

# Heriot-Watt University

## Proposed deposit of Native Oysters, Firth of Forth two sites.

### Navigational Risk Assessment V1 – November 2023

This document has been prepared by

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for  
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## 1.0 Introduction

This document has been prepared to assess the risk to navigation of the proposed Native Oyster deposit plots near Inchmickery and Inchkeith in the Firth of Forth. It outlines the existing level of navigational use with the Firth of Forth, additional movements associated with the project and identifies, with mitigation where necessary, risk associated with the proposed deposits.

The reader is asked to refer to plans and chart extracts submitted in support of the two marine licence applications for information as to the location of the proposed plots.

## 2.0 Project Assumptions

In preparing this document we have made the following assumptions:

### 2.1 Seabed depth on initial deposit

We have assumed that pre-deposit seabed depth, referred to chart datum, is as shown on Admiralty Chart 0754, "Approaches to Leith and Burntisland" (Scale 1:25000).

Once deposited to the sea bed Oysters will, in the short term, settle into a layer of maximum 0.1m above the seabed. This layer is no deeper than existing, matrix of shelly gravel, cobbles and occasional boulders, present in the area.

### 2.2 Seabed depth as project matures.

Through spawning and subsequent larval recruitment back onto the site there is an expectation that biogenic reef habitat may develop at the location of the sites, this may reach a maximum of 0.5m above the seabed in the medium to long term. If such habitat develops this will be of similar height above the seabed as the occasional boulders already present at the deposit sites.

### 2.3 Surface equipment

There is no surface equipment or marker buoys associated with the sites

### 2.4 Sub-Surface equipment

Subsurface equipment is limited to 4no 15m lengths of biodegradable line per site, with 100 oysters glued onto each line. These will be deployed at the initial deposit and will form the source of oysters for the monitoring of the population. Lines will be weighted/pinned horizontally to the seabed (c5m depth) and checked during monitoring visits. Lines will be removed before the end of the three year licence period sought.

## 2.5 Vessel Movements

Vessels associated with the projects will be stationary or slow moving whilst on the site and will make direct passage from Granton Harbour to the site and return.

## 3.0 Assessment of Existing Navigation.

### 3.1 – Background

The Firth of Forth is known to be an area of active shipping used by large numbers of vessels for both commercial and recreational voyages. The Firth is highly industrialised with regular movements of large vessels associated with petrochemical terminals at Grangemouth upstream of the proposed sites, ship recycling to the north at Burntisland and military shipbuilding and maintenance at Rosyth and ship maintenance and renewables support at Leith. In addition, there are numerous vessel movements associated with passenger transport and recreational sailing with several harbours and marinas surrounding the Firth. The entirety of the proposed site is enclosed within the boundary of the Firth of Forth Harbour Area managed by Forth Ports Ltd.

The proposed sites have been chosen based on factors including, but not limited to, the suitability of the seabed as oyster habitat, the ability to access the site within reasonable boat travel time and relatively shallow depths providing inherent separation from large deep drafted vessels and navigational channels. The project has sought to avoid charted navigational features such as recreational anchorages and dredge spoil dumping areas. In effect mitigation of navigational impacts is inherent in the site selection.

### 3.2 – Use of AIS dataset

In seeking to assess the existing navigational movements at the proposed sites we obtained Automated Identification System (AIS) datasets for the period 1<sup>st</sup> January 2021 to 31<sup>st</sup> October 2023 (the sampling period) covering areas of approximately 1km<sup>2</sup> within which the sites are enclosed. This data was uploaded into GIS to provide an indication of vessel movements in proximity to the sites. Data points showing the GPS position of all AIS equipped vessels in the area during the sampling period were used to prepare the heatmaps shown and discussed below. In compiling the heatmap a small number of AIS datapoints from Search and Rescue Helicopters was removed.

### 3.2.1 Inchkeith Site – Data Summary

The site is proposed in an area charted as being 5.5m in depth at chart datum. The closest charted anchorage is Lima Anchorage c1500m to the south west. A deep channel (Leith Channel) lies 400m to the south of the site.

The Navigation Heatmap. Represents 1430 data points from 251 vessels during the study period 1<sup>st</sup> January 2021 to 31<sup>st</sup> October 2023. Note the distribution of vessels is aggregated towards the deeper water channel in the south east of the sampled area with relatively few vessels making passage over the site.

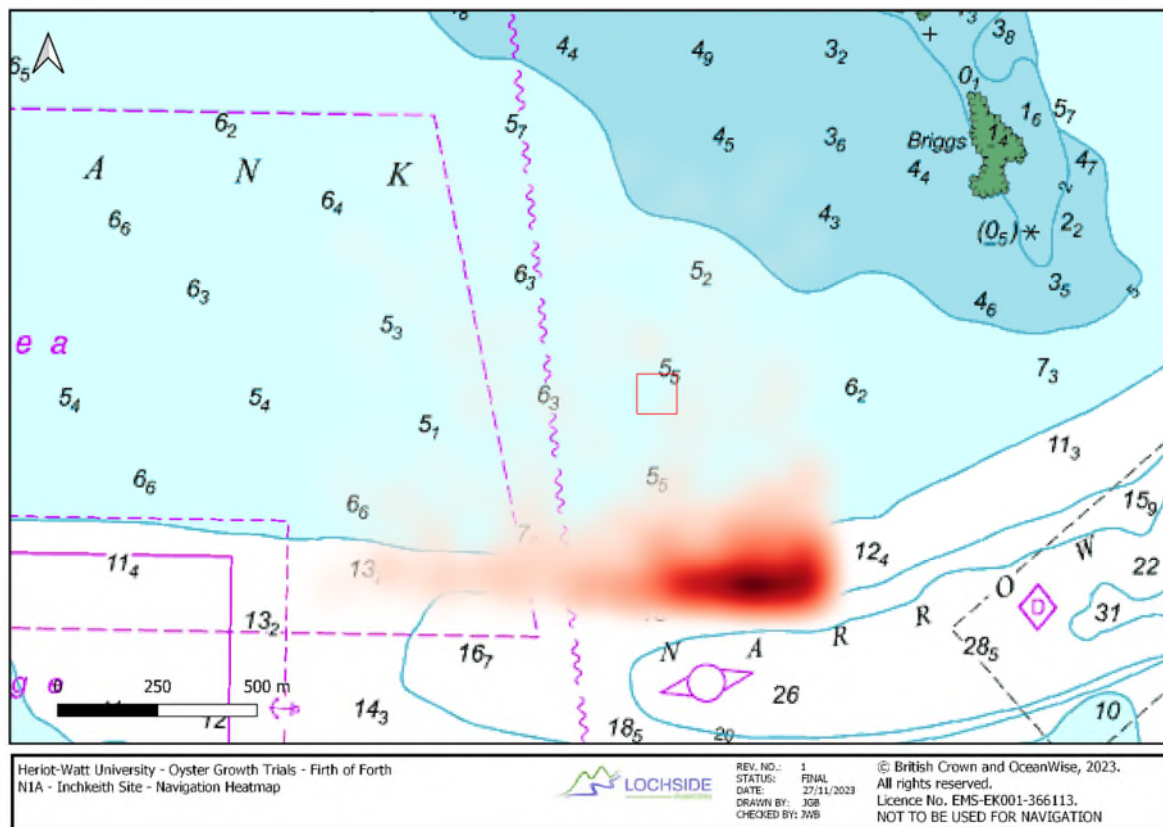
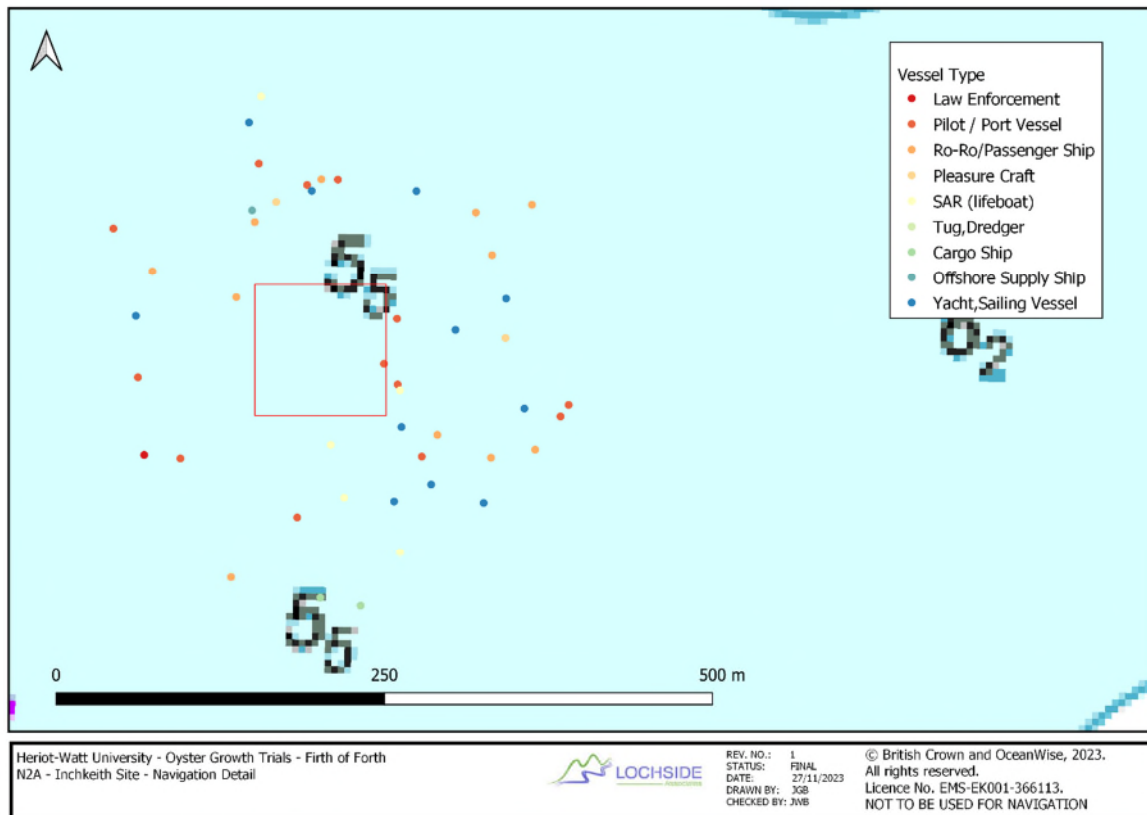


Figure N2A below shows the AIS datapoints for vessels navigating within 200m of the site mid point of the Inchkeith site during the study period. The sample comprises 28 vessels, producing 50 data points over 39 visits. 12 of the 39 visits (c30%) were by vessels operated by Forth Ports Ltd. including the survey vessel Forth King and the Pilot boats Forth Leopard, Panther and Puma. The RO-RO ferry Loch Frisa accounted for 10% of the total data points. Loch Frisa is known to have undertaken sea trials in the Firth of Forth during May 2022, having undergone conversion works at Dales Marine in Leith prior to deployment to the Oban-Mull route. The relative intense use of the area by this vessel could be considered to be a one off but may be indicative of the use of this general area for sea trials of vessels following maintenance at Leith. During the study period there was a single recorded instance

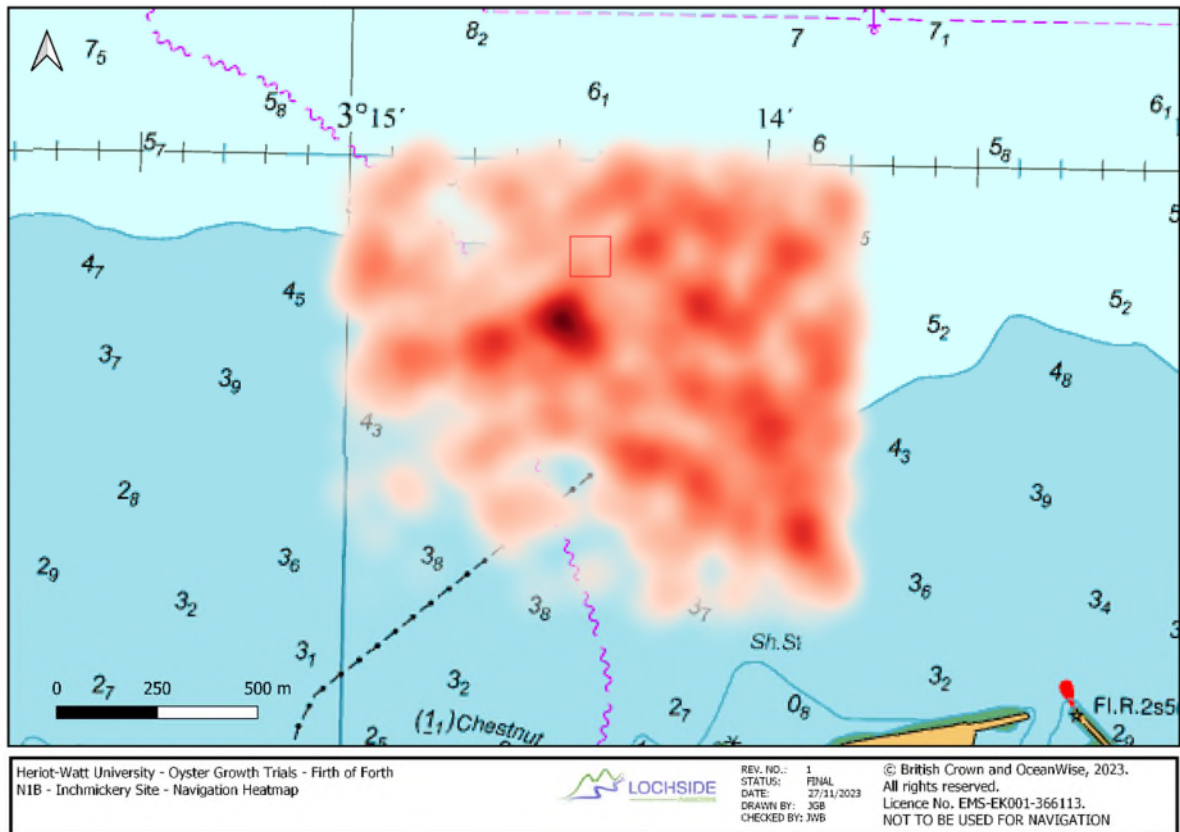
of a vessel data point co-incident with the Inchkeith site area this was produced by the Forth Puma Pilot vessel.



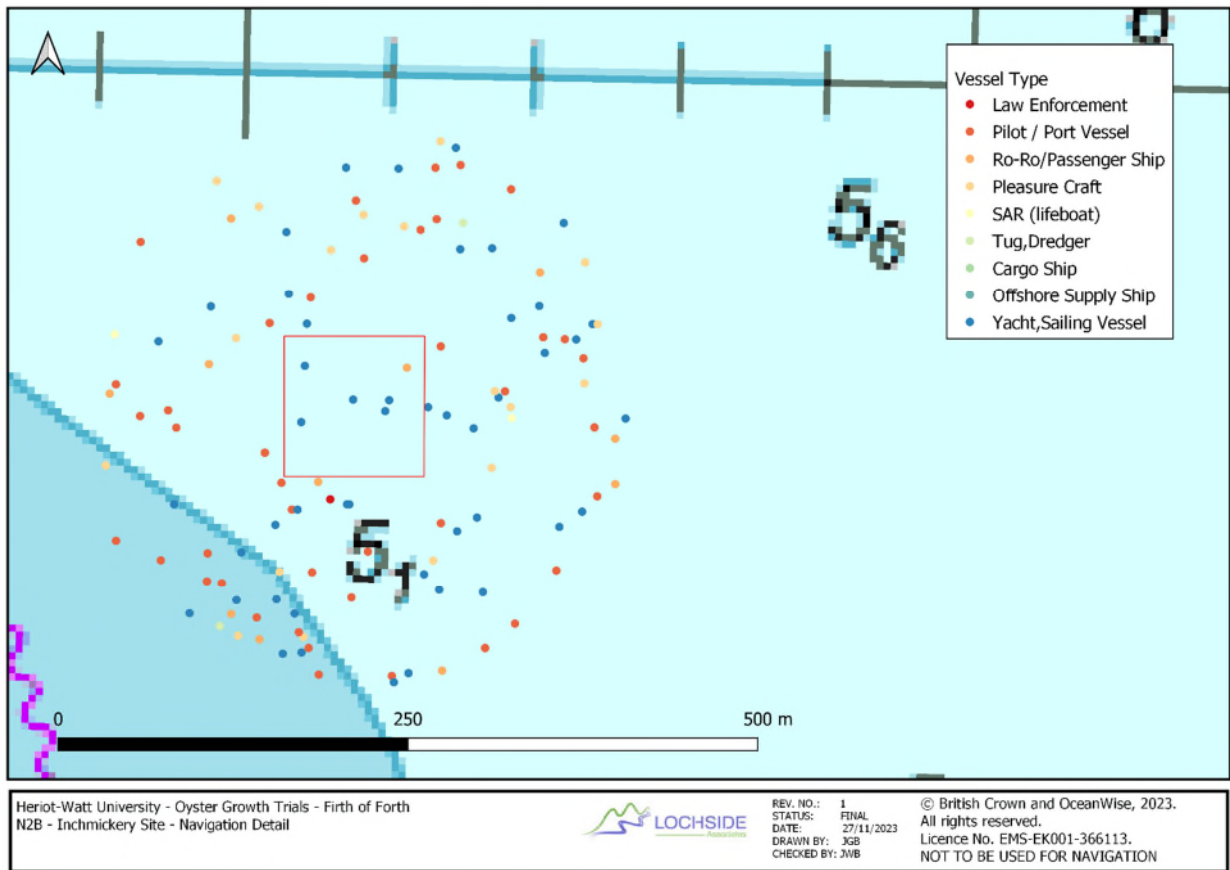
### 3.2.2 Inchmickery Site Summary

The site is proposed in an area charted as being just over 5m in depth at chart datum. The closest charted anchorage, a small vessel anchorage, is c600m to the north of the site with depths in the 7m to 11m range.

The navigation heatmap in Figure N1B below represents 1027 data points from 59 unique vessels during the study period 1<sup>st</sup> January 2021 to 31<sup>st</sup> October 2023. Note relatively even distribution of vessels across the study area with tracks appearing to trend along a north-west to south east line to and from Granton Harbour.



Detail showing AIS datapoints for vessels navigating within 200m of the site midpoint during the study period is shown in Figure N2B below. The data sampled depicts 37 vessels, producing 258 data points over 80 visits. 22 of the 80 visits (c27%) were by vessels operated by Forth Ports Ltd, the survey vessel Forth King and the Pilot boats Forth Leopard, Panther and Puma. The pleasure craft Dunedin Star, accounted for 6 of the visits whilst the passenger tour boats Forth Belle and Maid of the Forth account for 10 visits between them. Instances of vessel data points co-incident with the Inchmickery site area are limited to 6 and are representative of a single passage point by the Forth Belle and 4 points by 3 individual sailing vessels transiting the site area.



### 3.3 Data limitations

General Directions for the Firth of Forth issued by Forth Ports Ltd. require that certain classes of vessels carry AIS even if they are not required to do so under international regulations. For the Firth of Forth this includes commercial vessels of 40m or over in length overall, commercial vessels having a gross tonnage of 50 tons or more, any commercial vessel carrying more than 12 passengers and tugs engaged in towing or pushing, all of which must be fitted with AIS. In analysing the AIS data we can be reasonably confident that there is near 100% coverage of vessels within these classes within the analysed dataset.

For other vessels the use of AIS is recommended but voluntary and although AIS is recognised as an important safety feature, increasingly incorporated into navigation plotters or standalone devices for the leisure/recreational market it is not in use in 100% of vessels. Vessel movements for smaller vessels, for example sailing vessels not required to use AIS systems, may be under represented in datasets. AIS data nevertheless represents trends in the movement of vessels and is useful in this regard.

Analysing data for a relatively small area means that vessels travelling over a certain speed may cross the analysis area without recording a datapoint within it. Examples within the dataset include the RNLI lifeboat B836 which was the fastest of all vessels recorded at 36 knots, travelling at this speed this vessel could pass across the sample area in less than 3

minutes and not, therefore leave a data point. It is possible that high speed vessels even if fitted with AIS are under recorded in the datasets. Again, whilst AIS is not taken as being definitive it provides a reasonable, publically available indication of trends in vessel movements.

### 3.4 Commercial Fishing

The AIS dataset did not record the presence of any fishing vessels either on passage or undertaking fishing activity within the sampled areas. Fishing vessels are generally required to be fitted with Vessel Monitoring Systems (VMS) which can be monitored by officers from Marine Directorate Compliance. Fishing vessels are not generally required to be fitted with AIS so may be absent from the dataset for this reason. There is no publically available dataset for fishing vessel activity in the Firth of Forth providing the same level of detail as AIS. Marine Directorate, though Scotlands Marine Plan Interactive provides summary data derived from ICES technical report SR.2021.11. The dataset includes annual average intensity of use of the seabed from towed gear during the years 2010 – 2020 across a series of data rectangles approximating 5km (n-s) by 3km (e-w) giving an area of c16km<sup>2</sup>

The Inchkeith site lies at the very edge of a data rectangle indicating vessels fishing using towed gear targeting Nephrops and other crustaceans for between 2 and 12 hours a year. Bottom trawling takes place for an average of 2 days to one week per year and scallop dredging does not take place co-incident with the site. In contrast the Inchmickery site is not within any of the ICES data rectangles.

The nature of the seabed at the proposed sites where there are occasional large boulders, combined with the charted presence of anchoring areas and spoil dumping locations may make the immediate proximity of the site area unattractive for mobile gear as there is a risk of seabed snagging. The areas are more likely to be used by static gear fishermen and the presence of the oyster deposit sites would not necessarily preclude such use. Within the Firth of Forth, creel fishing for Nephrops is more likely to favour deeper, softer ground, whereas creel fishing for brown crab and lobster would be more likely to target hard ground close to the islands.

Overall it is not anticipated that the proposed deposits will have a significant interaction with fishing activity within the Firth of Forth.

### 3.5 Military Use

The overall AIS dataset identified a number of military vessels transiting the area but with no military vessels coming within 200m of the midpoint of either site. The Inchmickery site is outwith any Practice and Exercise Area (PEXA) whereas the Inchkeith Site is approximately on the boundary of two such PEXA areas, X5613N – Kirkaldy and X5613S – Aberlady. These areas are in use from time to time for practice and exercise by the submarine and surface fleet. These are both large areas and the site is located in an area of relatively shallow water on the



boundary between the two. Given the water depth it appears unlikely that there will be any conflict between the proposed oyster deployment and submarines or the larger surface fleet but there may be the potential for some interaction with smaller high speed craft if using the area. Project vessels will maintain listening watch on channel 16 for PEXA warning broadcasts.

### 3.6 Project vessel movements.

In line with the proposed monitoring plan it is predicted that the project will add a small number of vessel movements to the already significant number of vessel movements taking place in the Firth of Forth. The project is intended to be serviced by local workboat "Conserver" (MMSI: 235009391) or "Seahunter" operated from Granton Harbour by Seahunter Marine Ltd.. Deposit of oysters will take place over a short period of suitable tides during spring/summer and autumn 2024 with up to 5 return trips to each site. Monitoring will take place over the course of the summer and into the autumn with additional placement of oysters in the autumn if required. Over the course of the year it is anticipated that there will be a maximum of 10-15 return boat trips from Granton to each site associated with the project.

### 4.0 Navigational Risk

The section sets out aspects of the proposed project which may have the possibility of presenting a hazard to navigation. It describes the aspect, how navigational hazards may arise and if necessary suggests mitigation.

Risk is assessed by scoring the severity of any impact against the likelihood of any impact to provide a range of scores from 1 to 9. Where a risk score exceeds 4 it is considered that additional mitigation measures are required to reduce the likelihood or severity of the impact. Such mitigation measures are specified in the table below. The residual risk of impact is then presented.

		INCREASING LIKELIHOOD OF NAVIGATIONAL IMPACT (L)		
		1 Unlikely	2 Likely	3 Highly Likely
INCREASING SEVERITY OF NAVIGATIONAL IMPACT (S)	1 Low severity	1	2	3
	2 Medium severity	2	4	6
	3 High level severity	3	6	9

Potential Impact on Navigation Considering worst case scenario with no mitigation	Initial Risk (No Mitigation)			Comment and Mitigation	Residual Risk		
	L	S	R		L	S	R
Physical Presence of Oysters on the seabed. Short Term.	1	1	1	Physical Presence of Oysters on the seabed will not, in the short term (deployment +3 years) result in any risk to navigation. Oysters are likely to spread into a layer c0.1m thick which will not be prominent above existing seabed topography. Low risk of navigational impact. No further mitigation is required.	1	1	1
Physical Presence of Oysters on the seabed. Medium to long term.	1	1	1	In the medium to long term (deployment +3 years onwards) it is hoped that Oysters will become self recruiting with oyster spat settling alongside adult population to form new biogenic reef habitat. At most this will be 0.5m above the seabed and will only be marginally higher than existing seabed topography at each site. Low risk of navigational impact. No mitigation is required.	1	1	1
Vessel contact or entanglement with surface equipment (Impact on Project and Third Party Vessels)	1	1	1	There is no surface equipment proposed for use on the site. Low risk of navigational impact. No mitigation required	1	1	1

Potential Impact on Navigation Considering worst case scenario with no mitigation	Initial Risk (No Mitigation)			Comment and Mitigation	Residual Risk		
	L	S	R		L	S	R
Surface Vessel entanglement with subsurface equipment (Impact on Project and Third Party Vessels during surface navigation)	1	2	2	<p>Subsurface equipment is limited to 4no 15m lengths of biodegradable line per site, with 100 oysters glued onto each line. These will be deployed at the initial deposit and will form the source of oysters for the monitoring of the population.</p> <p>Lines will be weighted/pinned horizontally to the seabed (c5m depth) and checked during monitoring visits. Lines will be removed before the end of the three year licence period sought. Use of non floating biodegradable rope of small diameter and low breaking strength reduces the severity and likelihood of any risk to navigation from surface floating line.</p>	1	1	1
Fishing activity entanglement with subsurface equipment (Fishing vessel activity)	1	2	2	<p>Subsurface equipment is limited to 4no 15m lengths of biodegradable line per site, with 100 oysters glued onto each line. These will be deployed at the initial deposit and will form the source of oysters for the monitoring of the population.</p> <p>Lines will be weighted/pinned horizontally to the seabed (c5m depth) and checked during monitoring visits. Lines will be removed before the end of the three year licence period sought. Use of non floating biodegradable rope of small diameter and low breaking strength reduces the severity and likelihood of any risk to navigation from seabed entanglement with weighted line. Fishing activity in the site areas is assessed as being low. Following determination of Marine Licence the operator will pass site details on to UKHO for inclusion on navigational charts.</p>	1	1	1

Potential Impact on Navigation Considering worst case scenario with no mitigation	Initial Risk (No Mitigation)			Comment and Mitigation	Residual Risk		
	L	S	R		L	S	R
Small vessel mooring entanglement with subsurface equipment (Small vessel users)	1	2	2	<p>Subsurface equipment is limited to 4no 15m lengths of biodegradable line per site, with 100 oysters glued onto each line. These will be deployed at the initial deposit and will form the source of oysters for the monitoring of the population.</p> <p>Lines will be weighted/pinned horizontally to the seabed (c5m depth) and checked during monitoring visits. Lines will be removed before the end of the three year licence period sought. Use of non floating biodegradable rope of small diameter and low breaking strength reduces the severity and likelihood of any risk to navigation from seabed entanglement with weighted line. Small vessel mooring activity on the site is assessed as being low with proximity to recognised mooring areas likely to present more attractive opportunities for mooring</p> <p>Following determination of Marine Licence the operator will pass site details on to UKHO for inclusion on navigational charts.</p>	1	1	1
Navigation of Project Vessel to and from the site interaction with other vessels	1	3	3	<p>Vessel movements when navigating to and from the site fall within the requirements of the International Regulations for Preventing Collisions at Sea (IMO 1972). Whilst collision with other vessels is unlikely and the COLREGS help to reduce this likelihood, the outcome of any collision could be severe.</p> <p>The analysis of AIS data indicates that a significant proportion of the vessel traffic along and across the route to be taken by the project vessels relates to port operations. Project vessels will report movements to Forth Ports on departure and arrival from Granton Harbour</p>	1	3	3

Potential Impact on Navigation Considering worst case scenario with no mitigation	Initial Risk (No Mitigation)			Comment and Mitigation	Residual Risk		
Presence of slow moving vessel during site surface operations	1	3	3	<p>Vessel at slow speed when navigating on each site fall within the requirements of the International Regulations for Preventing Collisions at Sea (IMO 1972). Whilst collision with other vessels is unlikely and the COLREGS help to further reduce this likelihood, the outcome of any collision could be severe.</p> <p>The analysis of AIS data indicates that a significant proportion of the vessel traffic along and across the route to be taken by the project vessels relates to port operations. Project vessels will report movements to Forth Ports on departure and arrival from Granton Harbour</p>	1	3	3
Presence of Stationary / slow moving vessel during diving operations (Project Vessel and Third Party Vessels)	1	3	3	<p>Vessels conduction diving operations at each site fall within the requirements of the International Regulations for Preventing Collisions at Sea (IMO 1972). Collisions between vessels or impact of third party vessels on divers is unlikely but could be severe.</p> <p>During diving operations vessels will fly Alpha Flag advising other vessels to keep a safe distance.</p> <p>The analysis of AIS data indicates that a significant proportion of the vessel traffic close to the sites relates to port operations. Project vessels will report movements to Forth Ports on departure and arrival from Granton Harbour.</p> <p>Diving operation</p>	1	3	3

## Conclusions

The foregoing document sets out the existing level of navigation within the Firth of Forth, additional navigational movements expected as a result of project operations. It is concluded that there is a low risk of any navigational impacts on third party vessels resulting from the deployment of native oysters at two sites in the Firth of Forth. The deposit of oysters and modest seabed monitoring lines will be low in profile and therefore will have negligible impact. Any vessel movements and presence on site will be in-frequent and of short duration and will therefore be of low navigational impact in areas assessed as having relatively low levels of existing vessel movements. Any residual impacts will be mitigated through adherence to COLREGS and licence conditions during vessel operations.

Ends:

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