Technical Note

HaskoningDHV UK Ltd.
Water & Maritime

To:	Marine Directorate
From:	Rachel Greaves
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Copy:	Ian Kerr
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Classification:	Project related
Checked by	Emily Foster

Subject: **Port of Dundee Capital Dredge and Quay Works – Proposed Development Introduction**

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1 Introduction

The purpose of this note is to introduce a suite of works proposed in the Port of Dundee and the Lady Shoal approach channel in the Firth of Tay ('the Proposed Development'). This note sets out the description of the Proposed Development and the approach to the environmental assessment, including a description of the existing data and further surveys proposed. We would like to invite your initial comments.

2 Description of the Proposed Development

One of the primary uses of the Port of Dundee is the service and support of the offshore renewables industry. The port provides facilities for the transhipment and storage of components associated with wind farm projects. Due to the increasing size of the components and vessels used by the offshore renewables industry, the Port of Dundee is proposing to undertake works to accommodate changes in the industry, including potentially deepening a section of the Lady Shoal approach channel.

The Proposed Development would include the following components:

- Deepening of the approaches to DunEco Quay and Prince Charles Wharf (PCW) (**Figure 2-1)**;
- Western extension of the lay-down area (**Figure 2-2**);
- Placement of a rock mattress to limit leg penetration of jack-up vessels (**Figure 2-2**);
- PCW improvement works (**Figure 2-3** and **Figure 2-4**); and
- Deepening of a section of the Lady Shoal approach channel (**Figure 2-5**).

Each of the above elements are independent of each other and therefore could be undertaken in-isolation, all together, or in a variety of combinations, dependant on commercial need. There would be no change to the operations of the port, nor the number of vessels received at the port. The only operational change would be a minor change to maintenance dredging at the PCW and DunEco Quay approach channels.

2.1 Deepening of the approaches to DunEco Quay and PCW

The DunEco Quay approach is proposed to be deepened to -6m Chart Datum (CD) and the PCW approach is proposed to be deepened to -7mCD. From previous sampling, it is considered that the material will be primary sand and silt within the existing maintenance dredge area; however, it is possible that boulder clay may be encountered. This would generate approximately 31,000m^3 and 62,500m^3 of dredged material

respectively, including an overdredge tolerance of 0.3m, that would be disposed of at the existing licenced Middle Deep disposal site. As shown in **Figure 2-1**, the majority of the dredge depth would be approximately 0.5m to 2.5m.

2.2 Western extension of the lay-down area

An area of the Port of Dundee is proposed to be cleared to extend the existing lay down area, with the existing buildings and infrastructure removed. Thereafter, a stone hardstanding surface would be installed, along with new drainage and lighting as required. Any new lighting will be directed downward and away from the Firth of Tay and any other surrounding habitats in order to minimise potential impacts on local ecology and designated sites. Existing outfalls will be retained wherever possible. There are no marine works associated with this element of the works.

2.3 Placement of a rock mattress

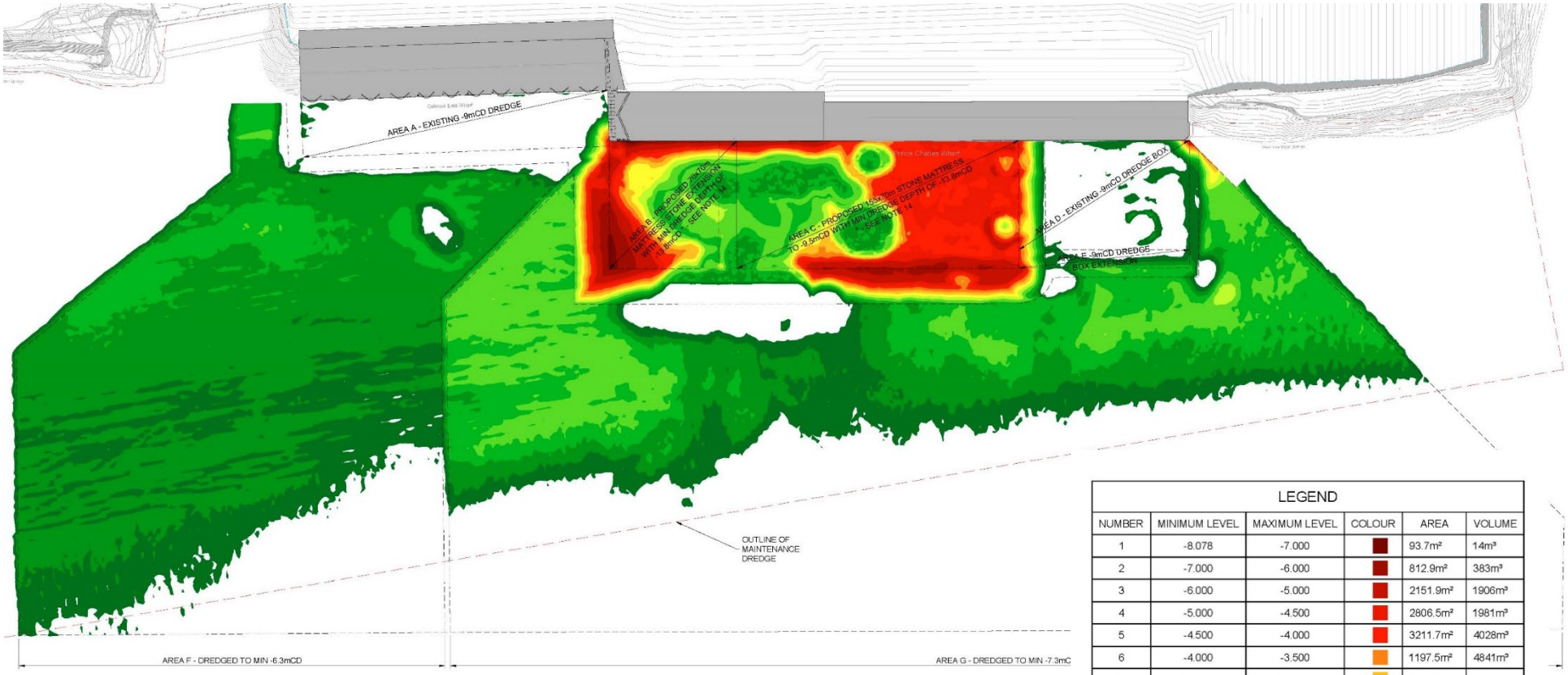
It is proposed to lay a rock mattress in order to limit leg penetration of jack-up vessels berthing at the Port of Dundee. The existing PCW berth pocket would be deepened from -9mCD to -13.5mCD with a 1:3 slope (**Figure 2-2**) and the rock mattress laid to 4m depth. The total dredge volume is estimated to be 54,000m^3 including an overdredge tolerance of 0.3m, to be removed by backhoe dredger and disposed of at the Middle Deep disposal site.

2.4 PCW improvement works

Improvement works are proposed to existing rock revetment and quay. The existing retaining wall to the rear of the quay will be demolished, likely carried out using land-based equipment. Existing fender piles will be extracted and fenders set aside for reuse. A 105m piled wall along the section of the PCW quay (**Figure 2-3**) will be installed replacing the existing. Localised excavation on the seabed may be required to remove any obstructions, using either land-based long reach excavators or dredging equipment as appropriate and fill will be added as required to bring to a level of -10m CD. This can be done in-combination with the placement of the rock mattress. Rock will be placed on top of the existing rock revetment to raise its level and maintain the protection of the quay.

2.5 Deepening of a section of the Lady Shoal approach channel

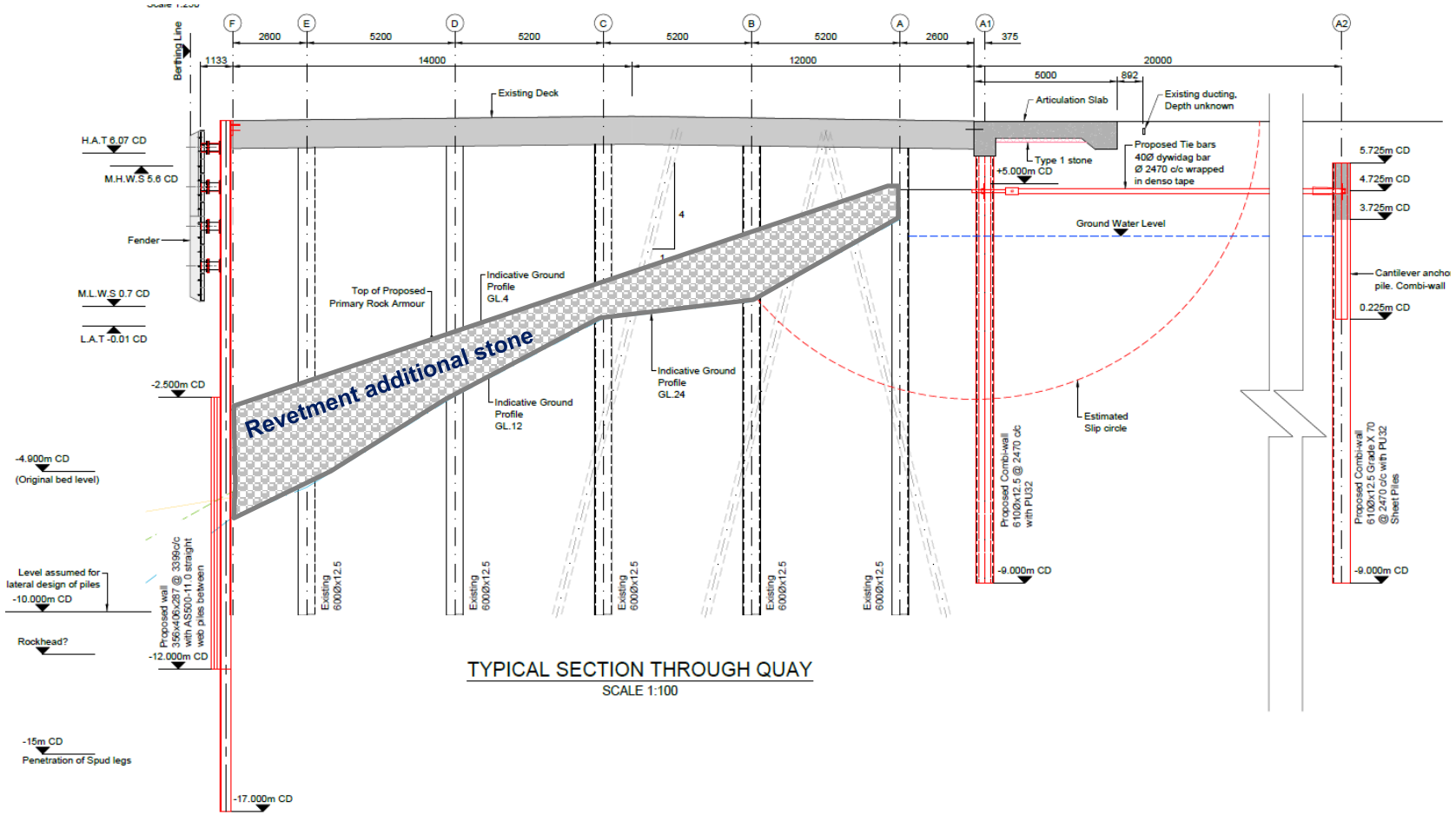
A section of the Lady Shoal approach channel would be dredged, targeting high spots **(Figure 2-5**) to create a uniform depth of -6.5m CD. Dredge depth would mostly be less than 1m and the dredge volume would be approximately 160,000m³, including an overdredge tolerance of 0.3m. Dredging likely be undertaken by a back hoe dredger, with the dredged material being disposed offshore at Middle Deep disposal site. Sediment sampling results show that this material will be predominantly sand with some silt. No maintenance dredging would be needed to maintain the deepened channel, following the capital dredge.



LEGEND					
NUMBER	MINIMUM LEVEL	MAXIMUM LEVEL	COLOUR	AREA	VOLUME
1	-8.078	-7.000		93.7m²	14m³
2	-7.000	-6.000		812.9m²	383m³
3	-6.000	-5.000		2151.9m²	1906m³
4	-5.000	-4.500		2806.5m²	1981m³
5	-4.500	-4.000		3211.7m²	4028m³
6	-4.000	-3.500		1197.5m²	4841m³
7	-3.500	-3.000		1301.1m²	5452m³
8	-3.000	-2.500		1444.5m²	6159m³
9	-2.500	-2.000		1605.1m²	6865m³
10	-2.000	-1.500		14358.8m²	9854m³
11	-1.500	-1.000		20919.0m²	19476m³
12	-1.000	-0.500		40195.2m²	35066m³
13	-0.500	0.000		22984.0m²	51528m³

Figure 2-1 Plan of works at Port of Dundee – areas without colours are at or deeper than dredge depth

Figure 2-2 Proposed western extension of the laydown area (shaded in pink) of at the Port of Dundee



TYPICAL SECTION THROUGH QUAY
SCALE 1:100

Figure 2-3 PCW improvement works (proposed new piles shown in red)

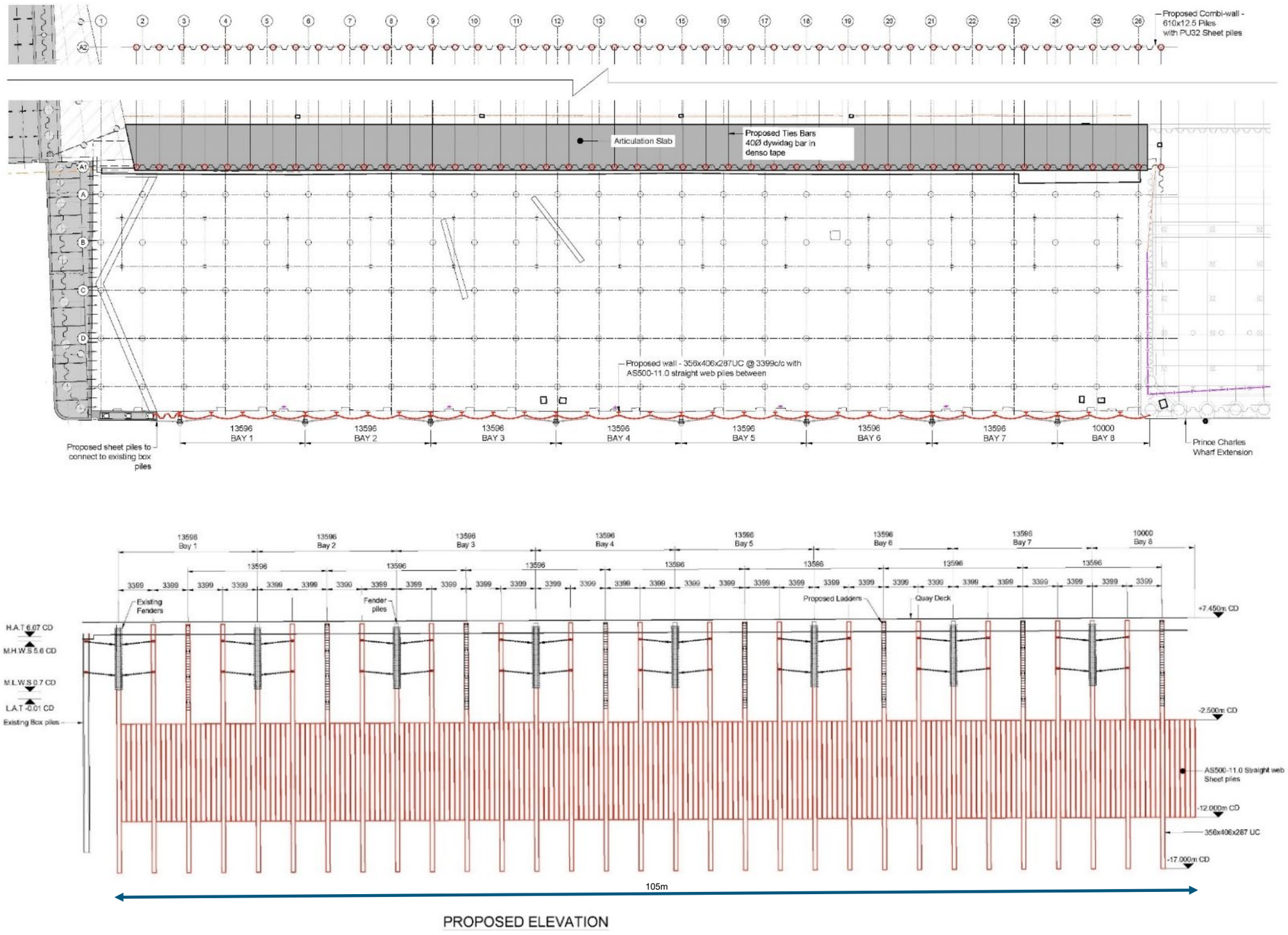


Figure 2-4 PCW quay plan view and front view

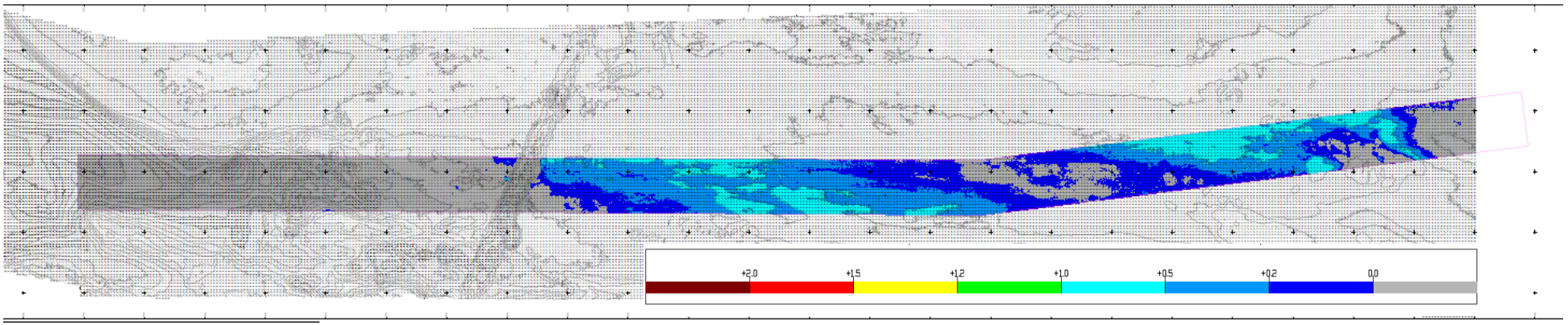


Figure 2-5 Location of Lady Shoal approach channel with depth of dredge shown in meters

3 Data to be used to inform the Habitats Regulations Appraisal (HRA)

3.1 Existing data

Existing data have been gathered and would be used to support and inform the HRA, as shown in **Table 3-1**.

Table 3-1 Existing data

Data	Details
Port of Dundee Bird survey 2024	BSG survey for Proposed Development at Dundee Dock: West Extension, Vantage Point Results Report, April 2024. A copy of this report has been provided with this note. The survey area consisted of a 180 degree viewshed facing south over the Tay Estuary. 12 months of low tide surveys were conducted from April 2023 – March 2024. An additional high tide survey was undertaken between May – August 2023 to capture potential foraging activity for little tern, which are listed as a breeding species on the Firth of Tay and Eden SPA and Ramsar site. The survey area is shown in **Figure 3-1** and covers the majority of the proposed DunEco and PCW dredging and construction works.
Geophysical Data - Lady Shoal	Aspect Multibeam bathymetric survey, Lady Shoal Geophysical Data August 2017. The survey covers the majority of the proposed Lady Shoal dredge area.
Sediment Sampling Lady Shoal Approach Channel	A sediment sampling plan was approved by the Marine Directorate in March 2024 for a sediment survey of the proposed Lady Shoal approach channel dredge.

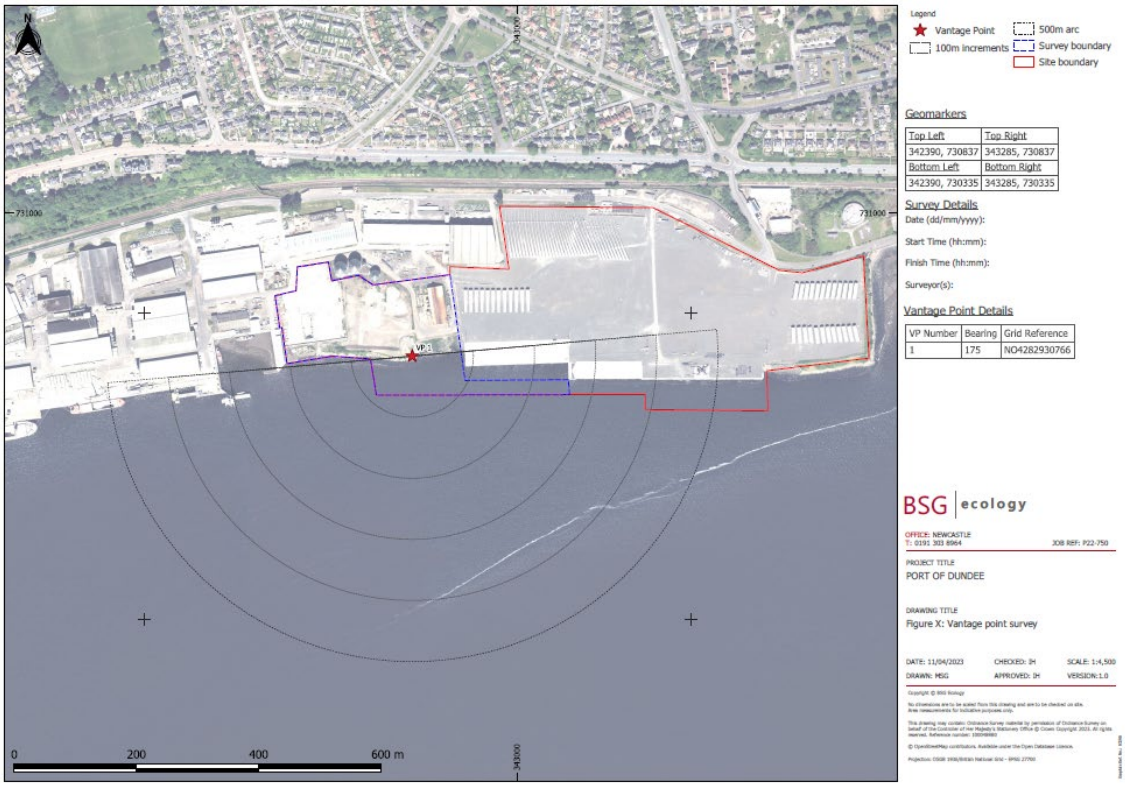


Figure 3-1 Port of Dundee Bird Survey Area 2023/2024

3.2 Further surveys and information

In order to support the marine licence application(s), further surveys are proposed, including a:

- benthic ecology survey of the proposed Lady Shoal approach channel dredge area;
- sediment quality survey from the DunEco Quay and PCW dredge area; and,
- hydrographic survey (using Acoustic Doppler Current Profilers, to collect data on current speeds and direction, turbidity and waves) to calibrate the hydrodynamic model.

Further details on the specifications of the surveys have been provided in **Appendix A** of this note.

In addition, the following numerical modelling studies would be undertaken:

- underwater noise modelling of the proposed dredging and piling works;
- hydrodynamic modelling to predict changes in erosion and accretion patterns, as a result of the Proposed Development; and,
- sediment dispersion modelling to predict increases in suspended sediment concentrations and subsequent deposition of suspended sediment as a result of the proposed dredging and disposal works.

Given that the DunEco Quay and PCW dredge area is within the Port of Dundee's existing maintenance dredge area, and therefore regularly dredged, a benthic ecology survey of this area is not considered necessary.

The number of vessels passing through the Lady Shoal approach channel in 2023 is presented in **Table 3-2**.

Table 3-2 number of vessels passing through the Lady Shoal approach channel in 2023

Vessel type	Movements through Lady Shoal Approach Channel*
Total Vessel calls (vessel calls greater than 40m LOA)	508 (242)
Pilot boat incoming/outgoing	968
Tug in/out	452
Total	**1,928**

* Note, vessel numbers do not include recreational vessels.

Given the level of vessel activity through the Lady Shoal approach channel, it is considered that any birds using the area are habituated to vessel disturbance and have available adjacent areas within the Tay to move into. Furthermore, proposed dredging works would be undertaken by a single back hoe dredger, over an anticipated duration of up to 30 days, which is not considered to result in a significant change in vessel numbers.

As such a bird survey of the proposed Lady Shoal approach channel dredge area is not considered necessary. Information from the proposed benthic ecology survey and modelling studies, as well as available information would be used to inform the HRA.

4 Early consideration of potential impacts on designated sites

4.1 Identification of designated sites

It is considered that the Proposed Development has the potential to effect the following designated sites and associated features:

- Firth of Tay and Eden Estuary Special Area of Conservation (SAC);
    - Estuaries
    - Sandbanks which are slightly covered by sea water all the time
    - Harbour seal
- Outer Firth of Forth and St Andrews Bay Complex Special Protection Area (SPA);
    - Various bird features
- Firth of Tay and Eden Estuary SPA and Ramsar site;
    - Various bird features and criteria
- Isle of May SAC;
    - Grey seal
- Berwickshire and North Northumberland Coast SAC;
    - Grey seal
- Moray Firth SAC
    - Bottlenose dolphin
- River Tay SAC
    - Sea lamprey
    - River Lamprey
    - Atlantic salmon
    - Otter

4.2 Potential impacts of the Proposed Development

There would be no change to the operation of the Port of Dundee as a result of the Proposed Development. As such, potential impacts during operation are limited to changes in coastal processes (i.e. accretion and erosion patterns) as a result of the proposed deepening works, and maintenance dredging of the DunEco Quay and PCW approaches, which already takes place. Given the limited extent of the proposed deepening, in terms of dredge depth, any effects to coastal processes are expected to be very localised to the deepened areas.

Potential construction related impacts are anticipated to arise from:

- visual disturbance from construction related activity and presence of dredging vessel;
- benthic habitat loss within the Lady Shoal dredge area;
- changes to water quality arising from the sediment plume;
- smothering as a result of the deposition of suspended sediment; and,

- airborne and underwater noise.

The proposed dredge to the approaches to the PCW and DunEco Quay is limited to within the footprint of the existing maintenance dredge area; therefore, it is considered that the habitats present within and surrounding are habituated to dredging related impacts. Given this, and with adherence to industry standard best practice measures, it is considered that the proposed works to the Port of Dundee would not result in significant effects to the designated sites.

The dredge area with the Lady Shoal approach channel, while over a large area, is predominantly shallow (less than 1m) and the anticipated dredge volume is relatively low. As no future maintenance dredging of the Lady Shoal approach channel area would be required, benthic habitats that would be lost as a result of the proposed dredge would be able to recolonise the deepened area. The shallow extent of the deepening means that no phase shift in the benthic communities present is anticipated. As such, potential impacts to benthic habitats are considered to be temporary and reversible.

As presented in **Table 3-2**, 1,928 vessels passed through the Lady Shoal approach channel in 2023, not including recreational vessels. The presence of a back-hoe dredger for up to 30 days is not considered to result in a significant change in vessel numbers. Given this, and the fact that any birds present are considered to be habituated to vessel disturbance, significant effects to bird features from disturbance are not anticipated.

These early considerations will be developed further through the HRA process.

5 Next steps

We would like to arrange a meeting to discuss the Proposed Development and to get your comments on the proposed further surveys and the early consideration of potential impacts on designated sites.

Appendix A Survey Specifications

1 Benthic ecology

1.1 Proposed station locations

Existing broadscale habitat mapping in and around the footprint of the proposed Lady Shoal dredge area indicates a variable seabed comprising predominantly circalittoral coarse sediment and sublittoral mussel beds on sediment[1] (see **Figure A1-1**).

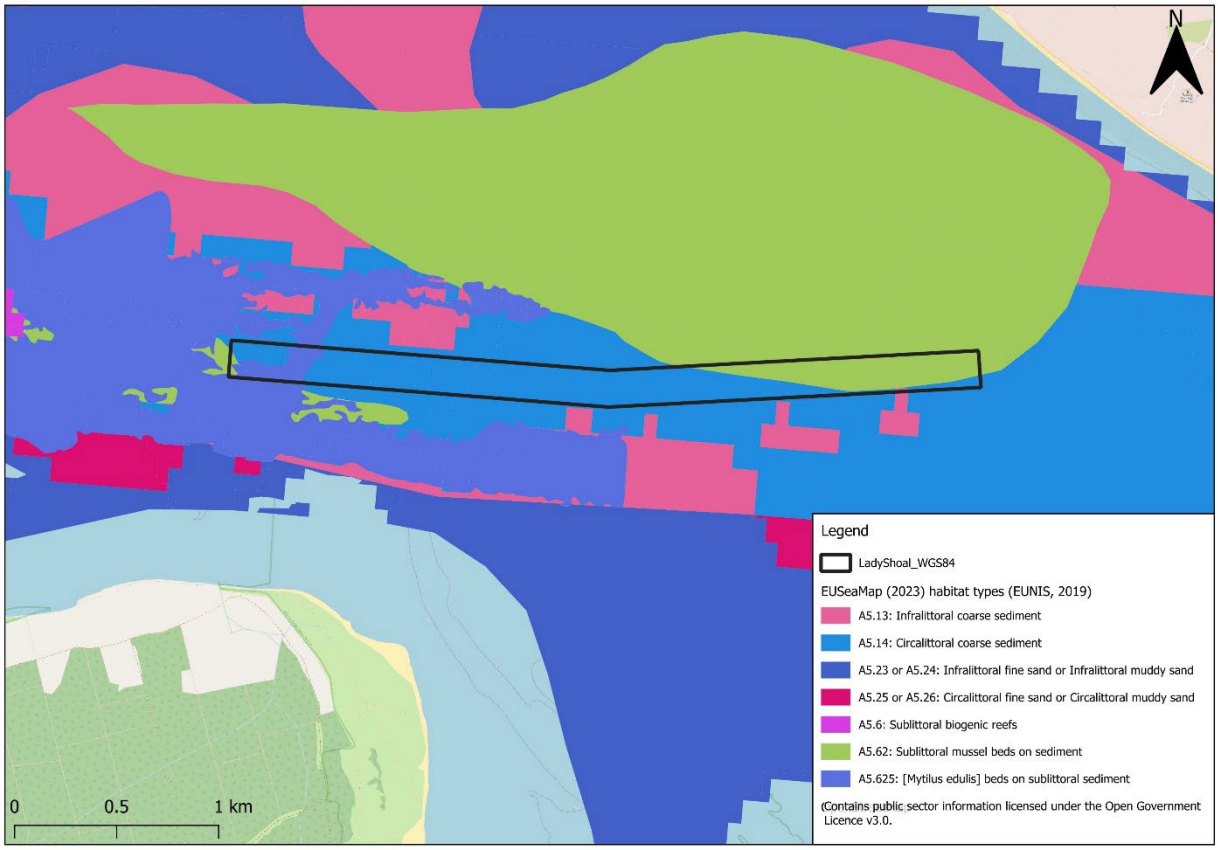


Figure A1-1 Distribution of broadscale habitats in the vicinity of the Proposed Lady Shoal dredge area (taken from EUSeaMap, 2023)

The 2004 Broad scale mapping of habitats in the Firth of Tay and Eden Estuary report (Bates *et al*, 2003) identified large areas of *Flustra foliacea* and other hydroid / bryozoan turf species on slightly scoured circalittoral rock or mixed substrata, and *Mytilus edulis* beds on sublittoral sediment within the proposed Lady Shoal dredge area, along with *Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles in the east of the dredge area.

Given the variability of benthic habitats and the Lady Shoal approach channel dredge, a two-phase approach to the benthic survey is proposed. Phase 1 will comprise 12, 100m or five minute video transects within (six) and outside (six) the proposed dredge area (see **Figure A1-2**). This footage will be reviewed onboard and used to establish appropriate sample station locations to characterise the benthos. Phase 2 will comprise infaunal sampling and Particle Size Analysis (PSA) of 12 sample station locations informed by the results of Phase 1. The coordinates of the proposed video / sample locations are provided in **Table**

[1] https://emodnet.ec.europa.eu/en/euseamap-2021-emodnet-broad-scale-seabed-habitat-map-europe

A1-1, noting the sample numbers and locations have the potential to change depending on the findings of the video transects.

Figure A1-2 Proposed benthic ecology survey station and video transect locations

Table A1-1 Coordinates for proposed station locations

Station	Lat.	Long.
1	56°27'5.13"N	2°48'30.26"W
2	56°27'11.09"N	2°49'52.38"W
3	56°27'14.72"N	2°49'23.43"W
4	56°27'12.85"N	2°48'55.54"W
5	56°27'14.63"N	2°48'10.22"W
6	56°27'12.56"N	2°47'33.63"W
7	56°27'17.18"N	2°46'50.24"W
8	56°27'18.08"N	2°46'12.50"W
9	56°27'20.83"N	2°48'31.81"W
10	56°27'24.10"N	2°46'30.49"W
11	56°27'20.28"N	2°45'35.07"W
12	56°27'11.32"N	2°46'27.13"W

These sampling stations are considered sufficient to characterise the benthic habitats and infaunal communities within the footprint of the proposed dredge area. The stations proposed located around the footprint of the proposed dredge area will provide details of the benthic communities that could potentially be affected by deposition of sediment during dredging.

1.2 Phase 1 - Video transects

Video imagery of epibenthic communities captured via Remote Operated Vehicle or Drop-Down Video (DDV) methods would be used for identifying benthic communities in accordance with the Marine Monitoring Handbook (JNCC, 2001) and the more current Epibiota Remote Monitoring from Digital Imagery: Operational Guidelines (Hitchin *et al*., 2015).

The 12, 100m or five minute video transects, six within the dredge area and six outside (see **Figure A1-2**) will be reviewed onboard and used to establish appropriate sample station locations to characterise the benthos in Phase 2.

A 1080p High Definition (HD) or Ultra HD 4k video camera will be equipped with subsea lights to ensure that the substrate can be adequately illuminated, and the video is of sufficient quality to enable accurate identification. Video quality will be reviewed, and suitability confirmed on-board the vessel.

Identification of the epifauna will be undertaken following the methodology below:

- Epifauna and epiflora will be identified (to the lowest possible taxa) and counted from the video transects, presence / absence of encrusting epifauna species will be noted including incidental observations of non-epifaunal species, such as demersal fish etc; and
- Sediment type will be identified.

Results will be entered into a spreadsheet in a format suitable for analysis and a full taxa list will be produced.

1.3 Phase 2 - Infaunal sampling

Collection of the benthic grab samples would be conducted in-line with best practice guidance (e.g. Marine Monitoring Handbook Procedural Guidance 3-9 (JNCC, 2001)). A 0.1m² Day grab (or similar) would be used for infaunal sampling. To confirm acceptance of the sample, the depth of bite following retrieval would be measured to ensure the sample exceeded 100mm depth. If the sample is rejected, up to three additional attempts would be made at the same station. If no successful samples are achieved after three additional attempts, the station will be rejected from further sampling.

A photo of the undisturbed sample will be taken. A sub-sample would then be taken from the undisturbed surface of the grab sample and retained for PSA. If cobbles (>63 mm) are present in the sample, they will not be included as part of the PSA sub-sample. The remainder of the sample will be placed onto a 0.5mm mesh stainless sieve, photographed and information recorded (i.e. sample volume, visual characteristics of the sediment, presence of anoxia and epifauna, dimensions of cobbles) before being collected in a storage vessel where it will be preserved in formalin. Preserved samples will be transported to a suitable laboratory that adopts the procedures set out in the UK National Marine Biological Analytical Quality Control (NMBAQC[2]) scheme.

Identification of infaunal specimens will be undertaken in the laboratory following the methodology below:

- Samples will be re-sieved over 0.5mm mesh and transferred to 70% alcohol;
- Fauna will be extracted from the sample, identified to the lowest taxonomic level possible and enumerated;
- Results will be entered into a spreadsheet in a format suitable for analysis;

[2] https://www.nmbaqcs.org/

- A photographic reference collection of species identified will be retained;
- Any encrusting epifauna within the samples will be identified, presence/absence noted and also recorded on the spreadsheet;
- Individuals per species and ash-free dry weight biomass will be recorded; and
- A full taxa list will be produced.

1.3.1 Particle size analysis

Subsampling of sediments for PSA is an essential accompaniment to macrofaunal surveys. This allows the macrofaunal data to be accurately referenced against variations in particle size characteristics. The full particle size distribution (at 0.5 phi intervals) will be reported for each sample and sediment type classified for each station.

1.4 Reporting

Habitats at each station will be classified based on infaunal and epifaunal composition, and PSA results. Description of habitats will be based on the EUNIS 2019 classification system, to classification level 5 (biotopes) wherever data allow. The report will include a predicted habitat map of the study area.

Presence of protected features (including taxa / habitats classed as Priority Marine Features in Scotland), invasive non-native species, and indicator species of contaminated or disturbed seabed will be highlighted in the report and significance discussed.

To summarise, the following will be included in the report:

- Detail of the methodology employed, including any limitations encountered, with coordinates of survey locations and other metadata;
- Detail of PSA, providing information on sediment types present at each station (e.g. in line with Folk 1954 classification or similar);
- Multivariate and univariate analysis of infauna community metrics at each station, plus between-station similarities and variability;
- Description of epifauna and epiflora presence in video imagery;
- Mapping of habitat types across the survey area; and
- Detail of any features of conservation interest, invasive non-native species and indicator species.

2 Sediment quality survey

For the combined dredge volume for the deepening of the DunEco Quay approach channel, PCW approach channel and PCW berth is approximately 147,500m³. Eight stations are therefore proposed to be sampled in accordance with MD-LOT's guidance[3]. Sampling stations have been located across the proposed dredge footprint as depicted in **Figure A2-1**.

[3] https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2020/02/marine-licensing-applications-and-guidance/documents/guidance/pre-disposal-sampling-guidance/pre-disposal-sampling-guidance/govscot%3Adocument/Pre-disposal%2Bsampling%2Bguidance.pdf

Figure A2-1 Sediment sampling locations

The coordinates for the eight proposed sampling locations are presented in **Table A2-1**.

Table A2-1 Coordinates for proposed sediment sample locations

Sample station	Lat.	Long.
1	56°27'48.28"N	2°55'47.84"W
2	56°27'49.69"N	2°55'39.10"W
3	56°27'49.95"N	2°55'23.20"W
4	56°27'51.13"N	2°55'9.53"W
5	56°27'53.16"N	2°55'39.90"W
6	56°27'52.67"N	2°55'30.24"W
7	56°27'52.96"N	2°55'19.48"W
8	56°27'48.86"N	2°55'32.54"W

Undisturbed samples will be collected using a vibro-core (or similar equipment). In accordance with the MD-LOT guidance**Error! Bookmark not defined.**, subsamples will be taken from each station at the surface layer (0-0.15m), full-depth (limited by the boulder clay / glacial till level) and at 0.5m intervals between. All subsamples will be retained. Initially, surface, full-depth and one mid-layer subsample from each station will be sent for sediment analysis.

2.1 Sediment analysis

Sediment subsamples collected from the eight stations will be sent for analysis to a laboratory that meets the standard requirements set out within the MD-LOT guidance[Error! Bookmark not defined.]. The laboratory will:

- Have ISO 17025 accreditation for marine sediment analysis;
- Employ analytical methods that meet the limit of detection and sensitivity requirements set out in the Clean Seas Environment Monitoring Programme green book; and
- Take part in intercomparison exercises (e.g. Quality Assurance of Information on Marine Environmental Monitoring in Europe).

The sediment samples will be sent for analysis following MD-LOT's guidance[Error! Bookmark not defined.], including testing for:

- Particle size analysis
- Metals, including
    - Arsenic
    - Cadmium
    - Chromium
    - Copper
    - Mercury
    - Nickel
    - Lead
    - Zinc
- Polyaromatic hydrocarbons (PAHs), including
    - Acenaphthene
    - Acenaphthylene
    - Anthracene
    - Fluorene
    - Naphthalene
    - Phenanthrene
    - Benzo[a]anthracene
    - Benzo[b]fluoranthene
    - Benzo[k]fluoranthene
    - Benzo[a]pyrene
    - Benzo[g,h,i]perylene
    - Dibenzo[a,h]anthracene
    - Chrysene
    - Fluoranthene
    - Pyrene
    - Indeno(1,2,3cd)pyrene
- Total hydrocarbons
- Polychlorinated Biphenyls (PCBs)
- Organotins

In addition, total organic carbon will be included in the analysis.

3 Hydrographic survey

The purpose of this survey is to provide measured baseline tidal currents for calibrating a hydrodynamic model which will be used to predict the effects of deepening the proposed dredge areas and also the effects of the sediment plume and subsequent deposition of suspended sediment. Information on turbidity and waves will also be collected.

3.1 Scope of work

3.1.1 Measurement of currents

Speed and direction of currents shall be measured for 30 days. The data shall be recorded at five-minute intervals (or more frequently) at a vertical interval of 0.5m (or less) from 0.5m above the seabed to 0.5m below the water surface.

3.1.2 Measurement of turbidity

Turbidity profiles shall be measured for a simultaneous period of 30 days. The data shall be recorded at, at least five-minute intervals at a vertical interval of 0.5m (or less) from 0.5m above the seabed to 0.5m below the water surface. Turbidity readings will be converted to suspended sediment concentrations (mg/l), calibrated by taking water samples near to the location of the ADCPs.

3.1.3 Measurement of Waves

Wave data shall be measured for a simultaneous period of 30 days. These data shall include processed wave height, period, direction as well as wave spectrum.

3.2 Methodology

3.2.1 General

The methodology and equipment used for the measurements shall be suitable for the marine environment at the site and capable of collecting data to the specified accuracy. The equipment(s) (with its specifications) to be used shall be provided in the method statement and the equipment(s) shall be properly calibrated before they are used in the measurements. The methodology and the equipment to be used for the work shall be suitable for the marine environment at the site and capable of collecting data to the specified accuracy.

3.2.2 Deployment of Acoustic Doppler Current Profilers

The deployment of Acoustic Doppler Current Profilers (ADCP) shall be at two locations as shown in **Figure A3-1**, and the coordinates presented in **Table A3-1** ADCP Coordinates. ADCP 1 is close to the proposed dredging area at PCW, and ADCP 2 is at the Lady Shoal approach channel dredge.

Figure A3-1 ADCP Locations

Table A3-1 ADCP Coordinates

ADCP	Latitude	Longitude
1	56.462178°N	-2.917656°W
2	56.453871°N	-2.8081105°W

3.2.3 Daily Logs

Daily logs shall be maintained on the measurements including weather conditions and sea state.

3.2.4 Data Accuracy

The acceptable levels of accuracy of the measured data are provided in **Table A3-2**.

Table A3-2 Acceptable levels of accuracy

Parameters	Level of accuracy
Location	±1 metre
Seabed level	±0.1 metre
Current speed	±0.05 m/s
Current direction	±5 degrees
Wave height	±0.1 metre
Wave period	±1 second
Wave direction	±5 degrees

3.2.5 Reporting

The report shall include the methodology, data plots, quality checks and accuracy, and data interpretation. The report shall also include the personnel and equipment used for the measurements an indication of the

accuracy achieved and general notes on the weather conditions and sea states. The report shall present the following:

a) Times-series of the measured currents, turbidity, and waves
b) Current and wave roses
c) Wave spectrum
d) Results from turbidity measurements, water sampling and suspended sediment analyses

4 Environmental considerations

There are a number of internationally designated sites within close proximity to the proposed surveys, as set out in **Table A4-1.**

Table A4-1 Designated sites in proximity to the proposed surveys

Designated site	Distance from Port of Dundee (km)	Distance from Lady Shoal approach channel (km)
Firth of Tay and Eden Estuary Special Area of Conservation (SAC)	0	0
Outer Firth of Forth and St Andrews Bay Complex Special Protection Area (SPA)	0	0
Firth of Tay and Eden Estuary SPA and Ramsar site	2.9	10
Barry Links SAC	7.5	3

Features for which these sites have been designated for are seabirds, marine mammals, fish, and benthic habitats.

As noted above, these sampling works will be undertaken over a period of up to five days, though not necessarily in parallel, between September and December. Due to the existing nature of the site, with large vessels present and travelling through the Firth regularly, it is expected that any seabirds present within the area would be habituated to any potential disturbance. Therefore, it is expected that there would be no significant disturbance to seabirds as a result of the proposed surveys. Furthermore, the presence of a survey vessel is not considered to have the potential to significantly affect marine mammals or fish.

The proposed surveys are within the Firth of Tay and Eden Estuary SAC and may affect areas of mussel beds, which are a Priority Marine Feature. Sediment sampling will be undertaken only within the Port of Dundee's maintenance dredge area so habitats present are not considered to be sensitive to the proposed sampling. With regards to the benthic ecology survey, given the small number of samples required and small volume of material to be removed, a significant impact on the SAC or mussel beds is not anticipated.

All activities will be undertaken in line with best practice.

5 Navigation considerations

While samples would be undertaken in the Lady Shoal approach channel and the approaches to the PCW and DunEco Quay, this will be a short term activity, with a duration of up to five days. In addition, the samples will be collected from a vessel that can move out of the way, if required, with work carried out under the direction of the Harbour Authority. A notice to mariners will be issued by the Harbour Authority prior to the works commencing.

6 References

Bates, C. R., Moore, C. G., Malthus, T., Mair, J. M. & Karpouzli, E. (2004). Broad scale mapping of habitats in the Firth of Tay and Eden Estuary, Scotland. Scottish Natural Heritage Commissioned Report No. 007 (ROAME No. F01AA401D). Available online at: https://www.nature.scot/sites/default/files/2018-07/Publication%202003%20-%20%20SNH%20Commissioned%20Report%207%20-%20Broad%20scale%20mapping%20of%20sub%20littoral%20habitats%20in%20the%20Firth%20of%20Tay%20and%20Eden%20Estuary%2C%20Scotland.pdf

Hitchin, R., Turner, J.A. & Verling, E. (2015) Epibiota Remote Monitoring from Digital Imagery: Operational Guidelines. Available online at: https://www.nmbaqcs.org/media/mirhlqmu/epibiota_operational_guidelines_final.pdf

JNCC (2001) Marine Monitoring Handbook March 2001. Available online at: https://data.jncc.gov.uk/data/ed51e7cc-3ef2-4d4f-bd3c-3d82ba87ad95/marine-monitoring-handbook.pdf

Technical Note

HaskoningDHV UK Ltd.
Water & Maritime

To:	NatureScot
From:	Rachel Greaves
Date:	11 September 2024
Copy:	Ian Kerr
Our reference:	PC6550-RHD-XX-XX-ME-EV-0002
Classification:	Project related
Checked by	Emily Foster

Subject: **Port of Dundee Capital Dredge and Quay Works – Proposed Development Introduction**

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1 Introduction

The purpose of this note is to introduce a suite of works proposed in the Port of Dundee and the Lady Shoal approach channel in the Firth of Tay ('the Proposed Development'). This note sets out the description of the Proposed Development and the approach to the environmental assessment, including a description of the existing data and further surveys proposed. We would like to invite your initial comments.

2 Description of the Proposed Development

One of the primary uses of the Port of Dundee is the service and support of the offshore renewables industry. The port provides facilities for the transhipment and storage of components associated with wind farm projects. Due to the increasing size of the components and vessels used by the offshore renewables industry, the Port of Dundee is proposing to undertake works to accommodate changes in the industry, including potentially deepening a section of the Lady Shoal approach channel.

The Proposed Development would include the following components:

- Deepening of the approaches to DunEco Quay and Prince Charles Wharf (PCW) (**Figure 2-1)**;
- Western extension of the lay-down area (**Figure 2-2**);
- Placement of a rock mattress to limit leg penetration of jack-up vessels (**Figure 2-2**);
- PCW improvement works (**Figure 2-3** and **Figure 2-4**); and
- Deepening of a section of the Lady Shoal approach channel (**Figure 2-5**).

Each of the above elements are independent of each other and therefore could be undertaken in-isolation, all together, or in a variety of combinations, dependant on commercial need. There would be no change to the operations of the port, nor the number of vessels received at the port. The only operational change would be a minor change to maintenance dredging at the PCW and DunEco Quay approach channels.

2.1 Deepening of the approaches to DunEco Quay and PCW

The DunEco Quay approach is proposed to be deepened to -6m Chart Datum (CD) and the PCW approach is proposed to be deepened to -7mCD. From previous sampling, it is considered that the material will be primary sand and silt within the existing maintenance dredge area; however, it is possible that boulder clay may be encountered. This would generate approximately 31,000m^3 and 62,500m^3 of dredged material

respectively, including an overdredge tolerance of 0.3m, that would be disposed of at the existing licenced Middle Deep disposal site. As shown in **Figure 2-1**, the majority of the dredge depth would be approximately 0.5m to 2.5m.

2.2 Western extension of the lay-down area

An area of the Port of Dundee is proposed to be cleared to extend the existing lay down area, with the existing buildings and infrastructure removed. Thereafter, a stone hardstanding surface would be installed, along with new drainage and lighting as required. Any new lighting will be directed downward and away from the Firth of Tay and any other surrounding habitats in order to minimise potential impacts on local ecology and designated sites. Existing outfalls will be retained wherever possible. There are no marine works associated with this element of the works.

2.3 Placement of a rock mattress

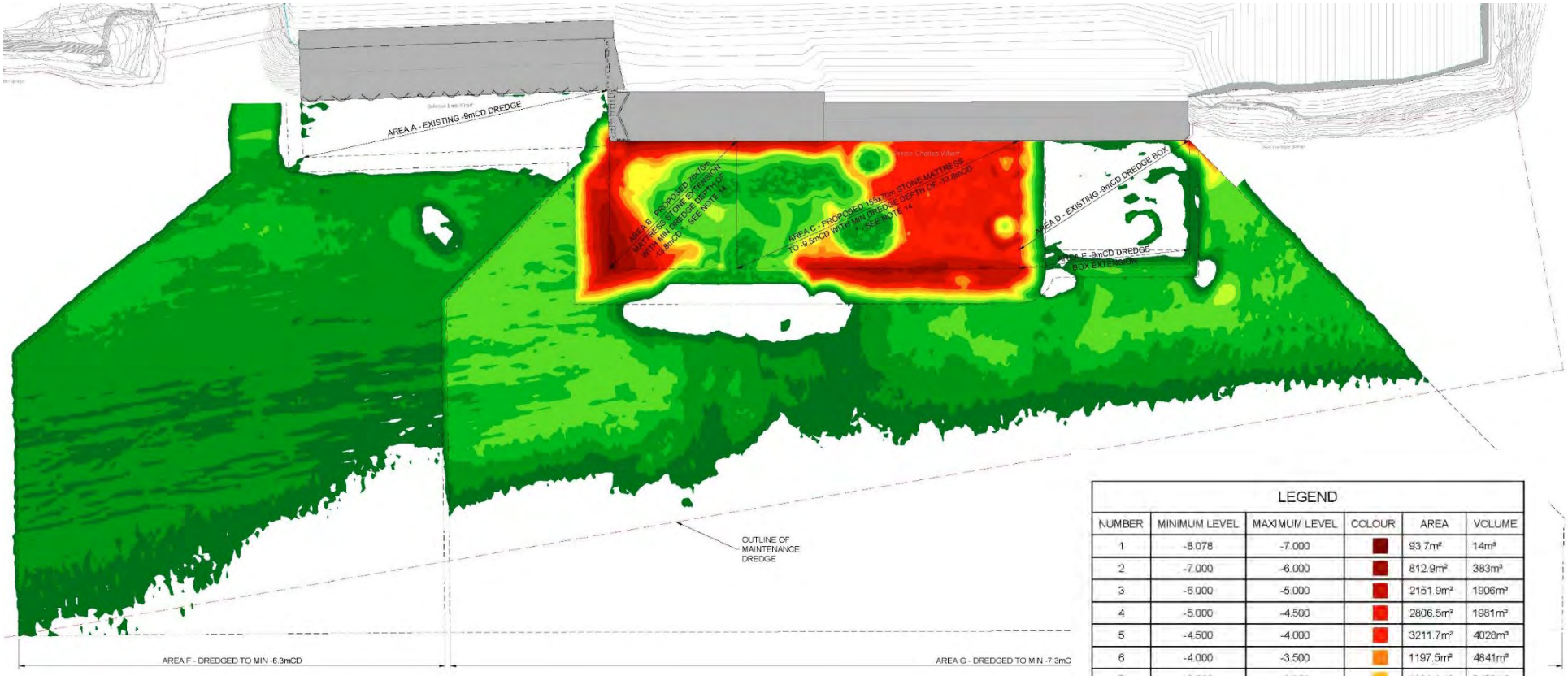
It is proposed to lay a rock mattress in order to limit leg penetration of jack-up vessels berthing at the Port of Dundee. The existing PCW berth pocket would be deepened from -9mCD to -13.5mCD with a 1:3 slope (**Figure 2-2**) and the rock mattress laid to 4m depth. The total dredge volume is estimated to be 54,000m^3 including an overdredge tolerance of 0.3m, to be removed by backhoe dredger and disposed of at the Middle Deep disposal site.

2.4 PCW improvement works

Improvement works are proposed to existing rock revetment and quay. The existing retaining wall to the rear of the quay will be demolished, likely carried out using land-based equipment. Existing fender piles will be extracted and fenders set aside for reuse. A 105m piled wall along the section of the PCW quay (**Figure 2-3**) will be installed replacing the existing. Localised excavation on the seabed may be required to remove any obstructions, using either land-based long reach excavators or dredging equipment as appropriate and fill will be added as required to bring to a level of -10m CD. This can be done in-combination with the placement of the rock mattress. Rock will be placed on top of the existing rock revetment to raise its level and maintain the protection of the quay.

2.5 Deepening of a section of the Lady Shoal approach channel

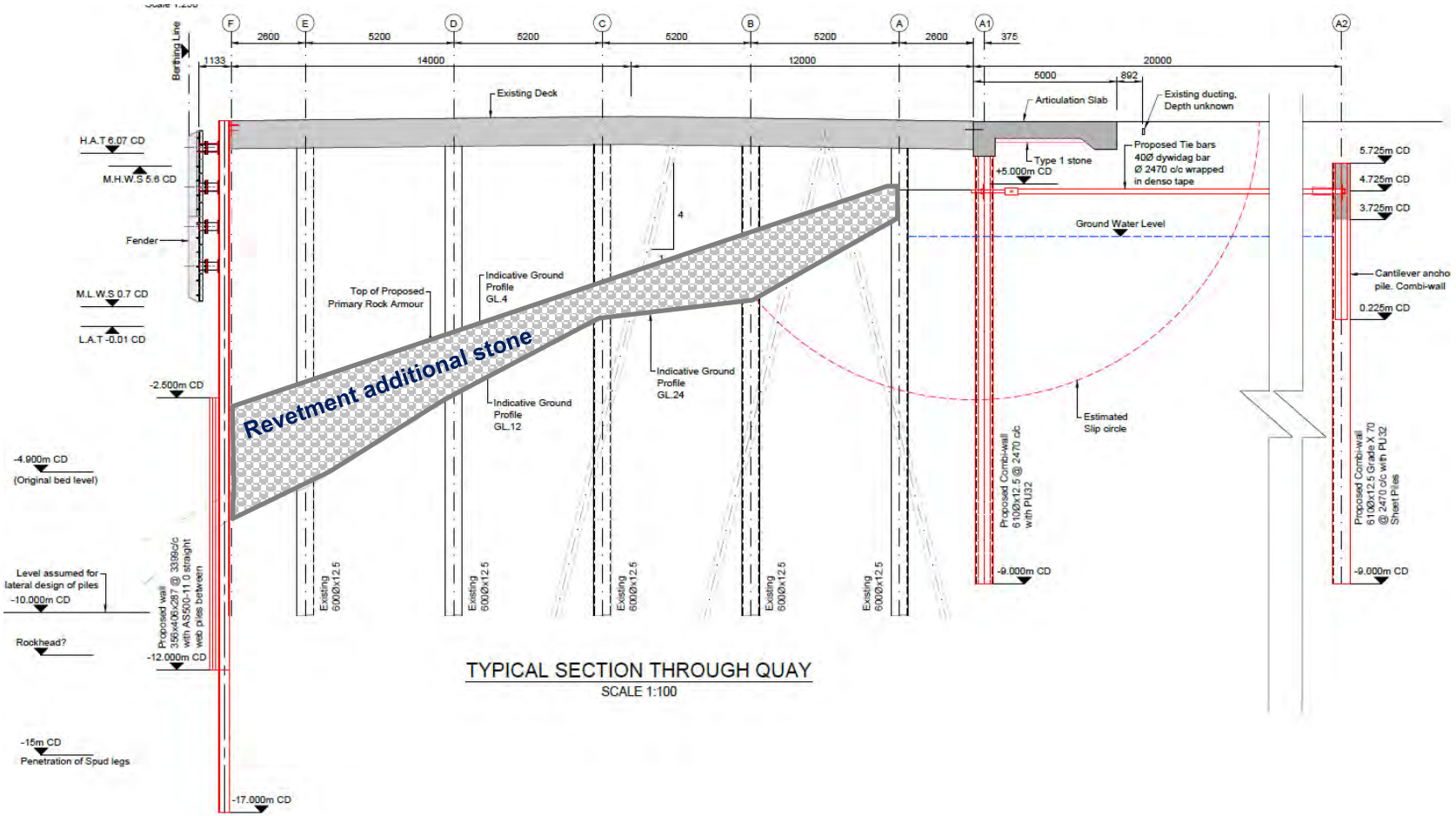
A section of the Lady Shoal approach channel would be dredged, targeting high spots **(Figure 2-5**) to create a uniform depth of -6.5m CD. Dredge depth would mostly be less than 1m and the dredge volume would be approximately 160,000m³, including an overdredge tolerance of 0.3m. Dredging likely be undertaken by a back hoe dredger, with the dredged material being disposed offshore at Middle Deep disposal site. Sediment sampling results show that this material will be predominantly sand with some silt. No maintenance dredging would be needed to maintain the deepened channel, following the capital dredge.



LEGEND					
NUMBER	MINIMUM LEVEL	MAXIMUM LEVEL	COLOUR	AREA	VOLUME
1	-8.078	-7.000		93.7m²	14m³
2	-7.000	-6.000		812.9m²	383m³
3	-6.000	-5.000		2151.9m²	1906m³
4	-5.000	-4.500		2806.5m²	1981m³
5	-4.500	-4.000		3211.7m²	4028m³
6	-4.000	-3.500		1197.5m²	4841m³
7	-3.500	-3.000		1301.1m²	5452m³
8	-3.000	-2.500		1444.5m²	6159m³
9	-2.500	-2.000		1605.1m²	6865m³
10	-2.000	-1.500		14358.8m²	9854m³
11	-1.500	-1.000		20919.0m²	19476m³
12	-1.000	-0.500		40195.2m²	35066m³
13	-0.500	0.000		22984.0m²	51528m³

Figure 2-1 Plan of works at Port of Dundee – areas without colours are at or deeper than dredge depth

Figure 2-2 Proposed western extension of the laydown area (shaded in pink) of at the Port of Dundee



TYPICAL SECTION THROUGH QUAY
SCALE 1:100

Figure 2-3 PCW improvement works (proposed new piles shown in red)

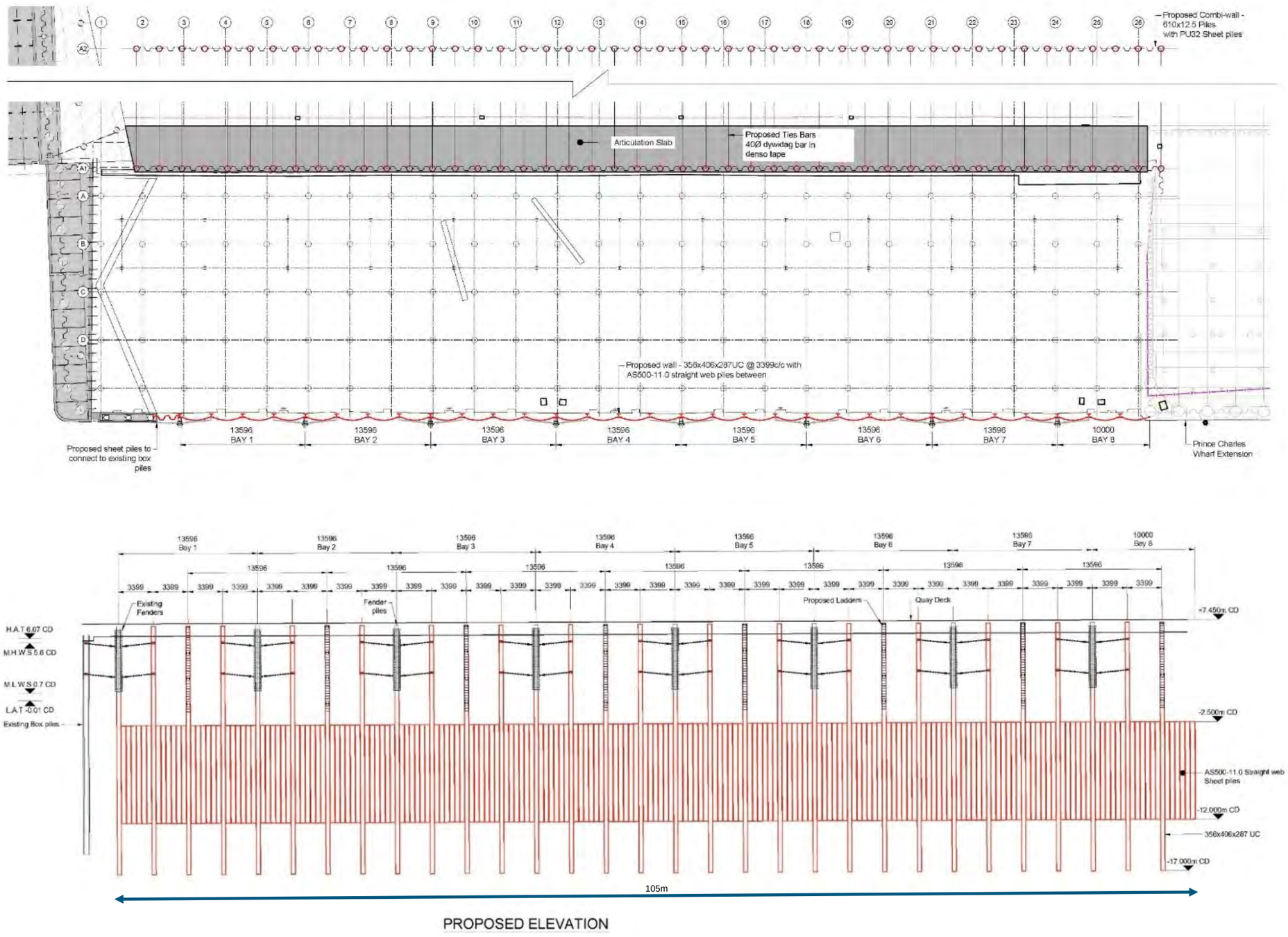


Figure 2-4 PCW quay plan view and front view

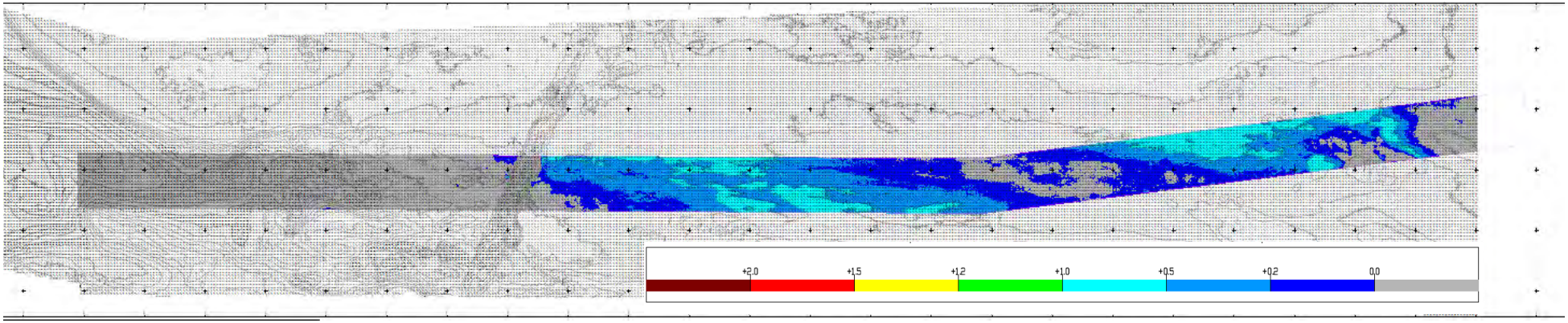


Figure 2-5 Location of Lady Shoal approach channel with depth of dredge shown in meters

3 Data to be used to inform the Habitats Regulations Appraisal (HRA)

3.1 Existing data

Existing data have been gathered and would be used to support and inform the HRA, as shown in **Table 3-1**.

Table 3-1 Existing data

Data	Details
Port of Dundee Bird survey 2024	BSG survey for Proposed Development at Dundee Dock: West Extension, Vantage Point Results Report, April 2024. A copy of this report has been provided with this note. The survey area consisted of a 180 degree viewshed facing south over the Tay Estuary. 12 months of low tide surveys were conducted from April 2023 – March 2024. An additional high tide survey was undertaken between May – August 2023 to capture potential foraging activity for little tern, which are listed as a breeding species on the Firth of Tay and Eden SPA and Ramsar site. The survey area is shown in **Figure 3-1** and covers the majority of the proposed DunEco and PCW dredging and construction works.
Geophysical Data - Lady Shoal	Aspect Multibeam bathymetric survey, Lady Shoal Geophysical Data August 2017. The survey covers the majority of the proposed Lady Shoal dredge area.
Sediment Sampling Lady Shoal Approach Channel	A sediment sampling plan was approved by the Marine Directorate in March 2024 for a sediment survey of the proposed Lady Shoal approach channel dredge.

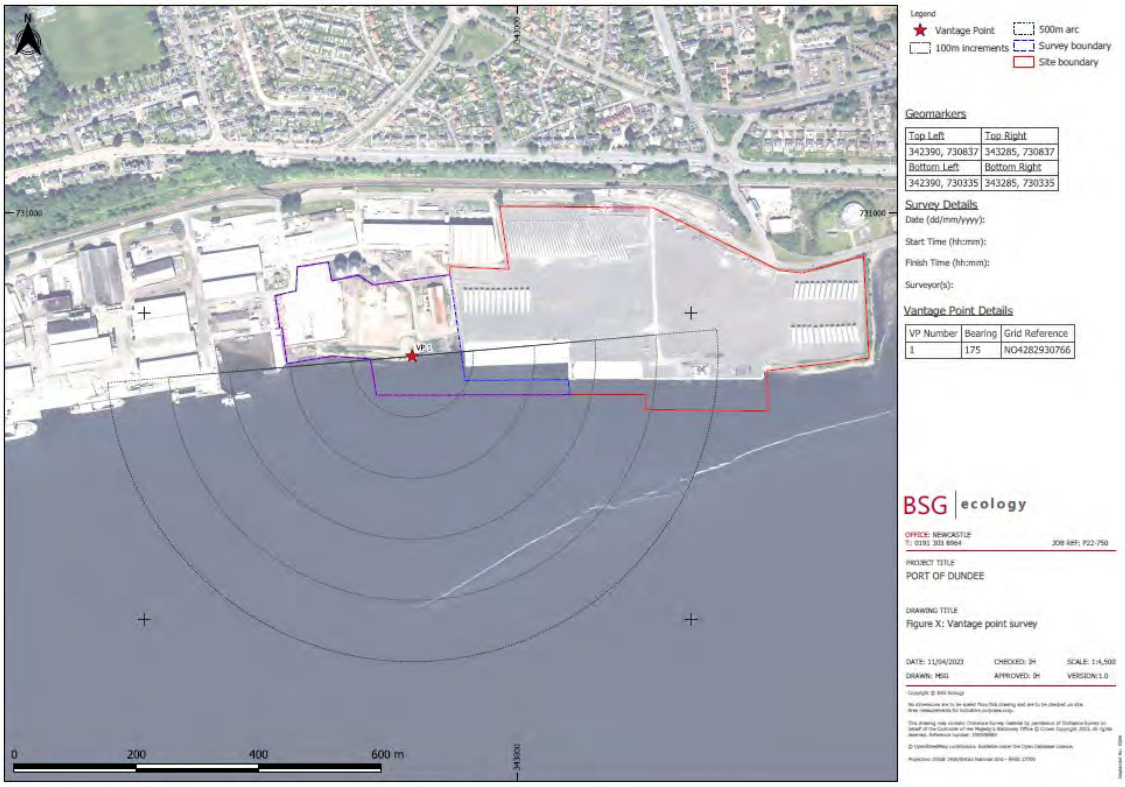


Figure 3-1 Port of Dundee Bird Survey Area 2023/2024

3.2 Further surveys and information

In order to support the marine licence application(s), further surveys are proposed, including a:

- benthic ecology survey of the proposed Lady Shoal approach channel dredge area;
- sediment quality survey from the DunEco Quay and PCW dredge area; and,
- hydrographic survey (using Acoustic Doppler Current Profilers, to collect data on current speeds and direction, turbidity and waves) to calibrate the hydrodynamic model.

Further details on the specifications of the surveys have been provided in **Appendix A** of this note.

In addition, the following numerical modelling studies would be undertaken:

- underwater noise modelling of the proposed dredging and piling works;
- hydrodynamic modelling to predict changes in erosion and accretion patterns, as a result of the Proposed Development; and,
- sediment dispersion modelling to predict increases in suspended sediment concentrations and subsequent deposition of suspended sediment as a result of the proposed dredging and disposal works.

Given that the DunEco Quay and PCW dredge area is within the Port of Dundee's existing maintenance dredge area, and therefore regularly dredged, a benthic ecology survey of this area is not considered necessary.

The number of vessels passing through the Lady Shoal approach channel in 2023 is presented in **Table 3-2**.

Table 3-2 number of vessels passing through the Lady Shoal approach channel in 2023

Vessel type	Movements through Lady Shoal Approach Channel*
Total Vessel calls (vessel calls greater than 40m LOA)	508 (242)
Pilot boat incoming/outgoing	968
Tug in/out	452
Total	**1,928**

* Note, vessel numbers do not include recreational vessels.

Given the level of vessel activity through the Lady Shoal approach channel, it is considered that any birds using the area are habituated to vessel disturbance and have available adjacent areas within the Tay to move into. Furthermore, proposed dredging works would be undertaken by a single back hoe dredger, over an anticipated duration of up to 30 days, which is not considered to result in a significant change in vessel numbers.

As such a bird survey of the proposed Lady Shoal approach channel dredge area is not considered necessary. Information from the proposed benthic ecology survey and modelling studies, as well as available information would be used to inform the HRA.

4 Early consideration of potential impacts on designated sites

4.1 Identification of designated sites

It is considered that the Proposed Development has the potential to effect the following designated sites and associated features:

- Firth of Tay and Eden Estuary Special Area of Conservation (SAC);
    - Estuaries
    - Sandbanks which are slightly covered by sea water all the time
    - Harbour seal
- Outer Firth of Forth and St Andrews Bay Complex Special Protection Area (SPA);
    - Various bird features
- Firth of Tay and Eden Estuary SPA and Ramsar site;
    - Various bird features and criteria
- Isle of May SAC;
    - Grey seal
- Berwickshire and North Northumberland Coast SAC;
    - Grey seal
- Moray Firth SAC
    - Bottlenose dolphin
- River Tay SAC
    - Sea lamprey
    - River Lamprey
    - Atlantic salmon
    - Otter

4.2 Potential impacts of the Proposed Development

There would be no change to the operation of the Port of Dundee as a result of the Proposed Development. As such, potential impacts during operation are limited to changes in coastal processes (i.e. accretion and erosion patterns) as a result of the proposed deepening works, and maintenance dredging of the DunEco Quay and PCW approaches, which already takes place. Given the limited extent of the proposed deepening, in terms of dredge depth, any effects to coastal processes are expected to be very localised to the deepened areas.

Potential construction related impacts are anticipated to arise from:

- visual disturbance from construction related activity and presence of dredging vessel;
- benthic habitat loss within the Lady Shoal dredge area;
- changes to water quality arising from the sediment plume;
- smothering as a result of the deposition of suspended sediment; and,

- airborne and underwater noise.

The proposed dredge to the approaches to the PCW and DunEco Quay is limited to within the footprint of the existing maintenance dredge area; therefore, it is considered that the habitats present within and surrounding are habituated to dredging related impacts. Given this, and with adherence to industry standard best practice measures, it is considered that the proposed works to the Port of Dundee would not result in significant effects to the designated sites.

The dredge area with the Lady Shoal approach channel, while over a large area, is predominantly shallow (less than 1m) and the anticipated dredge volume is relatively low. As no future maintenance dredging of the Lady Shoal approach channel area would be required, benthic habitats that would be lost as a result of the proposed dredge would be able to recolonise the deepened area. The shallow extent of the deepening means that no phase shift in the benthic communities present is anticipated. As such, potential impacts to benthic habitats are considered to be temporary and reversible.

As presented in **Table 3-2**, 1,928 vessels passed through the Lady Shoal approach channel in 2023, not including recreational vessels. The presence of a back-hoe dredger for up to 30 days is not considered to result in a significant change in vessel numbers. Given this, and the fact that any birds present are considered to be habituated to vessel disturbance, significant effects to bird features from disturbance are not anticipated.

These early considerations will be developed further through the HRA process.

5 Next steps

We would like to arrange a meeting to discuss the Proposed Development and to get your comments on the proposed further surveys and the early consideration of potential impacts on designated sites.

Appendix A Survey Specifications

1 Benthic ecology

1.1 Proposed station locations

Existing broadscale habitat mapping in and around the footprint of the proposed Lady Shoal dredge area indicates a variable seabed comprising predominantly circalittoral coarse sediment and sublittoral mussel beds on sediment[1] (see **Figure A1-1**).

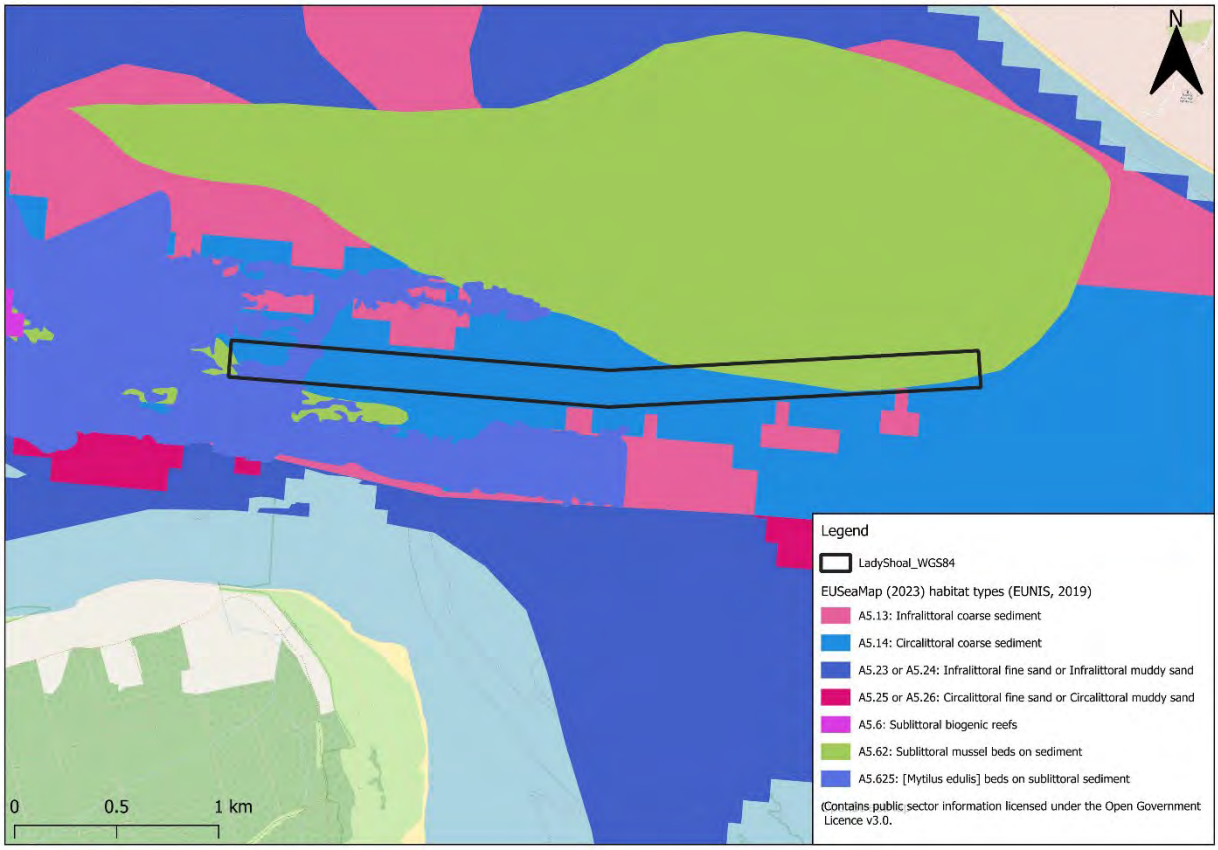


Figure A1-1 Distribution of broadscale habitats in the vicinity of the Proposed Lady Shoal dredge area (taken from EUSeaMap, 2023)

The 2004 Broad scale mapping of habitats in the Firth of Tay and Eden Estuary report (Bates *et al*, 2003) identified large areas of *Flustra foliacea* and other hydroid / bryozoan turf species on slightly scoured circalittoral rock or mixed substrata, and *Mytilus edulis* beds on sublittoral sediment within the proposed Lady Shoal dredge area, along with *Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles in the east of the dredge area.

Given the variability of benthic habitats and the Lady Shoal approach channel dredge, a two-phase approach to the benthic survey is proposed. Phase 1 will comprise 12, 100m or five minute video transects within (eight) and outside (six) the proposed dredge area (see **Figure A1-2**). This footage will be reviewed onboard and used to establish appropriate sample station locations to characterise the benthos. Phase 2 will comprise infaunal sampling and Particle Size Analysis (PSA) of 12 sample station locations informed by the results of Phase 1. The coordinates of the proposed video / sample locations are provided in **Table**

[1] https://emodnet.ec.europa.eu/en/euseamap-2021-emodnet-broad-scale-seabed-habitat-map-europe

A1-1, noting the sample numbers and locations have the potential to change depending on the findings of the video transects.

Figure A1-2 Proposed benthic ecology survey station and video transect locations

Table A1-1 Coordinates for proposed station locations

Station	Lat.	Long.
1	56°27'5.13"N	2°48'30.26"W
2	56°27'11.09"N	2°49'52.38"W
3	56°27'14.72"N	2°49'23.43"W
4	56°27'12.85"N	2°48'55.54"W
5	56°27'14.63"N	2°48'10.22"W
6	56°27'12.56"N	2°47'33.63"W
7	56°27'17.18"N	2°46'50.24"W
8	56°27'18.08"N	2°46'12.50"W
9	56°27'20.83"N	2°48'31.81"W
10	56°27'24.10"N	2°46'30.49"W
11	56°27'20.28"N	2°45'35.07"W
12	56°27'11.32"N	2°46'27.13"W

These sampling stations are considered sufficient to characterise the benthic habitats and infaunal communities within the footprint of the proposed dredge area. The stations proposed located around the footprint of the proposed dredge area will provide details of the benthic communities that could potentially be affected by deposition of sediment during dredging.

1.2 Phase 1 - Video transects

Video imagery of epibenthic communities captured via Remote Operated Vehicle or Drop-Down Video (DDV) methods would be used for identifying benthic communities in accordance with the Marine Monitoring Handbook (JNCC, 2001) and the more current Epibiota Remote Monitoring from Digital Imagery: Operational Guidelines (Hitchin *et al*., 2015).

The 12, 100m or five minute video transects, eight within the dredge area and six outside (see **Figure A1-2**) will be reviewed onboard and used to establish appropriate sample station locations to characterise the benthos in Phase 2.

A 1080p High Definition (HD) or Ultra HD 4k video camera will be equipped with subsea lights to ensure that the substrate can be adequately illuminated, and the video is of sufficient quality to enable accurate identification. Video quality will be reviewed, and suitability confirmed on-board the vessel.

Identification of the epifauna will be undertaken following the methodology below:

- Epifauna and epiflora will be identified (to the lowest possible taxa) and counted from the video transects, presence / absence of encrusting epifauna species will be noted including incidental observations of non-epifaunal species, such as demersal fish etc; and
- Sediment type will be identified.

Results will be entered into a spreadsheet in a format suitable for analysis and a full taxa list will be produced.

1.3 Phase 2 - Infaunal sampling

Collection of the benthic grab samples would be conducted in-line with best practice guidance (e.g. Marine Monitoring Handbook Procedural Guidance 3-9 (JNCC, 2001)). A 0.1m² Day grab (or similar) would be used for infaunal sampling. To confirm acceptance of the sample, the depth of bite following retrieval would be measured to ensure the sample exceeded 100mm depth. If the sample is rejected, up to three additional attempts would be made at the same station. If no successful samples are achieved after three additional attempts, the station will be rejected from further sampling.

A photo of the undisturbed sample will be taken. A sub-sample would then be taken from the undisturbed surface of the grab sample and retained for PSA. If cobbles (>63 mm) are present in the sample, they will not be included as part of the PSA sub-sample. The remainder of the sample will be placed onto a 0.5mm mesh stainless sieve, photographed and information recorded (i.e. sample volume, visual characteristics of the sediment, presence of anoxia and epifauna, dimensions of cobbles) before being collected in a storage vessel where it will be preserved in formalin. Preserved samples will be transported to a suitable laboratory that adopts the procedures set out in the UK National Marine Biological Analytical Quality Control (NMBAQC[2]) scheme.

Identification of infaunal specimens will be undertaken in the laboratory following the methodology below:

- Samples will be re-sieved over 0.5mm mesh and transferred to 70% alcohol;
- Fauna will be extracted from the sample, identified to the lowest taxonomic level possible and enumerated;
- Results will be entered into a spreadsheet in a format suitable for analysis;

[2] https://www.nmbaqcs.org/

- A photographic reference collection of species identified will be retained;
- Any encrusting epifauna within the samples will be identified, presence/absence noted and also recorded on the spreadsheet;
- Individuals per species and ash-free dry weight biomass will be recorded; and
- A full taxa list will be produced.

1.3.1 Particle size analysis

Subsampling of sediments for PSA is an essential accompaniment to macrofaunal surveys. This allows the macrofaunal data to be accurately referenced against variations in particle size characteristics. The full particle size distribution (at 0.5 phi intervals) will be reported for each sample and sediment type classified for each station.

1.4 Reporting

Habitats at each station will be classified based on infaunal and epifaunal composition, and PSA results. Description of habitats will be based on the EUNIS 2019 classification system, to classification level 5 (biotopes) wherever data allow. The report will include a predicted habitat map of the study area.

Presence of protected features (including taxa / habitats classed as Priority Marine Features in Scotland), invasive non-native species, and indicator species of contaminated or disturbed seabed will be highlighted in the report and significance discussed.

To summarise, the following will be included in the report:

- Detail of the methodology employed, including any limitations encountered, with coordinates of survey locations and other metadata;
- Detail of PSA, providing information on sediment types present at each station (e.g. in line with Folk 1954 classification or similar);
- Multivariate and univariate analysis of infauna community metrics at each station, plus between-station similarities and variability;
- Description of epifauna and epiflora presence in video imagery;
- Mapping of habitat types across the survey area; and
- Detail of any features of conservation interest, invasive non-native species and indicator species.

2 Sediment quality survey

For the combined dredge volume for the deepening of the DunEco Quay approach channel, PCW approach channel and PCW berth is approximately 147,500m³. Eight stations are therefore proposed to be sampled in accordance with MD-LOT's guidance[3]. Sampling stations have been located across the proposed dredge footprint as depicted in **Figure A2-1**.

[3] https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2020/02/marine-licensing-applications-and-guidance/documents/guidance/pre-disposal-sampling-guidance/pre-disposal-sampling-guidance/govscot%3Adocument/Pre-disposal%2Bsampling%2Bguidance.pdf

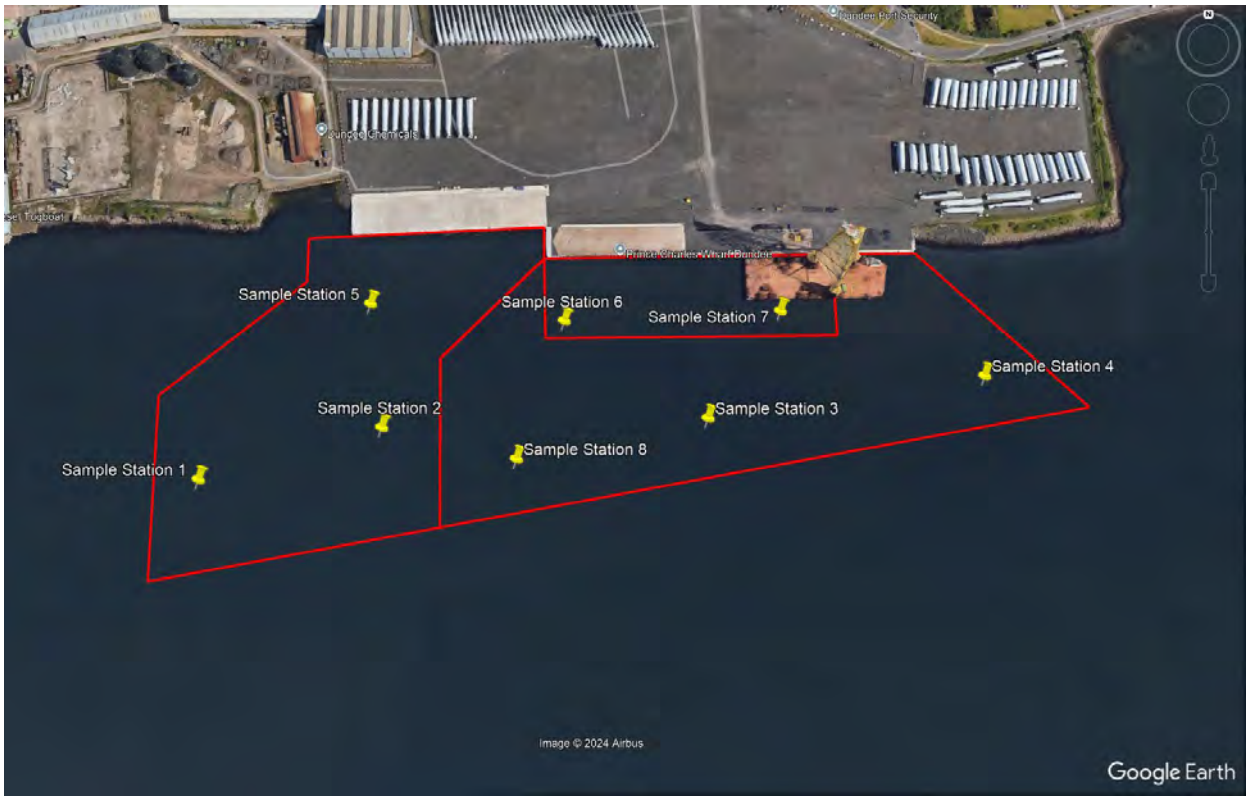


Figure A2-1 Sediment sampling locations

The coordinates for the eight proposed sampling locations are presented in **Table A2-1**.

Table A2-1 Coordinates for proposed sediment sample locations

Sample station	Lat.	Long.
1	56°27'48.28"N	2°55'47.84"W
2	56°27'49.69"N	2°55'39.10"W
3	56°27'49.95"N	2°55'23.20"W
4	56°27'51.13"N	2°55'9.53"W
5	56°27'53.16"N	2°55'39.90"W
6	56°27'52.67"N	2°55'30.24"W
7	56°27'52.96"N	2°55'19.48"W
8	56°27'48.86"N	2°55'32.54"W

Undisturbed samples will be collected using a vibro-core (or similar equipment). In accordance with the MD-LOT guidance**Error! Bookmark not defined.**, subsamples will be taken from each station at the surface layer (0-0.15m), full-depth (limited by the boulder clay / glacial till level) and at 0.5m intervals between. All subsamples will be retained. Initially, surface, full-depth and one mid-layer subsample from each station will be sent for sediment analysis.

2.1 Sediment analysis

Sediment subsamples collected from the eight stations will be sent for analysis to a laboratory that meets the standard requirements set out within the MD-LOT guidance[Error! Bookmark not defined.]. The laboratory will:

- Have ISO 17025 accreditation for marine sediment analysis;
- Employ analytical methods that meet the limit of detection and sensitivity requirements set out in the Clean Seas Environment Monitoring Programme green book; and
- Take part in intercomparison exercises (e.g. Quality Assurance of Information on Marine Environmental Monitoring in Europe).

The sediment samples will be sent for analysis following MD-LOT's guidance[Error! Bookmark not defined.], including testing for:

- Particle size analysis
- Metals, including
    - Arsenic
    - Cadmium
    - Chromium
    - Copper
    - Mercury
    - Nickel
    - Lead
    - Zinc
- Polyaromatic hydrocarbons (PAHs), including
    - Acenaphthene
    - Acenaphthylene
    - Anthracene
    - Fluorene
    - Naphthalene
    - Phenanthrene
    - Benzo[a]anthracene
    - Benzo[b]fluoranthene
    - Benzo[k]fluoranthene
    - Benzo[a]pyrene
    - Benzo[g,h,i]perylene
    - Dibenzo[a,h]anthracene
    - Chrysene
    - Fluoranthene
    - Pyrene
    - Indeno(1,2,3cd)pyrene
- Total hydrocarbons
- Polychlorinated Biphenyls (PCBs)
- Organotins

In addition, total organic carbon will be included in the analysis.

3 Hydrographic survey

The purpose of this survey is to provide measured baseline tidal currents for calibrating a hydrodynamic model which will be used to predict the effects of deepening the proposed dredge areas and also the effects of the sediment plume and subsequent deposition of suspended sediment. Information on turbidity and waves will also be collected.

3.1 Scope of work

3.1.1 Measurement of currents

Speed and direction of currents shall be measured for 30 days. The data shall be recorded at five-minute intervals (or more frequently) at a vertical interval of 0.5m (or less) from 0.5m above the seabed to 0.5m below the water surface.

3.1.2 Measurement of turbidity

Turbidity profiles shall be measured for a simultaneous period of 30 days. The data shall be recorded at, at least five-minute intervals at a vertical interval of 0.5m (or less) from 0.5m above the seabed to 0.5m below the water surface. Turbidity readings will be converted to suspended sediment concentrations (mg/l), calibrated by taking water samples near to the location of the ADCPs.

3.1.3 Measurement of Waves

Wave data shall be measured for a simultaneous period of 30 days. These data shall include processed wave height, period, direction as well as wave spectrum.

3.2 Methodology

3.2.1 General

The methodology and equipment used for the measurements shall be suitable for the marine environment at the site and capable of collecting data to the specified accuracy. The equipment(s) (with its specifications) to be used shall be provided in the method statement and the equipment(s) shall be properly calibrated before they are used in the measurements. The methodology and the equipment to be used for the work shall be suitable for the marine environment at the site and capable of collecting data to the specified accuracy.

3.2.2 Deployment of Acoustic Doppler Current Profilers

The deployment of Acoustic Doppler Current Profilers (ADCP) shall be at two locations as shown in **Figure A3-1**, and the coordinates presented in **Table A3-1** ADCP Coordinates. ADCP 1 is close to the proposed dredging area at PCW, and ADCP 2 is at the Lady Shoal approach channel dredge.

Figure A3-1 ADCP Locations

Table A3-1 ADCP Coordinates

ADCP	Latitude	Longitude
1	56.462178°N	-2.917656°W
2	56.453871ºN	-2.8081105ºW

3.2.3 Daily Logs

Daily logs shall be maintained on the measurements including weather conditions and sea state.

3.2.4 Data Accuracy

The acceptable levels of accuracy of the measured data are provided in **Table A3-2**.

Table A3-2 Acceptable levels of accuracy

Parameters	Level of accuracy
Location	±1 metre
Seabed level	±0.1 metre
Current speed	±0.05 m/s
Current direction	±5 degrees
Wave height	±0.1 metre
Wave period	±1 second
Wave direction	±5 degrees

3.2.5 Reporting

The report shall include the methodology, data plots, quality checks and accuracy, and data interpretation. The report shall also include the personnel and equipment used for the measurements an indication of the

accuracy achieved and general notes on the weather conditions and sea states. The report shall present the following:

a) Times-series of the measured currents, turbidity, and waves
b) Current and wave roses
c) Wave spectrum
d) Results from turbidity measurements, water sampling and suspended sediment analyses

4 Environmental considerations

There are a number of internationally designated sites within close proximity to the proposed surveys, as set out in **Table A4-1.**

Table A4-1 Designated sites in proximity to the proposed surveys

Designated site	Distance from Port of Dundee (km)	Distance from Lady Shoal approach channel (km)
Firth of Tay and Eden Estuary Special Area of Conservation (SAC)	0	0
Outer Firth of Forth and St Andrews Bay Complex Special Protection Area (SPA)	0	0
Firth of Tay and Eden Estuary SPA and Ramsar site	2.9	10
Barry Links SAC	7.5	3

Features for which these sites have been designated for are seabirds, marine mammals, fish, and benthic habitats.

As noted above, these sampling works will be undertaken over a period of up to five days, though not necessarily in parallel, between September and December. Due to the existing nature of the site, with large vessels present and travelling through the Firth regularly, it is expected that any seabirds present within the area would be habituated to any potential disturbance. Therefore, it is expected that there would be no significant disturbance to seabirds as a result of the proposed surveys. Furthermore, the presence of a survey vessel is not considered to have the potential to significantly affect marine mammals or fish.

The proposed surveys are within the Firth of Tay and Eden Estuary SAC and may affect areas of mussel beds, which are a Priority Marine Feature. Sediment sampling will be undertaken only within the Port of Dundee's maintenance dredge area so habitats present are not considered to be sensitive to the proposed sampling. With regards to the benthic ecology survey, given the small number of samples required and small volume of material to be removed, a significant impact on the SAC or mussel beds is not anticipated.

All activities will be undertaken in line with best practice.

5 Navigation considerations

While samples would be undertaken in the Lady Shoal approach channel and the approaches to the PCW and DunEco Quay, this will be a short term activity, with a duration of up to five days. In addition, the samples will be collected from a vessel that can move out of the way, if required, with work carried out under the direction of the Harbour Authority. A notice to mariners will be issued by the Harbour Authority prior to the works commencing.

6 References

Bates, C. R., Moore, C. G., Malthus, T., Mair, J. M. & Karpouzli, E. (2004). Broad scale mapping of habitats in the Firth of Tay and Eden Estuary, Scotland. Scottish Natural Heritage Commissioned Report No. 007 (ROAME No. F01AA401D). Available online at: https://www.nature.scot/sites/default/files/2018-07/Publication%202003%20-%20%20SNH%20Commissioned%20Report%207%20-%20Broad%20scale%20mapping%20of%20sub%20littoral%20habitats%20in%20the%20Firth%20of%20Tay%20and%20Eden%20Estuary%2C%20Scotland.pdf

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NatureScot
Scotland's Nature Agency
Buidheann Nàdair na h-Alba

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{Via email only: [Redacted]

15 October 2024

Our ref: CPA177088

Dear Emily,

Pre-application Comments: Proposed Development in Port of Dundee, Firth of Tay

Thank you for consulting NatureScot on the above proposal.

1. Summary of proposal

There is a suit of works proposed in the Port of Dundee and the Lady Shoal approach channel in the Firth of Tay. These works include deepening of the approaches to DunEco Quay and Prince Charles Wharf (PCW), Western extension of the lay-down area, placement of a rock mattress to limit leg penetration of jack-up vessels, PCW improvement works and deepening of a section of the Lady Shoal approach channel. These elements are independent of each other and can be undertaken in isolation, all together or in a variety of combinations. The works are planned to start in spring or summer 2025.

2. Summary of advice

We have provided comments on the potential impacts the proposed works could have on designated sites and their qualifying interests that are connected to the development site, based on the information provided. We have also provided advice on the survey requirements for marine mammals, benthic habitats and ornithology. Existing bird survey data is insufficient for assessment and additional bird surveys are required for areas involved in the marine elements of the proposal at the port development site (and Lady shoal?). We also advise an increase the benthic ecology survey coverage, sediment dispersion modelling output request, and for further information on Aspect multibeam bathymetric survey with regards to blue mussel. In addition, we require further clarity as to the certainty that future dredging at Lady Shoal approach would not be required. We advise that a full review of existing data on marine mammal presence in this area is undertaken. As the proposal currently stands, it may merit a NatureScot objection due to lack of data, impacts to Priority Marine Features (PMF's) and impacts to designated sites.

3. Appraisal

There are a number of designated sites within and connected to the area where the works are proposed. The site's status means that the requirements of the Conservation (Natural Habitats, &c.) Regulations 1994 as amended (the "Habitats Regulations") apply. Consequently, Dundee Port authority is required to consider the effect of the proposal on the designated sites before it can be consented (commonly known as Habitats Regulations Appraisal). The NatureScot website has a summary of the legislative guidance here.

Our advice is that this proposal is likely to have a significant effect on the designated sites outlined below. With the limited information available at this stage, NatureScot cannot undertake an appropriate assessment against the conservation objectives of the proposed development on these designated sites. We have the following comments to make in relation to the designated sites that have connectivity to the works at Dundee Port.

4. Designated Sites

4.1 Firth of Tay and Eden Estuary Special Area of Conservation (SAC)

The Firth of Tay and Eden Estuary SAC is designated for its estuaries, subtidal sandbanks, intertidal mudflats and sandflats and its population of Harbour seal. Seagrass beds and blue mussel beds form part of the intertidal mudflats and sandflats feature and are both Priority Marine Features (PMF's). The proposed works are within the boundary of The Firth of Tay and Eden Estuary SAC.

Harbour Seal

This feature is in Unfavourable Declining condition, with numbers of harbour seals within the site having declined since designation (a 94% decline since the period 1990 – 2002). The SAC population is therefore highly vulnerable and a thorough assessment of impacts will be needed, along with a need for appropriate mitigation measures.

From the information provided at this stage, we advise that there is a potential risk of injury and/or disturbance from a number of the proposed activities to harbour seal in the Firth of Tay and Eden Estuary SAC. All activities which have the potential to produce underwater noise need to be considered in the Habitat Regulations Appraisal (HRA). Dredging, disposal and vessel movement can all cause disturbance. If geophysical surveys are required, there is a risk of injury and disturbance due to the underwater noise produced by the acoustic survey devices.

The activity with the greatest potential for impacts is pile driving. This activity can create noise levels which can cause auditory injury to marine mammals and can cause disturbance over a large area. The risks from this activity will need to be fully and quantitatively assessed, and it is likely that mitigation will need to be applied.

A Marine Mammal Mitigation Plan should be produced. Depending on the outcome of the assessment, it is possible that monitoring of marine mammals will be required, at pre-, during and post-construction stages.

Estuaries, subtidal sandbanks and intertidal mudflats and sandflats

The Firth of Tay and Eden Estuary SAC protects ~46% of blue mussel bed records within the Firth of Forth Marine Region and includes the largest known subtidal blue mussel beds, >400ha in the Firth of Tay. Therefore, impacts on Blue Mussel beds within this Marine Region may affect the national status of the blue mussel bed feature and may merit a NatureScot objection if the proposed development at the Lady Shoal approach channel is progressed as it stands.

Blue Mussel Beds are sensitive to physical loss of habitat and habitat extraction, physical disturbance (i.e. surface abrasion and penetration of sediment), changes in water flow and smothering (siltation). The proposed dredging could remove an estimated 4.72ha of the subtidal blue mussel bed based on the proposed dredge area and the predictive extent of the mussel bed. This does not include the indirect impacts of siltation and changes in water flow to surrounding beds. Blue mussel are also an important prey species for a variety of SPA designated species including common eider, common scoter, long-tailed duck and velvet scoter and there are possible impacts on prey availability of SPA features. An assessment of impacts to blue mussel beds using appropriate modelling and consideration of alternative sites such be included in an EIA.

Both intertidal and subtidal seagrass beds are a protected feature within Firth of Tay and Eden Estuary SAC (Sandbanks which are slightly covered by sea water all the time feature and Mudflats and sandflats not covered by seawater at low tide feature for the species *Z. noltei*). Records indicate only intertidal seagrass beds have been recorded here.

Seagrass beds are sensitive habitats. Coastal engineering and dredging activities can result in increased siltation and turbidity. FeAST (website) sets a high sensitivity of seagrass to siltation (light) and changes in water clarity. Sediment dispersion modelling should provide further information of the potential impacts to seagrass beds as well as further information on the frequency and duration of dredging activities.

We advise that the sediment dispersion modelling includes the outputs of deposition in “cm” to permit assessment against the FeAST benchmark. This will allow us to comment on whether these works will have an adverse affect on site integrity and if mitigating measures can be put in place to avoid impacts. Deepening of the Lady Shoal approach may remove areas of blue mussel beds.

4.2 Firth of Tay and Eden Estuary Special Protection Area (SPA)

The Firth of Tay and Eden Estuary SPA is designated for a number of seabirds (21 in total). The Firth of Tay and Eden Estuary SPA is located approximately 4.5km from the proposed western extension of the laydown area and approximately 1km from the Lady Shoal approach channel.

There are impact pathways with potential to undermine the conservation objectives of this SPA’s qualifying bird qualifying features. Further information will be required to assess impact of these pathways. Airborne and underwater noise from the proposed dredging, construction works, vibro-core sampling, piling works, and potential geophysical surveying could cause significant disturbance/displacement depending on the timing, duration and sound level/intensity. Depending on the activity, there is also a risk of injury to diving birds through underwater noise. Further assessment of these aspects will be required to determine potential impacts on marine and wading birds from this SPA.

There will be visual disturbance from the construction activity and vessels, including the dredger. The pre-app document states there would be no change to the operation of the Port of Dundee, as a result of the proposed development, with a minor change to maintenance dredging, although this is not quantified. Details should be given in future consultations on the current level of dredging and associated vessel movements and the proposed increase for future maintenance dredging. Limited information has been given on the increase in vessel movements during construction/dredging. Further details required to assess the impact on SPA features will include the vessel routes, timings and number of trips, including to the disposal site. Timing and duration of all works in each element will be required.

The proposed dredging in the Lady Shoal approach channel will be undertaken by a single back hoe dredger, over c.30 day period. Although it has been stated that this will not be a significant increase in vessel numbers, there will be disturbance to the SPA qualifying species caused by the dredging of

approximately 160,000m³, through underwater noise, sediment disturbance, and continuous presence of a boat for a 30 day period (duration and time of year has not been provided so we are unable to provide detailed comments on this at this stage). Seasonal and spatial restrictions may be required to avoid disturbing and displacing marine birds, mitigation for this should be considered.

Deepening of the Lady Shoal approach may remove areas of blue mussel beds. Blue mussel are an important prey item for a variety of Firth of Tay and Eden Estuary SPA designated species including common eider, common scoter, long-tailed duck and velvet scoter. Deposition of suspended sediment has the potential to cause loss or habitat degradation to the benthic habitat around dredged areas and the disposal site, such as seagrass beds. Seagrass provides a nursery habitat for prey species that seabirds and diving birds depend on.

The disposal site is located within the Firth of Tay and Eden Estuary SAC, 3km from the Firth of Tay and Eden Estuary SPA and partially within the OFFSAB SPA. The site is located within 3km of known seagrass and blue mussel beds. The proposal would result in a potential total disposal of 307,500 m^3 of material at the site. Sediment plume may impact important supporting habitat for the marine birds and could displace birds from important foraging areas.

4.3 Moray Firth SAC

The Moray Firth SAC is designated for its subtidal sandbanks and population of bottlenose dolphin. Due to the distance between the site and Dundee port, there is no likely significant effect to the subtidal sandbanks feature of the SAC.

Although this site is distance from Dundee Port, it is known from photo-ID that individuals from the Moray Firth population frequently use the Firth of Tay region for foraging and other activities. There is therefore clear connectivity, and this site should be included in the HRA. From the information provided at this stage, we advise that there is a potential risk of injury and/or disturbance from a number of the proposed activities to bottlenose dolphin in the Moray Firth SAC. All activities which have the potential to produce underwater noise need to be considered in the HRA. Dredging, disposal and vessel movement can all cause disturbance. If geophysical surveys are required, there is a risk of injury and disturbance due to the underwater noise produced by the acoustic survey devices.

The activity with the greatest potential for impacts is pile driving. This activity can create noise levels which can cause auditory injury to marine mammals and can cause disturbance over a large area. The risks from this activity will need to be fully and quantitatively assessed, and it is likely that mitigation will need to be applied. A Marine Mammal Mitigation Plan should be produced. Depending on the outcome of the assessment, it is possible that monitoring of marine mammals will be required, at pre-, during and post-construction stages.

4.4 Outer Firth of Forth and St Andrews Bay Complex SPA

The Firth of Tay and Eden Estuary SPA is designated for several seabirds (28 in total). There are five SPA features that are also features of the Firth of Tay and Eden Estuary SPA: common scoter, goldeneye, long-tailed duck, red-breasted merganser and velvet scoter. The Outer Firth of Forth and St Andrews Bay Complex SPA is located next to the proposed western extension of the laydown area and the Lady Shoal approach channel is within the SPA.

There are impact pathways with potential to undermine the conservation objectives of this SPA's qualifying bird qualifying features. Further information will be required to assess impact of these pathways. The impact pathways described above for the Firth of Tay and Eden estuary SPA also apply to the Outer Firth of

Forth and St Andrews Bay Complex SPA. The disposal site is located partly within the Outer Firth of Forth and St Andrews Bay Complex SPA. The sediment plume may impact important supporting habitat for the marine birds and could displace birds from important foraging areas, particularly for marine bird associated with this site.

4.5 River Tay SAC

The River Tay SAC is designated for its populations of Atlantic salmon, brook lamprey, river lamprey, sea lamprey and otter. The works are unlikely to impact sea lamprey**,** river lamprey, brook lamprey or otter due to where the works are taking place in relation to the River Tay SAC. None of the works are taking place within the River Tay SAC, they the works are ~27km from the boundary of the site.

However, once Atlantic salmon have undergone smolt, they migrate from the River Tay to sea, passing through Firth of Tay. Downstream migration occurs in March, April and May and upstream migration occurs all year round. The months of greatest sensitivity for Atlantic Salmon are November-May. If the works are taking place during the downstream migration or during sensitive months, they could disrupt Atlantic salmon movements to and from the River Tay SAC. The works could also impact Atlantic salmon that are present in the area where works are taking place, especially areas where dredging and underwater construction are taking place. To avoid an adverse affect to Atlantic Salmon associated with the River Tay SAC, we advise that the works do not take place during the months of downstream migration or during the most sensitive months for Atlantic Salmon.

4.6 Isle of May SAC and Berwickshire & North Northumberland Coast SAC

The Isle of May SAC is designated for its populations of grey seal and reef habitats. The Berwickshire & North Northumberland Coast SAC is designated for its populations of grey seal and its marine and coastal habitats.

Although grey seals can and do forage considerable distances, the Conservation Objectives for grey seal SACs are related to the protection of the breeding colony. During this sensitive time, grey seals (especially females) do not travel further than approximately 20 km. Therefore, while there may be some connectivity to the works at Dundee Port, it is unlikely that there will be significant effects to these sites due to the distance they are from Dundee Port, roughly 40 km for the Isle of May SAC and 70 km for Berwickshire & North Northumberland Coast SAC.

5. Surveys

5.1 Marine Mammal Surveys

NatureScot advises that a full review of existing data on marine mammal presence in this area is undertaken. There is a lot of data available, mainly from the Sea Mammal Research Unit (SMRU) at St Andrews University. SMRU carries out monthly boat-based surveys for cetaceans within the St Andrews Bay and Firth of Tay region. They also carry out aerial surveys for harbour and grey seals. The data can be made available by SMRU but can also be accessed through NMPi.

Data from citizen science land-based surveys are also available. Citizen Fins data is collected by SMRU. Whale and Dolphin Conservation (WDC) collect data through the Shorewatch project and SeaWatch Foundation record data through their National Whale and Dolphin Week at Broughty Ferry. There may also be data available from previous developments in and around Dundee and the Firth of Tay, some of which may be available through Marine Scotland's licensing portal or directly from the developers.

All of this information will allow you to build a picture of marine mammal usage of the area, in terms of abundance, density, and seasonality. It is therefore unlikely that you will need to carry out your own marine mammal surveys. However, any additional data you can provide with the application will be useful in determining the likelihood of impacts to marine mammals. When carrying out any surveys for birds, any marine mammals observed during the surveys should also be recorded. As highlighted above, a Marine Mammal Mitigation Plan should be produced. Depending on the outcome of the assessment, it is possible that monitoring of marine mammals will be required, at pre-, during and post-construction stages.

5.2 Benthic Surveys

We advise that the sediment dispersion modelling that is going to be undertaken should include the outputs of deposition in "cm" to allow assessment against the FeAST (website) benchmarks. This should provide further information of the potential impacts to seagrass beds as well as further information on the frequency and duration of dredging activities.

The benthic ecology survey of the proposed Lady Shoal approach channel dredge area currently avoids modelled blue mussel beds. NatureScot requests additional sites be selected to the east of the site to include predicted beds. Suggested sites are: a) 56.45321 N, -2.82036 W and b) 56.45167 N, -2.82036 W. If Priority Marine Features (PMF) are detected within the proposed ROV surveys, the survey should be extended to assess the extent, quantity and quality of any potential PMF's. This will aid in setting an accurate baseline and the assessment of any potential impacts from the proposal. We also require further clarity on the certainty that dredging would not be required in the future for the proposed Lady Shoal area to allow us to assess the impacts to the Firth of Tay and Eden Estuary SAC and inform the appropriate assessment.

The 'Aspect multibeam bathymetric survey - Lady Shoal Geophysical Data - August 2017' is referred to in the consultation document. The extent that the survey covers or if the data can be used (potentially with ground truthing from proposed and/or additional benthic ecology surveys) to identify PMFs is not clear, particularly for mussel beds within the survey area. We require further clarity to these points and if required, the provision of updated bathymetry data and/or survey which can be used to identify, quantify direct (dredging) and indirect (siltation) to mussel beds.

The proposed Middle Deep disposal site is within the Firth of Tay and Eden Estuary Special Area of Conservation (SAC) and could impact this site with increased siltation, water clarity/quality changes on sensitive protected features such as blue mussel beds and seagrass beds. An assessment using appropriate modelling and consideration of alternative sites such be included in an EIA.

The proposed development, in particular the proposed deposition within the Firth of Tay and Eden Estuary SAC and the proposed dredge of Lady Shoal could result in a significant impact on the protected features of the SAC and have a deleterious impact on the conservation objectives of the SAC. With the limited information available at this stage, NatureScot cannot undertake a Habitats Regulations Appraisal (HRA) against the conservation objectives of the proposed development on the SAC. The proposed surveys will aid in our assessment.

5.3 Ornithology Surveys

The pre-application document includes a report on existing data – "BSG survey for Proposed Development at Dundee Dock: West Extension, Vantage Point Results Report, April 2024". The survey was undertaken to solely inform the 'Western extension of the laydown area' element of this proposal, which involves only land based works, from VP position NO4282930766. The survey area consisted of a 180 degree viewshed facing south over the Tay Estuary, out to 500m. Monthly low tide surveys (four hour watches) were

conducted between Apr 23 – Mar 24, with additional monthly high tide surveys between May and Aug 23. No further bird surveys have been proposed.

NatureScot advises further bird surveys of the areas involved with the marine aspects of this proposal will need to be carried out. Full coverage of the DunEco Quay/PCW dredge area needs to take place, which should include the area overlapping with the SPA. This is consistent with what we request for all Port expansion works. Given that the existing survey data has already determined that the three tern species are not using the Port area, we are content with the summer survey information presented to help us to make an assessment for these feature of the SPA's. However, for the non-breeding qualifying species we do not consider the current survey data sufficient. Surveys should take place at least monthly over the winter period (Oct-March ideally), and these should cover different times of day and different tidal states. Survey coverage should include the development footprint plus a buffer of at least 1km (preferably 2+km for divers). This survey effort will also be sufficient to cover the wading bird species associated with the Firth of Tay and Eden Estuary SPA.

Greylag goose and pink-footed goose are also qualifying interests of the Firth of Tay and Eden Estuary SPA. Geese fly over the site, can be present on the mudflat areas for feeding and roost close to the site. A survey for goose should also be undertaken, from more that one vantage point, to assess the usage of the site by these species. Local goose information from the GSMP (here) should also be used to complement the survey findings.

For capital dredge proposals in addition to the benthic survey required, as detailed above, bird surveys are also normally advised for the area. For the Lady Shoal approach channel it is acknowledged that this is already a busy channel for vessel traffic (1928 vessel movements in 2023), and the additional boat presence will be temporary. Within the application we recommend the applicant try to provide contextual information about what birds may be using this area. Local bird information from WeBS (here) may be one source to consider. Our main assessment on the Lady Shoal channel works will be based on the damage to prey supporting habitat for the qualifying features.

As the proposal progresses the applicant should think about potential mitigation that might be required to minimise the impacts to the bird qualifying features. Bird survey methodology including data presentation should be verified with NatureScot prior to the survey commencing to ensure data is suitable for further assessment.

If you require any further advise, please contact us.

Yours sincerely,

Polly Thompson
Operations Officer – Central Highland
[Redacted]