty	West Steps	RC
2	Aughinish	323.86	24/07/2025		Aughinish Jetty	Outer Berth - A	Cont	52°38.731'N,09°03.538'W	10:42	52°38.729'N,09°03.401'W	10:42	10.70	Aughinish Jetty	West Steps	RC
2	Aughinish	27.24	24/07/2025		Aughinish Jetty	Outer Berth - A	10:52	52°38.731'N,09°03.538'W	11:46	52°38.729'N,09°03.401'W	00:54	0.90	Aughinish Jetty	West Steps	RC
2	Aughinish	365.22	24/07/2025	716.32	Aughinish Jetty	Outer Berth - A	11:56	52°38.731'N,09°03.538'W		52°38.729'N,09°03.401'W	12:04	12.07	Aughinish Jetty	West Steps	RC
3	Aughinish	363.20	25/07/2025		Aughinish Jetty	Outer Berth - A	Cont	52°38.731'N,09°03.538'W	12:00	52°38.729'N,09°03.401'W	12:00	12.00	Aughinish Jetty	West Steps	RC
3	Aughinish	70.62	25/07/2025		Aughinish Jetty	Outer Berth - A	12:09	52°38.731'N,09°03.538'W	14:29	52°38.729'N,09°03.401'W	02:20	2.33	Aughinish Jetty	West Steps	RC
3	Aughinish	285.01	25/07/2025	718.84	Aughinish Jetty	Outer Berth - A	14:35	52°38.731'N,09°03.538'W		52°38.729'N,09°03.401'W	09:25	9.42	Aughinish Jetty	West Steps	RC
4	Aughinish	407.09	26/07/2025		Aughinish Jetty	Outer Berth - A	Cont	52°38.731'N,09°03.538'W	13:27	52°38.729'N,09°03.401'W	13:27	13.45	Aughinish Jetty	West Steps	RC
4	Aughinish	59.53	26/07/2025		Aughinish Jetty	Outer Berth - A	13:30	52°38.731'N,09°03.538'W	15:28	52°38.729'N,09°03.401'W	01:58	1.97	Aughinish Jetty	West Steps	RC
4	Aughinish	256.77	26/07/2025	723.38	Aughinish Jetty	Outer Berth - A	15:31	52°38.731'N,09°03.538'W		52°38.729'N,09°03.401'W	08:29	8.48	Aughinish Jetty	West Steps	RC
5	Aughinish	396.50	27/07/2025		Aughinish Jetty	Outer Berth - A	Cont	52°38.731'N,09°03.538'W	13:06	52°38.729'N,09°03.401'W	13:06	13.10	Aughinish Jetty	West Steps	RC
5	Aughinish	18.16	27/07/2025		Aughinish Jetty	Outer Berth - A	13:10	52°38.731'N,09°03.538'W	13:46	52°38.729'N,09°03.401'W	00:36	0.60	Aughinish Jetty	West Steps	RC
5	Aughinish	304.69	27/07/2025	719.35	Aughinish Jetty	Outer Berth - A	13:56	52°38.731'N,09°03.538'W		52°38.729'N,09°03.401'W	10:04	10.07	Aughinish Jetty	West Steps	RC
6	Aughinish	446.44	28/07/2025		Aughinish Jetty	Outer Berth - A	Cont	52°38.731'N,09°03.538'W	14:45	52°38.729'N,09°03.401'W	14:45	14.75	Aughinish Jetty	West Steps	RC
6	Aughinish	55.49	28/07/2025		Aughinish Jetty	Outer Berth - A	14:47	52°38.731'N,09°03.538'W	16:37	52°38.729'N,09°03.401'W	01:50	1.83	Aughinish Jetty	West Steps	RC
6	Aughinish	221.96	28/07/2025	723.89	Aughinish Jetty	Outer Berth - A	16:40	52°38.731'N,09°03.538'W		52°38.729'N,09°03.401'W	07:20	7.33	Aughinish Jetty	West Steps	RC
7	Aughinish	335.96	29/07/2025		Aughinish Jetty	Outer Berth - A	Cont	52°38.731'N,09°03.538'W	11:06	52°38.729'N,09°03.401'W	11:06	11.10	Aughinish Jetty	West Steps	RC
7	Aughinish	110.98	29/07/2025		Aughinish Jetty	Outer Berth - A	11:10	52°38.731'N,09°03.538'W	14:50	52°38.729'N,09°03.401'W	03:40	3.67	Aughinish Jetty	West Steps	RC
7	Aughinish	57.51	29/07/2025		Aughinish Jetty	Outer Berth - A	14:52	52°38.731'N,09°03.538'W	16:46	52°38.729'N,09°03.401'W	01:54	1.90	Aughinish Jetty	West Steps	RC
7	Aughinish	215.40	29/07/2025	719.85	Aughinish Jetty	Outer Berth - A	16:53	52°38.731'N,09°03.538'W		52°38.729'N,09°03.401'W	07:07	7.12	Aughinish Jetty	West Steps	RC
8	Aughinish	457.03	30/07/2025		Aughinish Jetty	Outer Berth - A	Cont	52°38.731'N,09°03.538'W	15:06	52°38.729'N,09°03.401'W	15:06	15.10	Aughinish Jetty	West Steps	RC
8	Aughinish	95.85	30/07/2025		Aughinish Jetty	Outer Berth - A	15:12	52°38.731'N,09°03.538'W	18:22	52°38.729'N,09°03.401'W	03:10	3.17	Aughinish Jetty	West Steps	RC
8	Aughinish	166.47	30/07/2025	719.35	Aughinish Jetty	Outer Berth - A	18:30	52°38.731'N,09°03.538'W		52°38.729'N,09°03.401'W	05:30	5.50	Aughinish Jetty	West Steps	RC
9	Aughinish	463.59	31/07/2025		Aughinish Jetty	Outer Berth - A	Cont	52°38.731'N,09°03.538'W	15:19	52°38.729'N,09°03.401'W	15:19	15.32	Aughinish Jetty	West Steps	RC
9	Aughinish	78.19	31/07/2025		Aughinish Jetty	Outer Berth - A	15:30	52°38.731'N,09°03.538'W	18:05	52°38.729'N,09°03.401'W	02:35	2.58	Aughinish Jetty	West Steps	RC
9	Aughinish	174.04	31/07/2025	715.82	Aughinish Jetty	Outer Berth - A	18:15	52°38.731'N,09°03.538'W		52°38.729'N,09°03.401'W	05:45	5.75	Aughinish Jetty	West Steps	RC
10	Aughinish	214.90	01/08/2025		Aughinish Jetty	Outer Berth - A	Cont	52°38.731'N,09°03.538'W	07:06	52°38.729'N,09°03.401'W	07:06	7.10	Aughinish Jetty	West Steps	RC
10	Aughinish	25.67	01/08/2025		Aughinish Cells	Cells - B	09:27	52°38.225'N,09°03.461'W	10:00	52°38.225'N,09°03.461'W	00:33	0.55	Aughinish Cells	Cells	RC
10	Aughinish	230.26	01/08/2025		Aughinish Cells	Cells - B	10:04	52°38.225'N,09°03.461'W	15:00	52°38.225'N,09°03.461'W	04:56	4.93	Aughinish Cells	Cells	RC
10	Aughinish	59.90	01/08/2025		Aughinish Cells	Cells - B	15:25	52°38.225'N,09°03.461'W	16:42	52°38.225'N,09°03.461'W	01:17	1.28	Aughinish Cells	Cells	RC
10	Aughinish	108.91	01/08/2025	639.64	Aughinish Cells	Cells - B	21:40	52°38.225'N,09°03.461'W		52°38.225'N,09°03.461'W	02:20	2.33	Aughinish Cells	Cells	RC
11	Aughinish	23.34	02/08/2025		Aughinish Cells	Cells - B	Cont	52°38.225'N,09°03.461'W	00:30	52°38.225'N,09°03.461'W	00:30	0.50	Aughinish Cells	Cells	RC
11	Aughinish	99.57	02/08/2025		Aughinish Cells	Cells - B	11:32	52°38.225'N,09°03.461'W	13:40	52°38.225'N,09°03.461'W	02:08	2.13	Aughinish Cells	Cells	RC
11	Aughinish	181.26	02/08/2025		Aughinish Cells	Cells - B	14:00	52°38.225'N,09°03.461'W	17:53	52°38.225'N,09°03.461'W	03:53	3.88	Aughinish Cells	Cells	RC
11	Aughinish	111.24	02/08/2025	415.41	Aughinish Cells	Cells - B	21:34	52°38.225'N,09°03.461'W	23:57	52°38.225'N,09°03.461'W	02:23	2.38	Aughinish Cells	Cells	RC
12	Aughinish	155.58	03/08/2025		Aughinish Cells	Cells - B	12:30	52°38.225'N,09°03.461'W	15:50	52°38.225'N,09°03.461'W	03:20	3.33	Aughinish Cells	Cells	RC
12	Aughinish	109.69	03/08/2025	265.27	Aughinish Cells	Cells - B	16:34	52°38.225'N,09°03.461'W	18:55	52°38.225'N,09°03.461'W	02:21	2.35	Aughinish Cells	Cells	RC
13	Aughinish	248.93	04/08/2025		Aughinish Cells	Cells - B	10:06	52°38.225'N,09°03.461'W	15:26	52°38.225'N,09°03.461'W	05:20	5.33	Aughinish Cells	Cells	RC
13	Aughinish	106.58	04/08/2025	355.51	Aughinish Cells	Cells - B	15:43	52°38.225'N,09°03.461'W	18:00	52°38.225'N,09°03.461'W	02:17	2.28	Aughinish Cells	Cells	RC
14	Aughinish	226.37	05/08/2025		Aughinish Cells	Cells - B	10:45	52°38.225'N,09°03.461'W	15:36	52°38.225'N,09°03.461'W	04:51	4.85	Aughinish Cells	Cells	RC
14	Aughinish	60.68	05/08/2025	287.05	Aughinish Cells	Cells - B	17:00	52°38.225'N,09°03.461'W	18:18	52°38.225'N,09°03.461'W	01:18	1.30	Aughinish Cells	Cells	RC
15	Aughinish	159.47	06/08/2025	159.47	Aughinish Cells	Cells - B	06:55	52°38.225'N,09°03.461'W	10:20	52°38.225'N,09°03.461'W	03:25	3.42	Aughinish Cells	Cells	RC
	Total	8270.10		8270.10											

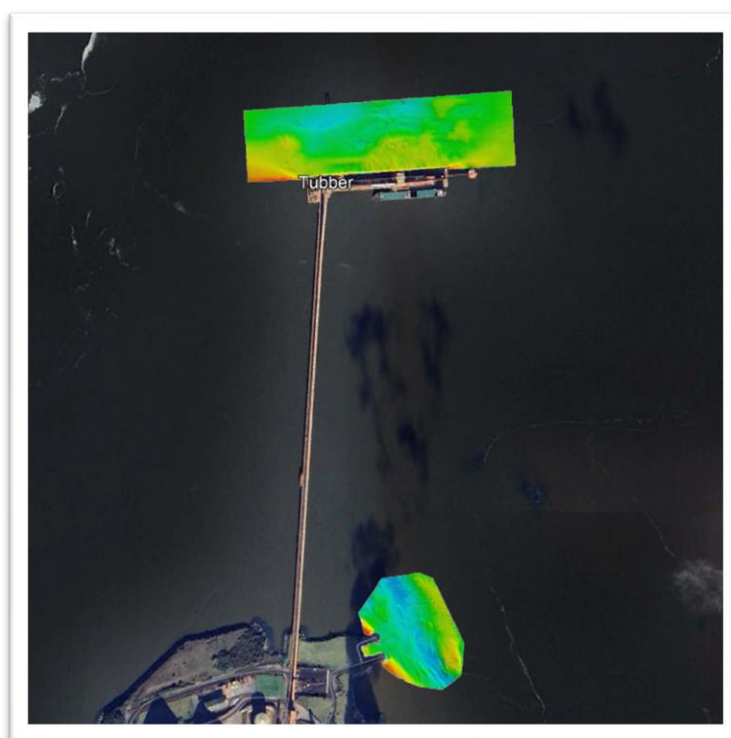
Attachment 3

Pre and Post-Dredging Bathymetry Surveys

Aughinish Berthing Pocket

July 2025

Survey report



NOTES

Survey type	Multibeam echosounder
Survey date	22/07/2025 & 01/08/2025 (Pre Plough) 01/08/2025 & 06/08/2025 (Post plough)
Report date	13/08/2025
Location	Main berth – Aughinish Marine Terminal – Shannon
Projection	ITM
Vertical Datum	Chart Datum (OSGM15-3.12 m)

DOCUMENT CONTROL

Prepared By	Date	Comment	Revision
LBER	13/08/2025	Issue	0
LBER	21/08/2025	Issue	1
LBER	25/08/2025	Issue	2

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1. Introduction

Hydromaster Ltd. was commissioned by Fastnet Shipping Ltd. to undertake pre and post plough surveys and volumetric analysis at the main berth of Aughinish and in the dredge area B, in Shannon River Co Limerick (figure 1).

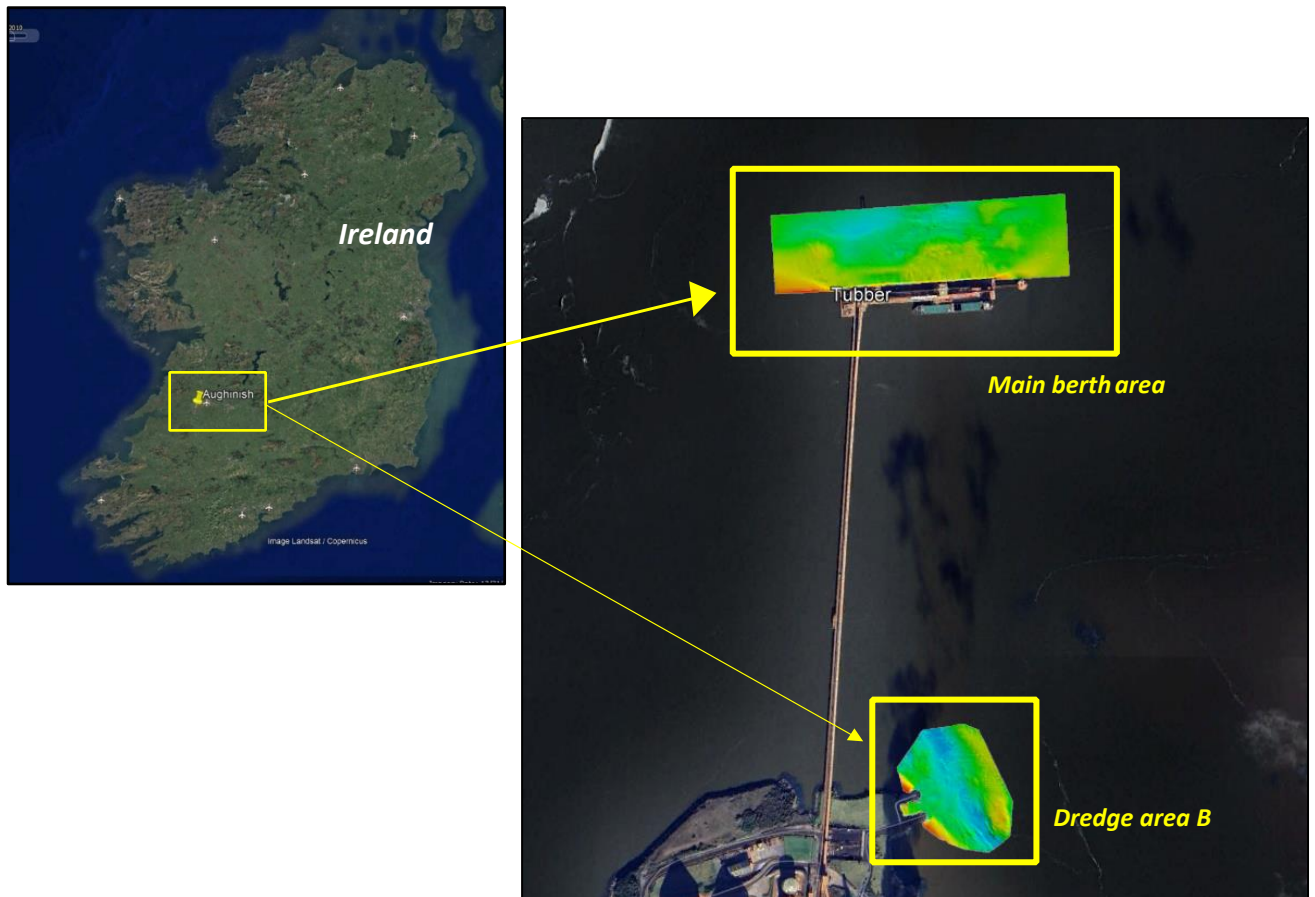


Figure 1: Survey areas

2. Methodology

2.1. Equipment used

A high resolution multibeam echo sounder, Norbit Winghead i77h with an integrated Applanix Wavemaster for navigation and position system was used (figure 2), aided by RTK.

Table 1 below lists all the used equipment.

Table 1: Survey equipment used

Equipment	Make/Model
GPS Positioning System	POS MV Wavemaster - Applanix
Motion Reference Unit	POS MV Wavemaster - Applanix
Multibeam Echosounder	Norbit Winghead i77h
Navigation / Data Logging Software	PDS2000
Sound Velocity Probe	YSI Castaway

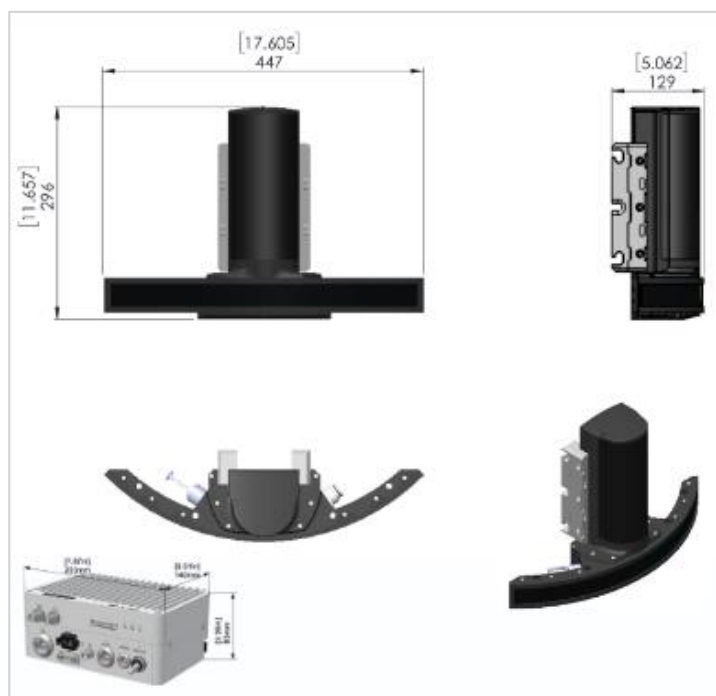


Figure 2: Norbit Winghead i77h Multibeam with integrated IMU

Below are the equipment offsets.

- Multibeam to Reference point

Lever Arm	+Fwd (m)	+Stbd (m)	+Dwn (m)
Sonar Ref. Point to IMU Ref. Point	0.092	0.000	0.040
Sonar Ref. Point to Measure Point	0.029	0.000	-0.027

- Multibeam to Primary antenna

Measure point to antenna bottom	
+Fwd	0.000 m
+Stbd	0.000 m
+Down	-3.425 m

- Primary to secondary antenna

Primary to Secondary Antenna Baseline Vector	
+Fwd	-1.135 m
+Stbd	1.156 m
+Down	1.479 m

- RTK Settings

AUX COM Port

Input

RTK/DGNSS

Output

None

Baud Rate

9600

Parity

☐ None
☒ Even
☐ Odd

Data Bits

☒ 7 Bits
☐ 8 Bits

Stop Bits

☐ 1 Bit
☒ 2 Bits

RTK/DGNSS

Input Type

CMR/CMR+

Line

☐ Serial
☒ Modem

Show Settings

2.2. Geodesy

The projection system used is Irish National Grid 75, the vertical datum is Chart Datum (CD), using the “OSGM15” Geoid model.

The project geodetic and projection parameters are presented in table 2 and 3 below.

Table 2: Project Geodetic parameters

Project geodetic parameters	
Datum Geodetic CRS	Geodetic datum of 1965 TM75
Reference Ellipsoid	Airy Modified 1849

Table 3: Projection parameters

Project Projection parameters	
Projection type	Irish National Grid (1975 adjustment)
Central Meridian	8° West
Scale factor on central Meridian	1.000035000
Origin latitude	53.50 ° North
False Easting (m) False northing (m)	200000 m 25000 m
EPSG	29903

3. Survey Operations

3.1. Survey summary

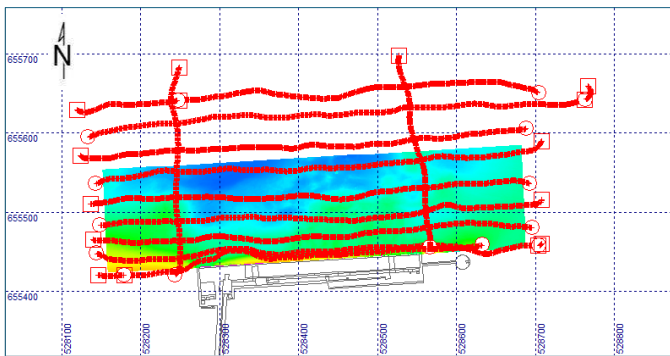
Hydromaster undertook three multibeam bathymetric surveys at Aughinish Jetty and in the dredge area B, as shown in table 4 below.

Table 4: Hydromaster's multibeam survey data

Hydromaster Survey #	Date	Area surveyed
Survey 1	22/07/2025	Pre plough survey: Main berth
	01/08/2025	Pre plough survey: Area B
Survey 2	01/08/2025	Post plough survey: Main berth
	06/08/2025	Post plough survey: Area B

Survey lines were orientated and spaced according to water depth to ensure 100% insonification of the survey site. Vessel tracks for both surveys are shown on figure 3.

Tracklines Main Berth (22/07/2025)



Tracklines Area B (01/08/2025)

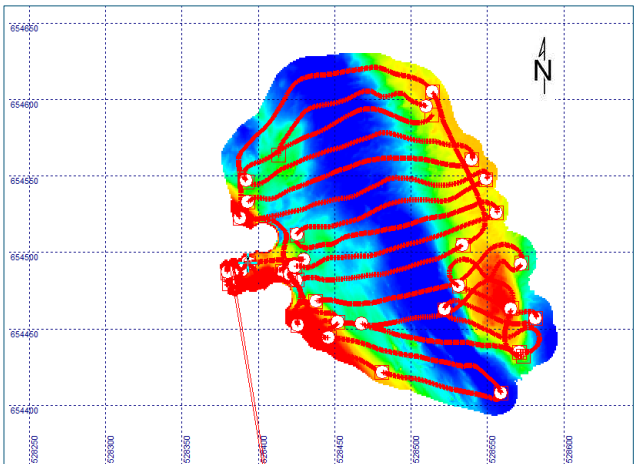
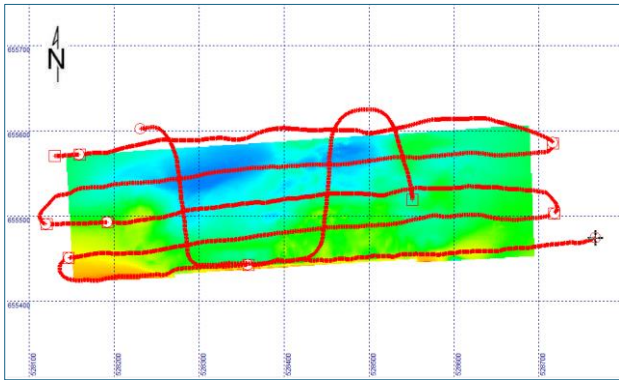


Figure 3: Tracklines Pre-Plough 22/07/2025 & 01/08/2025

Tracklines Main Berth (01/08/2025)



Tracklines Area B (06/08/2025)

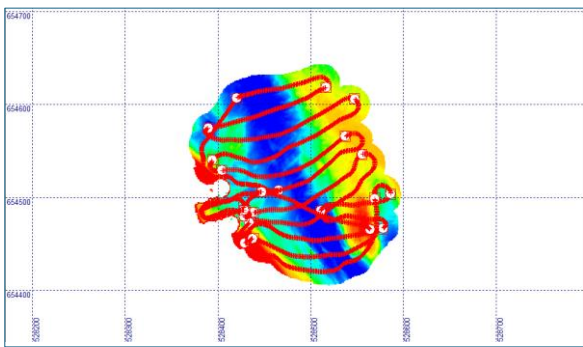


Figure 4: Tracklines Post-Plough 01/08/2025 and 06/08/2025

3.2. Survey controls

All vessel positions are derived from GNSS with Real Time Kinematic corrections. All soundings are derived from GPS height.

- Patch test calibration**

Patch tests have been done prior to survey operation in deep water. The Roll lines have been done over a flat seabed. Pitch and Yaw have been done over slopes. The following table shows the processed patch test values:

Table 5: Patch test values

Patch Test values (°)	
Roll	0.06°
Pitch	0.14 °
Yaw	-0.54°

4. Survey acquisition and processing

4.1. Data acquisition

The multibeam system was operating at 400 kHz, with 55 degrees (on starboard and port) beam width. Sound velocity profiles are taken at least prior any multibeam echosounder acquisition and additionally if refraction was observed in the data or on moving to a different survey area. The sound velocity was measured in a vertical profile in the deepest areas within each survey zone. These profiles were applied online, allowing changes to be observed in real time.

During survey operations, the Standard Deviation between lines was monitored for refraction, elevation and any other issues which effect sounding positions.

4.2. Data processing

The data collected during the survey is processed and verified for position and height, refraction and noise. The 1 m grid models are used to generate charts, calculate volumes among other deliverables.

5. Survey results

5.1. Bathymetry charts

5.1.1. Pre plough bathymetric survey

Figure 5 below shows the bathymetry of Aughinish main berth and dredge area B before the plough survey on the 22/07/2025 & 01/08/2025.

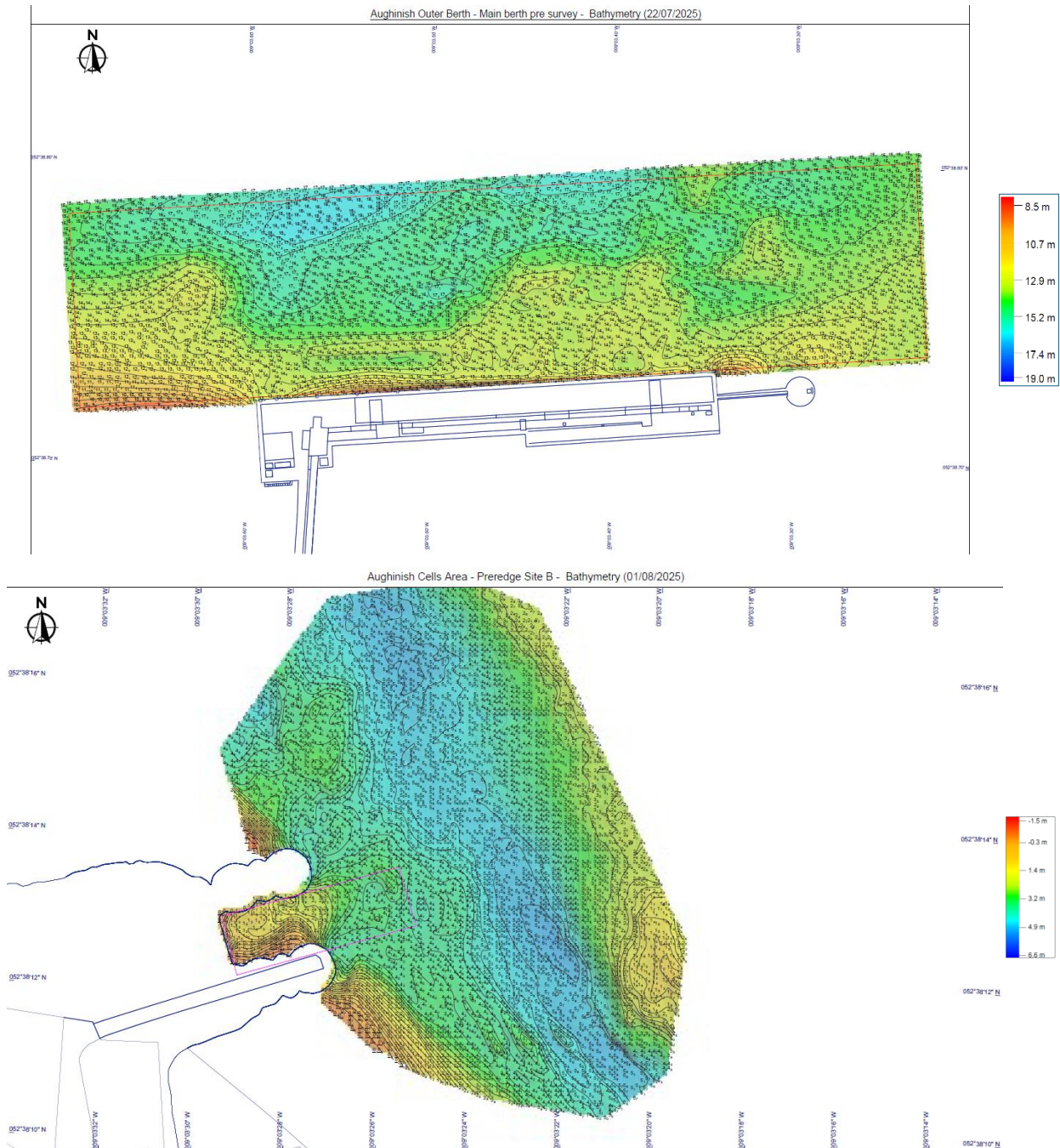
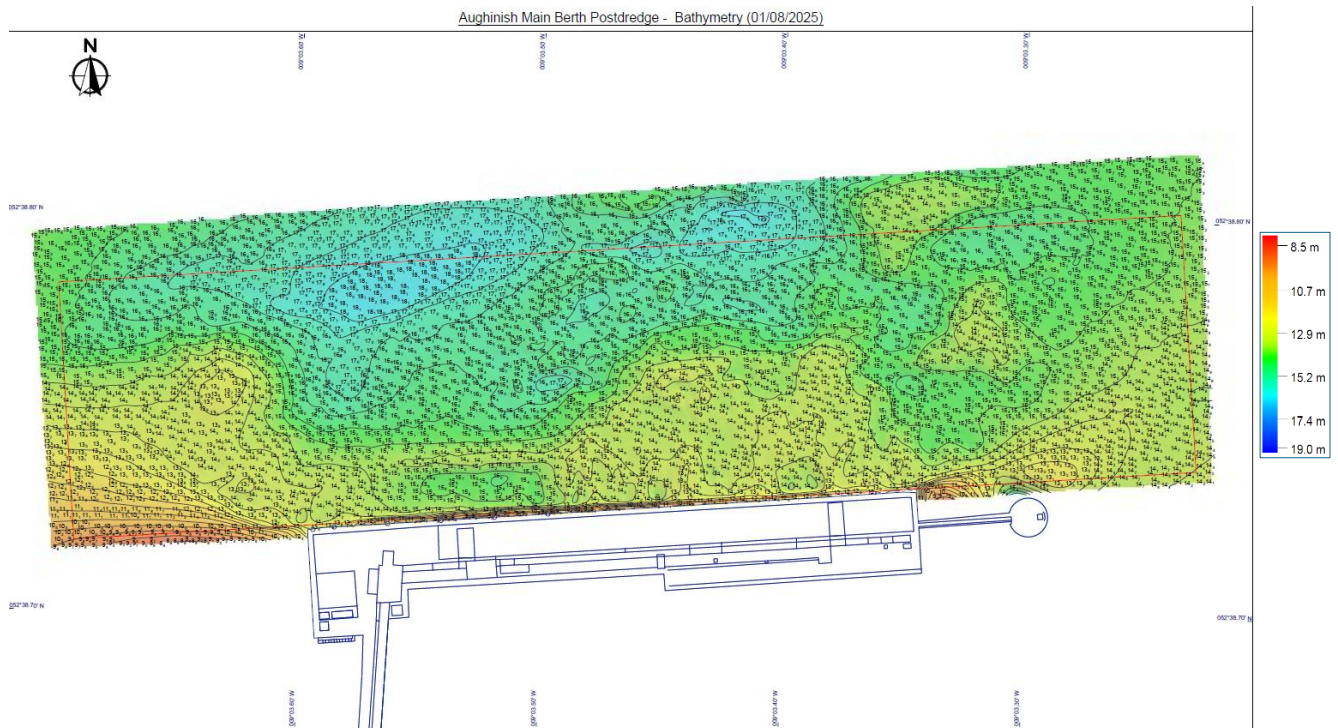


Figure 5: Pre plough bathymetry - Main berth and Area B

	Average depth	Shallowest depth	Deepest depth
Main berth 22/07/2025	-14.9	-8.7	-18.3
Dredge Area B 01/08/2025	-4.2	1.1	-6.3

5.1.2. Post plough bathymetric survey

Figure 6 shows the bathymetry of Aughinish main berth and dredge area B after the plough survey, the 01/08/2025 and the 06/08/2025.



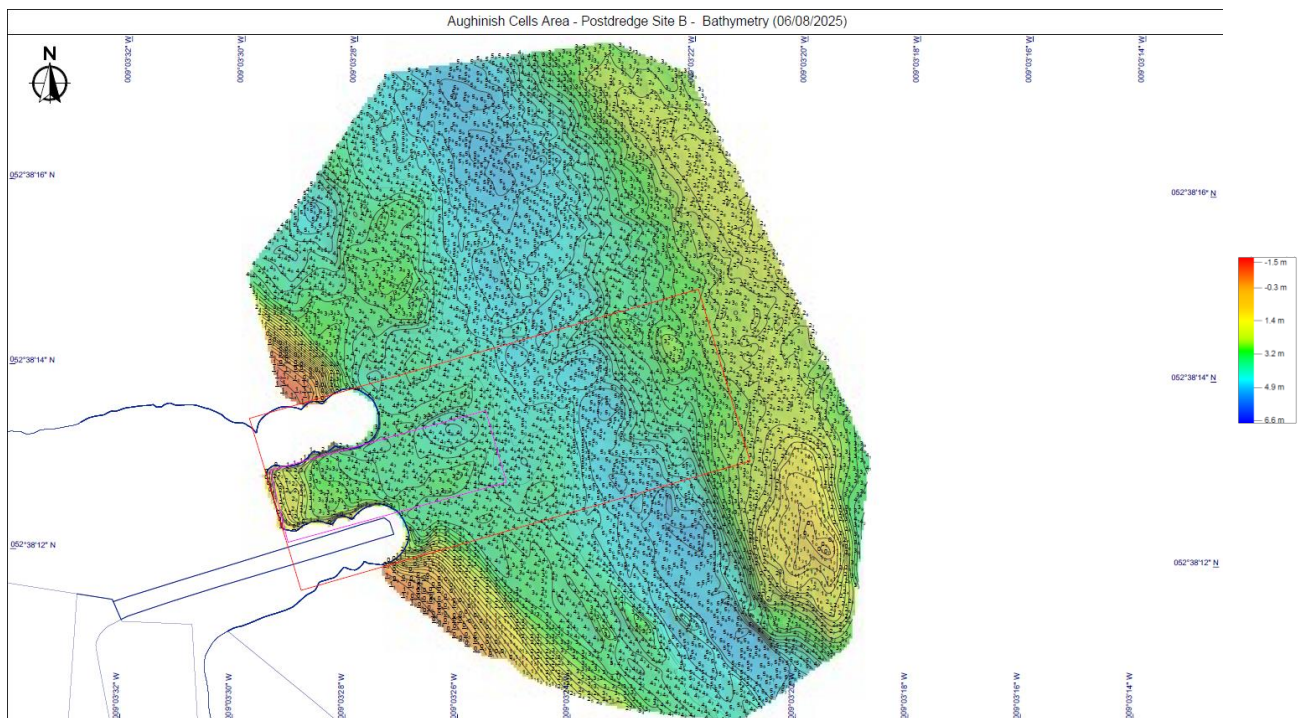


Figure 6: Post plough bathymetry - Main berth and Area B

Bathymetric information of the post-plough survey (01/08/2025 and 06/08/2025) are presented in table below (unit in meter):

	Average depth	Shallowest depth	Deepest depth
Main berth 01/08/2025	-15.3	-8.8	-18.3
Dredge Area B 06/08/2025	-3.6	1.4	-6.2

5.2. Difference model

Figure 7 & 8 shows a difference model between the two surveys 22/07/2025 & 01/08/2025 (Pre-plough) and 01/08/2025 and 06/08/2025 (Post-plough) within the main berth pocket and within dredge area B.

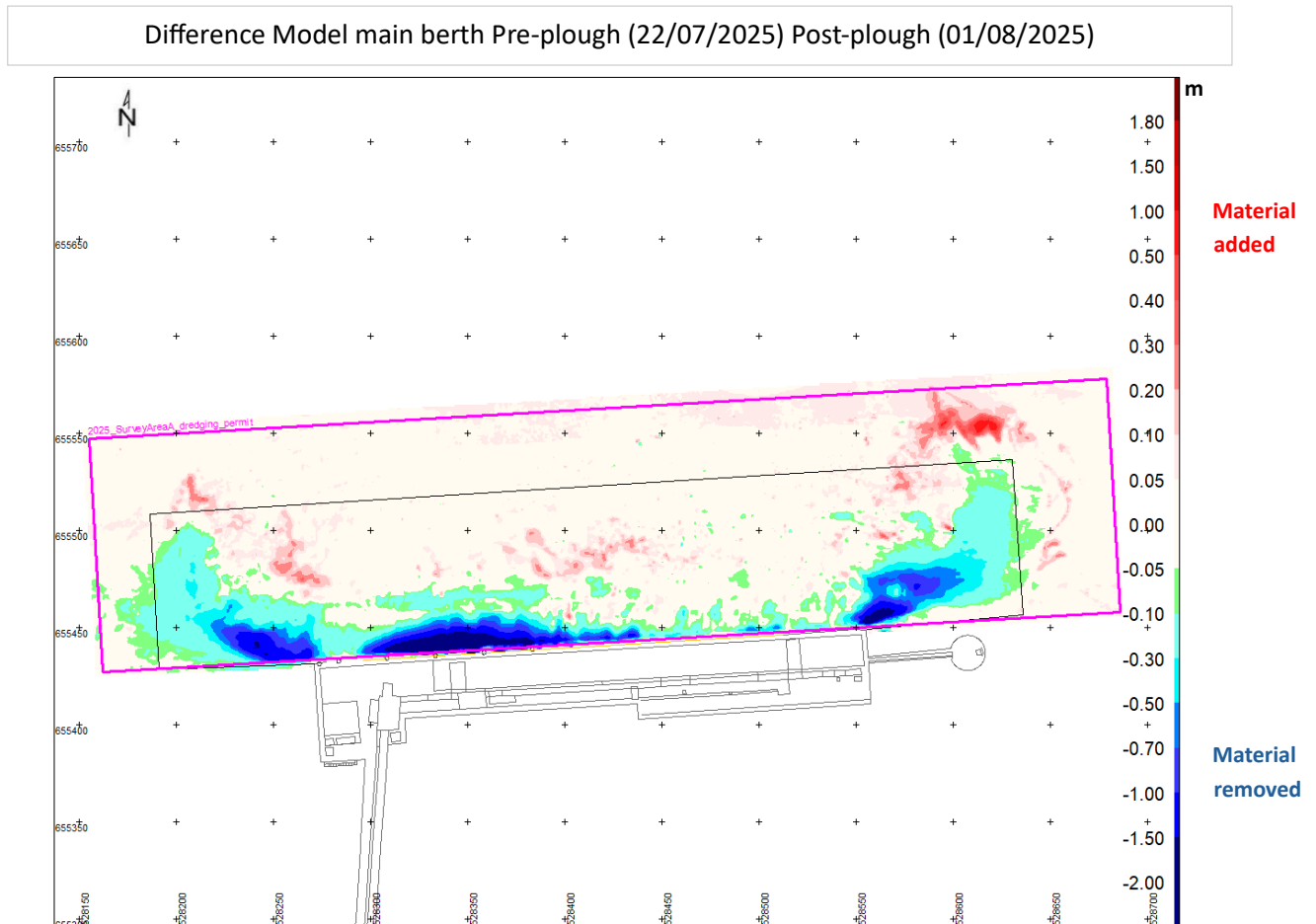


Figure 7: Difference Model between Pre and Post plough surveys within the Main Berth Pocket

Difference Model Area B Pre-plough (01/08/2025) and Post-plough (06/08/2025)

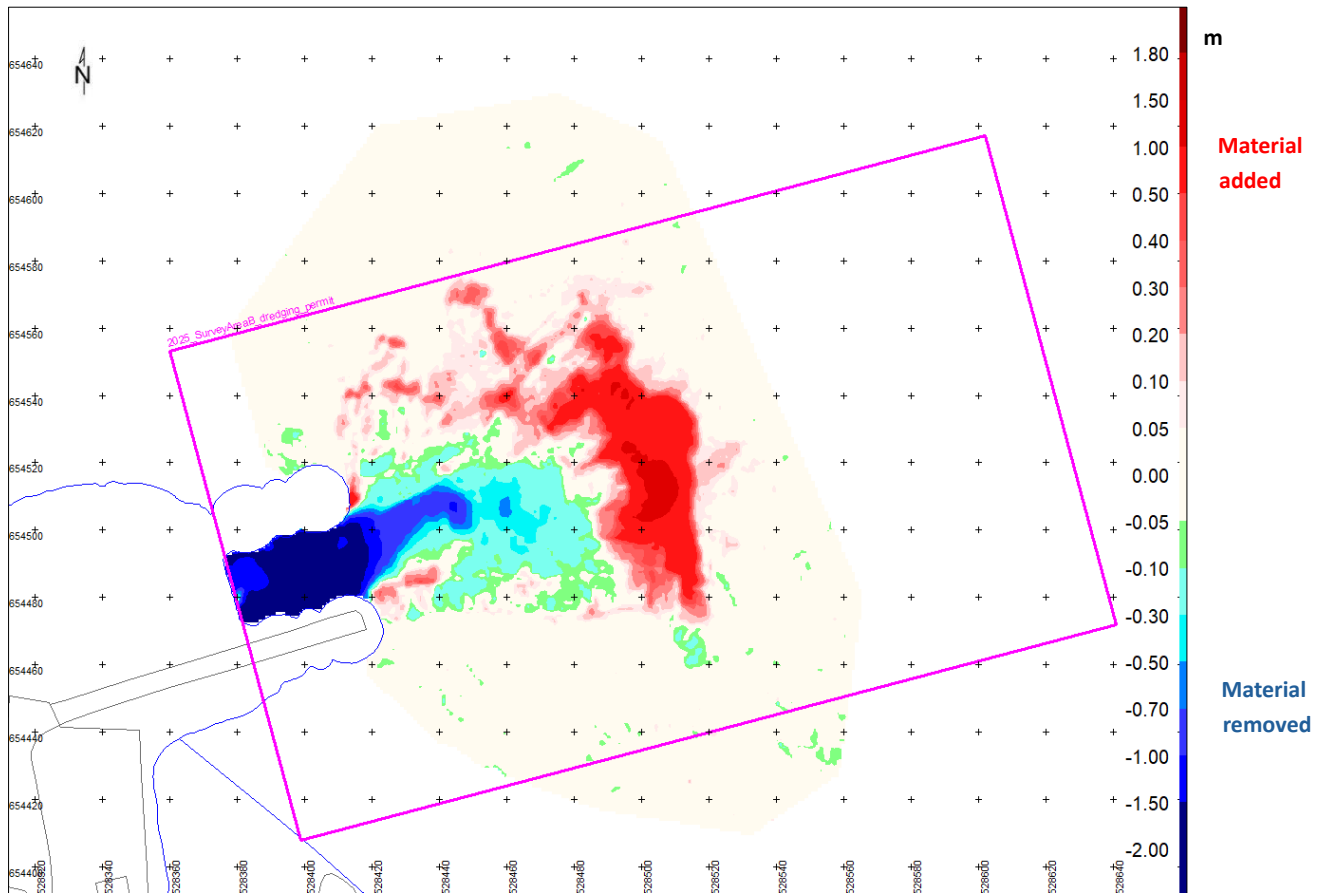


Figure 8: Difference Model between Pre and Post plough surveys within Area B

5.3. Volume computation

5.3.2. Volume computation main berth between 22/07/2025 Pre-plough and 01/08/2025 Post-plough

Grid model	250801_Aughinish_MainBerth_Postdredge_CD_ITM_1m_Zaverage.asc
Reference Grid model	250722_Aughinish_Mainberth_Predredge_CD_ITM_1m_Zaverage.asc
Boundary	Volume boundary (122 m wide from jetty) see below

Volume above	1601 m ³
Volume below	5427 m ³
Volume difference	3826 m ³

Difference Model Main Berth Post-plough (01/08/2025) and Pre-plough (22/07/2025)

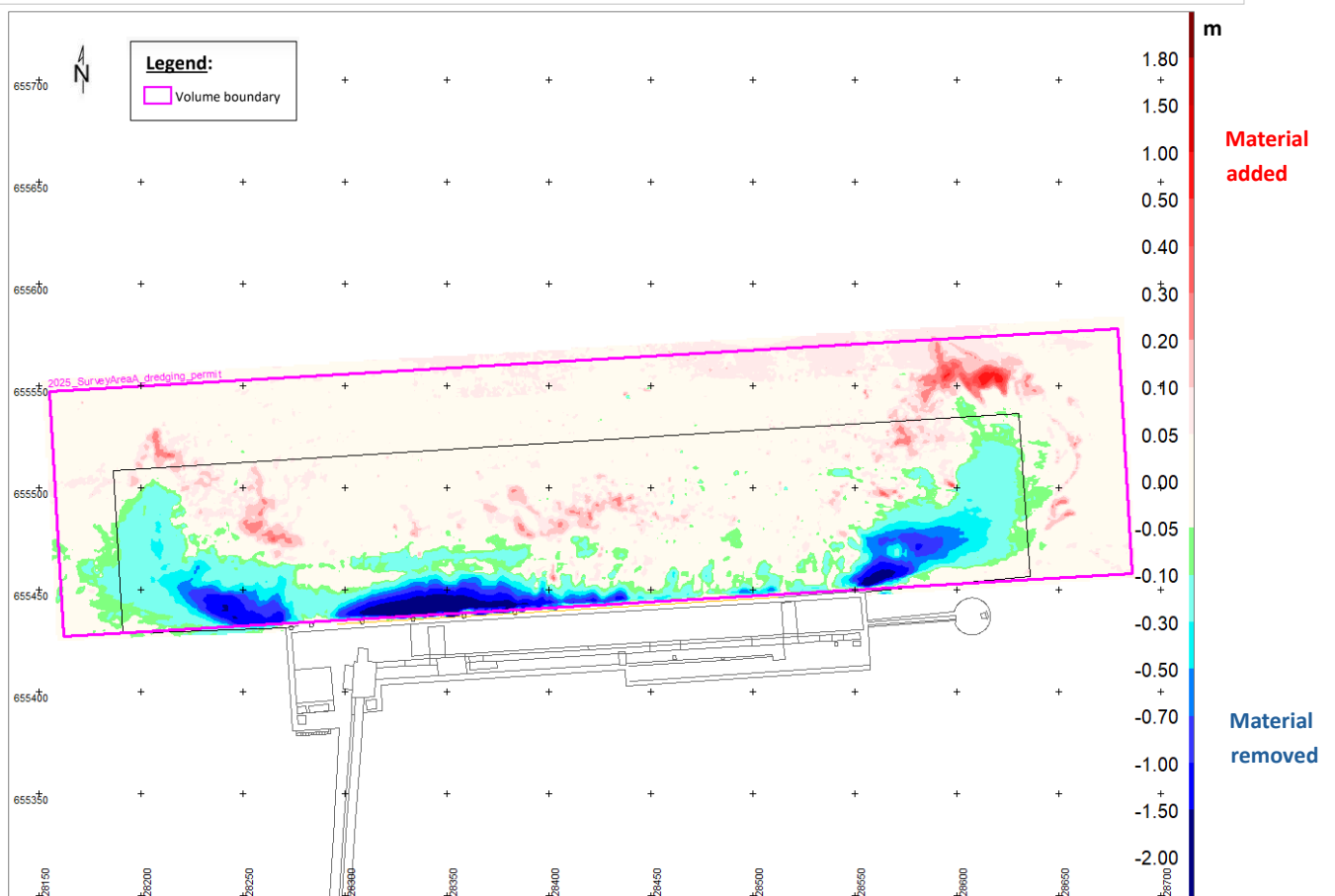
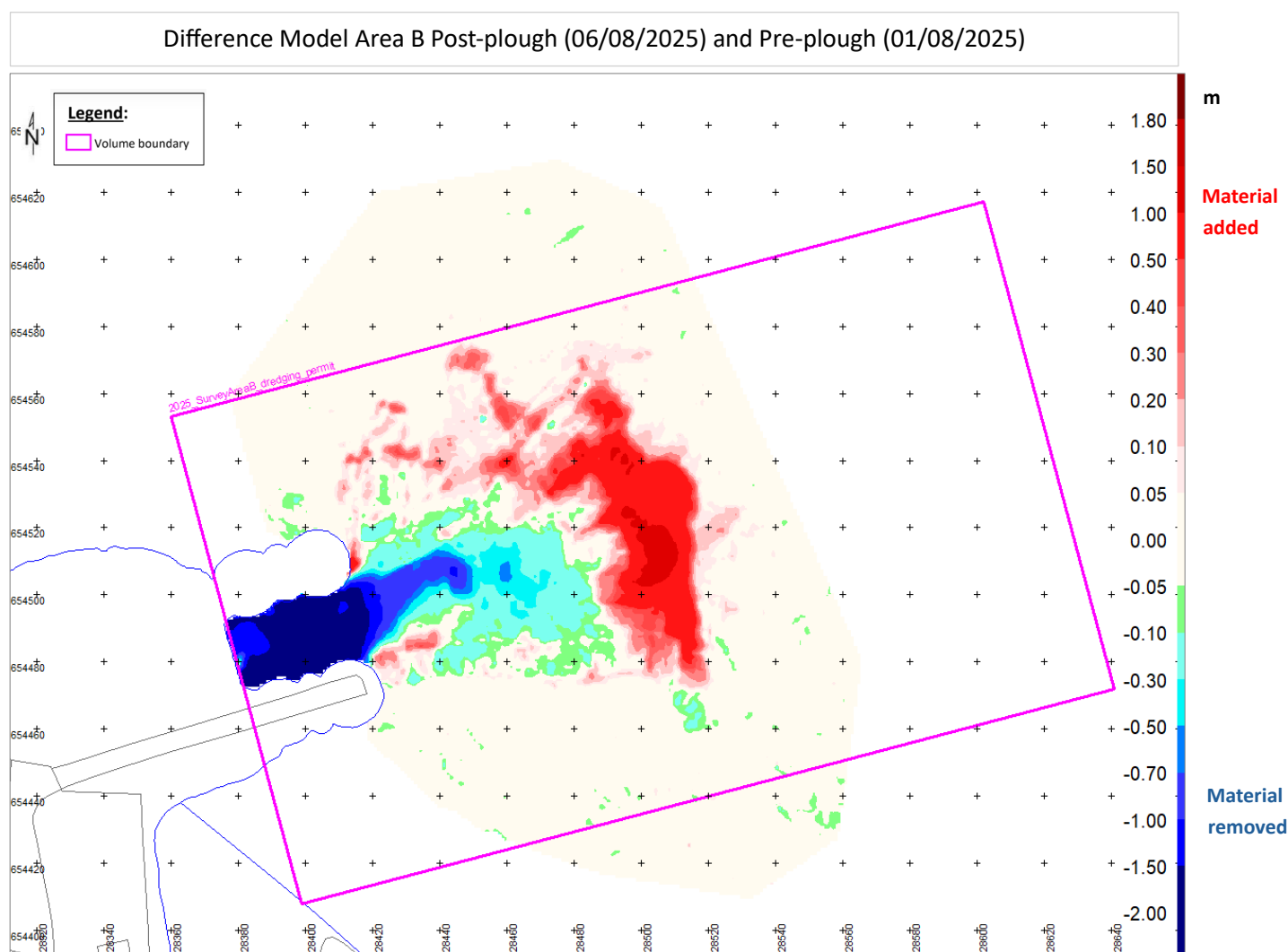


Figure 9: Difference model between Pre and Post plough surveys within the volume boundary (pink polygon)

5.3.3. Volume computation dredge area B between 01/08/2025 Pre-plough and 06/08/2025 Post-plough

Grid model	250806_Aughinish_AreaB_Postdredge_CD_ING_1m_Zaverage.asc
Reference Grid model	250801_Aughinish_AreaB_Predredge_CD_ITM_1m_Zaverage.asc
Boundary	Volume boundary (see below)

Volume above	1817 m ³
Volume below	2964 m ³
Volume difference	1147 m ³



Attachment 4

Turbidity Monitoring Report

A review of dredge related monitoring data at Aughinish Alumina in July 2025

IDS Data Report IDS-DR25-013

Revision 1

Report prepared by Scott Wylie

Email: scott.wylie@greenrebel.ie



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The Deployed System	4
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Threshold compliance.....	5
System Performance and Data Metrics	7
Conclusions	7
Appendices – Calibration Certificates	8

Introduction

IDS Monitoring Ltd (IDS) were contracted in the Summer of 2025 by Fastnet Shipping Ltd, on behalf of Aughinish Alumina, to install two turbidity monitoring buoys near the Aughinish Jetty. The purpose for these buoys was to monitor for dispersion of resuspended sediment during a dredging campaign in the vicinity of the jetty.

The brief received by IDS was as follows:

- The buoys were to be deployed at 52°38.779'N, 09°04.021'W (downstream buoy) and 52°38.464'N, 09°02.688'W (upstream buoy);
- The buoys were to be fitted with calibrated nephelometers within 1 m of the surface (Calibration Certificates have been provided separately);
- All turbidity data was to be delivered in Nephelometric Turbidity Units (NTU);
- The instruments should be fitted with an antifouling system (wiper);
- Data were to be collected and reported in 10-minute intervals;
- The systems should be capable of delivering real-time data to the bridge of the Dredge Vessel (Fastnet Sound) and remotely to the Aughinish Environmental Management (AEM) team. IDS installed a monitoring system on the bridge of the Fastnet Sound and implemented a web page so that staff at Aughinish could review the data in real-time. IDS also implemented a system within their control center to monitor data, alerts and provide 24/7 support to the Fastnet Shipping team; and
- The alert system implemented delivers messages in near-real-time to the Dredge Master and to AEM appointed staff. IDS were instructed by AEM that an upper threshold of 121 NTU was to trigger an alert.



Figure 1 – IDS DB150 Data buoys similar to those deployed at Aughinish (downstream left, Upstream right)

The buoys were deployed in July 2025 in advance of the dredging campaign, with operations running from July 23rd 2025 to the 6th August 2025. Both buoys were recovered upon completion of the survey in August 2025.

This report summarises the deployment, data collection and includes a review of all significant findings.

The Deployed System

IDS deployed two IDS DB150 data buoys at the locations shown in Figure 2. Both systems were fitted with Ponsel Nephelometers. Calibration data for the instruments have been provided separately to this report. The buoys were solar powered and the data acquisition system is the IDS DataPOD with GSM/GPRS. Both Systems were fitted with an IDS LGWiper for antifouling purposes, and these were programmed to wipe every hour and synchronised so as not to interfere with sampling.

The systems were deployed on 1st July 2025 on a chain mooring with 1.1 Tonne anchor weights. This original mooring design was selected so that the buoys could be deployed safely from the IDS contracted vessel.



Figure 2 – Site Map showing position of the deployed buoys and the primary dredge area.

Data were collected for a period before, during and after dredging operations so a full impact assessment of dredging on turbidity levels at the site could be completed. Data were delivered to an IDS Server and then immediately to the IDS DataLink interface deployed on the bridge of the Fastnet Sound. The same information was also available to the AEM team via a web browser. The latency between data sampling and display on the bridge of the Fastnet sound was typically less than 1-minute and 100% of the expected readings were collected and reported.

Automatic quality controls were applied to all incoming data by the DataLink system and outlier thresholds were defined for this deployment as 0 and 500 NTU (i.e., readings below 0 NTU and above 500 NTU were flagged as poor quality and not displayed by default). These data are not deleted and

can be viewed via the DataLink interface. These outlier thresholds were not triggered during the period of deployment including the pre- and post-dredge periods.

A screen grab of the data interface is shown in Figure 3.

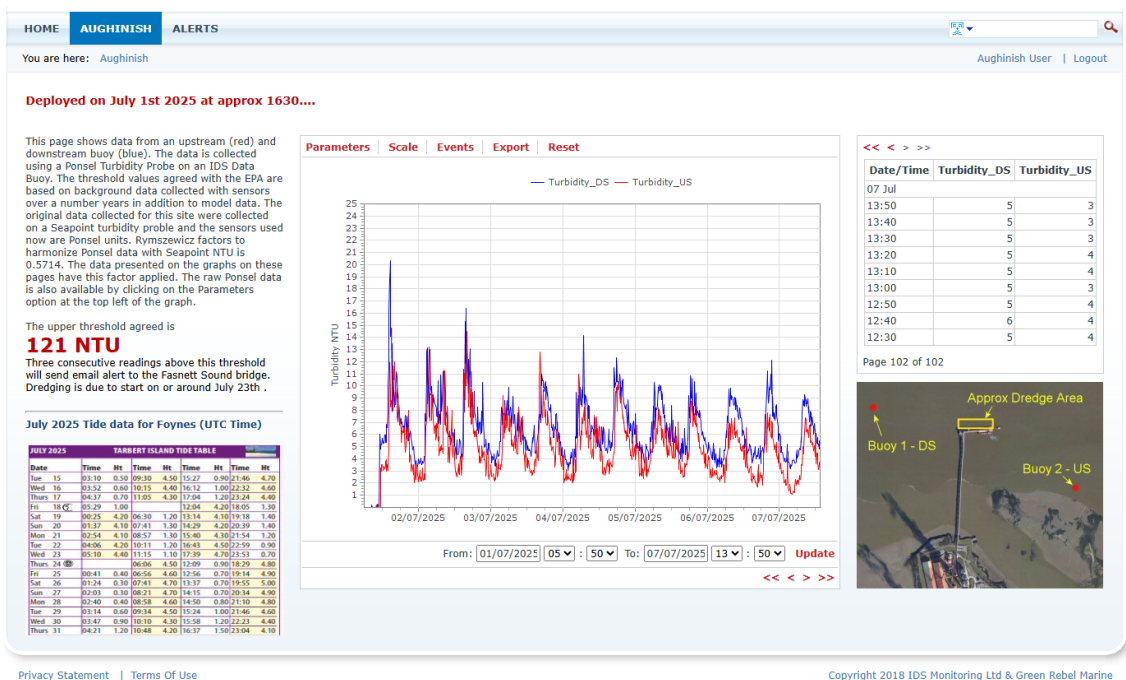


Figure 3 – Data Management Software on Fastnet Sound Bridge and available to all other users.

IDS provided instruction to the Fastnet Sound team prior to dredging and introduced the system to the AEM team. IDS setup alerts as required, and these are monitored by IDS.

Data Review

Data are considered under the headings of threshold compliance, system performance and metrics.

Threshold compliance

There were no readings that exceeded or came close to exceeding the upper threshold of 121 NTU during the dredging period. Figure 4 shows the turbidity readings collected for the dredging period as well as one week pre- and 48 hours post-dredging. The green box in Figure 4 highlights the dredging period itself, which is shown in detail in Figure 5. The dredging operations, in terms of impact on suspended sediment, was compliant and operated within the terms of the dredging licence.

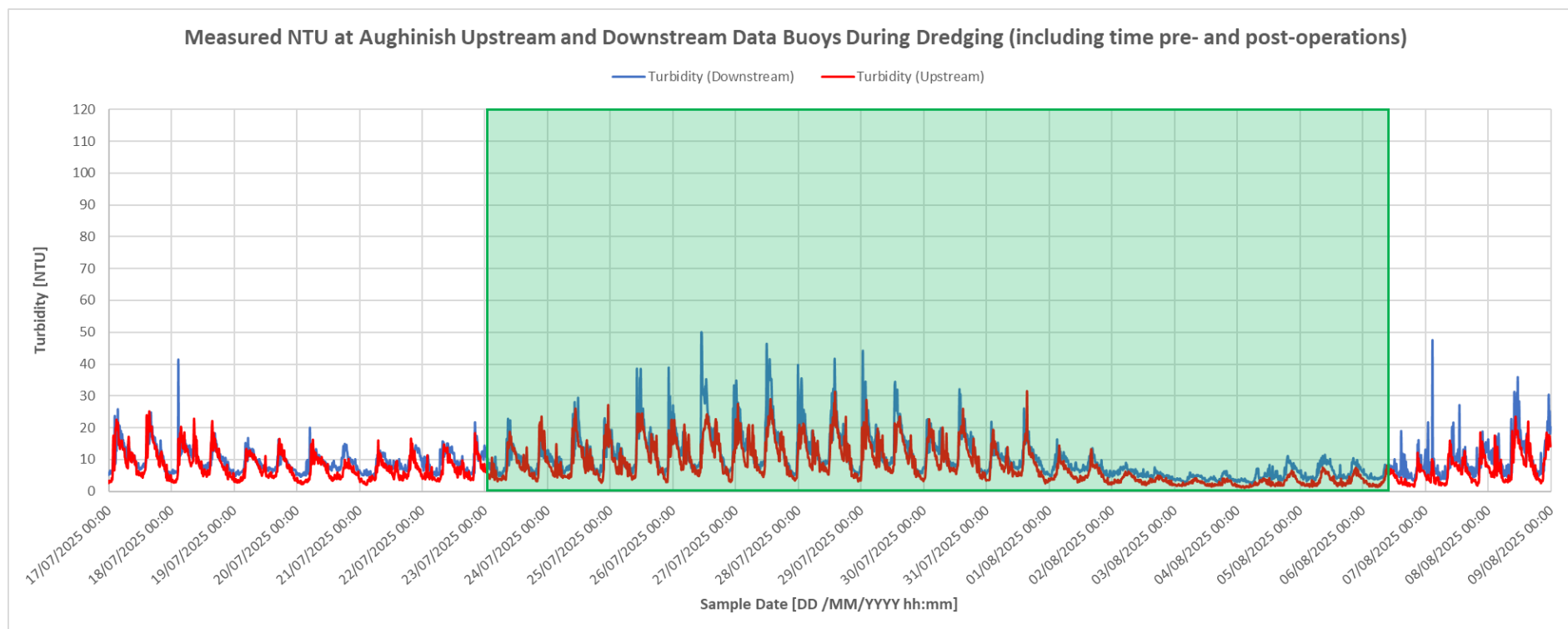


Figure 4 – Data from Dredge period (green box) including one weeks pre- and 48 hours post-dredging periods.

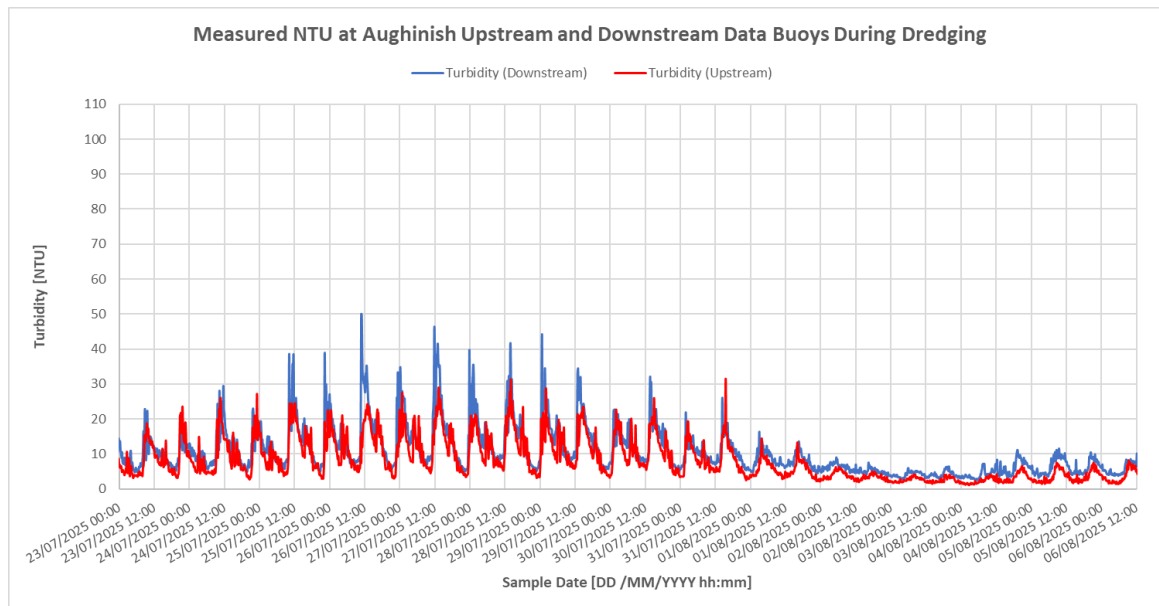


Figure 5 – Turbidity data for the dredge period, green box in Figure 4.

The turbidity values reported during the dredging period were consistent with those seen on previous measurement campaigns. The diurnal variation in ranges over the period in Figure 4 is due to the spring and neap tidal cycle, where more material is naturally resuspended during spring tides. This is as previously seen at this, and many other, sites.

System Performance and Data Metrics

In terms of system performance of both buoys, 100% of the required data was collected and reported.

Conclusions

The following conclusions are made in respect of these data:

- The data set is complete and is understood to meet the requirements of the dredging licence; and
- Examination of the overall data set for the period shows good correlation between both the upstream and downstream stations with a natural variability associated with the tide. The range of variation is consistent with what would be expected at this site.

Appendices – Calibration Certificates

These were provided previously with the deployment report.

Attachment 5

Suspended Solids Analysis Results

Water samples from River

Date	Location	Sample Time	Sample No.	Depth Sample Taken	State of Tide	Sample Taken by	Suspended Solids Results mg/L	Suspended Solids Results g/L
16-Jul-25	East Buoy	15:50	1	Surface	Ebb	SSL	71.2	0.071
16-Jul-25	East Buoy	15:55	2	4m	Ebb	SSL	78.7	0.079
16-Jul-25	East Buoy	16:00	3	8m	Ebb	SSL	85.5	0.086
16-Jul-25	West Buoy	16:15	4	Surface	Ebb	SSL	71.2	0.071
16-Jul-25	West Buoy	16:20	5	4m	Ebb	SSL	81.2	0.081
16-Jul-25	West Buoy	16:25	6	8m	Ebb	SSL	120.8	0.121
16-Jul-25	West Buoy	16:30	7	Surface	Flood	SSL	84.5	0.085
16-Jul-25	West Buoy	16:35	8	4m	Flood	SSL	88.8	0.089
16-Jul-25	West Buoy	16:40	9	8m	Flood	SSL	85.6	0.086
16-Jul-25	East Buoy	16:55	10	Surface	Flood	SSL	105.1	0.105
16-Jul-25	East Buoy	17:00	11	4m	Flood	SSL	81.4	0.081
16-Jul-25	East Buoy	17:05	12	8m	Flood	SSL	73.2	0.073
17-Jul-25	East Buoy	16:35	1	Surface	Ebb	SSL	71.1	0.071
17-Jul-25	East Buoy	16:40	2	4m	Ebb	SSL	84.9	0.085
17-Jul-25	East Buoy	16:45	3	8m	Ebb	SSL	84.8	0.085
17-Jul-25	West Buoy	17:00	4	Surface	Ebb	SSL	93.3	0.093
17-Jul-25	West Buoy	17:05	5	4m	Ebb	SSL	93.3	0.093
17-Jul-25	West Buoy	17:10	6	8m	Ebb	SSL	83.3	0.083
17-Jul-25	West Buoy	17:20	7	Surface	Flood	SSL	76.4	0.076
17-Jul-25	West Buoy	17:25	8	4m	Flood	SSL	85.0	0.085
17-Jul-25	West Buoy	17:30	9	8m	Flood	SSL	87.4	0.087
17-Jul-25	East Buoy	17:45	10	Surface	Flood	SSL	77.8	0.078
17-Jul-25	East Buoy	17:50	11	4m	Flood	SSL	92.6	0.093
17-Jul-25	East Buoy	17:55	12	8m	Flood	SSL	81.3	0.081
18-Jul-25	East Buoy	17:35	1	Surface	Ebb	SSL	38.8	0.039
18-Jul-25	East Buoy	17:40	2	4m	Ebb	SSL	42.5	0.043
18-Jul-25	East Buoy	17:45	3	8m	Ebb	SSL	53.2	0.053
18-Jul-25	West Buoy	18:00	4	Surface	Ebb	SSL	52.6	0.053
18-Jul-25	West Buoy	18:05	5	4m	Ebb	SSL	61.8	0.062
18-Jul-25	West Buoy	18:10	6	8m	Ebb	SSL	58.7	0.059
18-Jul-25	West Buoy	18:15	7	Surface	Flood	SSL	78.4	0.078
18-Jul-25	West Buoy	18:20	8	4m	Flood	SSL	70.2	0.070
18-Jul-25	West Buoy	18:25	9	8m	Flood	SSL	88.8	0.089
18-Jul-25	East Buoy	18:40	10	Surface	Flood	SSL	55.1	0.055
18-Jul-25	East Buoy	18:45	11	4m	Flood	SSL	44.3	0.044
18-Jul-25	East Buoy	18:50	12	8m	Flood	SSL	72.7	0.073
19-Jul-25	East Buoy	06:05	1	Surface	Ebb	SSL	50.2	0.050
19-Jul-25	East Buoy	06:10	2	4m	Ebb	SSL	64.5	0.065
19-Jul-25	East Buoy	06:15	3	8m	Ebb	SSL	48.3	0.048
19-Jul-25	West Buoy	06:30	4	Surface	Ebb	SSL	64.1	0.064
19-Jul-25	West Buoy	06:35	5	4m	Ebb	SSL	54.3	0.054
19-Jul-25	West Buoy	06:40	6	8m	Ebb	SSL	67.5	0.068
19-Jul-25	West Buoy	06:50	7	Surface	Flood	SSL	56.9	0.057
19-Jul-25	West Buoy	06:55	8	4m	Flood	SSL	30.7	0.031
19-Jul-25	West Buoy	07:00	9	8m	Flood	SSL	58.8	0.059
19-Jul-25	East Buoy	07:15	10	Surface	Flood	SSL	88.4	0.088
19-Jul-25	East Buoy	07:20	11	4m	Flood	SSL	100.4	0.100
19-Jul-25	East Buoy	07:25	12	8m	Flood	SSL	58.6	0.059
20-Jul-25	East Buoy	07:20	1	Surface	Ebb	SSL	63.9	0.064
20-Jul-25	East Buoy	07:25	2	4m	Ebb	SSL	67.6	0.068
20-Jul-25	East Buoy	07:30	3	8m	Ebb	SSL	78.1	0.078
20-Jul-25	West Buoy	07:45	4	Surface	Ebb	SSL	57.1	0.057
20-Jul-25	West Buoy	07:50	5	4m	Ebb	SSL	63.7	0.064
20-Jul-25	West Buoy	07:55	6	8m	Ebb	SSL	60.7	0.061
20-Jul-25	West Buoy	08:05	7	Surface	Flood	SSL	49.4	0.049
20-Jul-25	West Buoy	08:10	8	4m	Flood	SSL	54.8	0.055
20-Jul-25	West Buoy	08:15	9	8m	Flood	SSL	54.7	0.055
20-Jul-25	East Buoy	08:30	10	Surface	Flood	SSL	80.3	0.080
20-Jul-25	East Buoy	08:35	11	4m	Flood	SSL	68.2	0.068
20-Jul-25	East Buoy	08:40	12	8m	Flood	SSL	56.0	0.056
21-Jul-25	East Buoy	08:35	1	Surface	Ebb	SSL	51.3	0.051
21-Jul-25	East Buoy	08:40	2	4m	Ebb	SSL	108.3	0.108
21-Jul-25	East Buoy	08:45	3	8m	Ebb	SSL	116.9	0.117
21-Jul-25	West Buoy	09:00	4	Surface	Ebb	SSL	93.8	0.094
21-Jul-25	West Buoy	09:05	5	4m	Ebb	SSL	121.2	0.121
21-Jul-25	West Buoy	09:10	6	8m	Ebb	SSL	149.3	0.149
21-Jul-25	West Buoy	09:20	7	Surface	Flood	SSL	116.0	0.116
21-Jul-25	West Buoy	09:25	8	4m	Flood	SSL	119.4	0.119
21-Jul-25	West Buoy	09:30	9	8m	Flood	SSL	129.6	0.130
21-Jul-25	East Buoy	09:45	10	Surface	Flood	SSL	122.9	0.123
21-Jul-25	East Buoy	09:50	11	4m	Flood	SSL	98.4	0.098
21-Jul-25	East Buoy	09:55	12	8m	Flood	SSL	117.3	0.117
22-Jul-25	East Buoy	09:45	1	Surface	Ebb	SSL	37.7	0.038
22-Jul-25	East Buoy	09:50	2	4m	Ebb	SSL	67.3	0.067
22-Jul-25	East Buoy	09:55	3	8m	Ebb	SSL	79.7	0.080
22-Jul-25	West Buoy	10:10	4	Surface	Ebb	SSL	63.9	0.064
22-Jul-25	West Buoy	10:15	5	4m	Ebb	SSL	61.8	0.062
22-Jul-25	West Buoy	10:20	6	8m	Ebb	SSL	61.7	0.062
22-Jul-25	West Buoy	10:30	7	Surface	Flood	SSL	52.9	0.053
22-Jul-25	West Buoy	10:35	8	4m	Flood	SSL	66.4	0.066
22-Jul-25	West Buoy	10:40	9	8m	Flood	SSL	71.6	0.072
22-Jul-25	East Buoy	10:55	10	Surface	Flood	SSL	55.8	0.056
22-Jul-25	East Buoy	11:00	11	4m	Flood	SSL	85.6	0.086
22-Jul-25	East Buoy	11:05	12	8m	Flood	SSL	74.3	0.074
23-Jul-25	East Buoy	10:50	1	Surface	Ebb	SSL	97.7	0.098
23-Jul-25	East Buoy	10:55	2	4m	Ebb	SSL	101.0	0.101

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23-Jul-25	East Buoy		11:00	3	8m	Ebb	SSL	101.1	0.101
23-Jul-25	West Buoy		11:15	4	Surface	Ebb	SSL	117.8	0.118
23-Jul-25	West Buoy		11:20	5	4m	Ebb	SSL	125.3	0.125
23-Jul-25	West Buoy		11:25	6	8m	Ebb	SSL	101.0	0.101
23-Jul-25	West Buoy		11:35	7	Surface	Flood	SSL	105.2	0.105
23-Jul-25	West Buoy		11:45	8	4m	Flood	SSL	115.2	0.115
23-Jul-25	West Buoy		11:50	9	8m	Flood	SSL	127.1	0.127
23-Jul-25	East Buoy		12:05	10	Surface	Flood	SSL	115.9	0.116
23-Jul-25	East Buoy		12:10	11	4m	Flood	SSL	93.7	0.094
23-Jul-25	East Buoy		12:15	12	8m	Flood	SSL	124.7	0.125
24-Jul-25	East Buoy		11:45	1	Surface	Ebb	SSL	64.6	0.065
24-Jul-25	East Buoy		11:50	2	4m	Ebb	SSL	69.6	0.070
24-Jul-25	East Buoy		11:55	3	8m	Ebb	SSL	72.3	0.072
24-Jul-25	West Buoy		12:10	4	Surface	Ebb	SSL	54.4	0.054
24-Jul-25	West Buoy		12:15	5	4m	Ebb	SSL	58.4	0.058
24-Jul-25	West Buoy		12:20	6	8m	Ebb	SSL	71.0	0.071
24-Jul-25	West Buoy		12:30	7	Surface	Flood	SSL	59.2	0.059
24-Jul-25	West Buoy		12:35	8	4m	Flood	SSL	63.5	0.064
24-Jul-25	West Buoy		12:40	9	8m	Flood	SSL	60.2	0.060
24-Jul-25	East Buoy		12:55	10	Surface	Flood	SSL	67.4	0.067
24-Jul-25	East Buoy		13:00	11	4m	Flood	SSL	68.8	0.069
24-Jul-25	East Buoy		13:05	12	8m	Flood	SSL	73.6	0.074
25-Jul-25	East Buoy		12:35	1	Surface	Ebb	SSL	94.4	0.094
25-Jul-25	East Buoy		12:40	2	4m	Ebb	SSL	124.9	0.125
25-Jul-25	East Buoy		12:45	3	8m	Ebb	SSL	132.9	0.133
25-Jul-25	West Buoy		13:00	4	Surface	Ebb	SSL	113.5	0.114
25-Jul-25	West Buoy		13:05	5	4m	Ebb	SSL	127.5	0.128
25-Jul-25	West Buoy		13:10	6	8m	Ebb	SSL	109.5	0.110
25-Jul-25	West Buoy		13:20	7	Surface	Flood	SSL	121.1	0.121
25-Jul-25	West Buoy		13:25	8	4m	Flood	SSL	117.7	0.118
25-Jul-25	West Buoy		13:30	9	8m	Flood	SSL	132.8	0.133
25-Jul-25	East Buoy		13:45	10	Surface	Flood	SSL	129.5	0.130
25-Jul-25	East Buoy		13:50	11	4m	Flood	SSL	137.6	0.138
25-Jul-25	East Buoy		13:55	12	8m	Flood	SSL	113.1	0.113
26-Jul-25	East Buoy		13:15	1	Surface	Ebb	SSL	137.2	0.137
26-Jul-25	East Buoy		13:20	2	4m	Ebb	SSL	155.3	0.155
26-Jul-25	East Buoy		13:25	3	8m	Ebb	SSL	147.1	0.147
26-Jul-25	West Buoy		13:40	4	Surface	Ebb	SSL	140.5	0.141
26-Jul-25	West Buoy		13:45	5	4m	Ebb	SSL	142.5	0.143
26-Jul-25	West Buoy		13:50	6	8m	Ebb	SSL	145.4	0.145
26-Jul-25	West Buoy		14:00	7	Surface	Flood	SSL	143.4	0.143
26-Jul-25	West Buoy		14:05	8	4m	Flood	SSL	136.6	0.137
26-Jul-25	West Buoy		14:10	9	8m	Flood	SSL	138.1	0.138
26-Jul-25	East Buoy		14:25	10	Surface	Flood	SSL	125.1	0.125
26-Jul-25	East Buoy		14:30	11	4m	Flood	SSL	151.6	0.152
26-Jul-25	East Buoy		14:35	12	8m	Flood	SSL	137.8	0.138
27-Jul-25	East Buoy		13:55	1	Surface	Ebb	SSL	106.8	0.107
27-Jul-25	East Buoy		14:00	2	4m	Ebb	SSL	154.2	0.154
27-Jul-25	East Buoy		14:05	3	8m	Ebb	SSL	155.3	0.155
27-Jul-25	West Buoy		14:20	4	Surface	Ebb	SSL	146.4	0.146
27-Jul-25	West Buoy		14:25	5	4m	Ebb	SSL	164.9	0.165
27-Jul-25	West Buoy		14:30	6	8m	Ebb	SSL	153.4	0.153
27-Jul-25	West Buoy		14:40	7	Surface	Flood	SSL	143.1	0.143
27-Jul-25	West Buoy		14:45	8	4m	Flood	SSL	139.5	0.140
27-Jul-25	West Buoy		14:50	9	8m	Flood	SSL	148.3	0.148
27-Jul-25	East Buoy		15:05	10	Surface	Flood	SSL	161.2	0.161
27-Jul-25	East Buoy		15:10	11	4m	Flood	SSL	153.8	0.154
27-Jul-25	East Buoy		15:15	12	8m	Flood	SSL	161.2	0.161
28-Jul-25	East Buoy		14:30	1	Surface	Ebb	SSL	121.5	0.122
28-Jul-25	East Buoy		14:35	2	4m	Ebb	SSL	105.8	0.106
28-Jul-25	East Buoy		14:40	3	8m	Ebb	SSL	118.8	0.119
28-Jul-25	West Buoy		14:55	4	Surface	Ebb	SSL	114.4	0.114
28-Jul-25	West Buoy		15:00	5	4m	Ebb	SSL	130.3	0.130
28-Jul-25	West Buoy		15:05	6	8m	Ebb	SSL	146.9	0.147
28-Jul-25	West Buoy		15:10	7	Surface	Flood	SSL	147.7	0.148
28-Jul-25	West Buoy		15:15	8	4m	Flood	SSL	149.8	0.150
28-Jul-25	West Buoy		15:20	9	8m	Flood	SSL	134.3	0.134
28-Jul-25	East Buoy		15:35	10	Surface	Flood	SSL	148.6	0.149
28-Jul-25	East Buoy		15:40	11	4m	Flood	SSL	150.3	0.150
28-Jul-25	East Buoy		15:45	12	8m	Flood	SSL	135.7	0.136
29-Jul-25	East Buoy		15:00	1	Surface	Ebb	SSL	101.5	0.102
29-Jul-25	East Buoy		15:05	2	4m	Ebb	SSL	134.5	0.135
29-Jul-25	East Buoy		15:10	3	8m	Ebb	SSL	146.4	0.146
29-Jul-25	West Buoy		15:25	4	Surface	Ebb	SSL	130.5	0.131
29-Jul-25	West Buoy		15:30	5	4m	Ebb	SSL	149.4	0.149
29-Jul-25	West Buoy		15:35	6	8m	Ebb	SSL	141.8	0.142
29-Jul-25	West Buoy		15:45	7	Surface	Flood	SSL	142.6	0.143
29-Jul-25	West Buoy		15:50	8	4m	Flood	SSL	146.6	0.147
29-Jul-25	West Buoy		15:55	9	8m	Flood	SSL	152.8	0.153
29-Jul-25	East Buoy		16:10	10	Surface	Flood	SSL	147.6	0.148
29-Jul-25	East Buoy		16:15	11	4m	Flood	SSL	132.7	0.133
29-Jul-25	East Buoy		16:20	12	8m	Flood	SSL	142.0	0.142
30-Jul-25	East Buoy		15:35	1	Surface	Ebb	SSL	134.0	0.134
30-Jul-25	East Buoy		15:40	2	4m	Ebb	SSL	147.1	0.147
30-Jul-25	East Buoy		15:45	3	8m	Ebb	SSL	161.7	0.162
30-Jul-25	West Buoy		16:00	4	Surface	Ebb	SSL	139.4	0.139
30-Jul-25	West Buoy		16:05	5	4m	Ebb	SSL	133.5	0.134
30-Jul-25	West Buoy		16:10	6	8m	Ebb	SSL	154.3	0.154
30-Jul-25	West Buoy		16:15	7	Surface	Flood	SSL	104.6	0.105

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30-Jul-25	West Buoy	16:20	8	4m	Flood	SSL	152.4	0.152
30-Jul-25	West Buoy	16:25	9	8m	Flood	SSL	138.7	0.139
30-Jul-25	East Buoy	16:40	10	Surface	Flood	SSL	135.9	0.136
30-Jul-25	East Buoy	16:45	11	4m	Flood	SSL	128.2	0.128
30-Jul-25	East Buoy	16:50	12	8m	Flood	SSL	155.2	0.155
31-Jul-25	East Buoy	16:10	1	Surface	Ebb	SSL	49.0	0.049
31-Jul-25	East Buoy	16:15	2	4m	Ebb	SSL	44.8	0.045
31-Jul-25	East Buoy	16:20	3	8m	Ebb	SSL	45.3	0.045
31-Jul-25	West Buoy	16:35	4	Surface	Ebb	SSL	73.5	0.074
31-Jul-25	West Buoy	16:40	5	4m	Ebb	SSL	59.7	0.060
31-Jul-25	West Buoy	16:45	6	8m	Ebb	SSL	50.3	0.050
31-Jul-25	West Buoy	16:50	7	Surface	Flood	SSL	59.2	0.059
31-Jul-25	West Buoy	16:55	8	4m	Flood	SSL	77.7	0.078
31-Jul-25	West Buoy	17:00	9	8m	Flood	SSL	89.2	0.089
31-Jul-25	East Buoy	17:15	10	Surface	Flood	SSL	68.1	0.068
31-Jul-25	East Buoy	17:20	11	4m	Flood	SSL	60.5	0.061
31-Jul-25	East Buoy	17:25	12	8m	Flood	SSL	66.4	0.066
01-Aug-25	East Buoy	16:50	1	Surface	Ebb	SSL	66.2	0.066
01-Aug-25	East Buoy	16:55	2	4m	Ebb	SSL	80.4	0.080
01-Aug-25	East Buoy	17:00	3	8m	Ebb	SSL	96.5	0.097
01-Aug-25	West Buoy	17:15	4	Surface	Ebb	SSL	83.7	0.084
01-Aug-25	West Buoy	17:20	5	4m	Ebb	SSL	79.9	0.080
01-Aug-25	West Buoy	17:25	6	8m	Ebb	SSL	75.3	0.075
01-Aug-25	West Buoy	17:35	7	Surface	Flood	SSL	78.0	0.078
01-Aug-25	West Buoy	17:40	8	4m	Flood	SSL	82.9	0.083
01-Aug-25	West Buoy	17:45	9	8m	Flood	SSL	82.2	0.082
01-Aug-25	East Buoy	18:00	10	Surface	Flood	SSL	63.8	0.064
01-Aug-25	East Buoy	18:05	11	4m	Flood	SSL	75.9	0.076
01-Aug-25	East Buoy	18:10	12	8m	Flood	SSL	92.0	0.092
02-Aug-25	East Buoy	17:50	1	Surface	Ebb	SSL	67.7	0.068
02-Aug-25	East Buoy	17:55	2	4m	Ebb	SSL	74.2	0.074
02-Aug-25	East Buoy	18:00	3	8m	Ebb	SSL	63.3	0.063
02-Aug-25	West Buoy	18:15	4	Surface	Ebb	SSL	74.9	0.075
02-Aug-25	West Buoy	18:20	5	4m	Ebb	SSL	128.0	0.128
02-Aug-25	West Buoy	18:25	6	8m	Ebb	SSL	93.0	0.093
02-Aug-25	West Buoy	18:35	7	Surface	Flood	SSL	65.1	0.065
02-Aug-25	West Buoy	18:40	8	4m	Flood	SSL	74.8	0.075
02-Aug-25	West Buoy	18:45	9	8m	Flood	SSL	66.5	0.067
02-Aug-25	East Buoy	19:00	10	Surface	Flood	SSL	76.9	0.077
02-Aug-25	East Buoy	19:00	11	4m	Flood	SSL	79.5	0.080
02-Aug-25	East Buoy	19:10	12	8m	Flood	SSL	77.8	0.078
03-Aug-25	East Buoy	06:25	1	Surface	Ebb	SSL	56.0	0.056
03-Aug-25	East Buoy	06:30	2	4m	Ebb	SSL	55.5	0.056
03-Aug-25	East Buoy	06:35	3	8m	Ebb	SSL	73.1	0.073
03-Aug-25	West Buoy	06:50	4	Surface	Ebb	SSL	65.5	0.066
03-Aug-25	West Buoy	06:55	5	4m	Ebb	SSL	64.4	0.064
03-Aug-25	West Buoy	07:00	6	8m	Ebb	SSL	65.0	0.065
03-Aug-25	West Buoy	07:10	7	Surface	Flood	SSL	77.8	0.078
03-Aug-25	West Buoy	07:15	8	4m	Flood	SSL	57.7	0.058
03-Aug-25	West Buoy	07:20	9	8m	Flood	SSL	78.9	0.079
03-Aug-25	East Buoy	07:35	10	Surface	Flood	SSL	145.2	0.145
03-Aug-25	East Buoy	07:40	11	4m	Flood	SSL	65.2	0.065
03-Aug-25	East Buoy	07:45	12	8m	Flood	SSL	55.5	0.056
04-Aug-25	East Buoy	07:50	1	Surface	Ebb	SSL	53.6	0.054
04-Aug-25	East Buoy	07:55	2	4m	Ebb	SSL	87.3	0.087
04-Aug-25	East Buoy	08:00	3	8m	Ebb	SSL	60.8	0.061
04-Aug-25	West Buoy	08:15	4	Surface	Ebb	SSL	66.9	0.067
04-Aug-25	West Buoy	08:20	5	4m	Ebb	SSL	61.1	0.061
04-Aug-25	West Buoy	08:25	6	8m	Ebb	SSL	63.6	0.064
04-Aug-25	West Buoy	08:30	7	Surface	Flood	SSL	72.3	0.072
04-Aug-25	West Buoy	08:35	8	4m	Flood	SSL	86.0	0.086
04-Aug-25	West Buoy	08:40	9	8m	Flood	SSL	74.0	0.074
04-Aug-25	East Buoy	08:55	10	Surface	Flood	SSL	75.1	0.075
04-Aug-25	East Buoy	09:00	11	4m	Flood	SSL	68.2	0.068
04-Aug-25	East Buoy	09:05	12	8m	Flood	SSL	56.9	0.057
05-Aug-25	East Buoy	09:00	1	Surface	Ebb	SSL	124.1	0.124
05-Aug-25	East Buoy	09:05	2	4m	Ebb	SSL	107.7	0.108
05-Aug-25	East Buoy	09:10	3	8m	Ebb	SSL	109.8	0.110
05-Aug-25	West Buoy	09:25	4	Surface	Ebb	SSL	103.8	0.104
05-Aug-25	West Buoy	09:30	5	4m	Ebb	SSL	149.6	0.150
05-Aug-25	West Buoy	09:35	6	8m	Ebb	SSL	136.1	0.136
05-Aug-25	West Buoy	09:45	7	Surface	Flood	SSL	155.7	0.156
05-Aug-25	West Buoy	09:50	8	4m	Flood	SSL	151.0	0.151
05-Aug-25	West Buoy	09:55	9	8m	Flood	SSL	142.9	0.143
05-Aug-25	East Buoy	10:10	10	Surface	Flood	SSL	142.2	0.142
05-Aug-25	East Buoy	10:15	11	4m	Flood	SSL	151.0	0.151
05-Aug-25	East Buoy	10:20	12	8m	Flood	SSL	167.5	0.168
06-Aug-25	East Buoy	10:00	1	Surface	Ebb	SSL	21.8	0.022
06-Aug-25	East Buoy	10:05	2	4m	Ebb	SSL	37.4	0.037
06-Aug-25	East Buoy	10:10	3	8m	Ebb	SSL	51.6	0.052
06-Aug-25	West Buoy	10:25	4	Surface	Ebb	SSL	57.4	0.057
06-Aug-25	West Buoy	10:30	5	4m	Ebb	SSL	57.4	0.057
06-Aug-25	West Buoy	10:35	6	8m	Ebb	SSL	58.1	0.058
06-Aug-25	West Buoy	10:45	7	Surface	Flood	SSL	93.0	0.093
06-Aug-25	West Buoy	10:50	8	4m	Flood	SSL	58.5	0.059
06-Aug-25	West Buoy	10:55	9	8m	Flood	SSL	69.2	0.069
06-Aug-25	East Buoy	11:10	10	Surface	Flood	SSL	60.8	0.061
06-Aug-25	East Buoy	11:15	11	4m	Flood	SSL	70.3	0.070
06-Aug-25	East Buoy	11:20	12	8m	Flood	SSL	164.1	0.164

Water samples from River

07-Aug-25	East Buoy		10:00	1	Surface	Ebb	SSL	67.1	0.067
07-Aug-25	East Buoy		10:55	2	4m	Ebb	SSL	84.1	0.084
07-Aug-25	East Buoy		11:00	3	8m	Ebb	SSL	83.6	0.084
07-Aug-25	West Buoy		11:15	4	Surface	Ebb	SSL	93.0	0.093
07-Aug-25	West Buoy		11:20	5	4m	Ebb	SSL	94.2	0.094
07-Aug-25	West Buoy		11:25	6	8m	Ebb	SSL	99.6	0.100
07-Aug-25	West Buoy		11:35	7	Surface	Flood	SSL	90.5	0.091
07-Aug-25	West Buoy		11:40	8	4m	Flood	SSL	118.5	0.119
07-Aug-25	West Buoy		11:45	9	8m	Flood	SSL	90.7	0.091
07-Aug-25	East Buoy		12:00	10	Surface	Flood	SSL	104.8	0.105
07-Aug-25	East Buoy		12:05	11	4m	Flood	SSL	98.0	0.098
07-Aug-25	East Buoy		12:10	12	8m	Flood	SSL	99.3	0.099
08-Aug-25	East Buoy		11:35	1	Surface	Ebb	SSL	92.9	0.093
08-Aug-25	East Buoy		11:40	2	4m	Ebb	SSL	53.6	0.054
08-Aug-25	East Buoy		11:45	3	8m	Ebb	SSL	90.4	0.090
08-Aug-25	West Buoy		12:00	4	Surface	Ebb	SSL	80.0	0.080
08-Aug-25	West Buoy		12:05	5	4m	Ebb	SSL	97.9	0.098
08-Aug-25	West Buoy		12:10	6	8m	Ebb	SSL	103.7	0.104
08-Aug-25	West Buoy		12:20	7	Surface	Flood	SSL	109.5	0.110
08-Aug-25	West Buoy		12:25	8	4m	Flood	SSL	109.9	0.110
08-Aug-25	West Buoy		12:30	9	8m	Flood	SSL	111.8	0.112
08-Aug-25	East Buoy		12:45	10	Surface	Flood	SSL	94.3	0.094
08-Aug-25	East Buoy		12:50	11	4m	Flood	SSL	86.6	0.087
08-Aug-25	East Buoy		12:55	12	8m	Flood	SSL	104.3	0.104
09-Aug-25	East Buoy		12:15	1	Surface	Ebb	SSL	84.6	0.085
09-Aug-25	East Buoy		12:20	2	4m	Ebb	SSL	99.1	0.099
09-Aug-25	East Buoy		12:25	3	8m	Ebb	SSL	114.8	0.115
09-Aug-25	West Buoy		12:40	4	Surface	Ebb	SSL	78.9	0.079
09-Aug-25	West Buoy		12:45	5	4m	Ebb	SSL	88.3	0.088
09-Aug-25	West Buoy		12:50	6	8m	Ebb	SSL	105.6	0.106
09-Aug-25	West Buoy		13:00	7	Surface	Flood	SSL	119.0	0.119
09-Aug-25	West Buoy		13:05	8	4m	Flood	SSL	109.6	0.110
09-Aug-25	West Buoy		13:10	9	8m	Flood	SSL	123.5	0.124
09-Aug-25	East Buoy		13:25	10	Surface	Flood	SSL	105.3	0.105
09-Aug-25	East Buoy		13:30	11	4m	Flood	SSL	108.4	0.108
09-Aug-25	East Buoy		13:35	12	8m	Flood	SSL	131.9	0.132
10-Aug-25	East Buoy		12:55	1	Surface	Ebb	SSL	178.4	0.178
10-Aug-25	East Buoy		13:00	2	4m	Ebb	SSL	200.9	0.201
10-Aug-25	East Buoy		13:05	3	8m	Ebb	SSL	195.5	0.196
10-Aug-25	West Buoy		13:20	4	Surface	Ebb	SSL	133.6	0.134
10-Aug-25	West Buoy		13:25	5	4m	Ebb	SSL	156.4	0.156
10-Aug-25	West Buoy		13:30	6	8m	Ebb	SSL	172.1	0.172
10-Aug-25	West Buoy		13:40	7	Surface	Flood	SSL	175.4	0.175
10-Aug-25	West Buoy		13:45	8	4m	Flood	SSL	162.7	0.163
10-Aug-25	West Buoy		13:50	9	8m	Flood	SSL	130.1	0.130
10-Aug-25	East Buoy		14:05	10	Surface	Flood	SSL	185.6	0.186
10-Aug-25	East Buoy		14:10	11	4m	Flood	SSL	194.4	0.194
10-Aug-25	East Buoy		14:15	12	8m	Flood	SSL	205.9	0.206
11-Aug-25	East Buoy		13:35	1	Surface	Ebb	SSL	158.9	0.159
11-Aug-25	East Buoy		13:40	2	4m	Ebb	SSL	182.9	0.183
11-Aug-25	East Buoy		13:45	3	8m	Ebb	SSL	209.5	0.210
11-Aug-25	West Buoy		14:00	4	Surface	Ebb	SSL	148.8	0.149
11-Aug-25	West Buoy		14:05	5	4m	Ebb	SSL	145.9	0.146
11-Aug-25	West Buoy		14:10	6	8m	Ebb	SSL	132.5	0.133
11-Aug-25	West Buoy		14:20	7	Surface	Flood	SSL	131.4	0.131
11-Aug-25	West Buoy		14:25	8	4m	Flood	SSL	123.8	0.124
11-Aug-25	West Buoy		14:30	9	8m	Flood	SSL	128.9	0.129
11-Aug-25	East Buoy		14:45	10	Surface	Flood	SSL	176.7	0.177
11-Aug-25	East Buoy		14:50	11	4m	Flood	SSL	190.2	0.190
11-Aug-25	East Buoy		14:55	12	8m	Flood	SSL	154.7	0.155
12-Aug-25	East Buoy		14:10	1	Surface	Ebb	SSL	160.7	0.161
12-Aug-25	East Buoy		14:15	2	4m	Ebb	SSL	92.0	0.092
12-Aug-25	East Buoy		14:20	3	8m	Ebb	SSL	107.0	0.107
12-Aug-25	West Buoy		14:35	4	Surface	Ebb	SSL	151.2	0.151
12-Aug-25	West Buoy		14:40	5	4m	Ebb	SSL	129.5	0.130
12-Aug-25	West Buoy		14:45	6	8m	Ebb	SSL	112.4	0.112
12-Aug-25	West Buoy		14:55	7	Surface	Flood	SSL	98.2	0.098
12-Aug-25	West Buoy		15:00	8	4m	Flood	SSL	139.4	0.139
12-Aug-25	West Buoy		15:05	9	8m	Flood	SSL	162.9	0.163
12-Aug-25	East Buoy		15:20	10	Surface	Flood	SSL	145.6	0.146
12-Aug-25	East Buoy		15:25	11	4m	Flood	SSL	149.7	0.150
12-Aug-25	East Buoy		15:30	12	8m	Flood	SSL	176.4	0.176
13-Aug-25	East Buoy		14:45	1	Surface	Ebb	SSL	105.7	0.106
13-Aug-25	East Buoy		14:50	2	4m	Ebb	SSL	110.5	0.111
13-Aug-25	East Buoy		14:55	3	8m	Ebb	SSL	120.2	0.120
13-Aug-25	West Buoy		15:10	4	Surface	Ebb	SSL	108.5	0.109
13-Aug-25	West Buoy		15:15	5	4m	Ebb	SSL	116.0	0.116
13-Aug-25	West Buoy		15:20	6	8m	Ebb	SSL	117.3	0.117
13-Aug-25	West Buoy		15:30	7	Surface	Flood	SSL	120.0	0.120
13-Aug-25	West Buoy		15:35	8	4m	Flood	SSL	110.9	0.111
13-Aug-25	West Buoy		15:40	9	8m	Flood	SSL	109.0	0.109
13-Aug-25	East Buoy		15:55	10	Surface	Flood	SSL	125.5	0.126
13-Aug-25	East Buoy		16:00	11	4m	Flood	SSL	98.7	0.099
13-Aug-25	East Buoy		16:05	12	8m	Flood	SSL	96.0	0.096

Attachment 6

Marine Mammal Observer Report



Marine Mammal Observer Report

**Aughinish Alumina Geophysical Acoustic Surveys and Dredging
Campaign 2025**

Client: Aughinish Alumina Ltd.

Consultants: IWDG Consulting

Marine Mammal Observers: Fiona Cummins

Geophysical Survey Contractor and vessel: Hydromaster Ltd., *Warrior*

Dredging Contractor and vessel: Fastnet Shipping Ltd., *Fastnet Sound*

Dates: 22 July – 06 August 2025

**Irish Whale and Dolphin Group,
Merchant's Quay, Kilrush, Co. Clare, Ireland.**

August 2025

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Executive Summary

IWDG Consulting were contracted for Marine Mammal Observer (MMO) services for the Aughinish Alumina Ltd. dredging campaign 2025. A Joint Nature Conservation Committee (JNCC) certified MMO implemented marine mammal mitigation procedures as per the *Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters* (NPWS, 2014) for both bathymetry surveys and dredging operations.

Fastnet Shipping Ltd. were contracted for excavator assisted plough dredging operations and Hydromaster Ltd. for bathymetry surveys, at Dredge Sites A and B at the Aughinish Marine Terminal Jetty. Mizen Archaeology were contracted for archaeological monitoring services.

Geophysical survey operations of Dredge Site A were conducted on the 22nd and 28th of July 2025 and 01st August 2025, and Dredge Site B on the 28th of July and 01st and 06th of August. Dredging operations at Dredge Site A were carried out across ten days between the 23rd of July 2024 and 01st of August 2025. Dredging Operations at Dredge Site B were carried out between the 01st and 06th of August. The above described geophysical and dredging activities were carried out under the Maritime Area usage Licence number LIC230004 and Dumping as Sea Permit number S0026-02.

Before commencement of all operations during this project, pre-watches (PW) of a minimum of 30-minutes were conducted of the 500m mitigation zone (MZ) by the MMO, monitoring for the presence of marine mammals. If marine mammals were detected within the MZ during the PW, start of operations were delayed until the area had been clear of marine mammals for 30 minutes. If operations halted for more than 30 minutes another pre-watch was conducted. A 20-minute ramp up procedure was implemented for geophysical survey operations. Once dredging operations/ geophysical ramp-up commenced, operations continued until completed and operations were not halted if a marine mammal was sighted within the MZ.

Seventeen pre-watches were carried out during this maintenance dredging project, amalgamating in 9 hours and 46 minutes of pre-watch effort.

There were two bottlenose dolphin (*Tursiops truncatus*) sightings during this project. The first sighting was of three animals, before dredging operations commenced at Dredge Site A on the 23/07/2025. The animals stayed outside of the 500m mitigation zone for the duration of the pre-watch. The closest distance they came to operations was 650m and no mitigation action was required. The second sighting, on the 24/07/2025, was of a group of approximately 12 animals travelling west, along the north of the Shannon Estuary. The closest distance the animals came to operations was 900m. Dredging operations were ongoing when the sighting occurred, and no mitigation action was required.

It is the opinion of IWDG Consulting that is highly unlikely that the dredging operations or geophysical surveys had any significant impact on marine mammals in the area during the project.

Introduction

Location and duration of project

This report outlines operational activity and Marine Mammal Observation (MMO) results from the dredging campaign at Dredge Sites A and B at the Aughinish Alumina marine terminal jetty in 2025. This work involved geophysical survey activities and excavator assisted plough dredging. This work was carried out under the Maritime Area usage Licence number LIC230004 and Dumping as Sea Permit number S0026-02.

Hydromaster Ltd. were contracted for geophysical surveying operations, Fastnet Shipping Ltd. for dredging operations, IWDG consulting for Marine Mammal Observer services and Mizen Archaeology for archaeological monitoring services. Operations began on the 22nd of July 2025 and finished on the 06th of August 2025, culminating in 16 days of noise producing operations.

Legislation

All waters within Ireland's Exclusive Economic Zone (EEZ) have been designated as a Whale and Dolphin Sanctuary since 1991. Marine mammals in this area are safeguarded by national and international legislation, including the Wildlife Act (1976) and its subsequent amendments (2000, 2005, 2010, and 2012). Under this legislation, it is prohibited to hunt, injure, or willfully interfere with, disturb, or destroy the resting or breeding habitats of protected species within Irish territorial waters (within the 12 nautical mile limit). Annex IV of the EU Habitats Directive (92/43/EEC) identifies all cetacean species found in Ireland's EEZ, along with otters (*Lutra lutra*), as being of 'community interest' and in need of strict protection. Furthermore, species such as harbour porpoises (*Phocoena phocoena*), bottlenose dolphins (*Tursiops truncatus*), harbour seals (*Phoca vitulina*), grey seals (*Halichoerus grypus*), and otters are listed under Annex II of this directive. This designation obligates member states to establish Special Areas of Conservation (SACs) for these species and ensure the protection of these areas to prevent the deterioration of natural habitats and species habitats, as well as to minimize disturbance to the species for which these areas are designated.

Marine mammals exhibit a high reliance on sound, with cetaceans utilizing it for navigation, foraging, and social interaction. They are particularly susceptible to noise pollution, which can result in a range of adverse effects including physical injury, hearing impairment (temporary or permanent threshold shifts), a diminished capacity to interpret their surroundings and conspecifics (masking), behavioural disruptions (such as foraging interference or habitat displacement), chronic stress, and indirect consequences like reduced prey availability. The Marine Strategy Framework Directive (MSFD) (2008/56/EC) mandates EU member states to achieve or maintain Good Environmental Status (GES) for marine habitats. GES is evaluated based on 11 descriptors, one of which pertains to energy levels, including underwater noise. Recommended thresholds for continuous and impulsive noise levels were established in 2022.

The National Parks and Wildlife Service (NPWS) of the Department of the Environment, Heritage and Local Government has issued a Code of Practice for the Protection of Marine Mammals during Acoustic Seafloor Surveys in Irish Waters (NPWS, 2007). This was revised in 2014 to provide Guidance for managing risks to marine mammals from man-made sound sources in Irish waters (NPWS, 2014), which remains in effect today. These guidelines advocate for risk assessments of coastal and marine activities to evaluate the potential impacts of anthropogenic noise on protected marine mammal species. This ensures that spatial and temporal sensitivities are taken into account, informing the consent process appropriately. Additionally, the guidelines offer strategies for managing risks to marine mammals during dredging, drilling, pile driving,

geophysical acoustic surveys, and blasting operations conducted in Ireland's marine environments.

Mitigation guidelines for dredging operations and geophysical multibeam surveys are reproduced below:

4.3.1 Dredging

1. A qualified and experienced marine mammal observer (MMO) shall be appointed to monitor for marine mammals and to log all relevant events using standardised data forms (Appendix 7).

2. Unless information specific to the location and/or plan/project is otherwise available to inform the mitigation process (e.g., specific sound propagation and/or attenuation data) and a distance modification has been agreed with the Regulatory Authority, dredging activity shall not commence if marine mammals are detected within a 500m radial distance of the dredging sound source, i.e., within the Monitored Zone.

Pre-Start Monitoring

3. Dredging activities shall only commence in daylight hours where effective visual monitoring, as performed and determined by the MMO, has been achieved. Where effective visual monitoring, as determined by the MMO, is not possible the sound-producing activities shall be postponed until effective visual monitoring is possible.

4. An agreed and clear on-site communication signal must be used between the MMO and the Works Superintendent as to whether the relevant activity may or may not proceed, or resume following a break (see below). It shall only proceed on positive confirmation with the MMO.

5. In waters up to 200m deep, the MMO shall conduct pre-start-up constant effort monitoring at least 30 minutes before the sound-producing activity is due to commence. Sound-producing activity shall not commence until at least 30 minutes have elapsed with no marine mammals detected within the Monitored Zone by the MMO.

6. This prescribed Pre-Start Monitoring shall subsequently be followed immediately by normal dredging operations. The delay between the end of Pre-Start Monitoring and the necessary full dredging output must be minimised.

Dredging operations

7. Once normal dredging operations commence, there is no requirement to halt or discontinue the activity at night-time, nor if weather or visibility conditions deteriorate nor if marine mammals occur within a 500m radial distance of the sound source, i.e., within the Monitored Zone.

Breaks in sound output

8. If there is a break in dredging sound output for a period greater than 30 minutes (e.g., due to equipment failure, shut-down or location change) then all Pre-Start Monitoring must be undertaken in accordance with the above conditions prior to the recommencement of dredging activity.

Reporting

9. Full reporting on MMO operations and mitigation undertaken must be provided to the Regulatory Authority as outlined in Appendix 7.

4.3.4 GEOPHYSICAL ACOUSTIC SURVEYS

The measures outlined below are applicable to

- (i) all seismic surveys (including the testing and full operational use of airguns, water guns, sparkers, boomers and vertical seismic profiling [VSP] or checkshot systems) in inshore†† and offshore Irish waters;*
- (ii) all multibeam, single beam, side-scan sonar and sub-bottom profiler (e.g., pinger or chirp system) surveys within bays, inlets or estuaries‡‡ and within 1,500m of the entrance of enclosed bays/inlets/estuaries;*
- (iii) or as advised by the relevant Regulatory Authority.*

4.3.4 (ii). Multibeam, single beam, side-scan sonar & sub-bottom profiler surveys

1. A qualified and experienced marine mammal observer (MMO) shall be appointed to monitor for marine mammals and to log all relevant events using standardised data forms (Appendix 6).

2. Unless information specific to the location and/or plan/project is otherwise available to inform the mitigation process (e.g., specific sound propagation and/or attenuation data) and a distance modification has been agreed with the Regulatory Authority, acoustic surveying using the above equipment shall not commence if marine mammals are detected within a 500m radial distance of the sound source intended for use, i.e., within the Monitored Zone.

Pre-Start Monitoring

3. Sound-producing activities shall only commence in daylight hours where effective visual monitoring, as performed and determined by the MMO, has been achieved. Where effective visual monitoring, as determined by the MMO, is not possible the sound-producing activities shall be postponed until effective visual monitoring is possible.

4. An agreed and clear on-site communication signal must be used between the MMO and the Works Superintendent as to whether the relevant activity may or may not proceed, or resume following a break (see below). It shall only proceed on positive confirmation with the MMO.

5. In waters up to 200m deep, the MMO shall conduct pre-start-up constant effort monitoring at least 30 minutes before the sound-producing activity is due to commence. Sound-producing activity shall not commence until at least 30 minutes have elapsed with no marine mammals detected within the Monitored Zone by the MMO.

6. This prescribed Pre-Start Monitoring shall subsequently be followed by a Ramp-Up Procedure which should include continued monitoring by the MMO.

Ramp-Up Procedure

7. In commencing an acoustic survey operation using the above equipment, the following Ramp up Procedure (i.e., “soft-start”) must be used, including during any testing of acoustic sources, where the output peak sound pressure level from any source exceeds 170 dB re: 1µPa @1m:

(a) Where it is possible according to the operational parameters of the equipment concerned, the device’s acoustic energy output shall commence from a lower energy start-up (i.e., a peak sound pressure level not exceeding 170 dB re: 1µPa @1m) and thereafter be allowed to gradually build up to the necessary maximum output over a period of 20 minutes.

(b) This controlled build-up of acoustic energy output shall occur in consistent stages to provide a steady and gradual increase over the ramp-up period.

(c) Where the acoustic output measures outlined in steps (a) and (b) are not possible according to the operational parameters of any such equipment, the device shall be switched “on” and “off” in a consistent sequential manner over a period of 20 minutes prior to commencement of the full necessary output.

8. In all cases where a Ramp-Up Procedure is employed the delay between the end of ramp-up and the necessary full output must be minimised to prevent unnecessary high-level sound introduction into the environment. Once the Ramp-Up Procedure commences, there is no requirement to halt or discontinue the procedure at night-time, nor if weather or visibility conditions deteriorate nor if marine mammals occur within a 500m radial distance of the sound source, i.e., within the Monitored Zone.

Breaks in sound output

10. If there is a break in sound output for a period greater than 30 minutes (e.g., due to equipment failure, shut-down, survey line or station change) then all Pre-Start Monitoring and a subsequent Ramp-up Procedure (where appropriate following Pre-Start Monitoring) must be undertaken.

11. For higher output survey operations which have the potential to produce injurious levels of underwater sound (see sections 2.4, 3.2) as informed by the associated risk assessment, there is likely to be a regulatory requirement to adopt a shorter 5-10 minute break limit after which period all Pre-Start Monitoring and a subsequent Ramp-up Procedure (where appropriate following Pre-Start Monitoring) shall recommence as for start-up.

Reporting

12. Full reporting on MMO operations and mitigation undertaken must be provided to the Regulatory Authority as outlined in Appendix 6.

Marine Mammal species in the Shannon Estuary

A total of six pinniped species and 26 cetacean species (Table 1) have been recorded in Irish waters, with seven marine mammal species having been recorded within the Shannon estuary: the otter (Reid et al., 2013), bottlenose dolphin, common dolphin, harbour porpoise, harbour seal, grey seal (Daly et al. 2024; O’Brien 2015) and a recent addition is the humpback whale (IWDG, 2025). On 27/11/2024 a humpback whale was sighted in the Shannon Estuary, between Tarbert and Killimer for the first time in almost 60 years. This individual was sighted in the area consistently until 23/01/2025 giving a minimum residency in the area of 59 days.

The operational area for this project was in the inner estuary (east of Tarbert), where marine mammal presence is less commonly observed compared to the outer estuary but has nevertheless been shown to be an important habitat for marine mammals (Daly et al. 2024, Carmen et al., 2021). The Shannon Estuary is designated as a Special Area of Conservation (SAC), under the above-described EU Habitats directive, to protect a unique resident population of bottlenose dolphins. Bottlenose dolphins are the most sighted marine mammal species in the area, and static acoustic data collected at Aughinish between 2011 and 2014 found that bottlenose dolphins were detected on 20.3% of days that monitoring took place, with 85% of these detections occurring during the nighttime and 12.6% of detections classified as foraging click trains (Carmen et al., 2021).

Table 1. List of marine mammal species recorded in Irish waters, with species that have been recorded in the Shannon Estuary highlighted in bold.

Species	Taxonomic name	Status	Reference for record of species in the Shannon Estuary
Harbour seal	<i>Phoca vitulina</i>	Resident	Daly et al. (2024)
Grey seal	<i>Halichoerus grypus</i>	Resident	Daly et al. (2024)
Bearded seal	<i>Erignathus barbatus</i>	Vagrant	
Hooded seal	<i>Cystophora cristata</i>	Vagrant	
Ringed seal	<i>Pusa hispida</i>	Vagrant	
Walrus	<i>Odobenus rosmarus</i>	Vagrant	
Atlantic White-sided Dolphin	<i>Lagenorhynchus acutus</i>	Resident	-
Bottlenose Dolphin	<i>Tursiops truncatus</i>	Resident	Berrow et al. (1996), Daly et al. (2024), O'Brien et al. (2013)
Common Dolphin	<i>Delphinus delphis</i>	Resident	Daly et al. (2024)
Cuvier's Beaked Whale	<i>Ziphius cavirostris</i>	Resident	-
Harbour Porpoise	<i>Phocoena phocoena</i>	Resident	Daly et al. (2024)
Long-finned Pilot Whale	<i>Globicephala melas</i>	Resident	-
Northern Bottlenose Whale	<i>Hyperoodon ampullatus</i>	Resident	-
Risso's Dolphin	<i>Grampus griseus</i>	Resident	-
Striped Dolphin	<i>Stenella coeruleoalba</i>	Resident	-
White-beaked Dolphin	<i>Lagenorhynchus albirostris</i>	Resident	-
Killer Whale	<i>Orcinus orca</i>	Migratory	-
Blue Whale	<i>Balaenoptera musculus</i>	Migratory	-
Fin Whale	<i>Balaenoptera physalus</i>	Migratory	-
Humpback Whale	<i>Megaptera novaeangliae</i>	Migratory	IWDG, 2025
Minke whale	<i>Balaenoptera acutorostrata</i>	Migratory	-
Sei Whale	<i>Balaenoptera borealis</i>	Migratory	-
Sperm Whale	<i>Physeter macrocephalus</i>	Migratory	-
Beluga Whale	<i>Delphinapterus leucas</i>	Vagrant	-
Bowhead Whale	<i>Balaena mysticetus</i>	Vagrant	-
False Killer Whale	<i>Pseudorca crassidens</i>	Vagrant	-
Sowerby's Beaked Whale	<i>Mesoplodon bidens</i>	Vagrant	-
North Atlantic Right Whale	<i>Eubalaena glacialis</i>	Vagrant	-
Dwarf Sperm Whale	<i>Kogia sima</i>	Unknown	-
Gervais' Beaked Whale	<i>Mesoplodon europaeus</i>	Unknown	-
Pygmy Sperm Whale	<i>Kogia breviceps</i>	Unknown	-
True's Beaked Whale	<i>Mesoplodon mirus</i>	Unknown	-

Scope of Work

Operational Area

Geophysical survey and dredging operations were carried out at Aughinish Alumina marine terminal jetty at Dredge Sites A and B between the 22nd of July and 06th of August 2025. This jetty is located on the south side of the Shannon Estuary, approximately 60km inland from the mouth of the Shannon estuary, on Aughinish Island, Co. Limerick. The dredge site co-ordinates are outlined in Table 2. A map outlining the dredge sites can be seen in Figure 1.

Table 2. Co-ordinates of dredge sites during the Aughinish Alumina Dredge campaign 2025.

Dredge Site	Latitude	Longitude
A	52.64636	-9.06168
	52.64671	-9.05394
	52.64563	-9.05381
	52.64528	-9.06154
B	52.63745	-9.05843
	52.63806	-9.05487
	52.63677	-9.05427
	52.63616	-9.05782

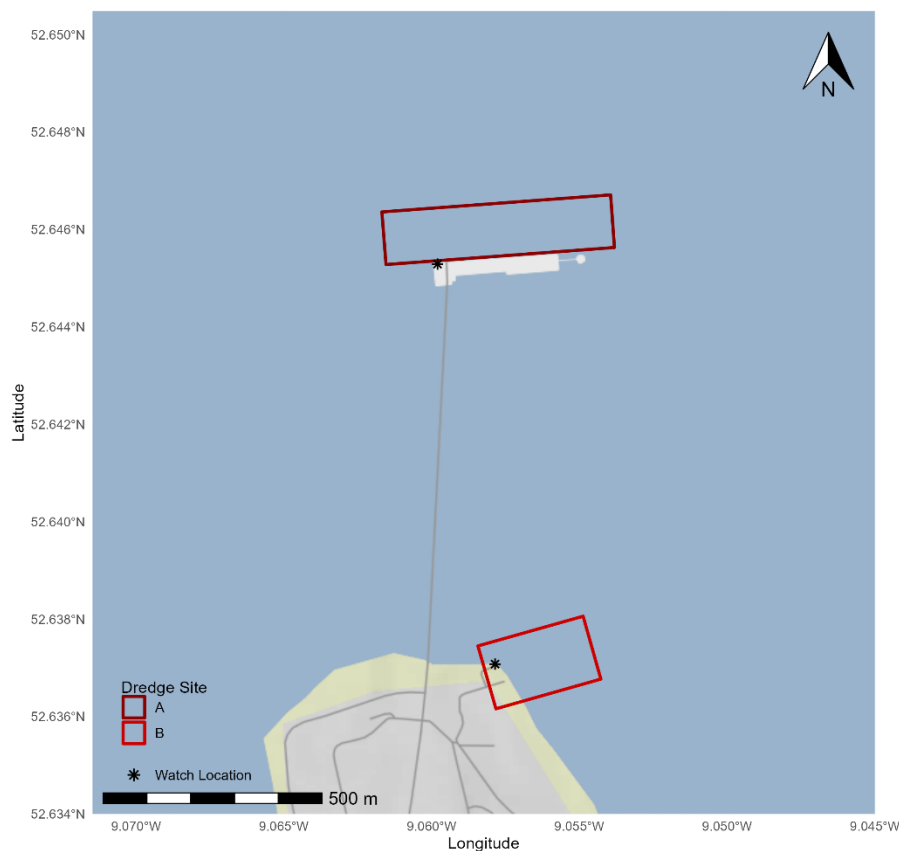


Figure 1. Dredge Sites A and B at the Aughinish Alumina Ltd. site, Aughinish Island, Co. Limerick. MMO watches were conducted from the Marine Terminal Jetty and the cells docking area for Dredge Areas A and B, respectively.

Geophysical Survey Operation Details

The geophysical surveys were conducted by Hydromaster Ltd. and involved using a Norbit Winghead multibeam echosounder (MBES) to map the seabed pre and post dredging operations at Dredge Sites A and B. This equipment operates at a frequency of 400kHz. There is no sound output data for this equipment publicly available. As per the licence requirements, a 20-minute ramp-up before start of full noise output was carried out. Due to the operational parameters of the equipment a progressional build-up of power was not possible. To avoid damage to the equipment a ramp-up was implemented where the equipment was turned on and off for five minutes sequentially, for 20-minutes, before continuous noise output began. All geophysical survey operations were conducted from a 4.3m small boat, the *Warrior* (see Figure 2).



Figure 2. The 'Warrior' conducting a geographical survey using a multibeam echosounder (MBES) in Dredge Area A.

Dredging Operation Details

Dredging operations were conducted by Fastnet Shipping Ltd. and consisted of excavator assisted plough dredging. This involved the use of a long arm tracking machine (Caterpillar 226DL Longreach), excavating areas of built-up material (Figure 3c and 3d). The excavated material was then plough dredged using a 10.5m bed levelling unit (Figure 3a and 3b).

At Dredge Site A excavating activities were carried out during hours of low tide in the daylight, outside of low tide and during hours of darkness plough dredging operations occurred. Operations were continuous once started, working on a 24/7 basis.

At Dredge Site B the area was excavated during hours of high tide and day light hours. Ploughing operations were also restricted to outside of low tide. Operations were not possible to be continuous on a 24/7 basis due to the tidal restrictions. When operations stopped during the night for more than 30-minutes they did not commence again until the next day, subject to 30 minute pre-watch by the on duty MMO. All dredging operations were conducted from the *Fastnet Sound*, a utility vessel (length 27.05m, width 10.8m), which can be seen in Figure 3.

Sound emissions from dredging operations and vessel activity are low frequency omnidirectional noise, ranging from tens of Hz to approximately 20kHz at sound pressure levels of 135-186 dB re 1 μ Pa (NPWS, 2014).



Figure 3. Ploughing operations at the Aughinish Alumina marine terminal jetty. (A) the bed levelling unit is raised here, this is used for ploughing operations, (B) the Fastnet Sound carrying out ploughing operations, the bed levelling unit is dropped to the sea bed (C) & (D) excavating operations being conducted from the Fastnet Sound by the long arm tracking machine.

Marine Mammal Observer Methodology

A Joint Nature Conservation Committee (JNCC) certified Marine Mammal Observer (MMO) was present during the dayshift to implement the National Park and Wildlife Service (NPWS) Guidelines to Minimise the Acoustic Impacts on Marine Mammals (2014). The IWDG MMOs on this project were Fiona Cummins and Simon Berrow.

All monitoring watches for geophysical and dredging operations at Dredge Site A were conducted from the Aughinish marine terminal jetty (co-ordinates: 52.6452882, -9.0597980). The height of this observation point above chart datum is 8.47m (Shannon Foynes Port Company, 2021). Monitoring watches for geophysical and dredging operations at Dredge Site B were conducted from the cells docking area (co-ordinates: 52.6452882, -9.0597980).

Prior to commencement of both geophysical and dredging operations a 30-minute pre-watch (PW) was carried out by the on-duty MMO, where the 500m mitigation zone (MZ) was monitored for the presence of marine mammals. All pre-watches were carried out in suitable conditions for marine mammal observation (during hours of daylight, in Beaufort wind force 4 or less and sea state WMO 4 or less) in accordance with 2014 Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters (NPWS, 2014). Once the MZ had been verified to be free of marine mammals for a period of 30 minutes the on-duty MMO communicated to crew that operations could commence. A ramp up was carried out prior to commencement of geophysical survey operations whereby the equipment was switched “on” and “off” for five minutes sequentially, for 20 minutes.

If a marine mammal was sighted within the MZ during the PW, start of operations were delayed until the MZ had been free of marine mammals for 30-minutes. If operations ceased for more than 30 minutes due to, for example, equipment breakdown or bad weather conditions, a pre-watch was carried out again before operations could recommence. Once operations commenced, (geophysical ramp-up/ dredging operations) there was no need to halt during the night-time or if a marine mammal was sighted with the MZ. The MMO carried out “effort watches” while operations were on-going and any sightings made were recorded.

When a sighting was made the species was identified when possible and recorded, along with its behaviour, heading, distance and true bearing to the animal. The operational activity that was ongoing at the time was also recorded (not operational/ geophysical survey/ ploughing/ excavating). Environmental data was recorded by the MMO before each watch (wind direction, Beaufort force, sea state (WMO), swell and visibility).

Operational activities, MMO monitoring, and marine mammal sightings were recorded in the appropriate NPWS data sheets, in accordance with the Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters (NPWS, 2014).

Visual surveying was aided by the use of Opticron DISCOVERY WP PC 8X42 binoculars. A Nikon D780 with a 100-400mm Sigma lens and AF-S NIKKOR 24-120mm f4 lens was used to photograph marine mammals sighted throughout the project and any vessels involved in geophysical and dredging operations. Distances were estimated using known distances to landmarks and water buoys as a reference.

Results

Sound Producing Activity

Geophysical Operations

Geophysical surveys took place across four days between the 22nd of July and 06th of August, the dates each area was surveyed can be seen in Table 3. The hours equipment was active at Site A was 3hrs 9mins, and Site B was 2hrs 25mins, resulting in a total of 5hrs 34mins of MBES noise production during this project. Durations for overall operations across the two sites are summarised in Table 4. All further details regarding recorded times for all MBES sound producing activities can be found in Appendix III: Record of Operational Activity.

Dredging Operations

Operational sound sources during the dredging campaign included excavation and ploughing. Operations took place over a period of 15 days, from the 23rd of July to the 06th of August, across two areas, Dredge Site A and B (Table 3). Operations consisted of 210 hrs 4 mins of dredging at Site A and 40 hrs 47 mins of dredging at Site B, amalgamating in 250 hrs 51 mins of dredging operations for this project. Durations for overall excavation and ploughing operations across the two sites are summarised in Table (Table 4). All further details regarding recorded times for all dredging sound producing activities can be found in Appendix III: Record of Operational Activity.

Table 3. Dates that dredging and geophysical survey operations occurred.

Dredge Site	Dates of Geophysical Operations	Dates of Dredging Operations
A	22/07/2025, 28/07/2025, 01/08/2025	23/07/2025-01/08/2025
B	28/07/2025, 01/07/2025, 06/08/2025	01/08/2025-06/08/2025

Table 4. Summary of all noise producing operations during the 2025 dredging campaign.

Operation		Hrs of Operation (hh:mm)		Total (hh:mm)
		Dredge Site A	Dredge Site B	
Dredging Operations	Excavating hours	18:22:00	22:20:00	40:42:00
	Ploughing hours	191:42:00	18:27:00	210:09:00
	Total Dredging Operations	210:04:00	40:47:00	250:51:00
MBES Operations	MBES ramp-up	1:00:00	1:00:00	2:00:00
	MBES full output	2:09:00	1:25:00	3:34:00
	Total MBES ramp-up + full noise output	3:09:00	2:25:00	5:34:00
Total noise production				
MBES & Dredging operations		213:13:00	43:12:00	256:25:00

Marine Mammal Observer Effort

A total of 17 pre-start watches, and 64 effort watches were conducted throughout this project for both dredging and geophysical survey operations across Dredge Site A and B (Table 5). Pre-start watches accounted for a total of 9hrs and 46 mins of marine mammal observation and effort watches accounted for a total of 38 hrs and 19 mins. This culminated in 81 watches and a total of 48 hrs 5 mins of visual monitoring conducted by the MMO. A breakdown of visual effort across all operations in Dredge Sites A and B is given in Table 6. NPWS observer effort forms can be seen in Appendix II: Record of Marine Mammal Observer Effort.

Table 5. Summary of pre-watches conducted by MMOs throughout the project.

Pre-watch number	Date	Dredge Site	Operation	Time (BST)	Sightings within MZ	Delay
1	22/07/2024	A	MBES	10:10-10:40	0	00:00
2	23/07/2025	A	Dredging	10:27-10:57	0	00:00
3	28/07/2025	B	MBES	13:03-13:33	0	00:00
4	28/07/2025	A	MBES	14:17-14:47	0	00:00
5	01/08/2025	A	MBES	05:57-06:27	0	00:00
6	01/08/2025	B	MBES	07:20-07:51	0	00:00
7	01/08/2025	B	Dredging	08:57-09:27	0	00:00
8	01/08/2025	B	Dredging	21:14-21:44	0	00:00
9	02/08/2025	B	Dredging	11:02-11:32	0	00:00
10	02/08/2025	B	Dredging	21:04-21:34	0	00:00
11	03/08/2025	B	Dredging	12:00-12:30	0	00:00
12	03/08/2025	B	Dredging	16:04-16:34	0	00:00
13	04/08/2025	B	Dredging	09:36-10:06	0	00:00
14	05/08/2025	B	Dredging	09:00-10:45	0	00:00
15	05/08/2025	B	Dredging	16:30-17:00	0	00:00
16	06/08/2025	B	Dredging	06:25-06:55	0	00:00
17	06/08/2025	B	MBES	15:07-15:37	0	00:00

Table 6. Summary of all MMO monitoring, across both dredging and geophysical survey operations.

	MMO Effort	Dredge Site A		Dredge Site B		Total watches	Total duration
		No. of Watches	Duration	No. of Watches	Duration		
Dredging Operations	Pre-watch	1	0:30	10	6:15	11	6:45
	Effort watches-no operations	2	1:37	7	4:32	9	6:09
	Effort watches-excavating	15	9:31	8	4:32	23	14:03
	Effort watches-ploughing	17	10:02	7	2:42	24	12:44
	Total dredging MMO effort	35	21:40	32	18:01	67	39:41
MBES Operations	Pre-watch	3	1:30	3	1:31	6	3:01
	Effort watches-no operations	1	0:07	2	2:05	3	2:12
	Effort watches-MBES ramp-up and MBES full output	3	1:51	2	1:20	5	3:11
	Total MBES MMO Effort	7	3:28	7	4:56	14	8:24
Total MMO Effort MBES & Dredging operations		42	25:08	39	22:57	81	48:05

Environmental Conditions

There was a total of 81 weather monitoring stations during this project. For 98% of monitoring effort, combined weather conditions were suitable for marine mammal observation as sea state was recorded ≤ 3 , while 2% equated to sea state > 3 .

Sea state

Sea state 2 was the most frequent sea state recorded at 47%, followed by sea state 1 at 26%, sea state 3 at 25% and sea state 4 at 2%. Sea states 0 and 5-7 were not recorded (Figure 4).

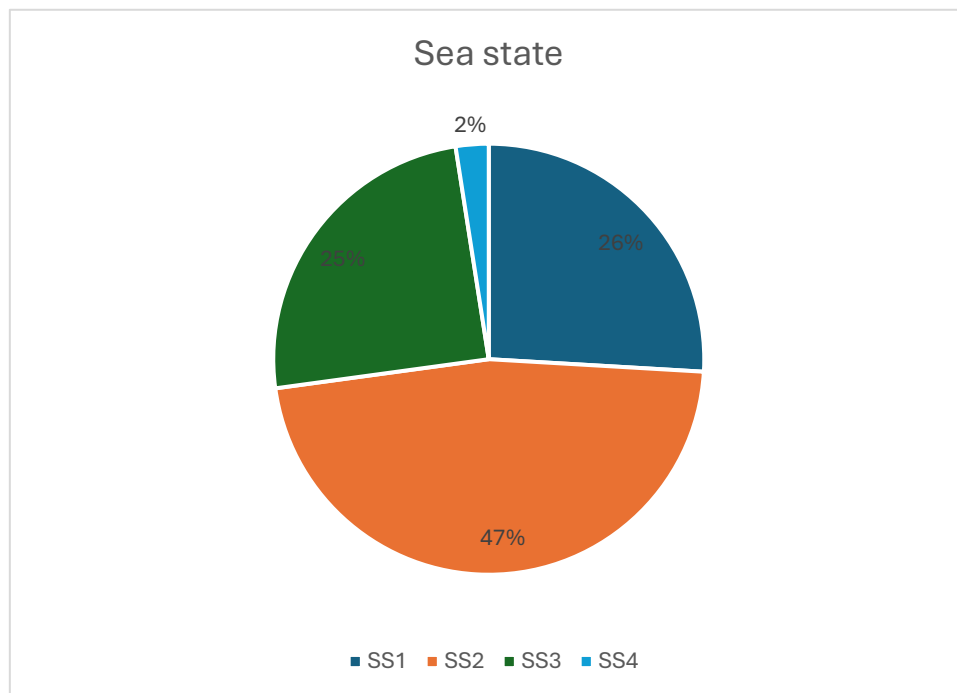


Figure 4. Summary showing proportion of sea states recorded during visual monitoring.

Visibility

Throughout monitoring, visibility was high (>10 km) for 44% of the monitoring effort, good (5-10 km) for 47%, moderate (1-5 km) for 9%. No occasions of poor visibility (<1 km) were recorded during monitoring effort (Figure 5).

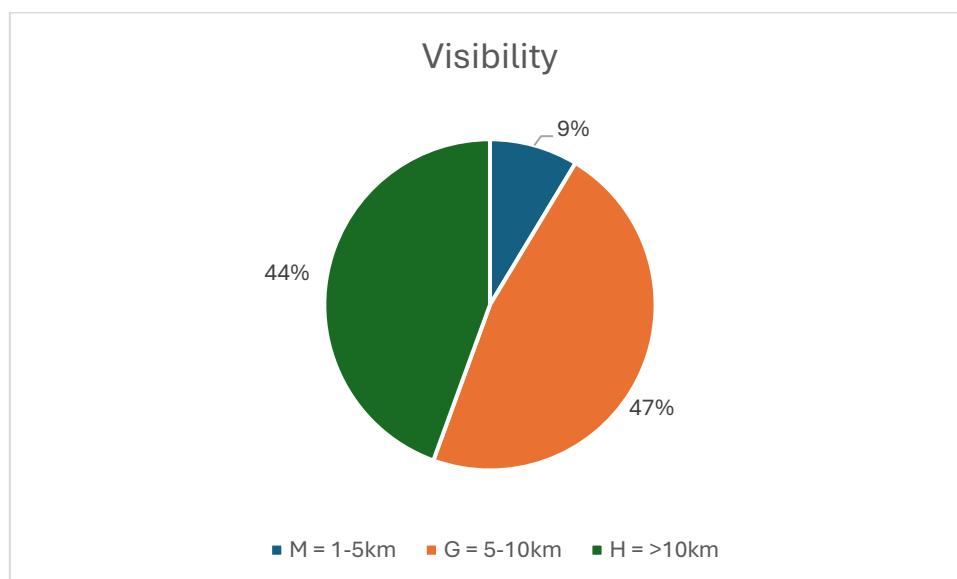


Figure 5. Summary showing proportion of visibility states recorded during visual monitoring.

Swell height

For 75% of weather stations, no swell was recorded. Low swell was recorded for 25% of weather stations. No medium (0-1m), or high (>1m) swell was recorded during monitoring (Figure 6).

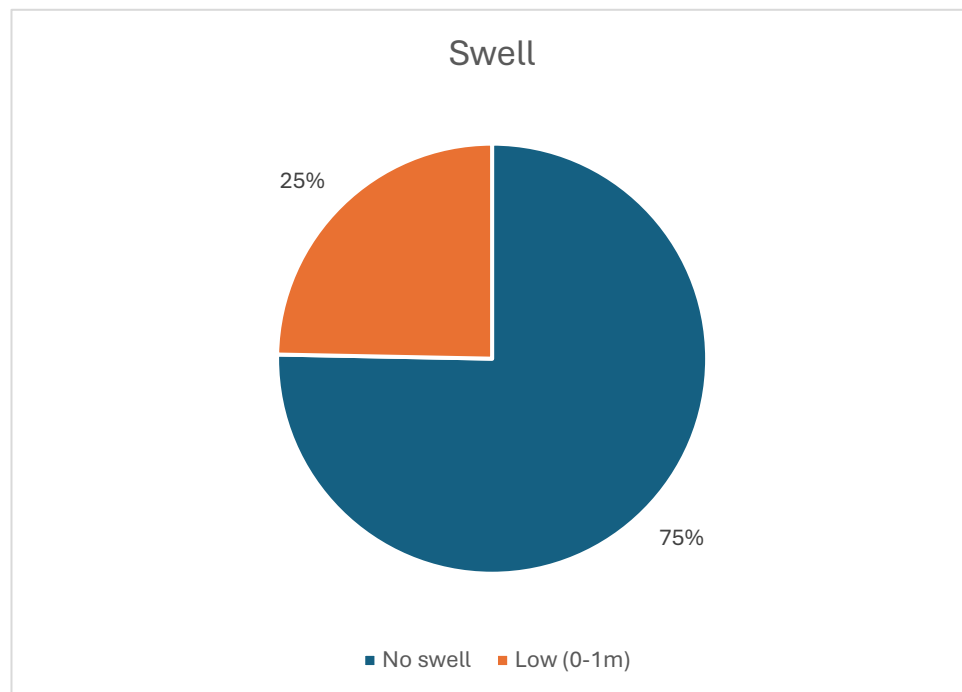


Figure 6. Summary showing proportion of swell heights recorded during monitoring watches.

Wind direction and Beaufort force

Westerly winds persisted throughout the project, ranging between Beaufort 1 to Beaufort 4. Westerlies were predominant at 37% of weather stations, followed by north-westerlies (35.8%). The most recorded Beaufort force was 3 at 49.4% of weather stations, followed by 2 (25.9%) and 4 (22.2%). Summary of wind conditions throughout monitoring effort are summarised in Figure 7, Figure 8 and Figure 9.

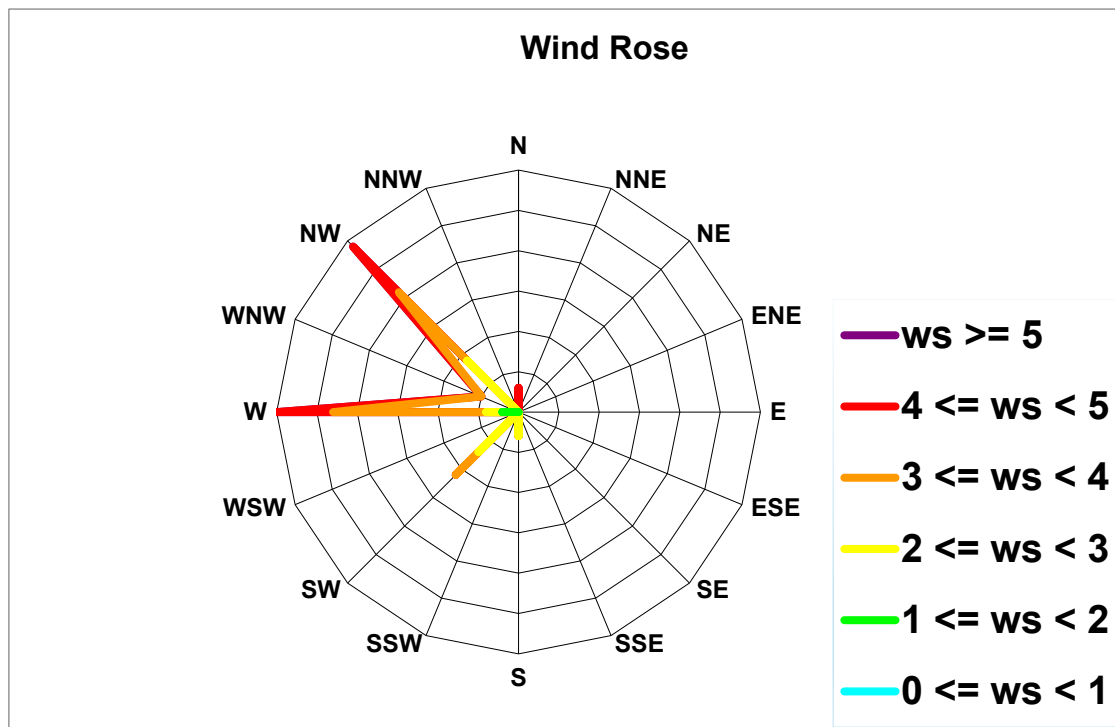


Figure 7. Windrose chart showing Beaufort wind force and wind directions recorded during monitoring watches.

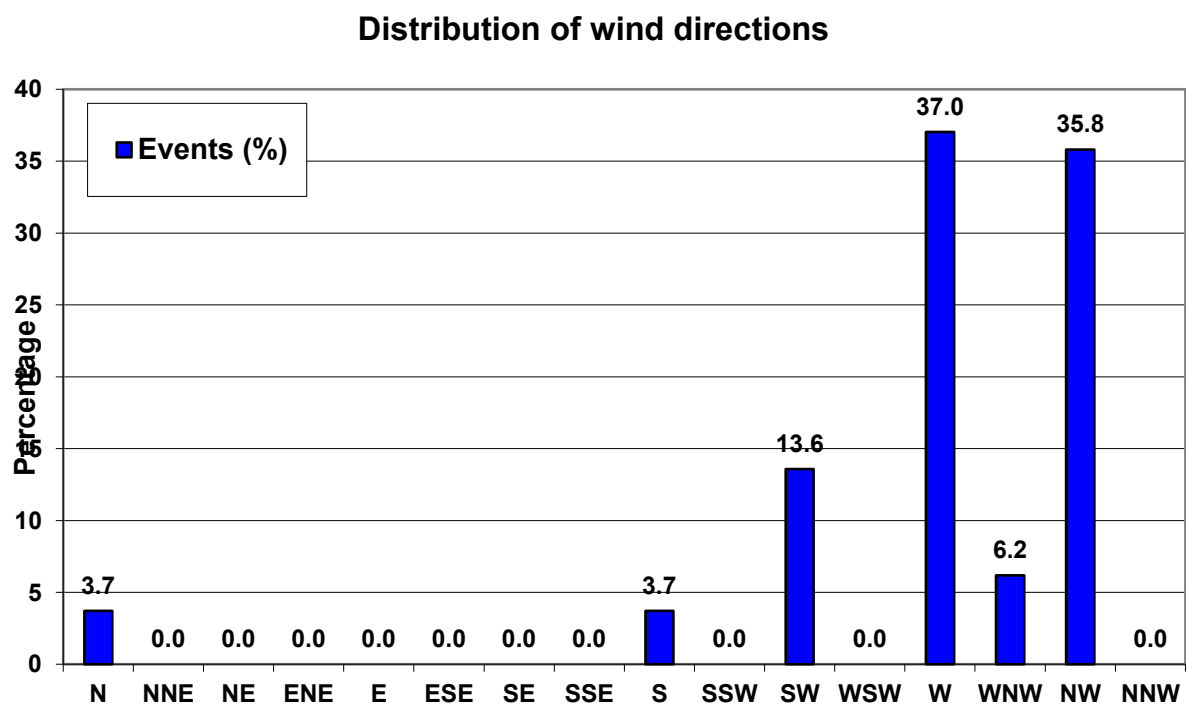


Figure 8. Summary of wind directions recorded during monitoring watches.

Distribution of wind speed classes

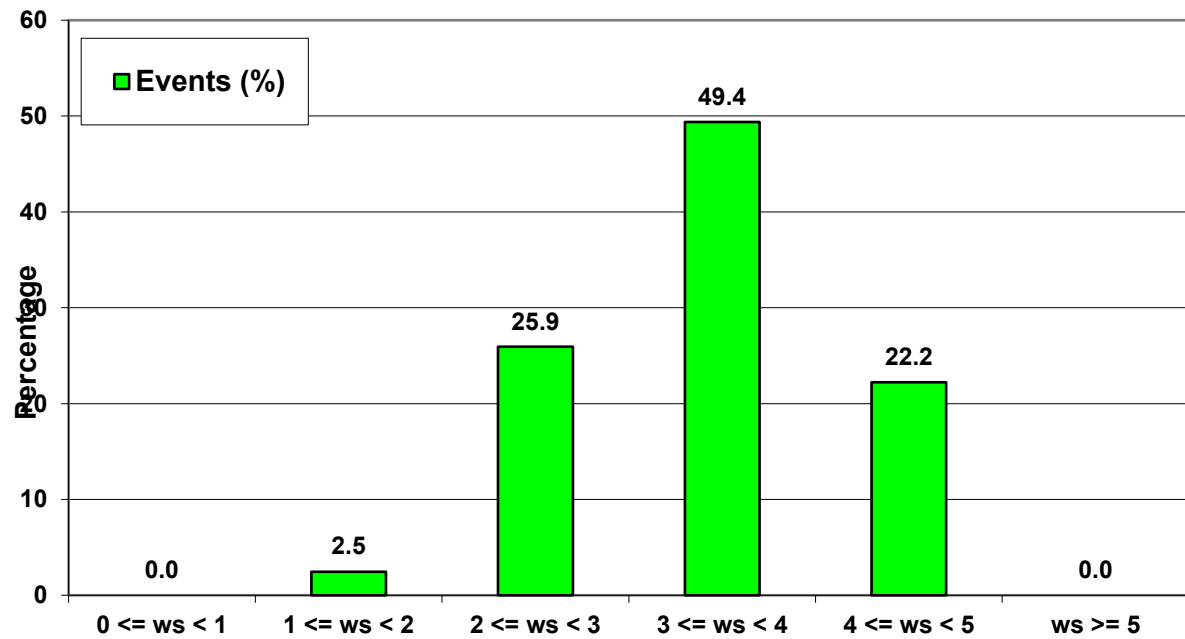


Figure 9. Summary of Beaufort wind forces recorded during monitoring watches.

Marine Mammal Sightings

There were two marine mammal sightings during this project. The first was of three bottlenose dolphins (*Tursiops truncatus*) on the 23/07/2025 prior to the commencement of dredging operations in Dredge Site A. The animals were initially sighted 3.5km from operations, to the north-east of Foynes Island. The animals were present during the pre-watch but remained outside of the 500m mitigation zone and start of operations did not need to be delayed. The closest distance the animals came to operations was 650m, which was once dredging operations had commenced.

The second sighting was on the 24/07/2025, when a group of approximately 12 bottlenose dolphins were travelling west on the north side of the estuary. Dredging operations were ongoing and no mitigation action was required. The initial distance to the sighting was 2.5km and the closest distance the animals got to operations was 900m. A summary of sighting details can be seen in Table 7. Figure 10 shows sighting locations and photographs of the sighting from the 23/07/2025 can be seen in Figure 11. NPWS sighting forms can be seen in Appendix I: Record of Marine Mammal Sightings.

Table 7. Marine mammals sighted during the 2025 Aughinish Alumina dredging campaign.

Project Sighting No.	Time	Name	Species	Group size	Mitigation (Y/N)	Range when first seen (m)	Closest Distance to Operation (m)	Observer Position	Animal Position*
01	10:11	Bottlenose dolphin	<i>Tursiops truncatus</i>	3	N	3500	650	52.6452882, -9.0597980	52.63452, -9.108376
02	10:09	Bottlenose dolphin	<i>Tursiops truncatus</i>	12	N	2500	900	52.6452882, -9.0597980	52.634521, -9.108377

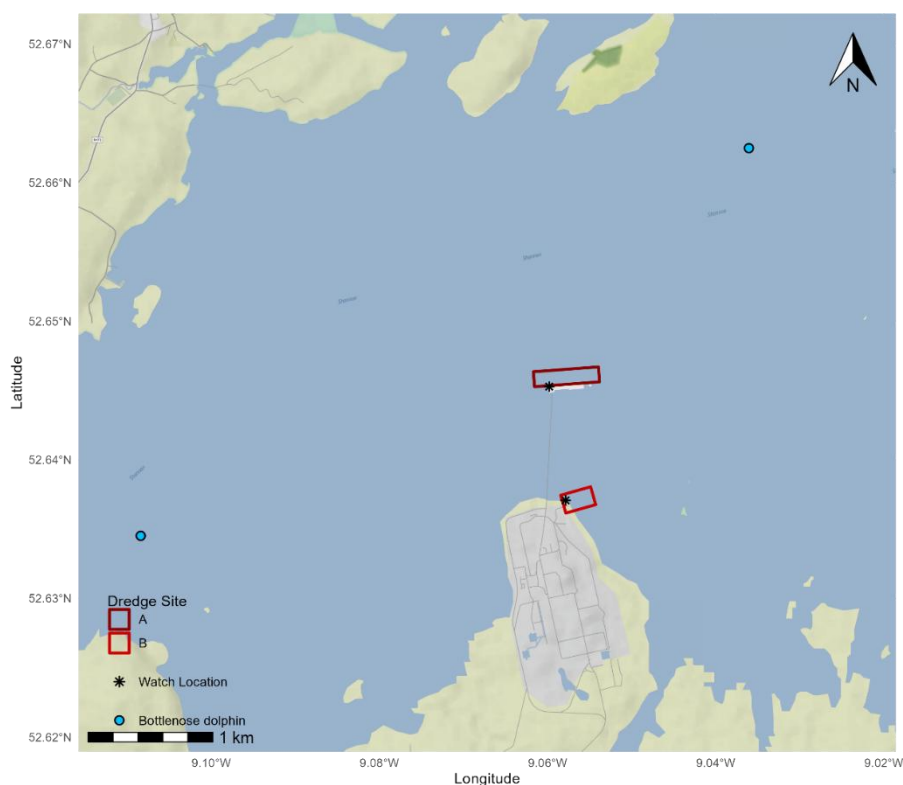


Figure 10. Locations of marine mammal sightings, Dredge sites and watch locations during this project. The mapped locations of the sightings are where the animals were first seen.



Figure 11. Photographs of bottlenose dolphins sighted on the 23/07/2025 (sighting 1). (A) A juvenile bottlenose dolphin breaching, (B) an adult bottlenose dolphin slow swimming close to Aughinish Island.

Mitigation Actions

No mitigation action was required throughout this project.

Conclusion

Overall, the environmental conditions throughout maintenance dredging were favourable for visual monitoring of marine mammals. A qualified MMO was present before dredging and geophysical operations commenced to ensure there were no marine mammals within the 500m MZ. Once noise producing operations commenced, there was no requirement to halt or discontinue the activity at night-time, nor if weather or visibility conditions deteriorate, nor if marine mammals occurred within a 500m radial distance of the sound source (NPWS, 2014).

Two marine mammal sightings occurred throughout the project, neither of which required mitigation action.

Seventeen pre-watches were carried out during this project. Effort watches were conducted throughout the project, amalgamating in 64 effort watches, to monitor marine mammal presence in the area and note any behaviours in relation to project operations.

There were no instances of non-compliance during this project, with all actions implemented in accordance with *Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters* (NPWS, 2014), the Maritime Area usage Licence number: LIC230004 and Dumping at Sea Permit number S0026-02. It is the opinion of IWDG Consulting that it is highly unlikely that the dredging or geophysical operations had any significant impact on marine mammals in the area during the project.

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Appendix I: Record of Marine Mammal Sightings

DATA FORM FOR COASTAL/MARINE WORKS - MARINE MAMMAL SIGHTING RECORDS

Options in italics should be circled or underlined as appropriate. Complete 1 record per sheet.

Operation/Activity (please tick)		☒ Dredging	☐ Drilling	☐ Pile Driving	☐ Blasting	☐ Other (specify)
Date (dd/mm/yyyy)	Time (Local)	Time (GMT/UTC)		Sighting Record no.		
23/07/2025	10:11			01		
How did this sighting occur? (please tick)						
While you were keeping a continuous watch for marine mammals				Y		
Spotted incidentally by you or someone else				___		
Other (please specify)				___		
Details:.....						
Platform type & name (e.g. ship, rig, headland)			Observer's name			
Aughinish marine terminal jetty			Fiona Cummins			
Observer's position (Latitude/Longitude or 6-figure Grid reference)					Water depth (metres) (if available)	
52.6452882, -9.0597980						
Species recorded Bottlenose Dolphin			Certainty of identification (underline) <u>Definite</u> / probable / possible			
Total number of animals (best estimate)		No. of adults	No. of juveniles	No. of calves		
3		2	1	-		
Maximum number (estimated total)		Minimum number (estimated total)				
4		3				
Description (include features such as overall size; shape of head; position, shape and size of dorsal fin; colour and patterning; height, direction, shape of blow) Robust grey body, short beak, large crescent shaped dorsal fin.			Photograph or video taken <u>Yes</u> / No			
			Direction of travel of animals in relation to platform/vessel (draw arrow) (initial) ↓ 			
Behaviour Animals observed travelling around the eastern side of Foynes Island, from north to south, and back north again. They were north-east of Foynes Island when dredging began at which point they started travelling towards our location. They stayed south-west of the jetty for about 15 minutes, breaching several times, before travelling west again. Last seen at ~11:40.			Direction of travel of animals (compass points or degrees) Initial: 175			

Activity of platform/vessel	Operation/activity under way	Closest distance of animals from platform/vessel (metres)
Initially not operational. Animals were outside the MZ so go ahead was given to start dredging at 10:57, dredging was active for the rest of the duration of the sighting.	(when animals first seen) <i>Yes / <u>No</u> / Pre-Start watch</i>	(Record even if not operating) Initial distance: 3500m Closest distance: 650m

DATA FORM FOR COASTAL/MARINE WORKS - MARINE MAMMAL SIGHTING RECORDS

Options in italics should be circled or underlined as appropriate. Complete 1 record per sheet.

Operation/Activity (please tick)		<u>Dredging</u>	Drilling	Pile Driving	Blasting	Other (specify)
Date (dd/mm/yyyy)	Time (Local)	Time (GMT/UTC)		Sighting Record no.		
24/07/2025	10:09			02		
How did this sighting occur? (please tick)						
While you were keeping a continuous watch for marine mammals				Y		
Spotted incidentally by you or someone else				—		
Other (please specify)				—		
Details:.....						
Platform type & name (e.g. ship, rig, headland)			Observer's name			
Aughinish marine terminal jetty			Fiona Cummins			
Observer's position (Latitude/Longitude or 6-figure Grid reference)					Water depth (metres) (if available)	
52.6452882, -9.0597980						
Species recorded Bottlenose Dolphin			Certainty of identification (underline) <u>Definite</u> / probable / possible			
Total number of animals (best estimate)		No. of adults	No. of juveniles	No. of calves		
12		10	1	1		
Maximum number (estimated total)		Minimum number (estimated total)				
15		10				
Description (include features such as overall size; shape of head; position, shape and size of dorsal fin; colour and patterning; height, direction, shape of blow) Robust grey body, short beak, large crescent shaped dorsal fin.			Photograph or video taken Yes / <u>No</u>			
			Direction of travel of animals in relation to platform/vessel (draw arrow) (initial) 			
Behaviour Travelling west. Last seen 10:36.			Direction of travel of animals (compass points or degrees) Initial: 255 Initial bearing to sighting: 40			
Activity of platform/vessel	Operation/activity under way (when animals first seen)		Closest distance of animals from platform/vessel (metres) (Record even if not operating)			
Ploughing.	Yes / <u>No</u> / Pre-Start watch		Initial distance: 2500m Closest distance: 900m			

Appendix II: Record of Marine Mammal Observer Effort

Dredging Operations- Dredge Area A

DATA FORM FOR COASTAL/MARINE WORKS – RECORD OF MONITORING EFFORT

Location: Aughinish Island **Platform name:** Aughinish marine terminal jetty- Dredge Area A **Platform type:** Land - Jetty **Client:** Aughinish Alumina Ltd. **MMO(s):** Fiona Cummins

Please record the following information every day (as many lines per day as you wish), even if no marine mammals are seen.

Type of operation or activity Dredging, Drilling, Pile driving, Blasting, other	Date (dd/mm/yyyy)	Marine Mammal Observer (name/initials)	Time you began monitoring for marine mammals (GMT/UTC)	Time you stopped monitoring for marine mammals (GMT/UTC)	Duration of monitoring watch (minutes)	Duration of the sound-producing operation/activity while you were monitoring for marine mammals (minutes)	Start Lat/Long position (if static/moving)	End Lat/Long position (if moving)	Wind direction & Beaufort wind force (e.g., SW 2)	Sea State (WMO) (0 to 9)	Swell height Choose from: 0 = no Swell L = 0-1 m M = 1-2 m H = 2+ m	Visibility Choose from: P = < 1 km M = 1-5 km G = 5-10 km H = >10 km
None/ EW1	23/07/2025	FC	09:30	10:27	57	0	52.6452882, -9.0597980	N/A	NW 3	2	0	H
None/ PW1	23/07/2025	FC	10:27	10:57	30	0	52.6452882, -9.0597980	N/A	NW 3	2	0	H
Dredging-excavating/ EW2	23/07/2025	FC	10:57	12:00	63	63	52.6452882, -9.0597980	N/A	NW 3	2	0	H
Dredging-excavating/ EW3	23/07/2025	FC	12:15	12:45	30	30	52.6452882, -9.0597980	N/A	NW 3	2	0	H
Dredging-excavating/ EW4	23/07/2025	FC	13:25	13:48	23	23	52.6452882, -9.0597980	N/A	NW 4	3	0	H
Dredging-ploughing	23/07/2025	-	-	-	-	-	-	-	-	-	-	-
Dredging-ploughing/ EW5	24/07/2025	FC	09:47	10:42	55	55	52.6452882, -9.0597980	N/A	W 1	1	0	G

Dredging-excavating/ EW6	24/07/2025	FC	10:42	11:22	40	30	52.6452882, -9.0597980	N/A	W 1	1	0	G
Dredging-ploughing	24/07/2025	-	-	-	-	-	-	-	-	-	-	-
Dredging-ploughing/ EW7	25/07/2025	FC	11:27	12:00	33	33	52.6452882, -9.0597980	N/A	SW 3	2	0	H
Dredging-excavating/ EW8	25/07/2025	FC	12:00	12:40	40	31	52.6452882, -9.0597980	N/A	SW 3	2	0	H
Dredging-excavating/ EW9	25/07/2025	FC	14:20	14:29	9	9	52.6452882, -9.0597980	N/A	SW 3	2	0	H
Dredging-ploughing/ EW10	25/07/2025	FC	14:29	15:00	31	25	52.6452882, -9.0597980	N/A	SW 3	2	0	H
Dredging-ploughing/ EW11	26/07/2025	FC	12:05	13:27	82	82	52.6452882, -9.0597980	N/A	W 4	3	L	G
Dredging-Excavating/ EW12	26/07/2025	FC	13:27	13:45	18	15	52.6452882, -9.0597980	N/A	NW 3	3	L	G
Dredging-Ploughing/ EW13	26/07/2025	FC	16:15	17:00	45	45	52.6452882, -9.0597980	N/A	W 3	2	L	G
Dredging-Ploughing/ EW14	27/07/2025	FC	12:15	13:06	51	51	52.6452882, -9.0597980	N/A	WNW 3	2	0	G
Dredging-Excavating/ EW15	27/07/2025	FC	13:06	13:46	40	36	52.6452882, -9.0597980	N/A	WNW 3	2	0	G
Dredging-Ploughing/ EW16	27/07/2025	FC	13:46	14:10	24	14	52.6452882, -9.0597980	N/A	WNW 3	2	0	G
Dredging-Ploughing/ EW17	27/07/2025	FC	15:40	16:00	20	20	52.6452882, -9.0597980	N/A	WNW 3	2	0	G
Dredging-Ploughing/ EW18	28/07/2025	FC	11:40	12:00	20	20	52.6452882, -9.0597980	N/A	WNW 3	2	0	H

Dredging- Ploughing/ EW19	28/07/2025	FC	14:10	14:45	35	35	52.6452882, -9.0597980	N/A	W 3	2	0	H
Dredging- Excavating/ EW20	28/07/2025	FC	14:45	15:10	25	23	52.6452882, -9.0597980	N/A	W 3	3	0	M
Dredging- Ploughing/ EW21	28/07/2025	FC	17:00	17:30	30	30	52.6452882, -9.0597980	N/A	W 3	3	0	M
Dredging- Ploughing/ EW22	29/07/2025	FC	14:20	14:50	30	30	52.6452882, -9.0597980	N/A	NW 4	3	L	G
Dredging- Excavating/ EW23	29/07/2025	FC	14:50	15:00	10	8	52.6452882, -9.0597980	N/A	NW 4	3	L	G
Dredging- Excavating/ EW24	29/07/2025	FC	15:55	16:46	51	51	52.6452882, -9.0597980	N/A	NW 4	3	L	G
Dredging- Ploughing/ EW25	29/07/2025	FC	16:46	17:30	44	37	52.6452882, -9.0597980	N/A	NW 3	2	0	H
Dredging- Ploughing	30/07/2025	-	-	-	-	-	-	-	-	-	-	-
Dredging- Excavating/ EW26	30/07/2025	FC	15:20	17:15	115	115	52.6452882, -9.0597980	N/A	W 3	3	L	M
Dredging- Excavating/ EW27	30/07/2025	FC	18:10	18:22	12	12	52.6452882, -9.0597980	N/A	W 3	2	0	M
Dredging- Ploughing/ EW28	30/07/2025	FC	18:22	18:31	9	1	52.6452882, -9.0597980	N/A	W 3	2	0	M
Dredging- Ploughing/ EW29	31/07/2025	-	14:20	15:00	40	40	52.6452882, -9.0597980	N/A	NW 4	3	0	G
Dredging- Excavating/ EW30	31/07/2025	FC	15:20	16:20	60	50	52.6452882, -9.0597980	N/A	NW 4	3	0	G
Dredging- Excavating/ EW31	31/07/2025	FC	16:50	18:05	75	75	52.6452882, -9.0597980	N/A	NW 4	3	0	G

Dredging- Ploughing/ EW32	31/07/2025	FC	18:05	18:30	25	15	52.6452882, -9.0597980	N/A	NW 4	3	0	G
Dredging- Ploughing/ EW33	01/08/2025	FC	05:57	07:06	69	69	52.6452882, -9.0597980	N/A	NW 2	1	0	G
None/ EW34	01/08/2025	FC	07:06	07:10	4	0	52.6452882, -9.0597980	N/A	NW 2	1	0	G

Dredging Operations- Dredge Area B

DATA FORM FOR COASTAL/MARINE WORKS – RECORD OF MONITORING EFFORT

Location: Aughinish Island, Co. Limerick **Platform name:** Cells docking area – Dredge Area B **Platform type:** Land **Client:** Aughinish Alumina Ltd. **MMO(s):** Fiona Cummins, Simon Berrow

Please record the following information every day (as many lines per day as you wish), even if no marine mammals are seen.

Type of operation or activity Dredging, Drilling, Pile driving, Blasting, other	Date (dd/mm/yyyy)	Marine Mammal Observer (name/initials)	Time you began monitoring for marine mammals	Time you stopped monitoring for marine mammals	Duration of monitoring watch	Duration of the sound-producing operation/activity while you were monitoring for marine mammals	Start Lat/Long position	End Lat/Long position	Wind direction & Beaufort wind force	Sea State (WMO)	Swell height	Visibility
			(GMT/UTC)	(GMT/UTC)	(minutes)	(minutes)	(if static/moving)	(if moving)	(e.g., SW 2)	(0 to 9)	Choose from: 0 = no Swell L = 0-1 m M = 1-2 m H = 2+ m	Choose from: P = < 1 km M = 1-5 km G = 5-10 km H = >10 km
None-EW1	01/08/2025	FC	08:45	08:57	12	0	52.6370773, -9.0578510	-	NW 2	1	0	H
None-PW1	01/08/2025	FC	08:57	09:27	30	0	52.6370773, -9.0578510	-	NW 2	1	0	H
Dredging-Ploughing/EW2	01/08/2025	FC	09:27	09:37	10	10	52.6370773, -9.0578510	-	NW 2	1	0	H
Dredging-Excavating/EW3	01/08/2025	FC	11:56	12:25	29	29	52.6370773, -9.0578510	-	NW 3	2	0	H
Dredging-Excavating/EW4	01/08/2025	FC	14:20	15:00	40	40	52.6370773, -9.0578510	-	NW 3	2	L	H
Dredging-Ploughing/EW5	01/08/2025	FC	15:00	16:30	90	65	52.6370773, -9.0578510	-	NW 3	2	L	H
None-EW6	01/08/2025	FC	20:55	21:10	15	0	52.6370773, -9.0578510	-	NW 3	2	0	H
None- PW2	01/08/2025	FC	21:10	21:40	30	0	52.6370773, -9.0578510	-	NW 3	2	0	H

Dredging-Ploughing/ EW7	01/08/2025	FC	21:40	21:50	10	10	52.6370773,-9.0578510	-	NW 3	2	0	H
Dredging-Ploughing	02/08/2025	-	-	-	-	-	-	-	-	-	-	-
None/ EW8	02/08/2025	FC	10:35	11:02	27	0	52.6370773,-9.0578510	-	SW 2	1	0	H
None/ PW3	02/08/2025	FC	11:02	11:32	30	0	52.6370773,-9.0578510	-	SW 2	1	0	H
Dredging-Ploughing/ EW9	02/08/2025	FC	11:32	11:40	8	8	52.6370773,-9.0578510	-	SW 2	1	0	H
Dredging-Ploughing/ EW10	02/08/2025	FC	12:40	13:10	30	30	52.6370773,-9.0578510	-	SW 2	1	0	H
Dredging-Excavating- EW11	02/08/2025	FC	14:00	15:00	60	60	52.6370773,-9.0578510	-	SW 2	1	0	H
Dredging-Excavating EW12	02/08/2025	FC	16:07	16:45	38	38	52.6370773,-9.0578510	-	SW 2	1	0	H
None/ PW4	02/08/2025	FC	21:04	21:34	30	0	52.6370773,-9.0578510	-	SW 2	1	0	H
Dredging-Ploughing	02/08/2025	-	-	-	-	-	-	-	-	-	-	-
None- EW14	03/08/2025	FC	11:06	12:00	54	0	52.6370773,-9.0578510	-	W 3	2	0	G
None- PW5	03/08/2025	FC	12:00	12:30	30	0	52.6370773,-9.0578510	-	W 3	2	0	G
Dredging-Excavating/ EW15	03/08/2025	FC	12:30	12:45	15	15	52.6370773,-9.0578510	-	W 3	2	0	G
None-EW16	03/08/2025	FC	15:50	16:04	14	0	52.6370773,-9.0578510	-	W 3	2	0	G
None-PW6	03/08/2025	FC	16:04	16:34	30	0	52.6370773,-9.0578510	-	W 3	2	0	G
Dredging-Ploughing/ EW17	03/08/2025	FC	16:34	17:00	26	26	52.6370773,-9.0578510	-	W 3	2	0	G

None-EW18	04/08/2025	FC	07:40	08:53	73	0	52.6370773,-9.0578510	-	W 4	3	L	G
None-EW19	04/08/2025	FC	08:53	09:00	7	0	52.6370773,-9.0578510	-	W 4	3	L	M
None-EW20	04/08/2025	FC	09:00	09:36	36	0	52.6370773,-9.0578510	-	W 4	3	L	G
None-PW7	04/08/2025	FC	09:36	10:06	30	0	52.6370773,-9.0578510	-	W 4	3	L	G
Dredging-Excavating-EW21	04/08/2025	FC	10:06	10:15	9	9	52.6370773,-9.0578510	-	W 4	3	L	G
Dredging-Ploughing/EW22	04/08/2025	FC	15:26	16:00	34	17	52.6370773,-9.0578510	-	W 4	3	L	G
None/ PW8	05/08/2025	SB	09:00	10:45	105	0	52.6370773,-9.0578510	-	N 4	4	L	G
Dredging-Excavating/EW23	05/08/2025	SB	11:30	12:51	81	81	52.6370773,-9.0578510	-	N 4	4	L	G
None- PW9	05/08/2025	SB	16:30	17:00	30	0	52.6370773,-9.0578510	-	N 4	3	L	G
Dredging/Ploughing	05/08/2025	-	-	-	-	-	-	-	-	-	-	-
None-PW10	06/08/2025	SB	06:25	06:55	30	0	52.6370773,-9.0578510	-	S 2	1	L	G
Dredging-Ploughing	06/08/2025	-	-	-	-	-	-	-	-	-	-	-

Geophysical Operations- Dredge Area A

DATA FORM FOR COASTAL/MARINE WORKS – RECORD OF MONITORING EFFORT

Location: Aughinish Island **Platform name:** Aughinish marine terminal Jetty- Dredge Area A **Platform type:** Jetty **Client:** Aughinish Alumina Ltd. **MMO(s):** Fiona Cummins

Please record the following information every day (as many lines per day as you wish), even if no marine mammals are seen.

Type of operation or activity Dredging, Drilling, Pile driving, Blasting, other	Date (dd/mm/yyyy)	Marine Mammal Observer (name/initials)	Time you began monitoring for marine mammals (GMT/UTC)	Time you stopped monitoring for marine mammals (GMT/UTC)	Duration of monitoring watch (minutes)	Duration of the sound-producing operation/activity while you were monitoring for marine mammals (minutes)	Start Lat/Long position (if static/moving)	End Lat/Long position (if moving)	Wind direction & Beaufort wind force (e.g., SW 2)	Sea State (WMO) (0 to 9)	Swell height Choose from: 0 = no Swell L = 0-1 m M = 1-2 m H = 2+ m	Visibility Choose from: P = < 1 km M = 1-5 km G = 5-10 km H = >10 km
None-SiteA/PW1	22/07/2025	FC	10:10	10:40	30	0	52.6452882, -9.0597980	-	W 2	2	0	G
MBES-SiteA/EW1	22/07/2025	FC	10:40	11:25	25	25	52.6452882, -9.0597980	-	W 2	2	0	G
None-SiteA/EW2	28/07/2025	FC	14:10	14:17	7	0	52.6452882, -9.0597980	-	W 3	2	0	H
None-SiteA/PW2	28/07/2025	FC	14:17	14:47	30	0	52.6452882, -9.0597980	-	W 3	2	0	H
MBES-SiteA/EW3	28/07/2025	FC	14:47	15:10	23	23	52.6452882, -9.0597980	-	W 3	2	0	M
None-SiteA/PW2	01/08/2025	FC	05:57	06:27	30	0	52.6452882, -9.0597980	-	NW 2	1	0	G
MBES-SiteA/EW4	01/08/2025	FC	06:27	07:10	43	43	52.6452882, -9.0597980	-	NW 2	1	0	G

Geophysical Operations- Dredge Area B

DATA FORM FOR COASTAL/MARINE WORKS – RECORD OF MONITORING EFFORT

Location: Aughinish Island, Co.Limerick **Platform name:** Cells docking area - Dredge Site B **Platform type:** Land **Client:** Aughinish Alumina Ltd. **MO(s):** Fiona Cummins, Simon Berrow

Please record the following information every day (as many lines per day as you wish), even if no marine mammals are seen.

Type of operation or activity Dredging, Drilling, Pile driving, Blasting, other	Date (dd/mm/yyyy)	Marine Mammal Observer (name/initials)	Time you began monitoring for marine mammals	Time you stopped monitoring for marine mammals	Duration of monitoring watch	Duration of the sound-producing operation/activity while you were monitoring for marine mammals	Start Lat/Long position	End Lat/Long position	Wind direction & Beaufort wind force	Sea State (WMO)	Swell height	Visibility
			(GMT/UTC)	(GMT/UTC)	(minutes)	(minutes)	(if static/moving)	(if moving)	(e.g., SW 2)	(0 to 9)	Choose from: 0 = no Swell L = 0-1 m M = 1-2 m H = 2+ m	Choose from: P = < 1 km M = 1-5 km G = 5-10 km H = >10 km
None-SiteB/ EW2	28/07/2025	FC	12:50	13:03	13	0	52.6370773, -9.0578510	-	W 3	2	0	H
None-SiteB/PW1	28/07/2025	FC	13:03	13:33	30	0	52.6370773, -9.0578510	-	W 3	2	0	H
MBES-SiteB/ EW3	28/07/2025	FC	13:33	14:00	27	27	52.6370773, -9.0578510	-	W 3	2	0	H
None-SiteB/PW2	01/08/2025	FC	07:20	07:51	31	0	52.6370773, -9.0578510	-	NW 2	1	0	H
MBES-SiteB/EW3	01/08/2025	FC	07:51	08:45	54	53	52.6370773, -9.0578510	-	NW 2	1	0	H
MBES-SiteB/ EW4	06/08/2025	SB	13:15	15:07	112	0	52.6370773, -9.0578510	-	S 2	1	0	H
MBES-SiteB/ PW3	06/08/2025	SB	15:07	15:37	30	0	52.6370773, -9.0578510	-	S 2	1	L	G

Appendix III: Record of Operational Activity

Dredging Operations- Dredge Area A

DATA FORM FOR COASTAL/MARINE WORKS - RECORD OF OPERATION/ACTIVITY

Platform name: *Fastnet Sound* **Platform type:** Utility vessel **Client:** Aughinish Alumina Ltd. **Contractor:** Fastnet Shipping Ltd. **MMO:** Fiona Cummins

Complete this form every time the sound-producing operation or activity (e.g., drilling, pile driving, blasting) occurs including overnight, whether for testing, full operation or any other purpose.

Type of operation or activity Dredging, Drilling, Pile driving, Blasting, other	Date (dd/mm/yyyy)	Sound-producing operation or activity			Pre-Start Monitoring effort for marine mammals					Action necessary		
		Time when ramp-up/soft-start began [if any] (GMT/UTC)	Time when equipment reached full power (GMT/UTC)	Time when equipment stopped or shut down (GMT/UTC)	Who carried out the monitoring for marine mammals? (Job Title)	Start time of monitoring for marine mammals [Pre-start-up] (GMT/UTC)	End time of monitoring for marine mammals (GMT/UTC)	Reason for non-detection of marine mammals? (e.g. sea state, swell, glare, poor light, fog, rain, etc.)	Were hydro-phones used? (Yes/No)	Were marine mammals present in the 30/60 mins before start-up? (Yes/No)	If Yes, give time when marine mammals were last seen (GMT/UTC)	If marine mammals were present, what action was taken? (e.g., delay ramp-up/soft start, delay full start-up)
None - EW1	23/07/2025	-	-	-	MMO	09:30	10:27	None	N	-	-	-
None - PW1	23/07/2025	-	-	-	MMO	10:27	10:57	None	N	Yes	10:11-11:40	None-outside MZ
Dredging-excavating/ EW2	23/07/2025	-	10:57	-	MMO	10:57	12:00	None	N	-	-	-
Dredging-excavating/ EW3	23/07/2025	-	-	-	MMO	12:15	12:45	None	N	-	-	-
Dredging-excavating/ EW4	23/07/2025	-	-	14:02	MMO	13:25	13:48	None	N	-	-	-
Dredging-ploughing	23/07/2025	-	14:10	23:59	MMO	-	-	None	N	-	-	-
Dredging-ploughing/ EW5	24/07/2025	-	00:00	10:42	MMO	09:47	10:42	None	N	-	-	-

Dredging-excavating/ EW6	24/07/2025	-	10:52	11:46	MMO	10:42	11:22	None	N	-	-	-
Dredging-ploughing	24/07/2025	-	11:56	23:59	MMO	-	-	None	N	-	-	-
Dredging-ploughing/ EW7	25/07/2025	-	00:00	12:00	MMO	11:27	12:00	None	N	-	-	-
Dredging-excavating/ EW8	25/07/2025	-	12:09	-	MMO	12:00	12:40	None	N	-	-	-
Dredging-excavating/ EW9	25/07/2025	-	-	14:29	MMO	14:20	14:29	None	N	-	-	-
Dredging-ploughing/EW 10	25/07/2025	-	14:35	23:59	MMO	14:29	15:00	None	N	-	-	-
Dredging-ploughing/ EW11	26/07/2025	-	00:00	13:27	MMO	12:05	13:27	Sea state	N	-	-	-
Dredging-excavating/ EW12	26/07/2025	-	13:30	15:28	MMO	13:27	13:45	Sea state	N	-	-	-
Dredging-ploughing/ EW 13	26/07/2025	-	15:31	23:59	MMO	16:15	17:00	None	N	-	-	-
Dredging-ploughing/ EW14	27/07/2025	-	00:00	13:06	MMO	12:15	13:06	None	N	-	-	-
Dredging-Excavating/ EW15	27/07/2025	-	13:10	13:46	MMO	13:06	13:46	None	N	-	-	-
Dredging-Ploughing/ EW16	27/07/2025	-	13:56	-	MMO	13:46	14:10	None	N	-	-	-
Dredging-Ploughing/ EW17	27/07/2025	-	-	23:59	MMO	15:40	16:00	None	N	-	-	-
Dredging-Ploughing/ EW18	28/07/2025	-	00:00	12:00	MMO	11:40	12:00	None	N	-	-	-

Dredging- Ploughing/ EW19	28/07/2025	-	12:00	14:45	MMO	14:10	14:45	None	N	-	-	-
Dredging- Excavating/ EW20	28/07/2025	-	14:47	16:37	MMO	14:45	15:10	None	N	-	-	-
Dredging- Ploughing/ EW21	28/07/2025	-	16:40	23:59	MMO	17:00	17:30	None	N	-	-	-
Dredging- Ploughing	29/07/2025	-	00:00	11:06	-	-	-	-	-	-	-	-
Dredging- Ploughing/ EW22	29/07/2025	-	11:10	14:50	MMO	14:20	14:50	Sea state	N	-	-	-
Dredging- Excavating/ EW23	29/07/2025	-	14:52	-	MMO	14:50	15:00	Sea state	N	-	-	-
Dredging- Excavating/ EW24	29/07/2025	-	-	16:46	MMO	15:55	16:46	Sea state	N	-	-	-
Dredging- Ploughing/ EW25	29/07/2025	-	16:53	23:59	MMO	16:46	17:30	-	N	-	-	-
Dredging- Ploughing	30/07/2025	-	00:00	15:06	-	-	-	-	-	-	-	-
Dredging- Excavating/ EW26	30/07/2025	-	15:12	-	MMO	15:20	17:15	Sea state	N	-	-	-
Dredging- Excavating/ EW27	30/07/2025	-	-	18:22	MMO	18:10	18:22	-	N	-	-	-
Dredging- Ploughing/ EW28	30/07/2025	-	18:30	23:59	MMO	18:22	18:31	-	N	-	-	-
Dredging- Ploughing/ EW29	31/07/2025	-	00:00	15:19	MMO	14:20	15:00	-	N	-	-	-
Dredging- Excavating/ EW30	31/07/2025	-	15:30	-	MMO	15:20	16:20	-	N	-	-	-

Dredging- Excavating/ EW31	31/07/205	-	-	18:05	MMO	16:50	18:05	-	N	-	-	-
Dredging- Ploughing/ EW32	31/07/2025	-	18:15	23:59	MMO	18:05	18:30	-	N	-	-	-
Dredging- Ploughing/ EW33	01/08/2025	-	00:00	07:06	MMO	05:57	07:06	-	N	-	-	-
None-EW34	01/08/2025	-	-	-	MMO	07:06	07:10	-	N	-	-	-

Dredging Operations- Dredge Area B

DATA FORM FOR COASTAL/MARINE WORKS - RECORD OF OPERATION/ACTIVITY

Platform name: *Fastnet Sound* **Platform type:** Utility vessel **Client:** Aughinish Alumina Ltd. **Contractor:** Fastnet Shipping Ltd. **MMO:** Fiona Cummins, Simon Berrow

Complete this form every time the sound-producing operation or activity (e.g., drilling, pile driving, blasting) occurs including overnight, whether for testing, full operation or any other purpose.

Type of operation or activity Dredging, Drilling, Pile driving, Blasting, other	Date (dd/mm/yyyy)	Sound-producing operation or activity			Pre-Start Monitoring effort for marine mammals					Action necessary		
		Time when ramp-up/soft-start began [if any] (GMT/UTC)	Time when equipment reached full power (GMT/UTC)	Time when equipment stopped or shut down (GMT/UTC)	Who carried out the monitoring for marine mammals? (Job Title)	Start time of monitoring for marine mammals [Pre-start-up] (GMT/UTC)	End time of monitoring for marine mammals (GMT/UTC)	Reason for non-detection of marine mammals? (e.g. sea state, swell, glare, poor light, fog, rain, etc.)	Were hydrophones used? (Yes/No)	Were marine mammals present in the 30/60 mins before start-up? (Yes/No)	If Yes, give time when marine mammals were last seen (GMT/UTC)	If marine mammals were present, what action was taken? (e.g., delay ramp-up/soft start, delay full start-up)
None-EW1	01/08/2025	-	-	-	MMO	08:45	08:57	-	N	-	-	-
None-PW1	01/08/2025	-	-	-	MMO	08:57	09:27	-	N	No	-	-
Dredging-Ploughing/EW2	01/08/2025	-	09:27	10:00	MMO	09:27	09:37	-	N	-	-	-
Dredging-Excavating/EW3	01/08/2025	-	10:04	-	MMO	11:56	12:25	-	N	-	-	-
Dredging-Excavating/EW4	01/08/2025	-	-	15:00	MMO	14:20	15:00	-	N	-	-	-
Dredging-Ploughing/EW5	01/08/2025	-	15:25	16:42	MMO	15:00	16:30	-	N	-	-	-
None-EW6	01/08/2025	-	-	-	MMO	20:55	21:14	-	N	-	-	-

None- PW2	01/08/2025	-	-	-	MMO	21:14	21:44		N	No		
Dredging- Ploughing/ EW7	01/08/2025	-	21:40	23:59	MMO	21:44	21:50	-	N	-	-	-
Dredging- Ploughing	02/08/2025	-	00:00	00:30	-	-	-	-	-	-	-	-
None/ EW8	02/08/2025	-	-	-	MMO	10:35	11:02	-	N	-	-	-
None/ PW3	02/08/2025	-	-	-	MMO	11:02	11:32	-	N	No	-	-
Dredging- Ploughing/ EW9	02/08/2025	-	11:32	-	MMO	11:32	11:40	-	N	-	-	-
Dredging- Ploughing/ EW10	02/08/2025	-	-	13:40	MMO	12:40	13:10	-	N	-	-	-
Dredging- Excavating- EW11	02/08/2025	-	14:00	16:07	MMO	14:00	15:00	-	N	-	-	-
Dredging- Excavating EW12	02/08/2025	-	16:07	17:53	MMO	16:07	16:45	-	N	-	-	-
None/ PW4	02/08/2025	-	-	-	MMO	21:04	21:34	-	N	No	-	-
Dredging- Ploughing	02/08/2025	-	21:34	23:57	-	-	-	-	N	-	-	-
None- EW13	03/08/2025	-	-	-	MMO	11:06	12:00	-	N	N	-	-
None- PW5	03/08/2025	-	-	-	MMO	12:00	12:30	-	N	-	-	-
Dredging- Excavating/ EW14	03/08/2025	-	12:30	15:50	MMO	12:30	12:45	-	N	-	-	-
None-EW15	03/08/2025	-	-	-	MMO	15:50	16:04	-	N	-	-	-
None-PW6	03/08/2025	-	-	-	MMO	16:04	16:34	-	N	No	-	-

Dredging- Ploughing/ EW16	03/08/202 5	-	16:34	18:55	MMO	16:34	17:00	-	N	-	-	-
None/EW17	04/08/202 5	-	-	-	MMO	07:40	08:53	-	N	-	-	-
None-EW18	04/08/202 5	-	-	-	MMO	08:53	09:00	-	N	-	-	-
None/EW19	04/08/202 5	-	-	-	MMO	09:00	09:36	-	N	-	-	-
None/PW7	04/08/202 5	-	-	-	MMO	09:36	10:06	-	N	No	-	-
Dredging- Excavating/ EW20	04/08/202 5	-	10:06	15:26	MMO	10:06	10:15	-	N	-	-	-
Dredging- Ploughing/ EW21	04/08/202 5		15:43	18:00	MMO	15:26	16:00	-	N	-	-	-
Dredging- Excavating/ PW8	05/08/202 5	-	-	-	MMO	09:00	10:45	-	N	No	-	-
Dredging- Excavating/ EW22	05/08/202 5	-	10:45	15:36	MMO	11:30	12:51	-	N	-	-	-
None- PW9	05/08/202 5	-	-	-	MMO	16:30	17:00	-	N	-	-	-
Dredging- Ploughing	05/08/202 5	-	17:00	18:18	-	-	-	-	-	-	-	-
None- PW10	06/08/202 5	-	-	-	MMO	06:25	06:55	-	N	No	-	-
Dredging- Ploughing	06/08/202 5	-	06:55	10:20	-	-	-	-	-	-	-	-

Geophysical Operations- Dredge Area A

DATA FORM FOR COASTAL/MARINE WORKS - RECORD OF OPERATION/ACTIVITY

Platform name: Warrior **Platform type:** Small boat **Client:** Aughinish Aluma **Contractor:** Hydromaster Ltd. **MMO:** Fiona Cummins

Complete this form every time the sound-producing operation or activity (e.g., drilling, pile driving, blasting) occurs including overnight, whether for testing, full operation or any other purpose.

Type of operation or activity Dredging, Drilling, Pile driving, Blasting, other	Date (dd/mm/yyyy)	Sound-producing operation or activity			Pre-Start Monitoring effort for marine mammals					Action necessary		
		Time when ramp-up/soft-start began [if any] (GMT/UTC)	Time when equipment reached full power (GMT/UTC)	Time when equipment stopped or shut down (GMT/UTC)	Who carried out the monitoring for marine mammals? (Job Title)	Start time of monitoring for marine mammals [Pre-start-up] (GMT/UTC)	End time of monitoring for marine mammals (GMT/UTC)	Reason for non-detection of marine mammals? (e.g. sea state, swell, glare, poor light, fog, rain, etc.)	Were hydro-phones used? (Yes/No)	Were marine mammals present in the 30/60 mins before start-up? (Yes/No)	If Yes, give time when marine mammals were last seen (GMT/UTC)	If marine mammals were present, what action was taken? (e.g., delay ramp-up/soft start, delay full start-up)
None-SiteA/PW1	22/07/2025	-	-	-	MMO	10:10	10:40	-	N	No	-	NA
MBES-SiteA/EW1	22/07/2025	10:40	11:00	12:01	MMO	10:40	11:25	-	N	-	-	NA
None-SiteA/EW2	28/07/2025	-	-	-	MMO	14:10	14:17	-	N	-	-	NA
None-SiteA/PW2	28/07/2025	-	-	-	MMO	14:17	14:47	-	N	No	-	NA
MBES-SiteA/EW3	28/07/2025	14:47	15:07	15:38	MMO	14:47	15:10	-	N	-	-	NA
None-SiteA/PW2	01/08/2025	-	-	-	MMO	05:57	06:27	-	N	No	-	NA
MBES-SiteA/EW4	01/08/2025	06:27	06:47	07:24	MMO	06:27	07:10	-	N	-	-	NA

Geophysical Operations- Dredge Area B

DATA FORM FOR COASTAL/MARINE WORKS - RECORD OF OPERATION/ACTIVITY

Platform name: Warrior **Platform type:** 4.3m Small Boat **Client:** Aughinish Alumina Ltd. **Contractor:** Hydromaster Ltd. **MMO:** Fiona Cummins & Simon Berrow

Complete this form every time the sound-producing operation or activity (e.g., drilling, pile driving, blasting) occurs including overnight, whether for testing, full operation or any other purpose.

Type of operation or activity Dredging, Drilling, Pile driving, Blasting, other	Date (dd/mm/yyyy)	Sound-producing operation or activity			Pre-Start Monitoring effort for marine mammals					Action necessary		
		Time when ramp-up/soft-start began [if any] (GMT/UTC)	Time when equipment reached full power (GMT/UTC)	Time when equipment stopped or shut down (GMT/UTC)	Who carried out the monitoring for marine mammals? (Job Title)	Start time of monitoring for marine mammals [Pre-start-up] (GMT/UTC)	End time of monitoring for marine mammals (GMT/UTC)	Reason for non-detection of marine mammals? (e.g. sea state, swell, glare, poor light, fog, rain, etc.)	Were hydrophones used? (Yes/No)	Were marine mammals present in the 30/60 mins before start-up? (Yes/No)	If Yes, give time when marine mammals were last seen (GMT/UTC)	If marine mammals were present, what action was taken? (e.g., delay ramp-up/soft start, delay full start-up)
None-SiteB/EW1	28/07/2025	-	-	-	MMO	12:50	13:03	-	N	-	-	NA
None-SiteB/PW1	28/07/2025	-	-	-	MMO	13:03	13:33	-	N	No	-	NA
MBES-SiteB/EW2	28/07/2025	13:33	13:53	14:35	MMO	13:33	14:00	-	N	-	-	NA
None-SiteB/PW2	01/08/2025	-	-	-	MMO	07:20	07:51	-	N	No	-	NA
MBES-SiteB/EW3	01/08/2025	07:51	08:11	08:44	MMO	07:51	08:44	-	N	-	-	NA
None-SiteB/EW4	06/08/2025	-	-	-	MMO	13:15	15:07	-	N	-	-	NA
MBES-SiteB/ PW3	06/08/2025	15:37	15:57	16:07	MMO	15:07	15:37	-	N	No	-	NA

Attachment 7

Archaeology Monitoring Report

PROJECT

Aughinish Alumina Maintenance Dredging, Foynes, Co. Limerick

Scope

Archaeological Monitoring Report

LICENCE NO.

25E0712, 25R0317 & 25D0231

Client

Fastnet Shipping

PREPARED BY

Dr Carolyn Howle Outlaw and Ciara McCarthy

DATE

August 2025

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Acknowledgements

Mizen Archaeology Ltd. would like to thank Rob Cunningham from *Fastnet Shipping* and Henry O'Donnell from *Aughinish Alumina* for their assistance throughout the project. The project was funded by *Fastnet Shipping*. Julianna O'Donoghue was the archaeological licence holder for the project. Archaeological monitoring was carried out by Julianna O'Donoghue and Ciara McCarthy. The report was written by Dr Carolyn Howle Outlaw.

Abstract

This report relates the results of archaeological monitoring of dredging works which took place as part of the Aughinish Alumina Maintenance Dredging, Foynes, Co. Limerick. *Mizen Archaeology* were engaged by *Fastnet Shipping* to monitor the works (LIC230004 and S0026-02). The works included dredging and dumping at sea at Aughinish, Co. Limerick. The works were carried out over the course 14 days in July and August 2025.

The archaeological monitoring did not identify any archaeological material.

1 Introduction

1.1 General

This report relates the results of archaeological monitoring of maintenance dredging and dumping works which took place as part of the Aughinish Alumina Maintenance Dredging in Foynes, Co. Limerick (LIC230004 and S0026-02). *Mizen Archaeology* were engaged by *Fastnet Shipping* to monitor the works (25E0712, 25R0317 & 25D0231). The works were carried out over the course of 14 days in July and August 2025.

1.2 Archaeological Requirements

The requirement for archaeological monitoring was laid out in the project-specific conditions outlined in the Dumping at Sea Permit (S0026-02) and the Marine Usage Licence (LIC230004). These are reproduced below.

- *Monitoring Frequency/Time – Duration of the loading activities and activities carried out by a long-arm reach excavator to assist loading and dumping by plough dredging.*
- *Monitoring Locations – Loading areas and dumping sites by plough dredging, as per Conditions 1.3 and 1.4.*
- *Analysis Method/Technique – Monitoring to be undertaken by a suitably qualified archaeologist under a licence issued by the Department of House, Local Government and Heritage.*

2 Receiving Environment

2.1 Location

Aughinish Island is situated in Aughinish East, within the Shannon Estuary, approximately midway between Limerick City and the river's mouth. Formerly an island, it is now connected to the mainland. The jetty at Aughinish extends northward from Aughinish Point into the Shannon Estuary for approximately 900m, terminating in a long east-west oriented deep-water berth (Figure 1). This facility is designed to accommodate large vessels involved in the importation of bauxite and the export of processed alumina.

Dredge Area A extends in an east–west orientation along the full 350m length of the northern side of the deep-water jetty. Measuring approximately 350m by 65m, this is the most frequently utilised section of the jetty and requires maintenance dredging to ensure continued access for deep-draft vessels.

Dredge Area B, referred to as the Cells, measures approximately 75m by 35m. Accumulated siltation within this area has significantly impeded access for service and tender vessels operating from the Cells and along the adjacent approach jetty.

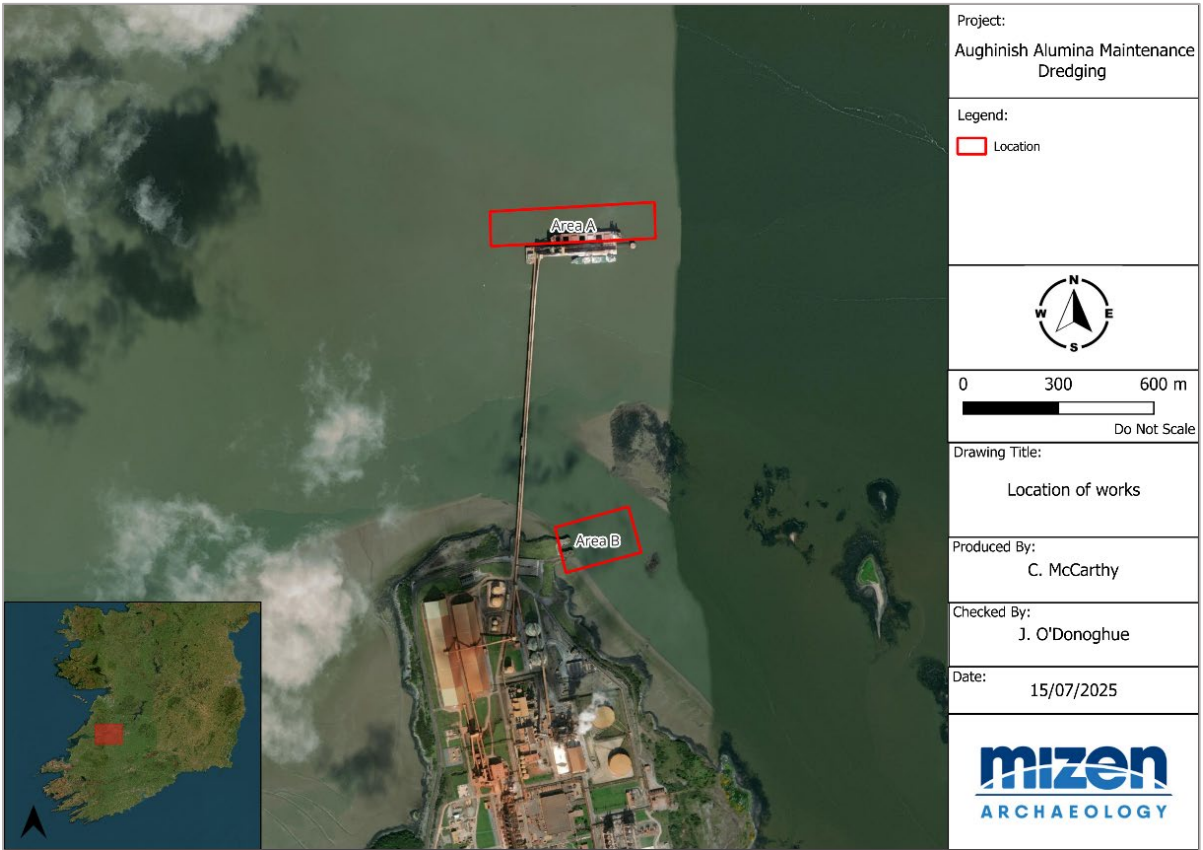


Figure 1: Site Location Map

Table 1: Townland of area of works

County	Barony	Civil Parish	Townland
Limerick	Shanid	Robertstown	Aughinish East

2.2 Soils and Geology

The principal soils consist of shallow brown earths and rendzinas (60%) with associated grey brown podzolic (25%), gleys (10%) and peat (5%). The parent geology material is limestone till (GSI).

3 Scope of Works

Dredging was carried out using a long-arm reach excavator and a plough within Dredge Area A and Dredge Area B (Figure 1).

4 Methodology

4.1 Desktop Study

The following sources were consulted as part of the desktop study:

- **The Record of Monuments and Places (RMP):** compiled by the Archaeological Survey of Ireland comprises of lists, classifications of monuments and maps of all recorded monuments with known locations and zones of archaeological significance. The National Monuments Service Wreck Viewer was also checked. The records are also accessible online from the National Monuments Section (NMS) of the Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs at www.archaeology.ie. These were used to establish the wider archaeological context of the site, both marine and terrestrial.
- **OSI:** Ordnance Survey Ireland historic and contemporary maps were examined to measure the changing landscape of the riverbank and the development of the village.
- **The Excavations Bulletin:** and its online database which contains summaries of all archaeological excavations (marine and terrestrial) carried out in Ireland, was also examined (www.excavations.ie).
- **Cartography:** several historic maps and charts were examined (see bibliography below for a full list).
- **Aerial photography:** a variety of low and high altitude aerial photography (vertical and oblique) was examined (www.archaeology.ie).
- **Documentary sources:** several sources were examined. For a full list of all sources examined see bibliography below.
- **Wreck Inventory of Ireland Database (WIID) and Wreck Viewer:** The information contained within the inventory was gathered from a broad range of cartographic, archaeological and documentary sources, and each entry in the Inventory gives information on the ship's name, type of vessel, port of origin, owner's name, cargo, date of loss and other relevant information where available. The Record of Piers and Harbours is a draft unpublished document compiled by the DAHG. It draws on various historical sources dealing with historical piers and harbour development in Ireland.

4.2 Archaeological Monitoring

An experienced underwater archaeologist monitored all dredging operations through constant visual inspection.

Area A was monitored from the jetty. The monitoring archaeologist walked next to the dredger, close enough to see and speak with the machine driver. Area B was likewise monitored from shore and the archaeologist stayed close to the dredger in order to see and speak with the machine driver.

If potential archaeological material was identified, a plan was in place for the monitoring archaeologist to liaise with the barge crew to retrieve and place the object on the deck for closer inspection. If the object was found to be archaeological, a 30m buffer zone was placed around the find spot until diving could take place to establish the extent and significance of the material, with notification to the National Monuments Service. Potentially archaeological material would be stored safely on the barge, wrapped in polythene, and maintained in a wet environment while further investigations were underway.

5 Archaeological and Historical Context

5.1 Historical Background

Due to Limerick City's proximity to the mouth of the Shannon River, the region around it, including Aughinish, has a long history of human activity and is rich in archaeological remains. Human settlement in the area dates to at least the Bronze Age and continues through the Medieval period and into the modern age.

There is evidence of Bronze Age settlements in Aughinish from stone enclosures excavated there. At one site, two enclosures were discovered measuring 35m in diameter. The banks were faced both internally and externally with limestone slabs. At one enclosure, a circular plan of a house, 8m in diameter, was discovered which contained pits filled with shells and coarse pottery (Waddell 2010). Another site produced Bronze Age circular houses, pits, quern stones, workings areas and courseware pottery. Some apparent rock-cut pits were also uncovered which were filled with seashells, presumably the refuse of a settlement in the nearby intertidal zone. It is thought that these type of small stone enclosures were the farmsteads of well-off farmers and farming families (O'Sullivan 2001).

Previous excavations in Aughinish have uncovered two *fulachtaí fiadh*, two cremation pits, and enclosures. *Fulachtaí fiadh*, also known as burnt mounds, are the most common prehistoric monument type in Ireland. On the surface, they may be visible as a crescent-shaped mound, generally located close to a water source, such a stream or river. Excavations of *fulachtaí fiadh* have sometimes revealed associated hearths, troughs, and arrangements of postholes. They were used for water

heating, although whether this was for cooking, bathing, or other purposes is debated. While examples have been dated from the Neolithic through to the Medieval period, the majority were constructed in the Bronze Age (2,500-500 BC). The two cremation pits were radiocarbon dated to 1323–1251cal. BC and were located c. 70m west of one of the *fulachtaí fiadh* (Gilligan 2011).

The Irish place-name for Limerick, *Luimnech*, dates back to at least AD 561. According to Begley (1906, 66), *Luimnech* referred to the estuary of the Shannon from the city to the sea, an area which includes Aughinish. An ancient poem mentions how the body of St. Cuimin Fada was carried up the *Luimneach* on a boat. The name seems to have originally applied to the Shannon Estuary or to a specific section of the Shannon River and is, more likely a derivative of *Loimeanach*, meaning ‘the bare marsh’ (Spellissy 1998, 18). ‘Limerick,’ however, is either a variant of the Norse term *Laemrich*, *Hlimrek* or *Allymrick*, meaning ‘the rich land,’ ‘rich soil’ or ‘rich loam.’ It may also be a Norse corruption of the original *Luimneach*. Aughinish itself is known as *Eachinis* in Irish, or ‘horse island.’ This may relate to former economic activity in the area related to horses (O’Sullivan 2001, 15).

In AD 834 a fleet of Vikings entered the Shannon and raided Kilpecon and Mungret in the territory of Uí Chonaill. The Vikings were settling across Ireland in strategic rivers, inlets and loughs including at Limerick which was referred to as a Viking ship base in 845. The Vikings saw the strategic importance of the River Shannon and made their way up the Shannon over the course of two years in the mid-840s. A possible longphort — an early Viking D-shaped harbour encampment — is located at Athlunkard, Co. Clare and two silver ingots were discovered nearby (Griffiths 2010). After AD 937 a growing permanency was being established by the Vikings who were becoming more intrinsically involved in native Irish political activity in the area.

The Deel Estuary flows northward out of Askeaton with a wide expanse of mudflats on the west in the area including Aughinish. Medieval fish traps were discovered in the Deel Estuary within its foreshore of soft silts and clays (O’Sullivan 2001). The mudflats at Aughinish are ideal environments for the preservation of further organic material.

When the Normans first arrived in Limerick in the 1170s, they found a long established strongly walled urban centre (Wiggins 2000, 13). The town walls overhung the riverbank (O’Flaherty 2010, 2). Two works, written from the Norman perspective, describe their assault on the town and both narrate the fording of the Abbey River. The *Expugnatio Hibernica of Giraldus Cambrensis* also describes both the fording of the river and the strength of the walls, but takes the story forward to the capture and subsequent abandonment of the city. A recent contour survey of the Abbey River bed carried out in connection with archaeological works for the Limerick Main Drainage has shown that the shallowest point is in the Baal’s Bridge area. This fact, along with the concentration of finds in the riverbed here,

points to the this being the fording point (Hodkinson 2002, 4–5). After the Anglo-Normans were besieged by Donal O’Brien, they fled Limerick. The Anglo-Normans did not return until after the death of Domnall Mór in 1194 (O’Flaherty 2010). The town was granted a charter shortly afterwards, in 1197.

In 1760, the town walls were in disrepair. Limerick was stripped of its status as a garrison town and demolition of its wall began, accompanied by an extensive building programme (Irish Walled Towns Network). The limestone used to build the new town, including its five bridges and quays, was sourced from several nearby quarries, including Halls, Mullins, and Ballysimon Lansdowne among others. The primary focus of the initial building programme was the construction of a regular line of quays on either side of Baal’s Bridge. By 1769, the early eighteenth-century quays and medieval mills had been replaced by the regular line of Charlotte’s Quay and Custom House Quay (O’Flaherty 2010, 8).

During the 1830s, turf was a valuable fuel in the region. This led to significant trade of turf between Poulmasharry and Aughinish. Turf was transported to Aughinish and boats often returned to Poulmasharry laden down with limestone (O’Sullivan 2001). Passengers were also transported between these areas on the turf boats.

5.2 Cartographic Information

On the First Edition 6-inch Ordnance Survey map (1842), two circular enclosures are seen south of the areas of work in Aughinish East, LI010-017 and LI919-019 (Figure 2). These are both described as a circular area with ‘bank revetted internally and externally with limestone slabs’ (heritagedata.ie). The area is now occupied by an industrial complex. In Aughinish West, a ringfort is visible, LI010-015, however there is no extant evidence of the monument. On the Second Edition 25-inch map (1900), this circular monument is not included (Figure 3). There is a fish weir less than 0.2 km south from Area B on the First Edition map, which is also not seen on the Second Edition map.

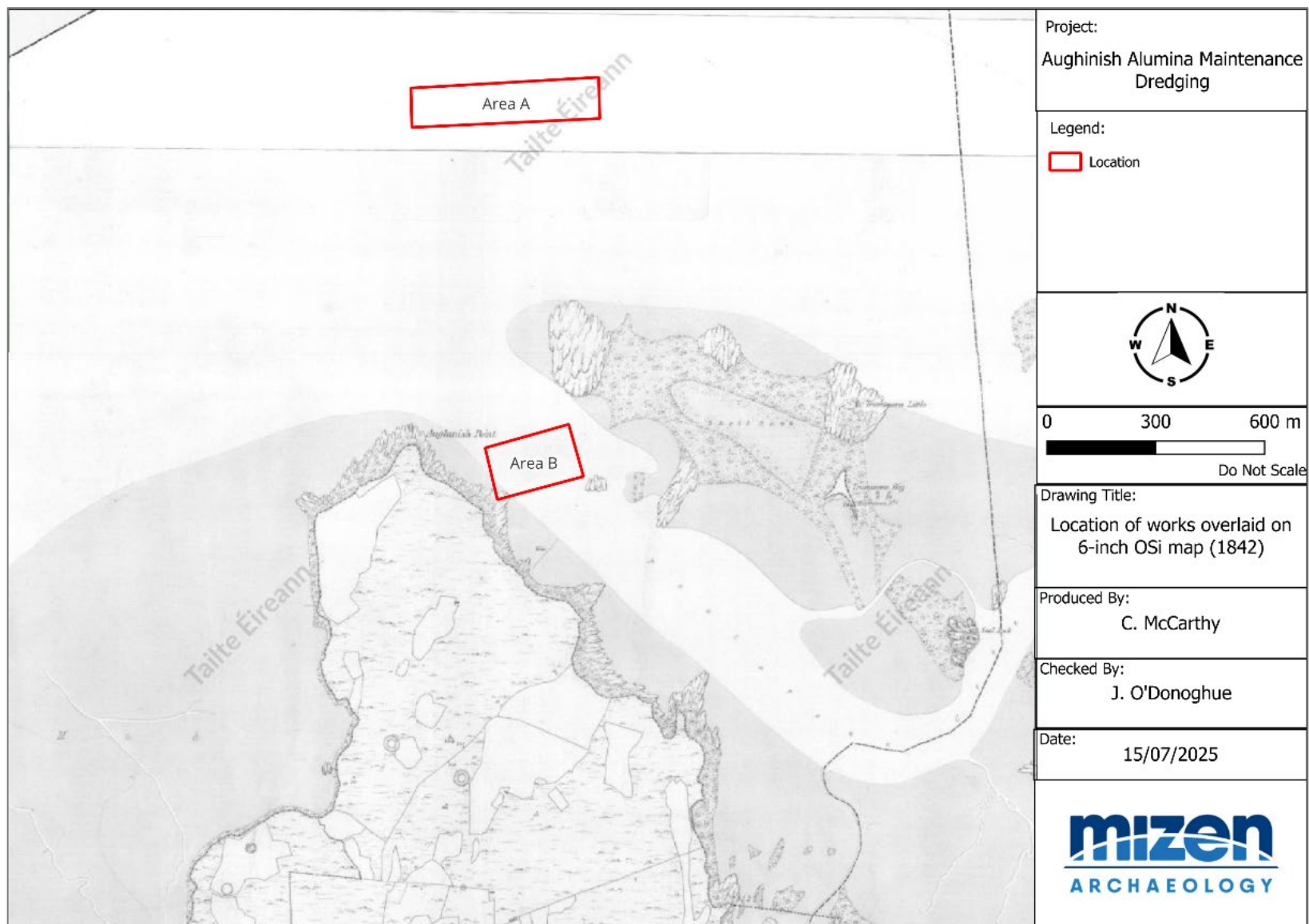


Figure 2: First Edition 6-inch Ordnance Survey Map of location of works

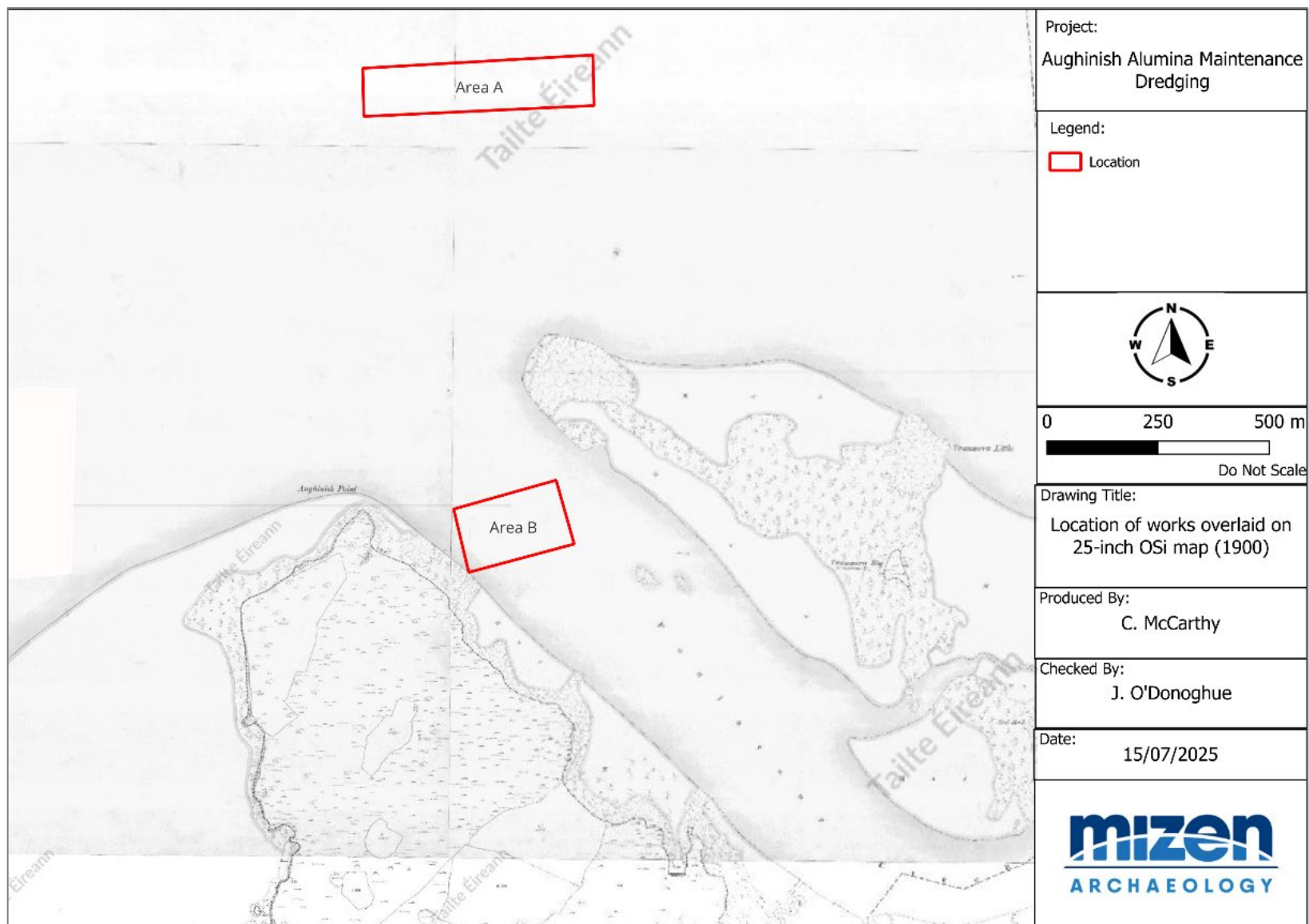


Figure 3: 25-inch Map overlaid on area of works

5.3 Sites and Monuments Record (SMR)

The Sites and Monuments Record (SMR) is the basic listing of all known or suspected monuments in Ireland. The Record of Monuments and Places (RMP) is a list of recorded monuments and places for each county. All monuments listed in the RMP are protected under the National Monuments Acts and any activities that could damage the monument are regulated.

There are nine SMRs within 2km of the area of works (Figure 4). The area was excavated before the development of the industrial complex here, which revealed a circular area 35m in diameter with features inside. Two ringforts are also noted in the area. A full description of the SMRs is given in the Appendix 1.

5.4 Architectural Heritage

There are no structures listed on the National Inventory of Architectural Heritage (NIAH) or the Record of Protected Structures (RPS) for County Limerick within 2km of the area of works.

5.5 Previous Archaeological Excavation and Investigations

There have been seven previous excavations within 2km of the works. There has also been two other instances of archaeological monitoring for the Aughinish Alumina Maintenance Dredging under licences numbers 18E0182 and 16E0415. Nothing of archaeological significance was observed during either session of monitoring. A full description of the excavations is given in Appendix 2. These included the excavation of the Bronze Age enclosures discussed in Section 5.1 above, work on Aughinish Castle, a Medieval enclosure, and various features discovered during test excavations and monitoring of development works.

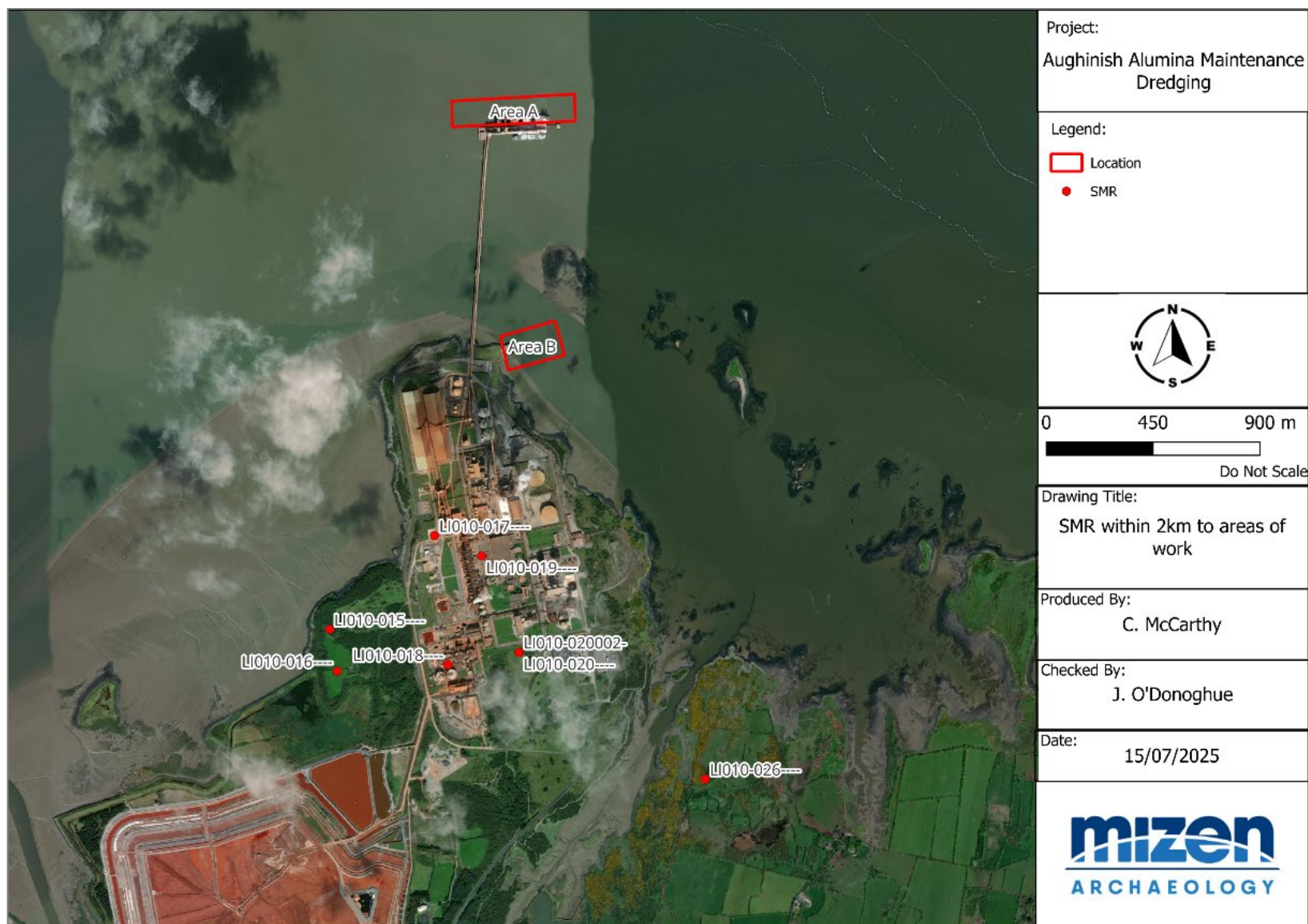


Figure 4: SMR in close proximity to area of works

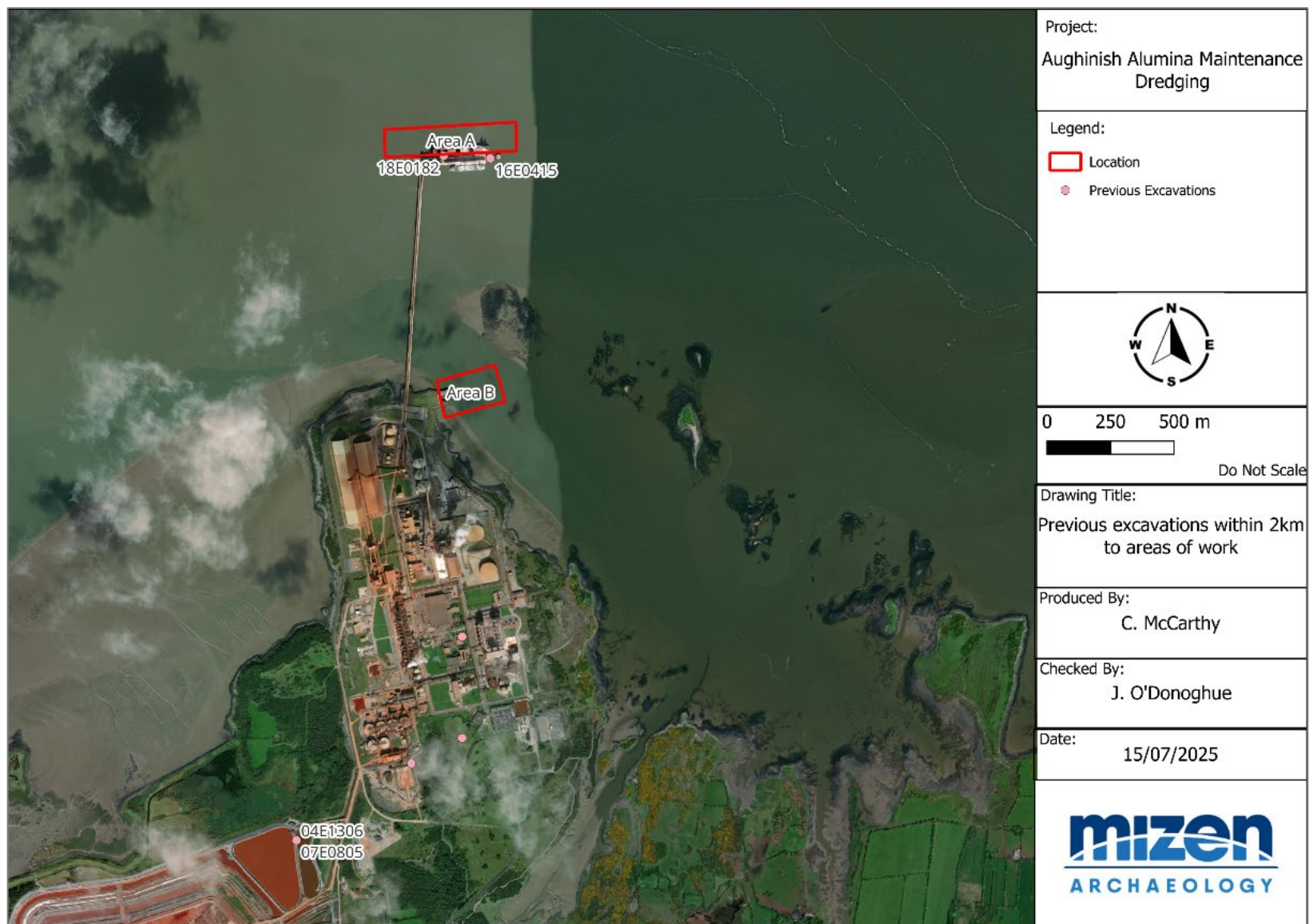


Figure 5: Previous excavations within 2km to area of work

5.6 Wreck Inventory of Ireland

The National Monuments Service (NMS) has compiled a database of shipwrecks from around the coast of Ireland – the Wreck Inventory of Ireland Database (WIID). The inventory lists c. 18,000 wrecks comprising both known and unknown losses, and with both known and uncharted locations, from within Ireland’s territorial waters and to the edge of Ireland’s Continental Shelf. Wrecks with known locations, numbering nearly 4000, are mapped and can be viewed on the NMS’s online Wreck Viewer.

There are eleven wrecks listed as lost near Foynes Island, just west of the area of works (Table 2). Only one of these has a known location, on Foynes Island itself (W10603). It is unknown when this metal wreck sank. Other wrecks are known to have been lost between 1788 and 1897.

Table 2: Wrecks lost near Foynes, Co. Limerick.

Wreck No	Wreck Name	Classification	Place of Loss	Date of Loss
W06109	<i>Liberty</i>	Sailing Boat	River Shannon, Foynes Island	05/12/1822
W06121	<i>Sabrina</i>	Schooner	River Shannon, Foynes Island, 3 miles ESE / Horse Rock	06/11/1890
W06131	Unknown	Sailing Ship	Foynes Island, Near	12/08/1788
W06155	<i>Castleragget</i>	Boat	Foynes Island	October 1833
W06329	<i>Alice</i>	Unknown	River Shannon, in / Foynes Island	30/03/1814
W10603	Unknown	Unknown	Foynes Island, west side. Shannon Estuary 52.61874, -9.11813	Unknown
W13810	<i>Gleaner</i>	Unknown	Foynes Island, near	07/01/1839
W14958	<i>William Cole</i>	Schooner	Foynes, ashore at	08/09/1897
W16789	<i>Laurel</i>	Brigantine	Foynes	12/09/1874
W17689	<i>Ton Mawr</i>	Unknown	Baltimore to Foynes, en route	28/11/1889
W17706	Unknown	Boat	Tarbert, near/ Limerick and Foynes, between	24/01/1860

6 Monitoring Results

Monitoring was carried out for 14 days in July and August 2025. An experienced underwater archaeologist monitored all dredging operations through constant visual inspection. A long-armed machine was used to move material, so it was accessible to the plough. Plough dredging was continued after the excavation was completed. The sediment consisted of a light greyish brown silt.

Area A was dredged for a total of nine days and Area B (Cells) was dredged for five days. Nothing of archaeological significance was discovered. In Area B there was occasional modern debris found.



Plate 1: Area A machine dredging



Plate 2: Area B (Cells) with plough dredge in view

7 Conclusion

Monitoring was carried out over the course of 14 days in July and August 2025.

The area of works at Aughinish has significant archaeological potential due to its location along the Shannon Estuary near Limerick City, its potential for organic preservation, and the number of shipwrecks known to have been located in the area. The archaeological monitoring, however, did not identify any archaeological material. Only modern debris was uncovered, including cables, modern plastic and tyres. This is likely due to the regular dredging of the area and the heavy modern ship traffic.

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8.1 Documentary Sources

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8.2 Other Sources

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- Historic Environment Viewer, National Monuments Service:
<https://www.archaeology.ie/archaeological-survey-ireland/historic-environment-viewer-application>
- Irish Walled Towns Network (IWTN): <https://irishwalledtownsnetwork.ie/>
- National Inventory of Architectural Heritage (NIAH): <http://www.buildingsofireland.ie/niah/>
- Irish Townlands and Historical Maps, Ordnance Survey of Ireland: <https://osi.maps.arcgis.com/apps/webappviewer/index.html?id=bc56a1cf08844a2aa2609aa92e89497e>
- Wreck Viewer, National Monuments Service:
<https://www.archaeology.ie/underwaterarchaeology/wreck-viewer>.

9 Appendix

Appendix 1: Sites and Monuments Record within 2km of Works

SMR No	Monument Type	ITM	Description
LI010-017----	Excavation - miscellaneous	528087 653710	Close to the W edge of Aughinish Island, in area now occupied by an industrial complex (Aughinish Alumina). The site was excavated in 1974 prior to the industrial development. It consisted of a roughly circular area (diam. 35m) enclosed by a bank revetted internally and externally with limestone slabs and having a rubble core (Kelly 1974). Excavation showed the site was built directly on bedrock, though 'there was evidence of levelling and clearance of the jagged bed-rock in one area suggesting a house site' (ibid.). Also uncovered were two large rock-cut pits and 'traces of an occupation layer underlying the internal wall collapse, which produced coarse pottery, a heavily corroded iron bridle bit, a bronze chisel and pin and two saddle querns' (ibid.). These finds led the excavator to conclude that 'the site was built and occupied exclusively during the Late Bronze Age' (ibid.). A similar site was excavated at the same time 200m to the SE (LI010-019---).
LI010-018----	Enclosure	528144 653165	On NW-facing slope of N-S ridge, on Aughinish Island overlooking the River Shannon; site now part of industrial complex (Aughinish Alumina). Excavated in 1974 prior to industrial development (Hickey 1973-4). Consists of ovoid area (56.5m N-S; 45m E-W) enclosed by 'stone bank covered in grass' which was truncated E->NW by 'a modern dry-stone fence' (ibid., 17, fig. 2). Excavation of interior revealed 'an absence of stratigraphy' with c. 0.25m of topsoil lying directly on limestone bedrock or a hard yellowish subsoil. Sections through the bank showed 'it was built on a thin layer of topsoil and was a dry-stone bank of flimsy construction' (ibid., 17, fig. 2 & 4). In SW quadrant of interior 'eight graves were uncovered occupying a small area ... they were aligned E-W and set closely together' (ibid., 19). The graves had been disturbed by agricultural activity but contained 'the skeletal remains of twelve individuals, male and female, whose ages ranged from infancy through adolescence to old age' (ibid.); no grave goods or any other datable material was recovered with the burials. Some animal bones were recovered both from interior and underneath enclosing bank, mostly from sheep; these led the excavator to conclude that the enclosure probably functioned as a sheep-fold (ibid., 23-4). Amongst the stray finds recovered was a shard from 'Belgium or Northern France ... probably of 16th or early 17th century date' (ibid., 21). Four separate phases of activity were discernible: some iron smelting took place here before the enclosure was built; then the enclosure was built, probably as a sheep-fold; at some stage part of the enclosure was used as a burial ground; and finally the enclosure fell into disrepair (ibid., 23). The excavator suggests that the most

			likely date for the sheep-fold was between 1666 and c. 1750 (ibid., 24). A similar feature was excavated at the same time 500m to the N (see LI010-019---).
LI010-019----	Excavation - miscellaneous	528286 653624	Close to the W edge of Aughinish Island, in an area now occupied by an industrial complex (Aughinish Alumina). The site was excavated in 1974 prior to the industrial development. It consisted of a roughly circular area (diam. 35m) enclosed by a bank revetted internally and externally by limestone slabs and with a rubble core (Kelly 1974). The excavation revealed 'the plan of a circular house 8m in diameter', with 'pits and some entrance features' (ibid.). Coarse pottery was found, similar to that found at a nearby site excavated at the same time 200m to the NW (LI010-017---). The excavator concluded that this site also dated to the Late Bronze Age. Also uncovered was 'a small rectangular stone-walled structure measuring 5m x 4m' which partially overlaid the 'collapsed fort wall'. There was no dating evidence for this structure but the excavator compared it with a similar feature excavated at the same time 500m to the S (LI010-018---).
LI010-020----	Castle - tower house	528444 653217	On Aughinish Island overlooking the River Shannon; site now part of industrial complex (Aughinish Alumina) but excavated in 1974 prior to this industrial development (Lynch 1974). Excavations revealed the base of a bawn wall (Wth 2.2m) enclosing a 'roughly circular' area (c. 80m N-S; c. 60m E-W), with well cobbled entrance on S side (Wth 3.5m). Whilst 'legal reasons prevented the investigation of the keep' (ibid.) considerable area-excitation was carried out within the bawn, revealing the base of 'a domed oven' (ibid.). Finds included sherds of late and post-medieval pottery, a wide range of iron objects, and an Irish halfpenny dating to the late 17th century. Also uncovered were the skeletons of 31 individuals, 'of which 'the majority were young children and babies' (ibid.). This latter suggests the presence of a burial ground for unbaptised children (killeen) (www.excavations.ie). The results of the excavation were summarised as following; 'Legal reasons prevented the investigation of the keep of the castle, so the excavation had to be confined to the bawn only. The castle itself, which dates to the late 16th — early 17th centuries, appeared to be set in a roughly circular enclosure, indicated by a low ridge showing in the grass. A preliminary trial trench was cut on the northern side of the site and this revealed the base of the bawn wall. This wall, which was well-built, averaged 2.20m in thickness and was built directly on the limestone bedrock. Subsequent trial trenches succeeded in picking up the line of the wall. It was roughly circular in plan with no evidence of towers. An entrance to the bawn area was found on the southern side; it is about 3.0m wide and well cobbled with small rounded stones. To the east of the castle, a portion of the bawn wall appears to have been built on an artificially constructed 'platform' of loose stones and earth. This 'platform' which is approx. 1.0m high, would have been necessary to make this area level with the adjacent field. No evidence was found of a ditch outside the wall. An interesting feature uncovered by the excavation, was a square-built structure, 3.40m x 3.40m, situated in

			the northern area of the bawn. Built on the square base was a roughly circular setting of stones. Extending from the square base was a thick layer of charcoal. Complete excavation revealed that the core of the structure was composed entirely of rubble. The only find was a badly corroded iron knife. This structure seems best interpreted as the base for a domed oven, of the type found on medieval sites. Considerable area-excavation was carried out within the bawn, and in the process, thirty-one skeletons were uncovered. Of these, thirty were concentrated in a small area, immediately north of the castle, the remaining one having been found in the southern area. Preliminary examination of these skeletons has revealed that the majority were young children and babies. Finds from the site include: animal bone; sherds of late and post-medieval pottery; a wide range of iron objects; clay-pipe fragments; a blue glass bead; a bronze disc-headed pin, and an Irish halfpenny dating to the reign of Charles 11(1683). (www.excavations.ie). According to local information part of ruin stood to a considerable height until 1930s when 'deemed unsafe and demolished' (Donnelly 1994, vol. 2, 15). By 1974 only visible remains of castle were some 'masonry fragments incorporated in a modern garden wall' (ibid.). Westropp (1906-7, 241-2) gives the following details about Aughinish Castle; 'The owners appear to have been, 1584-1601, Tiede O'Donogh or O'Dufiie, Aghanes or Aghnes Island (Inq. Exch, 54; Fi. 6566), and, 1604, R. Lyster, subject to dower of his mother Marg. Bourke (Inq. Chan, viii, 237). 1613 Sir J. Jephson, Aghniss, as part of estate of Monaster ny gillagh (Ib., 5a). 1616 Sir E. Berkeley, at his death. 1642 besieged (Dep. 302). 1655 F. Courtney (C.S. p. 95). Fabric - A long building about 65 feet [21m] by 28 feet [9m] wide, with three rooms and the remains of a fourth and western'.
LI010-015----	Ringfort - rath	527645 653314	In level terrain. Monument, depicted as embanked circular enclosure (diam. c. 25m) on 1841 OS 6-inch map, has been levelled. No trace of monument evident when inspected.
LI010-016----	Ringfort - rath	527677 653138	In level terrain. Monument, depicted as embanked circular enclosure (diam. c. 20m) on 1841 OS 6-inch map, has been levelled. No trace of monument evident when inspected.
LI010-026----	Moated site	529229 652682	In low-lying marshy area overgrown by gorse with frequent outcrops of limestone. Roughly rectangular area (35.6m E-W; 30m N-S) enclosed by earthen bank (int. H 0.9m; ext. H 1.2m) with external fosse (D 0.5m; Base Wth. 1.6m) W->E. Enclosing element E->W recently levelled but is evident as line of loose stony earth. Interior seems to be slightly raised above level of surrounding terrain; surface uneven and showing signs of recent disturbance. Marking present end of bank on E side is large limestone boulder (H 1.1m; 1.9m x 0.3m) embedded in the ground.
LI010-020001-	Bawn	528444 653217	On Aughinish Island overlooking the River Shannon; site now part of industrial complex (Aughinish Alumina) but excavated in 1974 prior to this industrial development (Lynch 1974). Excavations at Aughinish Castle (LI010-020----) revealed the base of a bawn wall (Wth 2.2m) enclosing a 'roughly circular' area (c. 80m N-S; c.

			60m E-W), with well cobbled entrance on S side (Wth 3.5m). Whilst 'legal reasons prevented the investigation of the keep' (ibid.) considerable area-excavation was carried out within the bawn, revealing the base of 'a domed oven' (ibid.). Finds included sherds of late and post-medieval pottery, a wide range of iron objects, and an Irish halfpenny dating to the late 17th century. Also uncovered were the skeletons of 31 individuals, 'of which 'the majority were young children and babies' (ibid.). This latter suggests the presence of a burial ground for unbaptised children (killeen).
LI010-020002-	Children's burial ground	528444 653217	On Aughinish Island overlooking the River Shannon; site now part of industrial complex (Aughinish Alumina) but excavated in 1974 prior to this industrial development (Lynch 1974). Excavations at Aughinish Castle (LI010-020----) revealed the base of a bawn wall (LI010-020001-) enclosing a 'roughly circular' area, with well cobbled entrance on S side. Whilst 'legal reasons prevented the investigation of the keep' (ibid.) considerable area-excavation was carried out within the bawn, revealing the base of 'a domed oven' (ibid.). Finds included sherds of late and post-medieval pottery, a wide range of iron objects, and an Irish halfpenny dating to the late 17th century. Also uncovered were the skeletons of 31 individuals, 'of which 'the majority were young children and babies' (ibid.). This latter suggests the presence of a burial ground for unbaptised children (killeen)' (www.excavations.ie).

Appendix 2: Previous Excavations

Table 3: Previous excavations within 2km of works

Licence No.	Site Name	ITM	Description
18E0182	Aughinish East	528404, 655443	Geomara were commissioned by Fastnet Shipping to carry out a program of archaeological monitoring of maintenance plough dredging at RUSAL Aughinish Alumina, in the River Shannon near Foynes, Co. Limerick. The works location consisted of one area on the Aughinish Alumina facility, a section of the outer berth. The dredging program was carried out from 16 to 21 April 2018. A previously completed archaeological assessment of the overall long-term maintenance dredging licence was carried out in 2015 and it recommended that any dredging be monitored by a qualified marine archaeologist. The program of maintenance dredging used plough dredging towed from the stern of Fastnet Sound, a 27m multicat, to reduce bed levels at a specific area of the northern side (outer berth) of the unloading jetty to a depth of -12.5m. The area monitored during the project covered the area of the outer berth, which was monitored from the vessel bridge. During the monitoring program and by recommendations of the archaeologists and the client the plough was brought to the surface every 6 hours. At each interval the plough was inspected in order to determine if anything of archaeological importance may have become lodged during the course of the dredging works. The monitoring operations of the dredging scheme did not record the presence of any potential archaeological material or features impacted or uncovered.
16E0415	Aughinish	528577, 655430	Monitoring of maintenance dredging at Aughinish, Co. Limerick took place from 18 to 26 August 2016. Plough dredging was carried out in three areas (Area A–C) by vessel ‘Shannon 1’, a Multi-Cat tug with a bed-levelling plough. Areas A and C was situated astride the Outer and Inner Deepwater Berth at the jetty that extends from Aughinish Point northwards into the Shannon for c.900m. Area B was situated at Aughinish Point at a small boat-lower, water berthing area.
--	Aughinish Site 1 & 2	528466, 653545	Both sites (1 and 2) were of similar construction, consisting of an internal and external revetment of limestone slabs and rubble core. Both measured 35m across and neither showed evidence of an accompanying ditch. Site 1 was built directly on bedrock and so no postholes were evident. However, there was evidence of levelling and clearance of the jagged bed-rock in one area suggesting a house site. Two large rock-cut pits were also uncovered. Traces of an occupation layer were found underlying the internal wall collapse, which produced coarse pottery, a heavily corroded iron bridle bit, a bronze chisel and pin and two saddle querns. The pin and bit are suggested to be of Halstatt C context; the chisel is of Downs type, and the pottery compares well with wares from LBA sites such as Rathgall and Lough Eskragh. It would seem that the site was built and occupied exclusively during the Late Bronze Age.

			At Site 2, 200 metres SE of Site 1 the plan of a circular house 8m in diameter was found, along with pits and some entrance features, which produced coarse pottery of the type found at Site 1. It would, then, also appear to date to the late Bronze Age. Remains of a small rectangular stone-walled structure measuring 5m x 4m partly overlaid the collapsed fort wall but was not directly dated. It compares with a structure excavated by Mrs. Hickey (site 5).
--	Auginish Island Site 7	528466, 653145	Legal reasons prevented the investigation of the keep of the castle, so the excavation had to be confined to the bawn only. The castle itself, which dates to the late 16th-early 17th centuries, appeared to be set in a roughly circular enclosure, indicated by a low ridge showing in the grass. A preliminary trial trench was cut on the northern side of the site and this revealed the base of the bawn wall. This wall, which was well-built, averaged 2.2m in thickness and was built directly on the limestone bedrock. Subsequent trial trenches succeeded in picking up the line of the wall. It was roughly circular in plan with no evidence of towers. An entrance to the bawn area was found on the southern side; it is about 3m wide and well cobbled with small rounded stones. To the east of the castle, a portion of the bawn wall appears to have been built on an artificially constructed 'platform' of loose stones and earth. This 'platform' which is approx. 1m high, would have been necessary to make this area level with the adjacent field. No evidence was found of a ditch outside the wall. An interesting feature uncovered by the excavation, was a square-built structure, 3.4m x 3.4m, situated in the northern area of the bawn. Built on the square base was a roughly circular setting of stones. Extending from the square base was a thick layer of charcoal. Complete excavation revealed that the core of the structure was composed entirely of rubble. The only find was a badly corroded iron knife. This structure seems best interpreted as the base for a domed oven, of the type found on medieval sites. Considerable area-excavation was carried out within the bawn, and in the process, thirty-one skeletons were uncovered. Of these, thirty were concentrated in a small area, immediately north of the castle, the remaining one having been found in the southern area. Preliminary examination of these skeletons has revealed that the majority were young children and babies. Finds from the site include: animal bone; sherds of late and post-medieval pottery; a wide range of iron objects; clay-pipe fragments; a blue glass bead; a bronze disc-headed pin, and an Irish halfpenny dating to the reign of Charles 11(1683).
--	Aughinish Island Site 5	528266, 653045	The site had been shown as an antiquity on the first edition of the Ordnance Survey map of 1840. At the time of excavation its large, broad-oval interior was partly enclosed by the original stone bank covered in grass and partly by a modern dry-stone fence. The entrance was through a narrow gap in the modern fence and there were no surface indications of an original entrance. It was sited above the 50ft contour on the exposed NW

			slope of a long ridge overlooking the river Shannon. Much of the interior was excavated revealing, beneath a thin layer of top-soil, either limestone bedrock or a mixture of stones and boulders set in a yellow subsoil. The original dry-stone bank contained some large limestone boulders but was essentially flimsy and had collapsed mainly outwards. No signs of a fosse was found nor postholes or trenches denoting a palisade. Four separate activities could be traced on the site. The first- some iron smelting- occurred before the building of the enclosure (iron slag was found underneath the enclosure bank). The enclosure appears to have been built not for human occupation since no evidence for this was found, but probably to contain animals. A thorough study of the animal bones by Edelgard Harbison-Soergel provided evidence which suggested that it was built as a sheep-fold rather than a cattle enclosure, and that its use as such was likely to have been between 1666 and c.1750. The enclosure was used for a period as a burial ground (a row of 8 shallow graves aligned E-W was found towards the SW edge of the interior). After it had fallen into disrepair, an insubstantial hut or shelter was erected beside it, partly overlying its collapsed wall. The only stratified finds were animal bones and iron slag from under the bank. The other finds span the period 16th-19th century- objects of iron include nails, a horseshoe, a hinge pivot and a knife of C16th type. Five fragments of clay pipes were found, a whetstone, a teapot-lid and a fragment of unglazed pottery. This sherd appears to be a handle from a stoneware costrel whose fabric would suggest a late 16th-early 17th context, deriving from N. France or Belgium.
07E0805	Aughinish island: Island Mac Téige / Aughinish West / Glenbane West	527813, 652742	A test excavation was carried out on a development site in Aughinish Island, Co. Limerick, in October 2007. The site spanned the three townlands of Island Mac Téige, Aughinish West and Glenbane West. The development site lay within the Shannon Estuary, c. 17km west of Limerick city, and comprised sixteen fields in total. The site is owned by Aughinish Alumina Ltd, who currently run an aluminium plant to the north of the development site. Works within the plant consist of the dissolution and processing of imported bauxite within a caustic soda in order to extract alumina for export to worldwide smelters. Residue left over from the process is stored within a bauxite residual disposal area (BRDA); the current BRDA bounds the development site to the north. Development plans propose the creation of a second BRDA as well as a borrow pit in the southern end of the site; glacial till is to be removed from this pit to form a composite lining system for the base of the proposed BRDA. This will aid environmental protection. Recommendations within the environmental impact assessment of the proposed development included that a non-invasive geophysical survey be carried across the development site, to be followed by test excavation to further assess any anomalies noted during the survey. Further recommendations included the monitoring of removal of townland boundaries and the recording of a site of architectural heritage prior to its demolition (The

			White House, located in the north-eastern corner of the development site). The latter two phases of groundworks will be carried out in 2008. The geophysical survey was carried out in 2007 by D. Harrison (07R0105). A number of anomalies were noted across the site in the form of linear features, possible pits and a large curving ditch. The test excavation commenced on 15 and was completed on 22 October 2007; 42 test-trenches were excavated across fifteen fields (one narrow field was needed for access and could not, therefore, be tested). Ten linear features were uncovered in Fields 1, 4, 6, 9, 18, 19 and 20. A burnt spread was noted in Field 3. Probable post-medieval burning was visible in Field 6. A small area of burning was also noted in Field 13 and cultivation activity was noted in Fields 1, 2, 6, 7, 9 and 18–20. It was recommended that these features will need to be fully excavated. All further site works will be monitored. It is anticipated that these works will take place in spring 2008.
04E1306	Aughinish	527813, 652742	Test-trenching was undertaken adjacent to a ringfort in advance of a gas pipeline construction project. The results of the excavation did not uncover any archaeological features or finds. Monitoring was subsequently undertaken during the gasline construction phase; four small-scale sites were uncovered during monitoring. Site 1 comprised two adjacent pits cut into orange subsoil and connected by a 0.03m-deep shallow linear depression. Both pits contained iron slag, clay lining from the furnace pits and iron bloom in the fills and this indicates that the pits were associated with ironworking. The absence of lime or limestone fluxes in the iron indicates a date in the Early Christian period for use of this site. Site 2 was a thin spread of shell over an area measuring 17m by 8m. The shell species included cockle, periwinkle, mussel and some oyster. The area had been reseeded in recent times and this agricultural work had disturbed the central area of the shell spread. Modern pottery sherds and clay-pipe fragments were found among the shell. The site was in close proximity to the estuary and the shell may have been introduced to the site as part of soil improvements where seaweed was spread as a fertiliser. Site 3a was a subcircular pit with some bone fragments in the basal fill. A large flat stone occupied part of the base on the north end. The pit fill was charcoal-enriched brown/black soil with some burnt bone, seashell and a burnt hazelnut shell fragment. The bone was concentrated in the south-west side. The bone fragments were too minute to identify as either animal or human. Five pieces of flint debitage were found at the base of the fill and Beaker pottery sherds were found throughout. The flint debitage may have been placed in the pit prior to infilling. A rounded water-rolled stone of old red sandstone was recovered from this fill. Some evidence of pocking/pitting on one end suggests use as a hammer stone.

			The pit appears to contain random deposits of pottery sherds, burnt bone and flint debitage. The pottery is from the Beaker period and includes 43 sherds representing at least five vessels. The pottery includes one sherd of Bell Beaker with zoned decoration including comb-impressed lines and short strokes. A second vessel can be categorised as Domestic Beaker and has impressed pits below the rim, both internally and externally. Two fragments of a third vessel are also decorated with impressed comb motifs and they may belong to the Bell Beaker classification. These fragments are from a small, thin-walled vessel (max. thickness 5.5mm). The remaining sherds are undecorated but on fabric type belong to two other vessels. The pottery was broken in antiquity and may have been deposited in the pit as some type of ritualistic gesture. Site 3b contained pits similar to post-pits and may indicate a settlement of unknown date in the area outside the pipeline wayleave. Site 4 was a paved area found at the edge of the wayleave and this continued into the baulk. Eight flat stones extended over an area measuring 0.92m by 0.29m. Ash and charcoal flecks were visible on the east side. Oxidised and charcoal-flecked soil was visible 0.54m to the west. The site was probably a hearth and, as it will not be affected by the pipeline works, it was covered with terram and gravel and remains intact.
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