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Ground Investigation Interpretative Report

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Ground Investigation Interpretative Report

Falmouth Docks Development

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Ground Investigation Interpretative Report
Falmouth Docks Development

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1. Introduction

1.1 Brief

Ramboll UK Limited (Ramboll) has been instructed by Falmouth Docks and Engineering Company (the "Client") to prepare a Ground Investigation Interpretative Report (GIIR) for the marine works associated with the redevelopment of Falmouth Port, Falmouth, Cornwall, TR11 4NR. This assessment has been undertaken assuming the site will be redeveloped; however, continuing to be used as the docks. A Site Location Plan is provided as Figure 1 in Appendix 1.

Although the EIA site boundary (as shown in Image 1 below) also includes the terrestrial portion of the site to the south and the south-west, the ground investigation was undertaken within the marine proposed development area only, in support of the Environmental Statement Chapter 7: Marine Water and Sediment Quality. As such, no assessment has been undertaken on the terrestrial parts of Falmouth Docks.

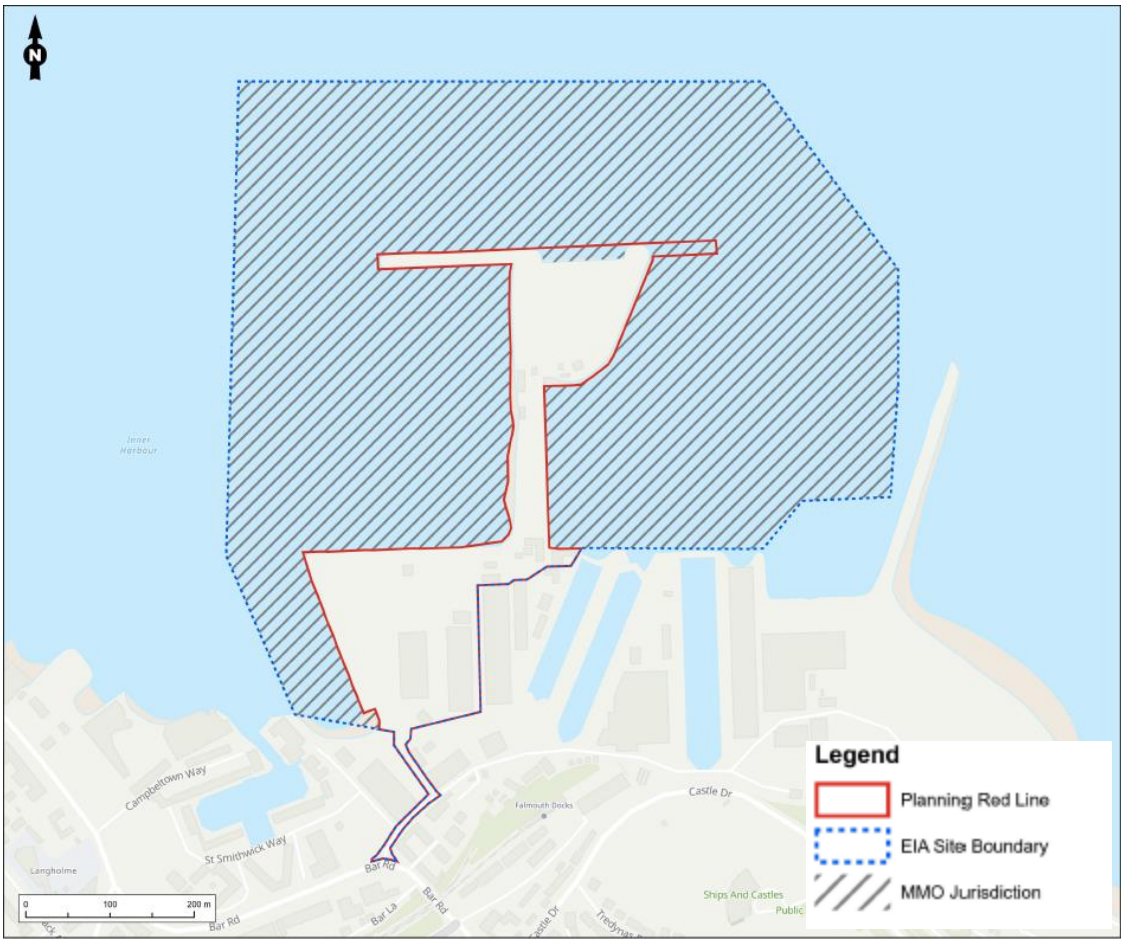


Image 1: EIA Site Boundary illustrated by the dashed blue line. Marine Management Organisation (MMO) jurisdiction area is indicated by the hashed area.

This contamination risk assessment is produced with consideration to Tier 2 of Stage 1 (Risk Assessment) of Land Contamination Risk Management (LCRM)[1] published by the Environment Agency (EA) in 2021. As such, the brief is to present the objectives, define the scope of investigation, define suitable generic assessment criteria to which results of investigation can be

[1] Environment Agency (EA), 2023. LCRM: Stage 1 risk assessment. https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm/lcrm-stage-1-risk-assessment

compared, present investigation findings and assessment of results, and update the preliminary Conceptual Site Model (CSM) for the site which was produced at the Preliminary Risk Assessment (PRA) stage[2].

The conclusions of the report are then intended to inform what further action may be needed.

1.2 Proposed Development

The proposed development would redevelop and modernise the existing facilities at Falmouth Dock to reinstate full alongside berth capability and increase berth capacity. The objectives of the proposed development are to repair and update the currently poor condition dock infrastructure in order to maintain existing business and future proof the dock with respect to cruise capacity, cargo capacity and renewable floating offshore wind (FLOW) (supporting the offshore wind market).

The full planning application and marine licence application (MLA) would comprise the following redevelopment activities:

- Pocket dredge of berth areas to achieve required underkeel clearance for larger cruise vessels (up to Excellence class) and the FLOW renewable energy device underkeel requirements (considered to be -10.5 m Chart Datum (CD));
- Removal of foul ground within areas of the former Kings and Empire Wharves;
- Surface skim of seabed on eastern side of the site to maintain -5.5 m (CD);
- Demolition of the remaining existing Western Wharf timber piles and above surface infrastructure;
- Construction of a new Western Wharf suspended deck structure;
- Demolition of the Northern Arm concrete structure and substructure to below seabed level and removal of the gang walkway and old timber piles that are located west of this structure;
- Construction of a suspended deck structure (Northern Wharf) in the existing 90 m gap between Queen's Wharf and the Northern Arm to create a longer functional wharf length;
- Upgrades to the existing Queen's Wharf structure;
- Extension of the Queen's Wharf suspended deck structure 50 m westward;
- Installation of a 290 m deck (the 'FLOW Deck') to facilitate a FLOW device;
- Upgrades to the existing Duchy Wharf structure to facilitate a FLOW device; and
- Demolition of on-site buildings and re-configuration of Falmouth Dock activities.

A general arrangement of the proposed works are illustrated by Image 2, overleaf.

[2] Ramboll, 2024. Falmouth Docks Contaminated Land Desk Study. Report Reference: RUK2023N00104-RAM-R-00073. Dated: August 2024.

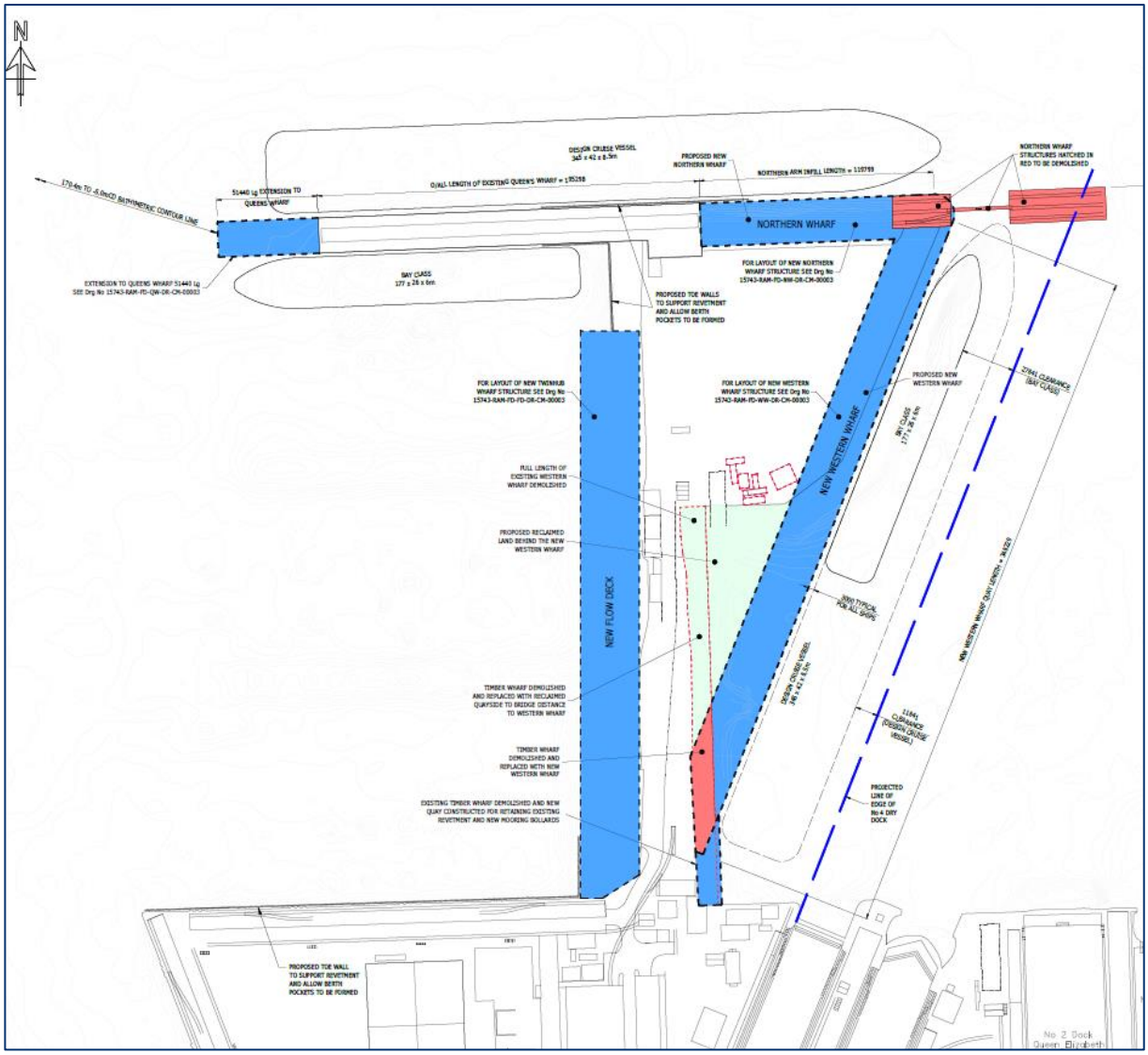


Image 2: General Arrangement of Offshore Works

1.3 Objectives and scope of work

The objectives of this report consider LCRM; specifically, the objectives include:

- Confirm which potential contaminant linkages identified at PRA stage are to be assessed;
- Document how the ground investigation was designed to assess those potential contaminant linkages and any constraints on the ground investigation;
- Document findings of the ground investigation, and interpret the environmental ground conditions encountered during ground investigation;
- Establish appropriate Generic Assessment Criteria (GAC) and a standard set of generic assumptions to assess the risks;
- Assess the potential for risks to both human health and environmental receptors (including controlled waters) based on the data collected;
- Assess the suitability of marine sediment for disposal at sea in line with the current guidance;
- Carry out a contaminated land risk assessment based on a source-pathway-receptor methodology;

- Present a refined CSM based on the findings of the ground investigation;
- Provide a commentary on contamination risks; and
- Identify where further action is needed.

1.4 Sustainability

The United Nations (UN) 2030 Agenda for Sustainable Development sets 17 Sustainable Development Goals (SDGs) which are designed to promote the achievement of a better and more sustainable future for all.

Contamination and pollution are recognised by the United Nations as risks to human health and wellbeing as well as sustainability of the places where we live. A target to substantially reduce those risks is enshrined in the UN Sustainable Development Goal (SDG) No 3: Good Health and Wellbeing, as well as SDG No. 11: Sustainable Cities and Communities, which also emphasises sustainable management of waste. Pollution is likewise recognised as a potential threat to water quality, both for human consumption and for its ability to support water-related ecosystems (UN SDG No. 6: Clean Water and Sanitation).

Contamination and pollution within soils, water and air at the site have been identified through the conceptual site model development process and strategic sampling and analysis. Characterisation and, if recommended as a result of the assessment contained within this report, remediation of contamination at the site thus directly support achievement of UN strategy. Implemented through technically robust investigation and risk assessment this focusses the proposals for remedial works where there is a scientifically justifiable need, thus minimising the carbon footprint of works carried out (supporting SDG No 13: Climate Action) as well as production of waste (SDG No. 11).

In order to recognise where the GQRA works completed are of relevance to the progression of the UN's SDG objectives, reference is made in this report to relevant SDGs.

1.5 Constraints and Limitations

This report has been prepared by Ramboll exclusively for the intended use by the client defining, among others, the purpose, the scope and the terms and conditions for the services. No other warranty, expressed or implied, is made as to the professional advice included in this report or in respect of any matters outside the agreed scope of the services or the purpose for which the report and the associated agreed scope were intended, or any other services provided by Ramboll.

In preparation of the report and performance of any other services, Ramboll has relied upon publicly available information, information provided by the client and information provided by third parties. Accordingly, the conclusions in this report are valid only to the extent that the information provided to Ramboll was accurate, complete and available to Ramboll within the reporting schedule.

Ramboll's services are not intended as legal advice, nor an exhaustive review of site conditions and / or compliance. This report and accompanying documents are initial and intended solely for the use and benefit of the client for this purpose only and may not be used by or disclosed to, in whole or in part, any other person without the express written consent of Ramboll. Ramboll neither owes nor accepts any duty to any third party, unless formally agreed by Ramboll through that party entering into, at Ramboll's sole discretion, a written reliance agreement.

Unless otherwise stated in this report, the scope of services, assessment and conclusions made assume that the site will continue to be used for its current purpose and end-use without significant changes either on-site or off-site.

The ground investigation works were undertaken during a discrete period of time. The findings and conclusions presented in this report are accordingly factually limited by these circumstances and, unless stated otherwise in the report, are preliminary. The field investigations were restricted to a level of detail necessary to meet the stated objectives of the services. The results of any measurements taken may vary spatially or with time and further confirmatory measurements should be made after any significant period of time has elapsed since the sampling took place. The interpretation of the geological and environmental quality conditions is based on extrapolation from point-source data in a heterogeneous environment. Accordingly, more detailed investigation may be appropriate dependent upon the client objectives.

Overall, Ramboll was able to investigate the identified potential contaminant sources and it is considered that the exploratory holes provide an appropriate coverage across the site.

2. Preliminary Risk Assessment

The following section summarises information gathered from the following report, which was produced in general accordance with Tier 1: Preliminary Risk Assessment (PRA) of Stage 1 of LCRM:

- Ramboll, 2024. Falmouth Docks Development. Contaminated Land Desk Study. Report Reference: 15743-RAM-FD-SW-RP-EV-00020. Version: 01. Dated: August 2024.

2.1 Description of Site and Setting

The site is located at the existing Falmouth Docks in Falmouth, Cornwall, TR11 4NR. The site includes part of the Carrick Roads estuary, and it is centred at the approximate National Grid Reference SW 81765 32796. The site location plan is provided as Figure 1 in Appendix 1.

The site is located within the Fal and Helford Special Area of Conservation (SAC) and within the Penryn Shellfish Waters; the Falmouth Bay to St Austell Bay Special Protection Area (SPA) is located approximately 200 m east of the site boundary at its nearest point. Bathing Waters are also located at Gyllyngvase Beach and Swanpool Beach, both categorised as excellent, and present approximately 1.0 km and 1.7 km south-west of the site, respectively.

A summary of the expected geology is provided in Table 2.1. This information was sourced from the British Geological Survey (BGS) website[3], the BGS geological map for the area (Geological Sheet 352)[4] and borehole logs from a historic ground investigation undertaken at the existing Central Causeway[5].

Superficial deposits are not expected to be present on-site.

Table 2.1 Anticipated Geology and Hydrogeology

Stratum	Estimated Average Thickness (m)	Description	Aquifer Designation	Hydrogeological Significance
Marine sediment	Unknown	Marine sediment	N/A	N/A
Portscatho Formation (Bedrock)	Up to 5.4 km (BGS)	Interbedded sandstone beds (up to 2 m) and slaty mudstone with sporadic thin siltstone beds.	Secondary A	Permeable formations with potential to support localised abstractions.

2.2 Potential for Contamination within the Marine Licensing Area (MLA)

Since the 19th century, the site has been used as an active harbour with its associated commercial and industrial processes and infrastructure (such as railway lines and cranes) and extensive historic land reclamation on the adjacent terrestrial area of the site including the "New Site" historic landfill. An electric sub-station is also present on the Central Causeway.

Vessels docking in the area may have given rise to the potential for historic spills, and there is the potential use of chemicals to manage a large fire circa 2000 which destroyed Queen's Wharf. Due to the presence of vessels, there is the potential for impact by organo-tin compounds such as tributyl-tin (TBT) and heavy metals in antifouling paints and treatments.

[3] https://www.bgs.ac.uk/. Accessed: May 2024.
[4] https://webapps.bgs.ac.uk/Memoirs/docs/B01739.html. Accessed: May 2024.
[5] GEL, 2022. Falmouth Causeway Factual Ground Investigation Report (ref. 36988)

It is also understood that a licensed sewage outfall is present in the south-east of the reclaimed land historic landfill (to the east of the site), which is in operation today.

The surrounding areas, including the terrestrial area to the south and south-west and which does not fall within the Marine Licensing area, have various uses with the potential for contamination sources.

The area to the south and south-west of the site has been used as docklands with commercial and industrial uses since the 19th century, with various works, an iron foundry, industrial activities and land reclamation. The current uses of this area also have the potential for contamination sources due to the industrial processes still occurring, such as the storage of fuels, chemicals, hydraulics and greases; the known presence of asbestos; a recycled glass cullet storage area and waste handling area; an electrical sub-station, and oil-water interceptors.

Further afield, the current industrial uses of the surrounding area also have the potential for sources of contamination, such as A&P dry docks and the Pendennis Shipyard to the east of the site, which have the potential for the storage of fuels and chemicals in tanks and leakages / spillages arising of other substances.

The historical uses of the land adjacent to the site include an iron foundry, docks, various tanks and works, garage and timber works. Contaminative land uses beyond the 250 m radius of the site included a quarry, tip, a landfill and oil storage tanks, which have generally been redeveloped and are considered to be too distant to pose a risk to the subject site.

A gas works was present approximately 360 m west of the site (and therefore upstream) until the earliest mapping to around circa 1910, which was eventually redeveloped to a car park by the 1960s. It is understood that the residual contamination from the gas works may be impacting the Falmouth Harbour to date, with news article as recent as October 2023[6] indicating potential leachate from the former gas works entering the water.

2.3 Previous Investigations

As reported within the Contaminated Land Desk Study, several phases of ground investigations have occurred within the Marine Licensing Area through time, with the pertinent information comprising the following:

- Presence of elevated concentrations of heavy metals, total petroleum hydrocarbons (TPHs) and some polycyclic aromatic hydrocarbons (PAHs) in soils, with potential risks to human health and controlled waters being identified.
- Ash was encountered across multiple locations in the Made Ground, and coal and iron staining were encountered in some locations in the Made Ground.
- The area of reclaimed land south of Northern Wharf which is classed as 'landfill' by the Environment Agency consists of shale, cobble, sand gravel, with one instance of sandy ash in the borehole logs.
- Presence of fragments of plastic, organic material, clinker, and glass in the Made Ground on the Central Causeway.
- Presence of low levels of PAHs, TPHs, and some heavy metals, none exceeding the threshold for commercial/industrial land use, in the Made Ground on the central causeway.
- Black organic material in marine boreholes at Empire Wharf and Queens Wharf.

[6] The Packet, October 2023. Sea pollution spotted near popular beach in Cornwall. Available at: https://www.falmouthpacket.co.uk/news/23851800.sea-pollution-spotted-near-popular-beach-cornwall/ Accessed: July 2024.

2.4 Preliminary Conceptual Site Model

The main environmental legislation relating to contaminated land in the UK is Part 2A of the Environmental Protection Act 1990. The philosophy behind Part 2A is the source-pathway-receptor potential contaminant linkage; for land to be contaminated all three aspects of this linkage must be present (i.e., a contaminant must be present and able to move along a pathway and impact a receptor). Further details are provided in Appendix 2.

A preliminary conceptual site model that identifies those potential contaminant linkages forms the output of the PRA and is a simplified representation of the environmental conditions at the site, and in the vicinity of the site, and is used to initially identify potentially sensitive receptors and potential pollutant linkages.

The information presented in the previous sections of this report has been collated and evaluated to present a preliminary conceptual site model for the site.

Potential pollutant linkages are identified using the source-pathway-receptor framework detailed in Appendix 2. An assessment of the potential significance of each linkage is then made by consideration of the likely magnitude and mobility of the source, the sensitivity of the receptor and nature of the migration/exposure pathways between them.

Table 2.2 summarises the assessment of PCLs associated with the site development.

The ground investigation was designed to assess the marine PCLs identified. The following sections describe the ground investigation strategy, the results of laboratory chemical analysis, and quantitative risk assessment. A revised conceptual model and qualitative source-pathway-receptor risk assessment is then presented.

Table 2.2 Preliminary Conceptual Site Model

Potential Contaminant Linkage	Source	Contaminants of Concern	Pathway	Receptor	Consequence of Risk being Realised
PCL1	Potential sources of contamination in marine sediments relating to current / historic use of the site as well as nearby land. Including fuel spills from boats, machinery and industry operating in the water as well as run-off of water / sediment from terrestrial activities, potential contamination in the reclaimed land on the wharves and Central Causeway, and potential metal loading in sediments from upstream mine discharges.	Heavy metals, PAHs, TBT, Polychlorinated biphenyls (PCBs), TPHs, Phenols, semi-volatile and volatile organic compounds (SVOCs, VOCs)	Mobilisation and redistribution of potentially contaminated sediments in the seabed during capital dredging and construction works (including demolition/removal of some of the existing marine structures).	Surface waterbody, WFD status and marine ecology receptors	Medium
PCL2		Heavy metals, PAHs, TBT, PCBs, TPHs, Phenols, SVOCs, VOCs	Migration via routes created by piles.	Groundwater in underlying aquifer	Medium
PCL3		Heavy metals, PAHs, TBT, PCBs, TPHs, Phenols, SVOCs, VOCs	Dermal contact and ingestion of suspended sediment / surface water. Dermal contact and ingestion of soil / soil dust, inhalation of soil dust for works to wharves and reclaimed area of the marine site.	Construction workers, port operatives and amenity users	Mild

3. Ground Investigation

3.1 Design

The ground investigation was designed to investigate the ground and surface water conditions at the marine portion of the site for the marine works, and to test the marine preliminary conceptual site model, focussing on the assessment of PCLs identified in Section 2.5.

3.2 Ground Investigation Activities

The ground investigation was undertaken by Geotechnical Engineering Ltd. All factual information pertaining to the investigation is provided in their Factual Ground Investigation Report[7]. The investigation was undertaken in general accordance with:

- BS 5930 Code of Practice for Ground Investigation[8]; and
- BS 10175 Investigation of Potentially Contaminated Sites – Code of Practice[9].

The level of investigation designed for is considered by Ramboll to be exploratory with respect to BS 10175. Exploratory locations are shown on Figure 2.

The ground investigation works were conducted between 18th and 20th March 2024 and consisted of a total of 21 vibrocores (labelled as VC-01 to VC-26) to the maximum depth of 6.0 m below the seabed level.

Marine sediment samples were taken at surface level, and at every 1 metre interval until the required depth or bedrock was reached.

In addition, surface water samples were taken from approximately 20 cm depth in 11 locations (VC-01, VC-05, VC-06, VC-12, VC-14 to VC-16, VC-22 and VC-24 to VC-26).

The samples were stored in cool boxes before being dispatched to an MMO accredited laboratory for testing.

3.3 Sample Location Rationale

The exploratory hole locations were chosen to give an indication of the conditions spread across the marine site in areas where dredging and in-ground works are proposed.

3.4 Sampling

Details of the general sampling and monitoring methods utilised during the investigation are provided in the aforementioned Factual Ground Investigation Report.

All marine sediment samples were tested for a suite of determinants as per the MMO requirements. These determinants are also associated with industrial uses and were chosen to target potential contamination that could exist in the sediment on site. This included heavy metals, total hydrocarbon content, organo-tins, pesticides, PAHs, PCBs, VOCs and SVOCs, and polybrominated diphenyl ethers (PBDEs).

All surface water samples were tested for a suite of determinants commonly associated with historical industrial use and brownfield land, including TPH, heavy metals, phenols, PAHs, VOCs and SVOCs, and organo-tins.

[7] Geotechnical Engineering Limited (2024) Falmouth Docks Development Factual Ground Investigation Report (Ref. 37977).
[8] British Standards (2015) Code of Practice for site Investigation BS5930:2015+A1:2020
[9] British Standards (2017) Code of Practice for the Investigation of Potentially Contaminated sites. BS10175:2011 + A2:2017

A select number of composite samples were also sent for Waste Acceptance Criteria (WAC) laboratory analysis.

3.5 Field Observations

3.5.1 Ground Conditions

Ground conditions identified during the ground investigation are summarised in Table 3.1. A full lithological description is recorded on the logs, which are provided in the Contractor's Factual Report.

Table 3.1 Ground Conditions Encountered

Stratum	Description	Depth to Base (mbgl)	Approximate Average Thickness (where encountered) (m)
Marine Deposits (Made Ground)	Marine deposits are at the surface of the seabed in most locations, with depth to base ranging from 0.05 to 2.60 mbgl. It was generally described as a soft slightly gravelly black silty CLAY or black clayey SILT with occasional anthropogenic material. Frequent fragments of shell, maerl and slate gravel was recorded across the investigated area. With depth, the Marine Deposits become firm to very stiff orangish brown or greenish grey gravelly CLAY with fine to coarse siltstone and slate gravel. Due to the anthropogenic material (rare deposits of clinker, rubber, wood, glass and fabric) encountered in some locations, this has been labelled Made Ground in logs for VC-09, VC-13A, VC-15, VC-16, VC-17, VC-19 and VC-26; however, it is likely that this anthropogenic material was part of the natural marine sediment that has settled in the marine portion of the site. Generally, the anthropogenic deposits were recorded along the northern and western areas.	0.05 – 2.6	~ 0.5 – 1.0
Portscatho Formation	Weathered Portscatho Formation was recorded as a soft locally thickly laminated grey CLAY, or very soft greenish grey mottled light bluish grey CLAY with shell fragments, to firm or stiff orangeish brown mottled greenish grey gravelly CLAY with slate and siltstone gravel. Below this, the formation was generally recorded as a greenish grey clayey fine to coarse mudstone or slate GRAVEL or greenish grey CLAY. Beds of very weak to weak thinly and thickly laminated greenish grey SLATE was recovered as clayey angular fine to coarse GRAVEL. Portscatho Formation was proven across the site in all locations, except where there was a refusal at a shallow depth. This stratum underlays the marine deposits in most locations, encountered at depths from 0.2 mbgl to 2.6 mbgl in these locations, however in some areas in the north, it was directly at ground surface.	Proven to at least 5.70* (*Base not encountered)	Undefined

The ground conditions encountered across the site are generally comparable to the geology described in the British Geological Survey (BGS) map of the area.

Made Ground is noted in the logs in the western part of the site, and sporadically in the northern part of the site. It is not logged in the east of the site. It is therefore likely that anthropogenic material from the surrounding land and upriver has settled preferentially in these areas.

Image 3 below illustrates where notable visually or olfactory impacted sediments were recorded during the ground investigation.

Image 3: Visual and olfactory evidence of potential contamination within the sediment deposits

Hydrocarbon odours were noted in shallow sediments across much of the site and extending below top 0.5 m in areas nearest to the central pier, to both west and east of the pier.

Organic odours, interpretated as natural organics and in places noted associated with peat deposits, are noted across all western and north-western locations, but are absent in the east and north-east of the site.

No visual or olfactory evidence of contamination was noted in the farthest east sampling locations.

4. Human Health Risk Assessment

4.1 Human Health Discussion

The following human health receptors have been identified in the preliminary CSM in Section 2.4:

- Port operators or amenity site users (bathing water users) downstream or in the immediate vicinity of the site; and
- Construction and demolition workers on-site.

In addition, groundwater as a potable water supply has also been identified as a receptor in the preliminary CSM and is assessed further in this section.

4.1.1 Port operators and amenity site users

The preliminary CSM in section 2.4 identified a risk to port operators and amenity site users due to the mobilisation of contaminated sediments during the marine works. However, as the site is a working dock with vessels and associated activities, there is unlikely to be a risk associated with bathing waters within the site itself.

The closest designated bathing water area is approximately 1 km south-west of the site and therefore the works are unlikely to pose a risk to the bathing water areas. The presence of Pendennis Point will direct currents (and thus sediment) away from the beaches, therefore no effect to the designated bathing water areas is anticipated.

There is the potential for incidental contact of people via water sports and other activities where there is the possibility for site users to come into contact with the water, however this will be infrequent and typically for a short-duration, and therefore this is considered to be a low risk.

The port operators are also unlikely to come into contact with the water for any significant length of time during or after the works, therefore this is considered to be a low risk.

4.1.2 Construction and demolition workers

The on-site construction workers were identified as a receptor in the preliminary CSM. As exposure times for construction workers are generally short-term, risks from site contamination are generally addressed through the use of appropriate working procedures and personal protective equipment (PPE) in line with the Management of Health and Safety at Work Regulations[10], Construction (Design and Management) Regulations[11] (for some sites) and the Control of Substances Hazardous to Health Regulations[12].

This risk in the preliminary stage was categorised as 'mild' and the risks to human health are thought to be low. The marine ecosystem is the most sensitive (and therefore critical receptor), so an assessment of the environmental risks will also be protective of human health. For this reason, no quantitative assessment has taken place for human health.

4.1.3 Groundwater Resource (as potable water supply)

The preliminary CSM in Section 2.4 identified a risk to the underlying groundwater aquifer at the site from migration via routes created by piles.

As will be discussed in Section 5 below, the site data has identified that the uppermost sediments in the marine area are the most contaminated. The proposed development works involve

[10] UK Statutory Instruments (1999) The Management of Health and Safety at Work Regulation No. 3242
[11] UK Statutory Instruments (2015) Construction (Design and Management) Regulations No. 51
[12] UK Statutory Instruments (2002) Control of Substances Hazardous to Health Regulations No. 2677

dredging and removal of much of the top layers of marine sediment at the site (dredging plan shown on Figure 3), therefore the dredging process would lead to the removal of the most impacted sediment with the remaining material being significantly less impacted. The risk to the groundwater aquifer beneath the site will therefore be significantly reduced as the majority of the contamination will be removed before the piling works begin. Risks to groundwater resources are therefore considered low.

No further quantitative assessment of the risks to the groundwater body is required.

5. Surface Water Quality Assessment

5.1 Assessment Approach

LCRM requires that the use of GAC is appropriate for a range of management and site-specific technical factors. In defining GAC for the water environment, Ramboll has considered stakeholder requirements, the complexity of the conceptual site model, combined and cumulative factors, potential changes in site circumstances, uncertainties and limitations.

The potential risk to the aquatic environment from entry of pollutants has been assessed using commonly accepted UK guidelines including country specific water regulations and the Environmental Quality Standards (EQS) defined in European legislation such as the Water Framework Directive (WFD) (2000/60/EC).

Surface water samples and marine sediment leachate samples have been assessed to determine the potential risk to the surface water environment.

The potential receptors in the water environment which have been identified comprise:

- The surface waters both within the site boundary and in the vicinity of it (the Carrick Roads estuary and the wider Carrick Roads Outer water body); and
- Aquatic communities (particularly maerl beds and benthic communities) within or in the vicinity of the site.

Assessment of the risk to these receptors is required using the appropriate GAC which are protective of that specific receptor. The water GAC selected to assess the above receptors are detailed in Appendix 2. For those determinands included in the analytical suite which do not have corresponding European screening criteria derived from the above sources, UK-specific GAC are utilised. Where these are not available reference is made to other international guidance, further details of which are provided in Appendix 2.

Sediment leachate data is available for 10 samples. This has been used as an initial indication of risks to the surface water environment from any release of impacts from the marine sediment.

The concentrations of determinands in samples of marine sediments and surface water can be split into three discrete areas: the north, east and west. Image 4 illustrates the divided areas.

In general, the northern part of the site includes boreholes and / or sampling locations VC-14, VC-26, VC-11, VC-09, VC-25, VC-07, VC-07A, and VC-06. The eastern part includes VC-01, VC-02A, VC-02, VC-03, VC-05, VC-22, and VC-24. And the western part includes VC12-A, VC-13A, VC-15, VC-16, VC-17, and VC-19. The areas referred to in the below sections therefore relate to these locations.

Image 4: The marine development area divided into the North (yellow), East (pink) and West (brown) areas.

5.2 Analytical Results

5.2.1 Surface Water Results

The results of the screening against relevant GACs are summarised in Table 5.1. The screened results are provided in full in Appendix 3 of the report. The laboratory certificates are provided in full within Appendix C of the Factual Ground Investigation Report.

Phenols, BTEX compounds, PAHs, SVOCs, VOCs and organotins were all recorded below the laboratory detection limit across all surface water samples.

Exceedances of screening criteria do not infer that an unacceptable risk is present; the outcome of the screening is assessed further in the context of a qualitative source-pathway-receptor risk assessment.

Table 5.1 Exceedances of Surface Water GAC within the Surface Water samples

Contaminant	No. of Samples	GAC (mg/l) [Source]	Number of Exceedances of GAC	Minimum Concentration (mg/l)	Maximum Concentration and Location (mg/l)	Distribution Comment
Ammoniacal Nitrogen as N	11	0.6 [S1]	3	0.2	0.7 (VC-01 and VC-06)	Marginal exceedances of ammoniacal nitrogen have been recorded within VC-01, VC-05 and VC-06, located to the east of the site.
Total Cyanide	11	0.001 [S1]	2	<LOD (0.02)	0.03 (VC-14)	Two total cyanide exceedances were encountered in VC-14 and VC-25, located to the north and northwest of the site. Detected concentrations were at or only marginally above the lab LOD but an order of magnitude above the GAC. It is possible there are other location where cyanide may be present above the GAC that have not been detected due to the lab method used.
Chromium VI	11	0.0006 [S1]	1	<LOD	0.003 (VC-22)	One exceedance of the GAC for chromium VI was recorded, located at VC-22 to the east of the site. Detected concentrations were at the lab LOD but above the GAC. The concentration was significantly below the saltwater maximum allowable concentration EQS.
Copper	11	0.0046 [S1]	2	0.003	0.008 (VC-01)	Two marginal exceedances were recorded in VC-01 and VC-05, located to the east of the site.
Lead	11	0.0013 [S2]	11	0.013	0.104 (VC-01)	Concentrations of lead that exceed the GAC were recorded in all locations across the site. The highest recorded concentration of lead was detected in sample VC-01 to the east of the site.
Nickel	11	0.00086 [S2]	1	<LOD	0.014 (VC-01)	The GAC for nickel was exceeded in one location in VC-01, to the east of the site.
Mercury	11	0.00007 [S2]	1	<LOD	0.0006 (VC-01)	The GAC for mercury was exceeded in one location in VC-01, to the east of the site.
Zinc	11	0.0068 [S1]	11	0.025	0.075 (VC-06)	Concentrations of zinc that exceed the GAC were recorded in all locations across the site. The highest recorded concentration of lead was detected in sample VC-06 to the east of the site.

Notes:

The following criteria have been used to select GAC:

S1 – Saltwater Annual Average Environment Agency EQSs

S2 – Other Surface Waters Annual Average – Water Framework Directive 'Good' Standard.

The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 or where not available EA EQSs to be utilised in surface water risk assessments as part of environmental permit applications and WFD assessments of works in coastal and transitional waters in England.

5.2.2 Sediment Leachate Results

Composite leachate samples were taken from 10 locations across the site. The results are provided in full in Appendix 3 screened against the GAC and the laboratory certificates are provided in full within Appendix C of the Factual Ground Investigation Report.

Leachate analyses are conducted by vigorously shaking sediment samples, assessing the potential for the leachability of contaminants from the sediments to the water. The samples were composite from across the strata in each location, they did not specifically target the most impacted sediment but instead give an indication as to the leachability of the borehole location as a whole.

There was one exceedance of the saltwater EQS recorded in the leachate data. The pH value in VC-03 in the east of the site recorded a slight pH exceedance, measuring at pH 8.8 against the GAC of 8.5. All other pH values were within the GAC range. There are no obvious sources to the slightly elevated pH within the sample, which largely comprised of the very soft black silty clay. pH is generally quite high ranging from pH8.1-pH8.8.

As there was only one minimal exceedance of the GAC in the leachate samples, it can be assumed that the leachability of the composite sediment samples and the potential for the leaching of contaminants into the surface water receptor are likely to be low. Therefore, it is unlikely that the marine sediments are the source of any contaminants present in the surface water.

5.3 Surface Water Discussion

Exceedances of Environmental Quality Standards (EQSs) for heavy metals, cyanide and ammoniacal nitrogen were present in the surface water samples collected from across the site.

Samples were not taken both at rising and falling tide, therefore there is the potential that the water quality could differ dependent on the time the samples were taken. Samples taken from VC-22, VC-14, VC-25 were taken during an Ebb Tide, samples from VC-01, VC-05, VC-06, VC-15, VC- 16, VC-24 and VC-26 were taken at a Flood Tide, and a sample from VC-12 was taken at High Tide. Based on the results from the samples taken at different times, there does not appear to be a correlation between contaminant concentration and tides.

The GAC for zinc and lead were exceeded in every sample across the site. Concentrations were all within a small range and there was no pattern of concentrations across the site, suggesting these compounds are ubiquitous in surface waters in this area.

The spatial distribution of the remaining contaminant exceedances within the water environment has been divided into the three outlined areas and are discussed below and produced as Image 5 below.

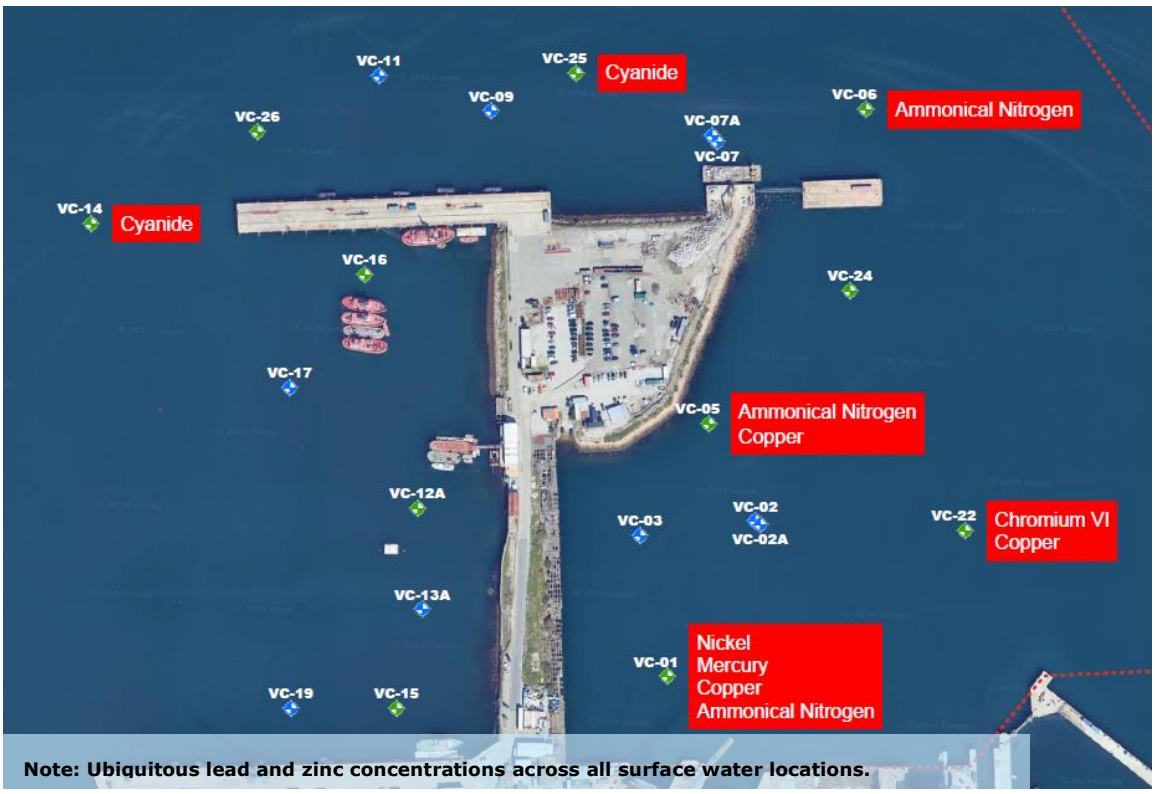


Image 5: Summary of surface water exceedances across the site.

North

Cyanide concentrations were recorded above the EQS in two locations, one to the north and one to the north-west of the site. All other cyanide concentrations were below the laboratory limit of detection; however, the limit of detection was an order of magnitude higher than the EQS value therefore it is possible that more samples would have shown exceedances.

Cyanide is often associated with gas works, and according to the historic mapping, a former gas works is known to have been present 360 m to the west of the site around 1910s. This site is listed on the Cornwall Council contaminated land register (Church Street Car Park, Falmouth, Cornwall, NGR: SW 80944 32821); one of the significant pollutant linkages listed is leaching of cyanide from soils and migration to the Fal Estuary. There is, therefore, the potential that the elevated cyanide concentrations to the north and north-west of the site are associated with the residual contamination with the gas works use. As elevated cyanide concentrations are not present across the site, cyanide is unlikely to originate from an on-site source.

East

Concentrations of ammoniacal nitrogen exceeded the EQS in three locations. All three exceedances were marginal, with the highest concentration recorded at 0.7 mg/l, very slightly above the EQS of 0.6 mg/l. Two of these exceedances were in the east, and one in the north-east of the site, which is indicative of an off-site source to the southeast of the site.

Chromium, copper, mercury, and nickel only exceeded the relevant EQS in samples taken from the east of the site, with more compounds noted in VC01 in the southeast of the site. This suggests a potential local source of heavy metal contamination to the south or southeast of the site.

According to an independent environmental database, a sewage outfall is present to the east of the site and there have also been two discharge consents to the east of the site, both for trade effluent. It is therefore possible that the source of the elevated heavy metals are related to these discharges into the surface water.

West

There were no exceedances of the relevant EQSs in the sampling locations in the western portion, other than lead and zinc that were found at elevated concentrations in every sample across the site.

5.3.1 Summary

Exceedances of lead and zinc were present across the site within the surface water. Exceedances of cyanide were noted in the north of the site, ammoniacal nitrogen and heavy metals were present in the east, and there did not appear to be a hotspot of contamination in the surface water in the west of the site.

It is likely that these discrete areas of contamination present in the surface water are due to the migratory routes of contaminants from specific off-site works, or discharges into the surface water. For example, a sewage outflow in the east of the site is a potential source of the ammoniacal nitrogen concentrations, and a historic gas works to the west of the site has the potential to be an off-site source of cyanide to the north and north-west of the site.

6. Marine Sediment Quality Assessment

6.1 Assessment Approach

To facilitate the redevelopment of the Falmouth Docks, dredging of marine sediments will be required to varying depths across the site. To understand potential disposal options for the sediments, the chemical quality of the sediment must be characterised to assess the suitability of the sediment for disposal at sea in line with MMO requirements, and to characterise the material sufficiently to understand alternative options should the material not be suitable for off-shore disposal.

In order to assess suitability for disposal to sea, sediment quality criteria are required to provide an understanding of risks to marine life from the potential contaminants in the sediment. In the UK, guidance is provided in the MMO Dredging Guidance[13] which includes the Cefas (Centre for Environment, Fisheries and Aquaculture Science) Action Levels (ALs) 1 and 2 (set in 1994).

An initial screening of the data against solely UK Cefas ALs was completed and presented for discussion with the MMO and Cefas. Discussions were held around the use of alternative (non-UK) risk-based screening values and where the dividing line between suitable for disposal and unsuitable should be drawn. Subsequent to the meeting, the MMO provided a detailed response with confirmation that a risk-based approach using sediment quality criteria from other countries would be preferable. A copy of the MMO correspondence letter is included within Appendix 4.

Ramboll has completed a review of the relevant guidance and sediment quality criteria available, taking into account comments provided by the MMO, to develop a risk-based approach to screening and assessment of the sediments at this site.

This review and the methodology adopted are summarised below, the screening values considered are all listed in Appendix 5.

A review of the UK Action Levels was completed by the MMO in 2015[14] which provided an overview of numerous sediment quality standards from different countries and concluded there that there are a range of limitations to using the ALs. A subsequent UK study, following on from the 2015 work, and published in 2022[15] provided further comment about the effect of changes to the action levels in the UK context. These studies identified that the Cefas AL1 criteria were typically overly restrictive compared to other OSPAR[16] states, whereas the AL2 values were typically less restrictive than other states. There are also notable contaminants where no UK guidance is available. Recommendations were made for the use of the Unites States Environmental Protection Agency (USEPA) risk-based values, German Action Levels and Canadian guidance; in particular for organics where UK guidance is limited.

In addition to the Cefas ALs, the following have been identified and are used in conjunction with the Cefas ALs to provide a risk-based assessment:

- OSPAR, 2009. Sediment Environmental Assessment Criteria (OSPAR EAC)[17];
- USEPA, 1996. Marine Sediment Ecotoxicological thresholds [18, 19, 20];

[13] Marine Management Organisation, 2023. Marine Licensing: sediment analysis and sample plans. https://www.gov.uk/guidance/marine-licensing-sediment-analysis-and-sample-plans Accessed: May 2024.

[14] Marine Management Organisation, 2015. High Level Review of Current UK Action Level Guidance. MMO Project No: 1053. Available at: High_level_review_of_current_UK_action_level_guidance_report__1053_.pdf (publishing.service.gov.uk). Accessed: July 2024.

[15] Mason, C.; Vivian, C.; Griffith, A.;Warford, L.; Hynes, C.; Barber, J.; Sheahan, D.; Bersuder, P.; Bakir, A.; Lonsdale, J.-A., 2022. Reviewing the UK's Action Levels for the Management of Dredged Material. Geosciences 2022, 12, 3. https://doi.org/10.3390/geosciences12010003

[16] Convention for the Protection of the Marine Environment of the North-East Atlantic, OSPAR Convention.

[17] OSPAR, 2009. Background Document on CEMP Assessment Criteria for QSR 2010. Available at: Microsoft Word - 461_Background Doc CEMP_ Assessment Criteria_Haz_Subs.doc (ospar.org). Accessed: July 2024

[18] USEPA, 1996. USEPA Ecotox thresholds. Publication 9345.0-12FSI, 1996. Available at: Ecotox Thresholds (epa.gov). Accessed: July 2024

[19] Lynda Webster and Rob Fryer, 2018. Status and trends of polycyclic aromatic hydrocarbons concentrations in sediment. UK Marine Online Assessment Tool, available at: https://moat.cefas.co.uk/pressures-from-human-activities/contaminants/pahs-in-sediment/. Accessed: July 2024

[20] Long, E.R. et al, 1995. Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments. Environmental Management, 19(1), pp.81–97.

- Canadian guidelines including the 1999 Interim Marine Sediment Quality Guidelines (Canada SQG)[21] (as listed on UK Marine Special Areas of Conservation website[18]) and Canadian Federal Environmental Quality Guidelines for PBDEs[22]; and
- German Action Levels (ALs)[23] for TBT, PCBs and organochlorine pesticides (OCPs).

Sediment quality criteria used in different countries can range quite widely in magnitude depending on the studies on which they are based, and the risk level considered appropriate to the derivation of the quality criteria. In order to define a way to quantify risk levels at different concentrations for the purposes of this study, a combination of the guideline values has been used to define Sediment Quality Guidelines (SQG) using the system described in Table 6.1 below.

Table 6.1: Proposed SQG assessment methodology

Risk Level	Description	Assessment Criteria
SQG1 Low Risk	Those concentrations which are measured below SQG1 are suitable for disposal to sea. Those concentrations which are measured above SQG1 represent a low risk, and are considered potentially suitable for disposal to sea. Further consideration in relation to SQG2 and SQG3 and the CSM are required for proportionate decision making in the UK context.	• Cefas AL1, as these values have been shown to be typically restrictive (low concentrations) compared to other OSPAR state guidelines; • USEPA effects range low (ERL), as these values are risk-based and reflect a low probability of effects on marine life; • German Action Level 1 has been used for compounds which are not currently included in the Cefas or USEPA lists; and • Canadian Federal Standards have been used for BDEs, in absence of Cefas criteria.
SQG2 Moderate Risk	This has been defined using risk-based median or probable effects concentrations, where possible. Those concentrations which are measured above SQG2 are unlikely to be suitable for disposal to sea. Further consideration of the CSM should be used for proportionate decision making in the UK context.	• USEPA effects range median (ERM); • German Action Level 2; and • Cefas Action Level 2 (AL2), in the absence of other values.
SQG3 High Risk	Those concentrations which are measured above SQG3 cannot be disposed to sea.	High risk has been defined using the Cefas AL2 as these have been shown to be typically less restrictive than other OSPAR state guidelines, and there is a concern that these may not be sufficiently restrictive to prevent harm to the environment. High risk levels are only defined for compounds with Cefas Action Levels or sufficient variation in screening values from other countries to warrant adding a category.

The guidelines selected for each category are summarised in Appendix 5 and described in Table 6.2 below.

Table 6.2 Contaminant specific review to define SQGs

Contaminant	Guideline Comparison
Chromium, copper, mercury, nickel, lead, zinc.	Cefas AL1 generally considered conservative for defining low risk and AL2 potentially not sufficiently conservative for defining probable risks. USEPA ERM is defined at higher level than the Canadian probable effects levels but lower than Cefas AL2. Considered reasonable indicator of probable effects for this study. Cefas AL1 has therefore been selected as the SQG1 value, and AL2 as the SQG3 value.
Arsenic	Numerous values are available and vary range in magnitude.

[21] Canadian Council of Ministers of the Environment (CCME), 1999. Canadian sediment quality guidelines for the protection of aquatic life. Accessed through UK Marine SACs Project website Accessed: July 2024.

[22] Government of Canada, 2013. Canadian Environmental Protection Act, 1999. Federal Environmental Quality Guidelines. Polybrominated Diphenyl Ethers (PBDEs). February 2013. Available at: https://www.canada.ca/en/environment-climate-change/services/evaluating-existing-substances/canadian-environmental-protection-act-1999-9.html Accessed: August 2024.

[23] OSPAR. Overview of Contracting Parties' National Action Levels for Dredged Material (2008 Update). Available at: https://www.ospar.org/documents?v=7113 Accessed: August 2024.

Contaminant	Guideline Comparison
	The Canadian SQC and USEPA ERL are similar at a value of around 0.5 x Cefas AL1. The USEPA ERL is therefore used in preference to the Cefas AL1 to define low risk. Cefas ALs are used to represent SQG2 and SQG3 values.
Cadmium	Numerous values are available and vary range in magnitude. The OSPAR EAC is lower than Cefas AL1. Canadian SQC is similar to Cefas AL1 and the USEPA ERM is higher than Cefas AL2. SQG1 and 2 have been defined used the Cefas ALs, and SQG3 has been defined by the USEPA ERM.
DBT	Cefas ALs are the only values available, these have been used as SQG1 and SQG3.
TBT	German ALs are more restrictive than the Cefas ALs. These are therefore used in preference to Cefas ALs as a precautionary approach to define SQG1 and SQG2. Cefas AL2 is used to define SQG3.
PAHs	Guideline values for PAHs have been defined using the USEPA approach including ERL and ERM values for individual PAHs and a calculation of total LMW (low molecular weight) and HMW (high molecular weight). SQG1 has been defined as the USEPA ERL, and SQG2 as the USEPA ERM.
PCBs	The UK guidance for PCBs is limited. German AL1 and AL2 are provided for seven individual congeners and are therefore used to define SQG1 and SQG2, respectively. Cefas AL1 and USEPA values are available for the sum of 7 and sum of 25 congeners. Cefas AL1 has been used for SQG1 for sum of seven congeners. Cefas AL1 / USEPA ERL (SQG1) and Cefas AL2 / USEPA ERM (SQG2 and SQG3) have been used for sum of 25 congeners.
Pesticides	A mix of German ALs supplemented by Cefas ALs and Canadian SQGs where German ALs are not available.
PBDEs	Canadian Federal Guidelines for PBDEs are assumed equivalent to an SQG1 low risk level and are used where these are available. No other guidelines are currently available for PBDEs.

6.2 Marine Sediment Assessment Results

The sediment analytical results laboratory certificates are provided in full within Appendix C of the Factual Ground Investigation Report.

The results are screened against SQG1, SQG2 and SQG3 in Appendix 6. A discussion of contaminant presence and distribution is provided in Table 6.3 below. The North, East and West areas are those as depicted in Image 4.

Table 6.3 Contaminant distribution assessment

Contaminant	Distribution Comment
Arsenic (As)	Concentrations of arsenic that exceed SQG1 were recorded across the site, mostly in the west and east. The highest recorded concentration, recorded >SQG2, was detected in VC-16 (0.0-0.10 m) in the west of the site. It is likely this reflects the naturally metal rich geology in the area.
Cadmium (Cd)	Concentrations of cadmium that exceeded SQG1 were focussed in the west of the site and in locations in close proximity to the wharves and structures to the east of the site. Maximum cadmium concentration was recorded in VC-19 (0.0-0.10 m; west of the site). Cadmium was present at a range of depths.
Chromium (Cr)	Concentrations of chromium that exceeded SQG1 were largely focussed in the west of the site and in locations in close proximity to the wharves and structures, generally in the top 1.0 mbgl. No exceedances were recorded in the north. Maximum concentration was recorded in VC-19 (0.0-0.10 m).
Copper (Cu)	Concentrations of copper that exceeded the SQG1 were spread across the whole site. The seven exceedances of SQG3 were all located in the west of the site, and in close proximity to the wharves and structures to the east of the site. There were no SQG3 exceedances in the north of the site. The majority of the SQG exceedances were located in the top 1.0 mbgl, however there are some exceedances at depth across the site. Maximum concentration was recorded in VC-19 (0.0-0.10 m).
Mercury (Hg)	Concentrations of mercury in exceedance of SQG3 were located across the site, largely concentrated around the west and the east in close proximity to the wharves and structures, however not exclusively. Maximum concentration was recorded in VC-03 (2.0-2.1 m) in the west of the site. Concentrations above SQG1 were present in majority of locations, mostly in the top 1.0 m; however, it was also noted at depth in VC-03 and VC-17.
Nickel (Ni)	Concentrations of nickel that exceeded SQG1 were present across the site, with elevated concentrations found through the full vertical profile of sediments analysed. It is likely this reflects the naturally metal rich geology in the area.
Lead (Pb)	Concentrations of lead that exceeded the SQGs were present across the site in the top 0 – 0.1 mbgl. The highest concentration was encountered in VC-16 (0.0-0.1 m), located in the west of the site.

Contaminant	Distribution Comment
	Concentrations at lower depths were located to the west and to the east in close proximity to the wharves and structures. Majority of the SQG3 exceedances were encountered in the western area of the site, with one exceedance (VC-14, 0.0-0.10 m) recorded in the north.
Zinc (pb)	Concentrations of zinc that exceeded the SQGs were present across the site in the top 0.0–0.1 mbgl. Concentrations at lower depths were located to the west and to the east in close proximity to the wharves and structures. All exceedances of SQG3 were encountered in the western area of the site, with the maximum concentration recorded in VC-19 (0.0-0.10 m).
Organotins	Organotins were encountered across the site in the top 0.0–0.10 mbgl. It was encountered at a lower depth in close proximity to the wharves and structures in the east of the site. No exceedances of SQG3 were encountered below 0.8 mbgl. Maximum DBT and TBT concentrations were recorded in VC-03 (in the east).
PAHs	PAH exceedances were generally present across the site in the top 0.10 mbgl. Concentrations above the SQG2 were identified in the east and west of the site, to the maximum depth of 2.10 mbgl (VC-03). The highest concentration was of phenanthrene, encountered in VC-13A in the west of the site (0.0–0.8 m).
PCBs	PCBs were encountered across the site, generally within the top 0.0–0.10 m. They were encountered at a lower depth in the west and in areas in close proximity to the wharves and structures in the east of the site. Exceedances of SQG2 were encountered in the west and east of the site, with the maximum concentrations for total of 25 congeners recorded in VC-15 (0.0-0.10 m) in the west.
Dieldrin	No dieldrin exceedances have been recorded against the available Cefas Action Level.
Pesticides	PPDDT was generally encountered across the site in the top 0.0–0.10 mbgl. It was encountered at a lower depth to the west, north-west, and areas in close proximity to the wharves and structures in the east of the site. Maximum concentration was recorded in VC-03 (0.0-0.10 m) in the east of the site.
BDE	BDE209 is found across the site in sediment from all depths, with highest concentrations in the surface sediments. Concentrations were generally below the SQG1 (although five samples were within one order of magnitude above the SQG1), and therefore, although ubiquitous at low concentrations, are not considered to pose a significant risk to the marine environment.

A risk-based approach was developed to assess the potential risks to the marine environment for sediments if the sediment were to be disposed to sea.

Risk assessment in this context is inherently subjective, relying on the level of risk deemed acceptable and the confidence in both site-specific data and the data used to derive the quality criteria. In order to estimate volumes of sediment considered unsuitable for disposal to sea using different risk levels, three scenarios are considered which are described in Table 6.4.

Table 6.4: Scenarios considered to classify the suitability of marine sediment for disposal at sea.

Scenario	Description	Discussion
Worst-case	All material with one or more contaminant above SQG1 is unsuitable for disposal to sea	Since all but one analysed sample from the site contained one or more compound above SQG1; using this approach, all material to be dredged would be considered unsuitable for disposal to sea. This is overly precautionary and not a suitably considered risk-based approach, which will not be considered further. Further assessment of all samples in relation to SQG2 and SQG3, the number and magnitude of exceedance of SQG1, and distribution of vertical and lateral impacts, has been completed to provide a risk-based proportionate approach to defining potential risks to the marine environment, as described in Scenario 1 and 2 below.
Scenario 1	Risk-based approach which is less conservative	Allows for limited moderate impacts to be disposed to sea, which in the overall context of the magnitude of impact, number of compounds present in the sample, material types, and vertical and lateral distribution of contaminants could be considered to pose a low risk.
Scenario 2	Risk-based approach which is more conservative	Allows limited samples to be disposed to sea if one compound was only marginally above the moderate risk level (SQG2). In particular, marginal impacts of metals which were all below Cefas AL2 and likely to be naturally high in the area due to the local geology and mining history. The assessment results in the deeper samples from VC-01, VC-14 and VC-19 are added to those considered unsuitable for disposal to sea in Scenario 1.

The scenarios above describe the use of the analytical data per sample location to determine risk levels. The samples considered unsuitable for disposal to sea in each scenario are shown through the colour coding in Appendix 6.

The next stage of the risk assessment, to understand lateral and vertical extent of contamination, has considered all exploratory hole logs and visual / olfactory evidence of contamination to determine the thickness of the stratum which each sample could be considered to represent. This provides a robust and evidence-based approach for estimating likely thickness of sediment considered unsuitable for disposal to sea in each scenario.

In addition to the quantitative data screening assessment above, qualitative assumptions are made in both Scenario 1 and 2 to define depths and areas of impacted sediment. These are described in Table 6.5 below.

Table 6.5 Extent of contaminated material qualitative assumptions

Discussion Item	**Scenario 1: Risk-based approach, less conservative**	**Scenario 2: Risk-based approach, more conservative**
Surface sediments: Surface sediments sampled across the entire dredging area contained a range of contaminants at elevated concentrations sufficient to conclude that all sediments in this layer pose a risk to marine ecology and are unsuitable for disposal to sea. This layer was generally described as very soft black silty CLAY and included variable visual and / or olfactory evidence of contamination including hydrocarbon odours and occasional coal and clinker.	Vertical extent of strata in the northern area taken as a reasonable worst-case average depth estimate; dredging technique assumed to be able to differentiate strata to reasonable accuracy to avoid over-excavation and reaction to observed conditions during works.	Vertical extent of strata in northern area conservatively assumed deeper than in Scenario 1.
Borderline moderate risk impacts below surface soft sediments at VC-14, VC-01, VC-19.	In this scenario, the borderline moderate impacts in VC-14, VC-01, VC-19 are considered suitable for sea disposal. The impacts are relatively minor and, when viewed in the context of volume and overall average concentrations, are mostly within natural strata and decrease with depth. These minor impacts are likely to represent only a small fraction of the total material to be excavated and, based on the balance of probabilities, are unlikely to pose a significant risk to the marine environment.	All deemed unsuitable.
Depth and extent of deep impact in western area: Deeper impacts were identified in the western area associated with the former wharves. However, the number of sampling points and depths achieved leave uncertainties on the vertical and lateral extent of this.	Assumptions on depth and extent of deep impact have been defined through the sample data, with impacts extending less deep to the north and south of the former wharves.	More conservative assumption on depth and extent of deep impact in western area has been used compared to Scenario 1.
Uncertainty adjacent to the infrastructure in the northern area: In the west and east areas, zones of deeper impacts are defined adjacent to the infrastructure. No sampling was undertaken directly adjacent to the infrastructure in the northern area.	All material below the impacted shallow surface sediment layer is assumed suitable for disposal to sea within the northern area.	As a conservative assumption for this scenario, a thin strip adjacent to the northern infrastructure has been defined as unsuitable for disposal to sea to a greater depth, to allow for potentially deeper impacts near the infrastructure in areas not sampled.

The vertical and lateral extent of materials assumed unsuitable for disposal to sea are shown for Scenario 1 on Figures 4a to 4d and for Scenario 2 on Figures 5a to 5d.

Scenario 1 is considered a reasonable worst-case scenario for development of the dredging plan.

7. Source-Pathway-Receptor Risk Assessment

7.1 Proposed Development Considerations

The dredging required as part of the development works will result in the mobilisation of potentially contaminated sediment, thus presenting a risk to the surface water body in the short term and marine ecology in the short and longer term in areas of sediment re-deposition. However, after completion of the construction works, much of the shallow sediment identified to contain the most significant contamination levels would have been removed from site, decreasing the overall contamination loading present in the marine area.

Piled foundations are proposed in the marine area; however, with appropriate piling techniques and the removal of the majority of the impacted contamination source materials, the risks to the groundwater body are unlikely to be significant.

7.2 Updated Conceptual Site Model and Qualitative Risk Assessment

The information presented in the previous sections of this report has been collated and evaluated to refine the preliminary conceptual site model for the site. The PCLs which were identified at PRA stage as posing a potentially significant risk are considered further by reassessment based on the ground investigation findings. This forms a qualitative risk assessment. Potential pollutant linkages are identified using the source-pathway-receptor framework detailed in Appendix 2. An assessment of the potential significance of each linkage is then made by consideration of the likely magnitude and mobility of the source, the sensitivity of the receptor and nature of the migration / exposure pathways between them.

This qualitative risk assessment has been undertaken by definition of risk categories in accordance with EA guidance, further details of which are provided in Appendix 2. Table 7.1 summarises the updated assessment of PCLs and risk categories associated with the proposed development as assessed following interpretation of the results of the ground investigation.

Table 7.1 Updated Conceptual Site Model

Potential Contaminant Linkage	Source	Pathway	Receptor	Probability of Risk being Realised	Consequence of Risk being Realised	Risk Classification
PCL1	Metals, organotins, hydrocarbons, PCBs, pesticides and PBDEs in shallow sediments to be dredged. Contamination in the marine sediment was present across the site in the shallow strata. Sediment in areas to the east and west of the central causeway are impacted to a greater depth.	Mobilisation and redistribution of potentially contaminated sediments in the riverbed during capital dredging and construction works (including demolition / removal of some of the existing marine structures).	Surface waterbody and WFD status. Seabed sediment quality in areas where mobilised sediment resettles (chemical suitability to support marine ecosystems)	Likely	Medium	**Moderate**

Risks identified as being moderate / low or higher are considered to be significant and are therefore PCLs of concern for which further actions are required.

8. Conclusions

8.1 Ground Investigation

A ground investigation was completed in the marine area, which was designed to provide sufficient information to assess the risks to the marine environment and to identify suitability of shallow sediments for disposal at sea based on the Falmouth Dock redevelopment scheme and associated required dredging.

The geology encountered during the intrusive works were largely as expected, with Marine Deposits overlying the Portscatho Formation at depth in most locations, and where the Marine Deposits were not present, the Portscatho Formation was encountered at ground level. Visual and olfactory evidence of contamination was encountered in almost all locations in the form of hydrocarbon and organic odours in shallow sediments.

8.1.1 Marine Sediment

Marine sediment samples were taken across the site at different depths.

Shallow soft sediments across the entire site were found to contain heavy metals, pesticides, PAHs, PCBs, and organotins in the top 0.0 - 0.10 m sample, confirming the visual / olfactory evidence of contamination in this surface layer. Contaminant concentrations in this layer are considered to reflect a high-risk to marine life and are considered unsuitable for disposal to sea.

Below the surface heavily impacted sediments, contaminant profiles varied across the site area. The northern area has recorded the lowest contamination levels, with few concentrations of contaminants above SQGs below the surface layer.

The western and eastern areas show more widespread contamination extending deeper adjacent to the wharf infrastructure.

A risk-based approach has been used to provide estimates of sediment volumes suitable for disposal to sea. All sediments are impacted with one or more compound above SQG1 (low risk) levels. Using a risk-based methodology (to provide a proportionate approach still protective of the environment), two scenarios were formulated to provide an upper and lower estimate of sediment volumes likely to be suitable for disposal to sea. Scenario 1 is considered a reasonable worst case scenario and has been used to inform the Environmental Statement and design of the dredging works. The approach will require agreement with Cefas for disposal to sea.

8.1.2 Surface water

A total of 11 water samples were taken across the site from different areas. Exceedances of the EQSs for lead and zinc were present within the surface water in all samples taken across the site.

Exceedances of cyanide were noted in the north of the site, ammoniacal nitrogen and heavy metals were present in the east. It is likely that the sources of the contaminants present in the surface water in discrete areas of the site are due to the migratory routes of off-site contamination, or due to outflows and discharges. For example, a sewage outflow in the east of the site is likely the source of the ammoniacal nitrogen concentrations, and a historic gas works to the west of the site has the potential to be an off-site source of cyanide to the north and north-west of the site.

Leachate analysis of composite sediment samples from each location confirmed limited leaching potential from materials in situ.

8.1.3 Risk Assessment

A qualitative risk assessment was completed to update the preliminary conceptual site model using the ground investigation information and assessment completed.

Potential receptors were identified which may be affected by water or sediment contamination during the proposed works, these included: the surface water body and WFD status, ecological receptors (on-site, in areas of proposed sediment disposal to sea, and in areas which may be affected by sediment mobilisation during works), the groundwater aquifer underlying the site, and human health.

There is considered to be an overall low risk to the underlying aquifer and a low risk to human health.

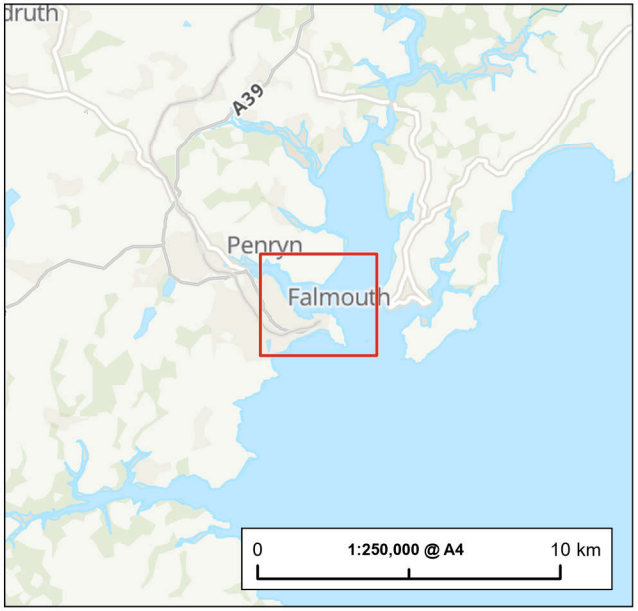
The only potential contaminant linkage of concern is the potential mobilisation of contaminants from marine sediment during capital dredging and in-ground works, which could impact the surface waterbody receptor and affect marine ecology on-site, in areas influenced by sediment migration during dredging, and at any off-shore sediment disposal sites. Mitigation measures will therefore be required to minimise these risks during works.

Following completion of the works, it is anticipated that the dredged area will have a significantly lower contaminant loading in the surface layers, thus improving the environmental quality and ecological potential of this area.

8.2 Sustainability

The findings discussed within this report support sustainable development of the site; through strategic sampling and analysis of various environmental media including soil and surface water, combined with technically robust investigation and detailed risk-based assessment processes. This facilitates proportionate and scientifically justifiable recommendations to reduce risks to humans and ecosystems alike. It allows for development of sustainable remedial measures and management of soils.

Appendix 1
Figures and Drawings



RAMBOLL

Figure Title: Site Location	Project Name: Falmouth Docks Development	Date: June 2024	
		Prepared By: BE	Figure No.: 1
Client: **Falmouth Docks and Engineering Company**	Project No./Filery ID: 1620015743 / RUK2023N00104	Scale: As Shown	Revision: 1.0

1620015743-RAM-MA-ZZ-00014_SiteLoc_03.pagx

Coordinate System: British National Grid. Projection: Transverse Mercator. Datum: OSGB 1936.

Legend

- EIA Site Boundary

Area

- NORTH
- EAST
- WEST
- Vibrocore Location

Figure Title
Site Investigation Locations

Project Name
Falmouth Docks Development

Project No./Filery ID
1620015743 / RUK2023N00104

Date	Figure No.	Revision
August 2024	2	2.0

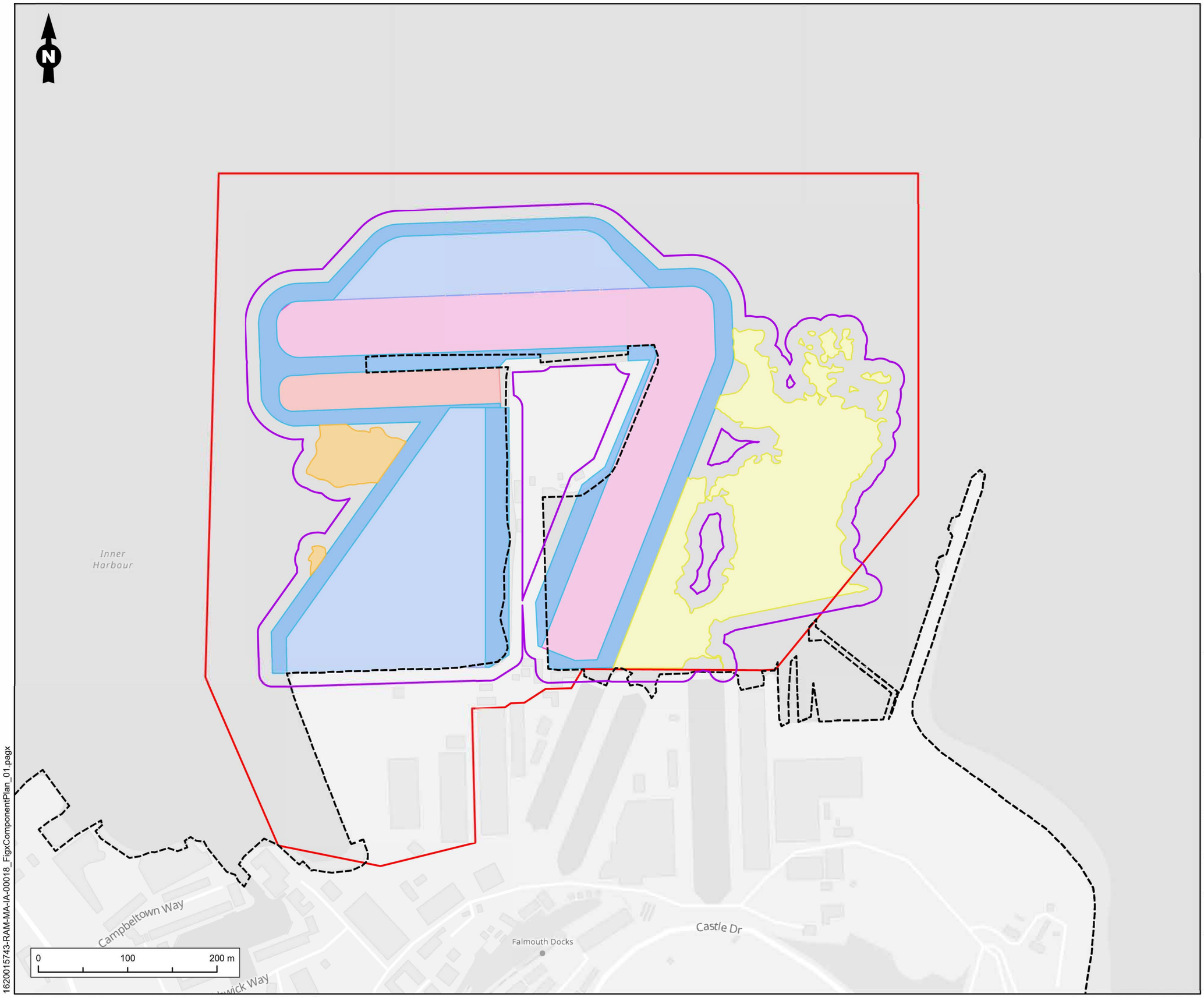
Prepared By	Scale
AHA	1:3 500 @A3

Client **Falmouth Docks and Engineering Company**

RAMBOLL

1620015743-RAM-MA-ZZ-00035_Fig2_SiteInvestigationLocations_02.pagx

Coordinate System: British National Grid. Projection: Transverse Mercator. Datum: OSGB 1936.



Legend

- Site Boundary
- England Admnistrative Boundary

Dredging Zones

- Dredge to -10.5m CD: 55,530 m2 229,847 m3
- Dredge to -10.5m CD for Twin Hub: 59,960 m2 223,745 m3
- Dredge to -10.5m CD for Bay Class: 9,810 m2 32,945 m3
- Graded Sides: 55,045 m2 122,506 m3
- Remove Obstructions from Demolished Timber Jetty -6.0 m CD: 5,501 m2 6,051 m3
- Surface Skim to Maintain -5.5m CD: 46,653 m2 26,646 m3
- Dredging Zone 15 m Buffer

Figure Title
Component Plan

Project Name
Falmouth Docks Development

Project No./Filery ID
1620015743 / REH2023N00104

Date	Figure No.	Revision
May 2024	3	1.0

Prepared By	Scale
BE	1:4,000 @A3

Client **Falmouth Docks and Engineering Company**

RAMBOLL

1620015743-RAM-MA-IA-00018_FigxComponentPlan_01.pagx

Coordinate System: British National Grid. Projection: Transverse Mercator. Datum: OSGB 1936.

Legend

- Site Boundary
- Section Line Extent
- Section Line
- Vibrocore Location

Depth of Material Unsuitable for Disposal at Sea (m)

- 0.3
- 0.5
- 0.7
- 1.5
- 2.0
- 3.0

Figure Title

Areas of marine sediment unsuitable for disposal to sea based on Scenario 1: Least Conservative

Project Name

Falmouth Docks Development

Project No./Filery ID

1620015743 / REH2023N00104

Date	Figure No.	Revision
September 2024	4A	1.0

Prepared By	Scale
AHA	1:4 000 @A3

Client **Falmouth Docks and Engineering Company**

RAMBOLL

1620015743-RAM-MA-IA-00019_FigxSedimentDepthScenario1_01.pagx

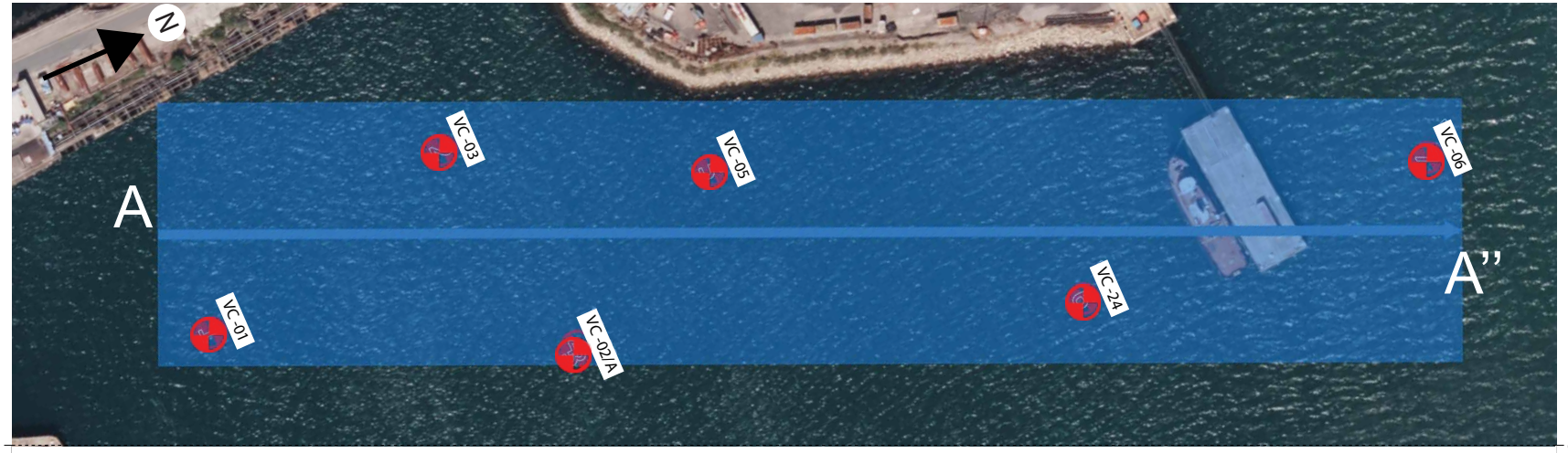
Coordinate System: British National Grid. Projection: Transverse Mercator. Datum: OSGB 1936.

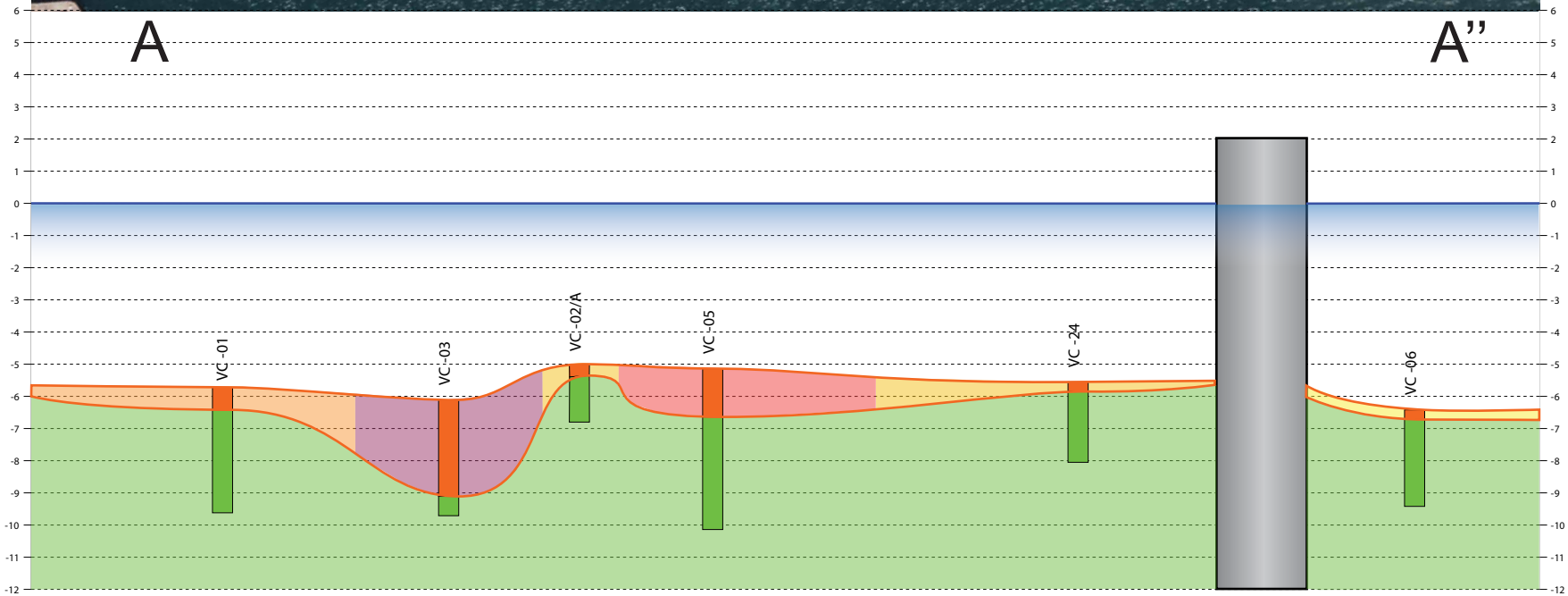
Dock infrastructure

Material deemed suitable for disposal to sea

Depth of material unsuitable for disposal at sea (m)

- 0.3
- 0.7
- 1.5
- 3.0





Chainage (m)	0.0	53.2	123.6	164.9	205.7	319.4	424.1	
Depth (m)		-5.7	-6.1	-5.0	-5.1	-5.6	-6.4	

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Figure Title
Scenario 1 (eastern area): vertical and lateral extent of materials assumed unsuitable for disposal to sea

Project Name
Falmouth Docks EIA

Date
Sep 2024

Figure No.
4B

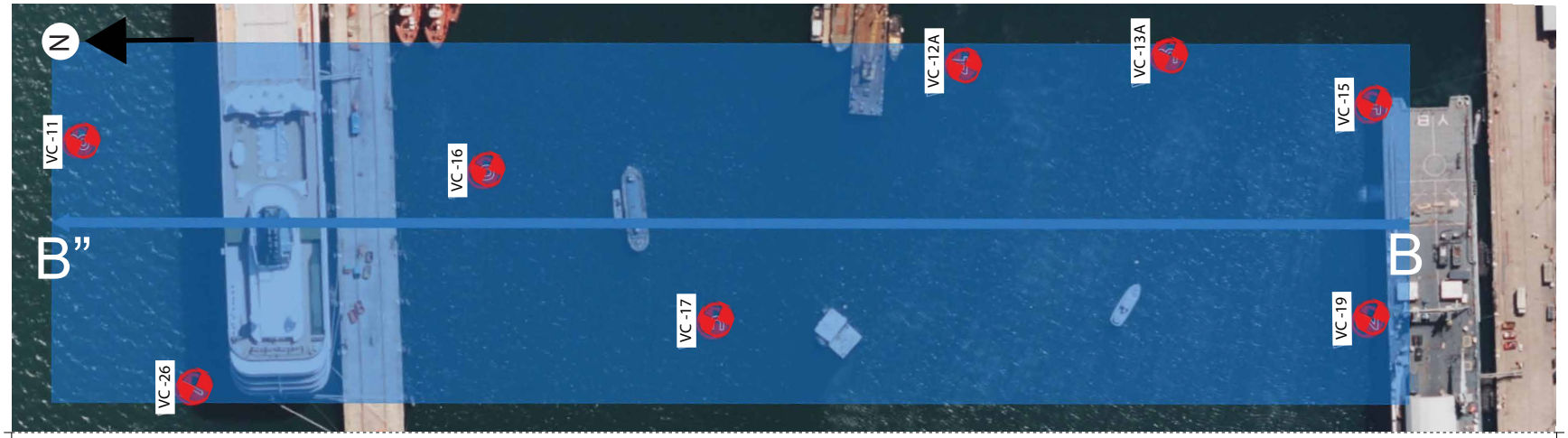
Project Number
1620015743 / REH2023N00104

Client
Falmouth Docks and Engineering Company

Vertical Scale 1:50

Horizontal Scale 1:500

Coordinate System:Great Britain National Grid with additional Helmert Corrections

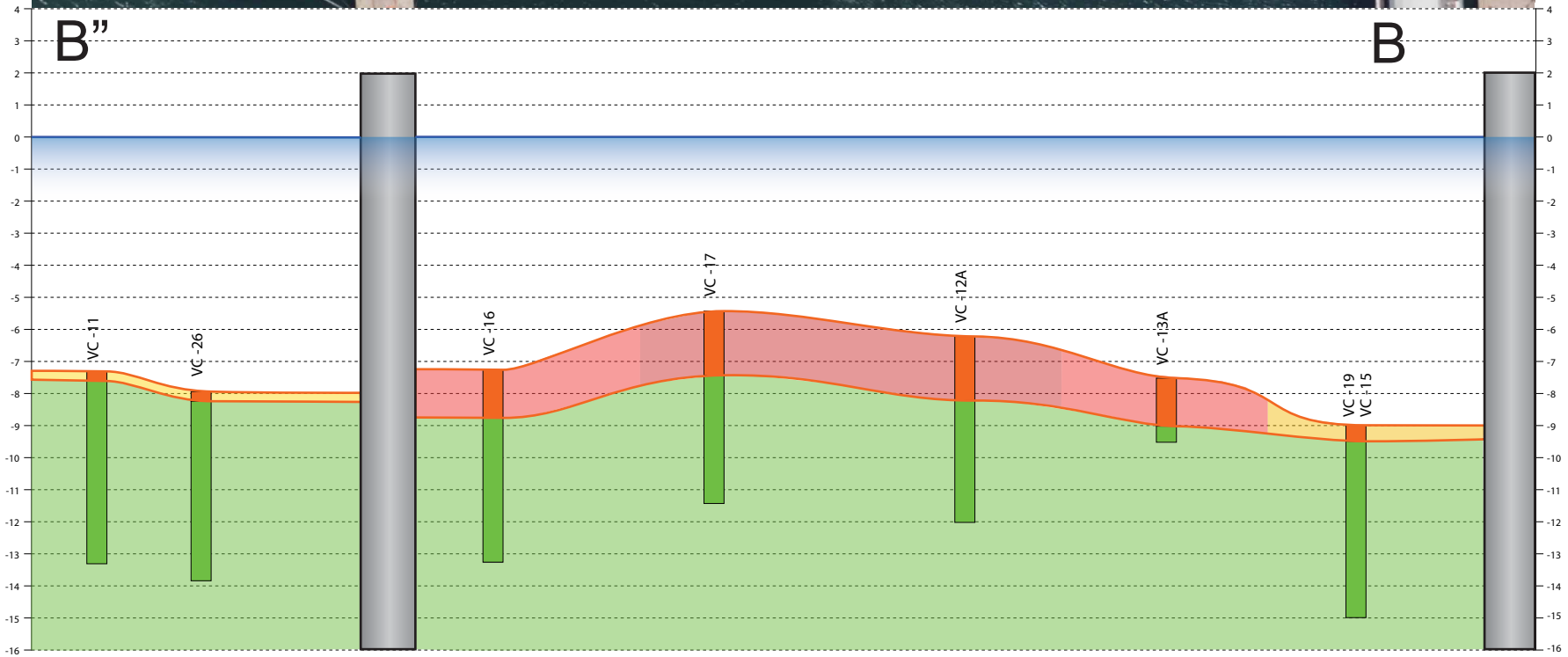


Dock infrastructure

Material deemed suitable for disposal to sea

Depth of material unsuitable for disposal at sea (m)

0.4
0.5
1.5
2.0



Chainage (m)	0.0	14.1	46.6	137.7	206.6	284.8	347.7	406.8	
Depth (m)	-7.3	-7.9	-7.3	-5.4	-6.2	-7.5	-9.0		

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Figure Title
Scenario 1 (western area): vertical and lateral extent of materials assumed unsuitable for disposal to sea

Project Name
Falmouth Docks EIA

Date
Sep 2024

Figure No.
4C

Project Number
1620015743 / REH2023N00104

Client
Falmouth Docks and Engineering Company

Vertical Scale
1:50

Horizontal Scale
1:500

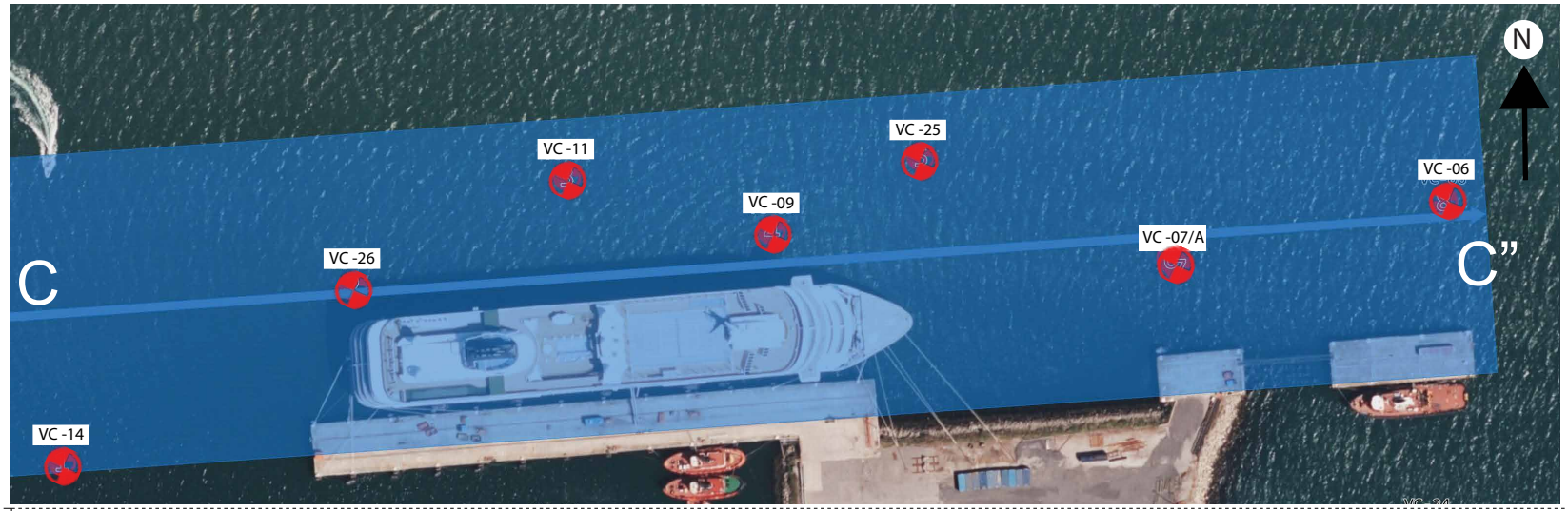
Coordinate System:Great Britain National Grid with additional Helmert Corrections

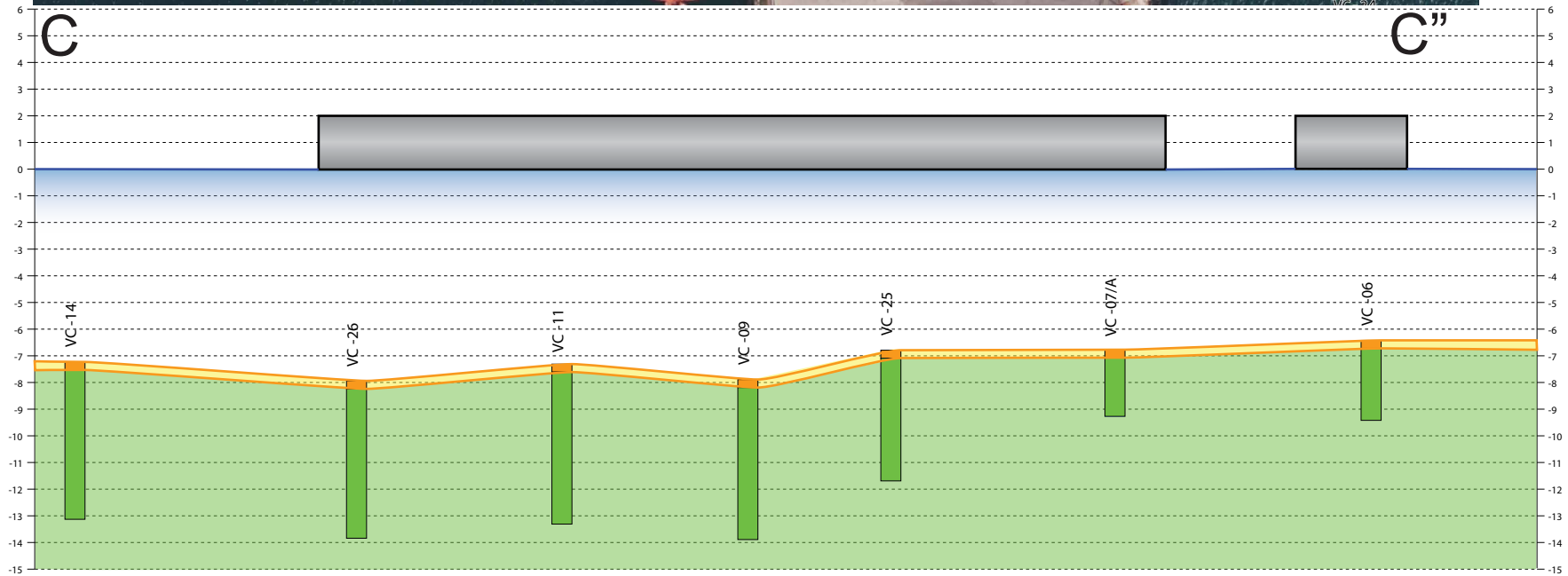
Dock infrastructure

Material deemed suitable for disposal to sea

Depth of material unsuitable for disposal at sea (m)

0.3





Chainage (m)	0.0	7.6	113.1	190.1	259.8	313.4	397.3	493.3
Depth (m)	-7.2		-7.9	-7.3	-7.9	-6.8	-6.8	-6.4

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Figure Title

Scenario 1 (northern area): vertical and lateral extent of materials assumed unsuitable for disposal to sea

Project Name

Falmouth Docks EIA

Date Sep 2024

Figure No. 4D

Project Number 1620015743 / REH2023N00104

Client Falmouth Docks and Engineering Company

Vertical Scale 1:60

Horizontal Scale 1:600

Coordinate System:Great Britain National Grid with additional Helmert Corrections

Legend

- Site Boundary
- Section Line Extent
- Section Line
- Vibrocore Location

Depth of Material Unsuitable for Disposal at Sea (m)

- 0.4
- 0.5
- 1.0
- 1.5
- 2.0
- 3.0

Figure Title

Areas of marine sediment unsuitable for disposal to sea based on Scenario 2: More Conservative

Project Name

Falmouth Docks Development

Project No./Filery ID

1620015743 / REH2023N00104

Date	Figure No.	Revision
September 2024	5A	1.0

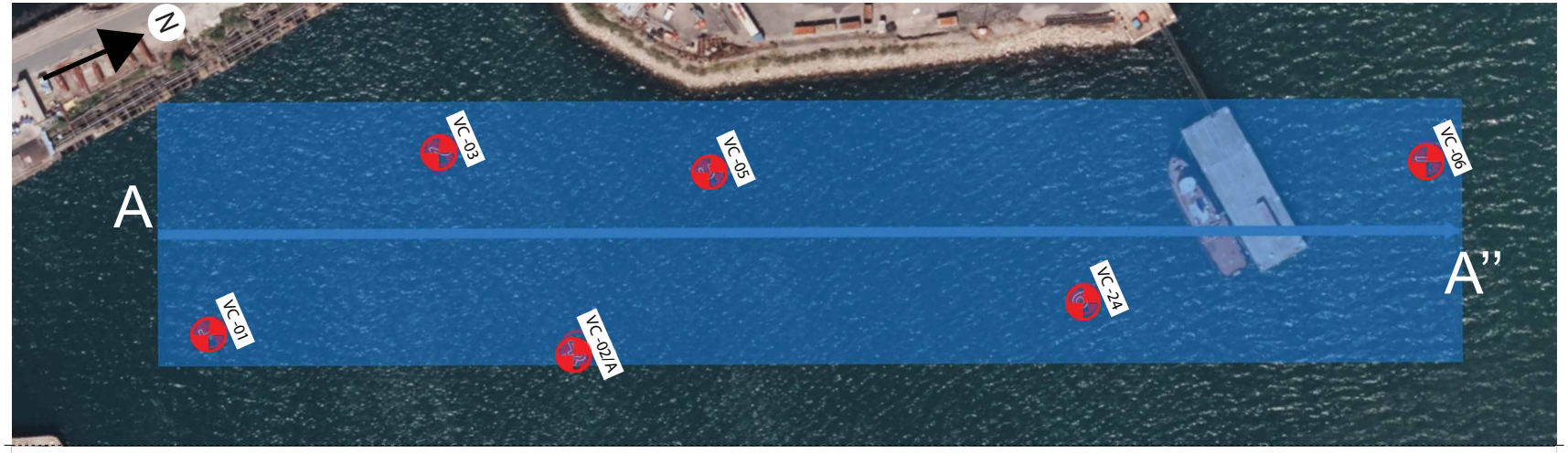
Prepared By	Scale
AHA	1:4 000 @A3

Client **Falmouth Docks and Engineering Company**

RAMBOLL

1620015743-RAM-MA-IA-00020_FigxSedimentDepthScenario2_01.pagx

Coordinate System: British National Grid. Projection: Transverse Mercator. Datum: OSGB 1936.

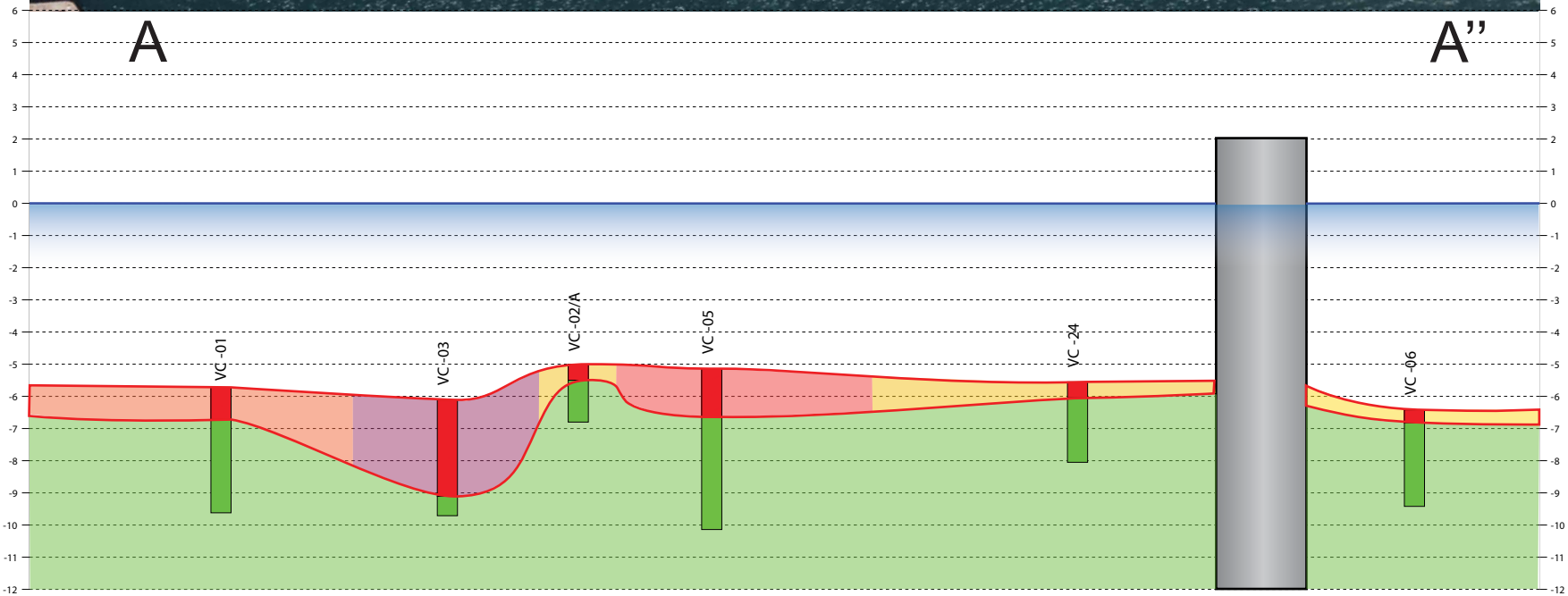


Dock infrastructure

Material deemed suitable for disposal to sea

Depth of material unsuitable for disposal at sea (m)

0.4
0.5
1.0
1.5
3.0



Chainage (m)	0.0	53.2	123.6	164.9	205.7	319.4	424.1	
Depth (m)		-5.7	-6.1	-5.0	-5.1	-5.6	-6.4	

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Figure Title
Scenario 2 (eastern area): vertical and lateral extent of materials assumed unsuitable for disposal to sea

Project Name
Falmouth Docks EIA

Date
Sep 2024

Figure No.
5B

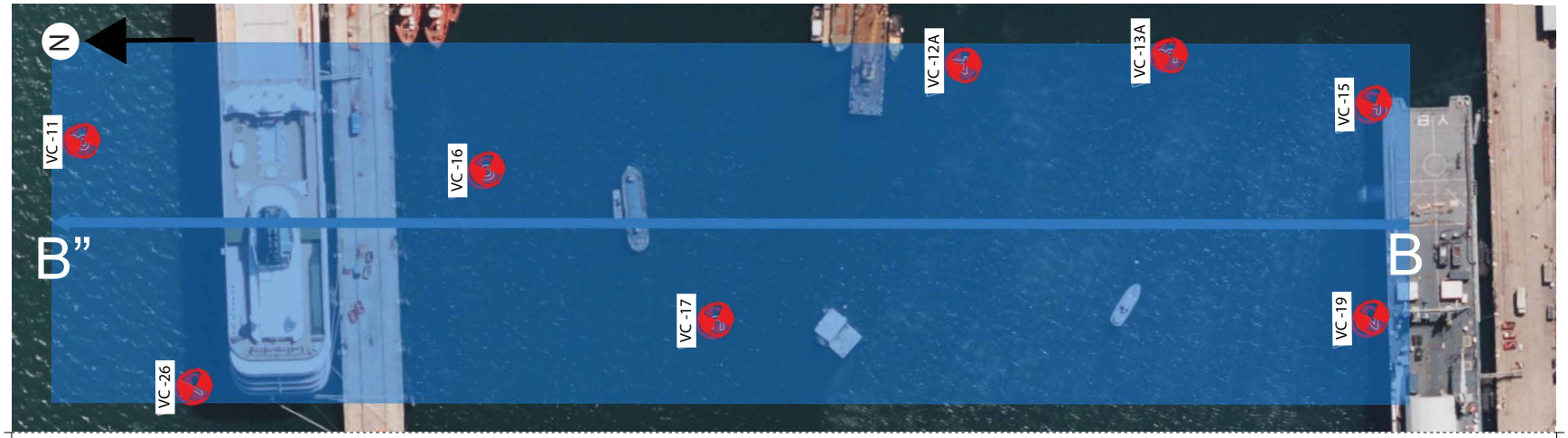
Project Number
1620015743 / REH2023N00104

Client
Falmouth Docks and Engineering Company

Vertical Scale
1:50

Horizontal Scale
1:500

Coordinate System:Great Britain National Grid with additional Helmert Corrections



Dock infrastructure

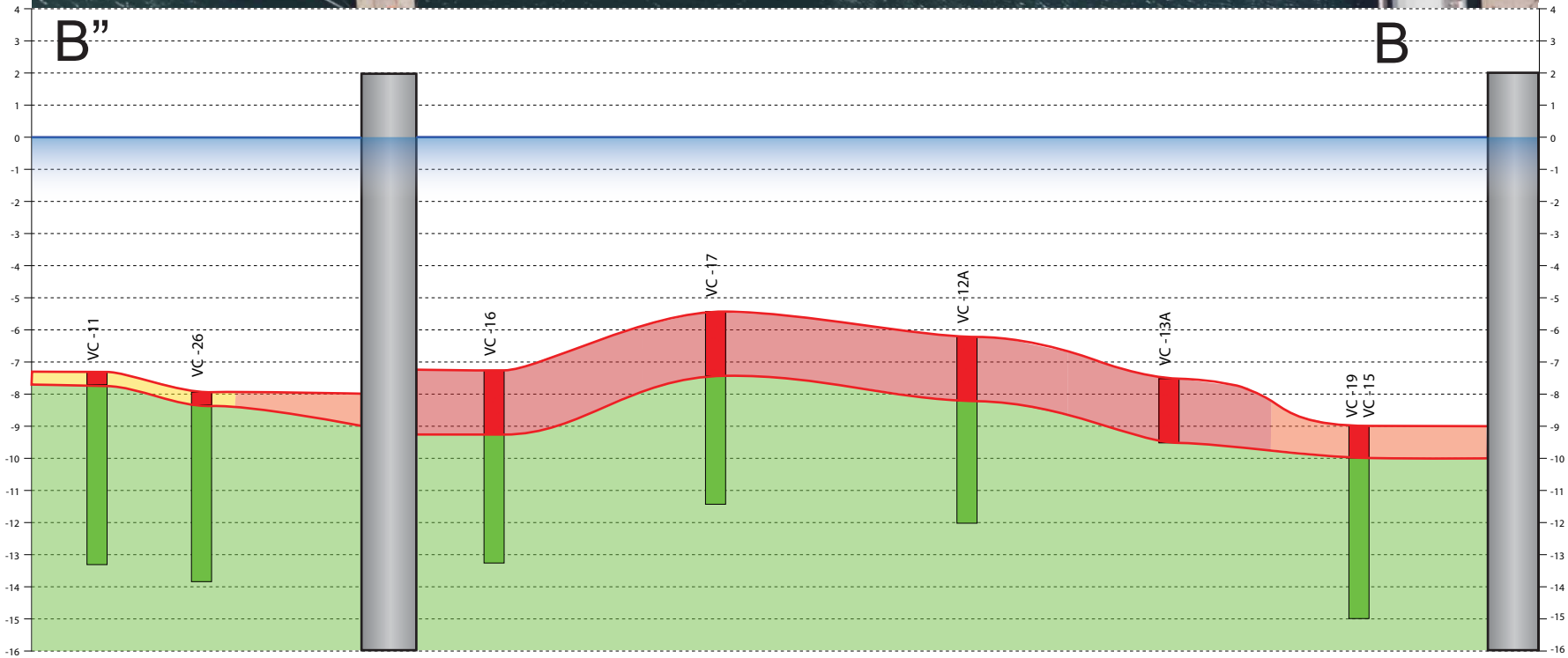
Material deemed suitable for disposal to sea

Depth of material unsuitable for disposal at sea (m)

0.4

1.0

2.0



Chainage (m)	0.0	14.1	46.6	137.7	206.6	284.8	347.7	406.8	
Depth (m)	-7.3	-7.9	-7.3	-5.4	-6.2	-7.5	-9.0		

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Figure Title
Scenario 2 (western area): vertical and lateral extent of materials assumed unsuitable for disposal to sea

Project Name
Falmouth Docks EIA

Date
Sep 2024

Figure No.
5C

Project Number
1620015743 / REH2023N00104

Client
Falmouth Docks and Engineering Company

Vertical Scale 1:50

Horizontal Scale 1:500

Coordinate System:Great Britain National Grid with additional Helmert Corrections

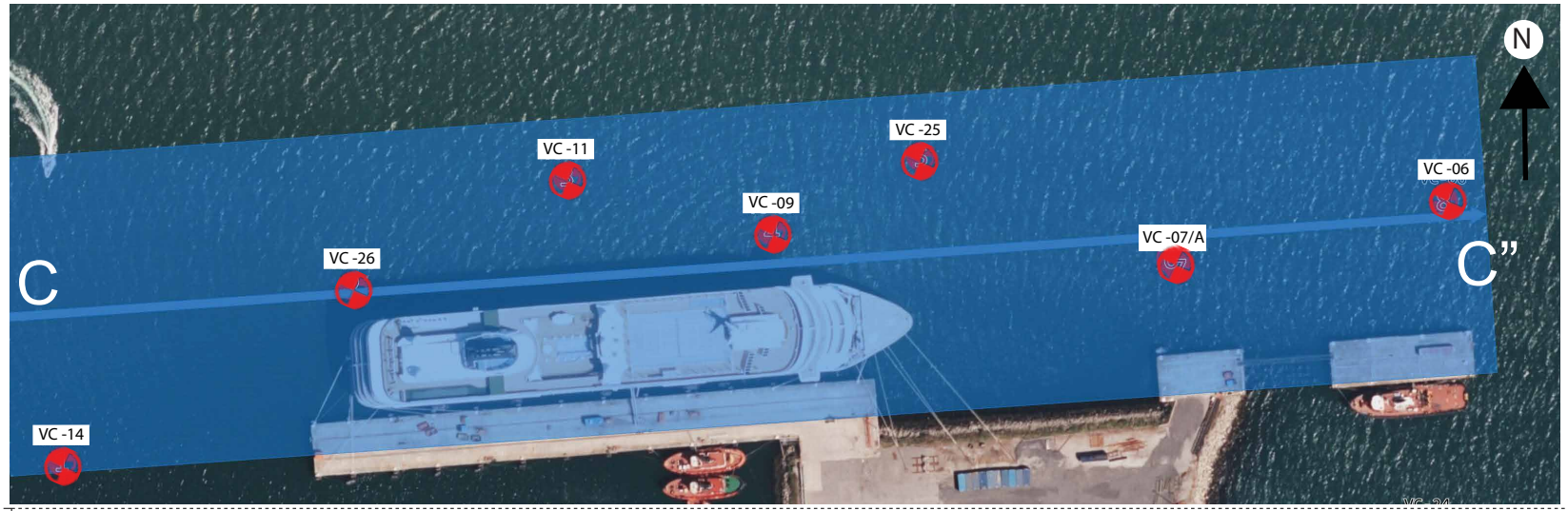
Dock infrastructure

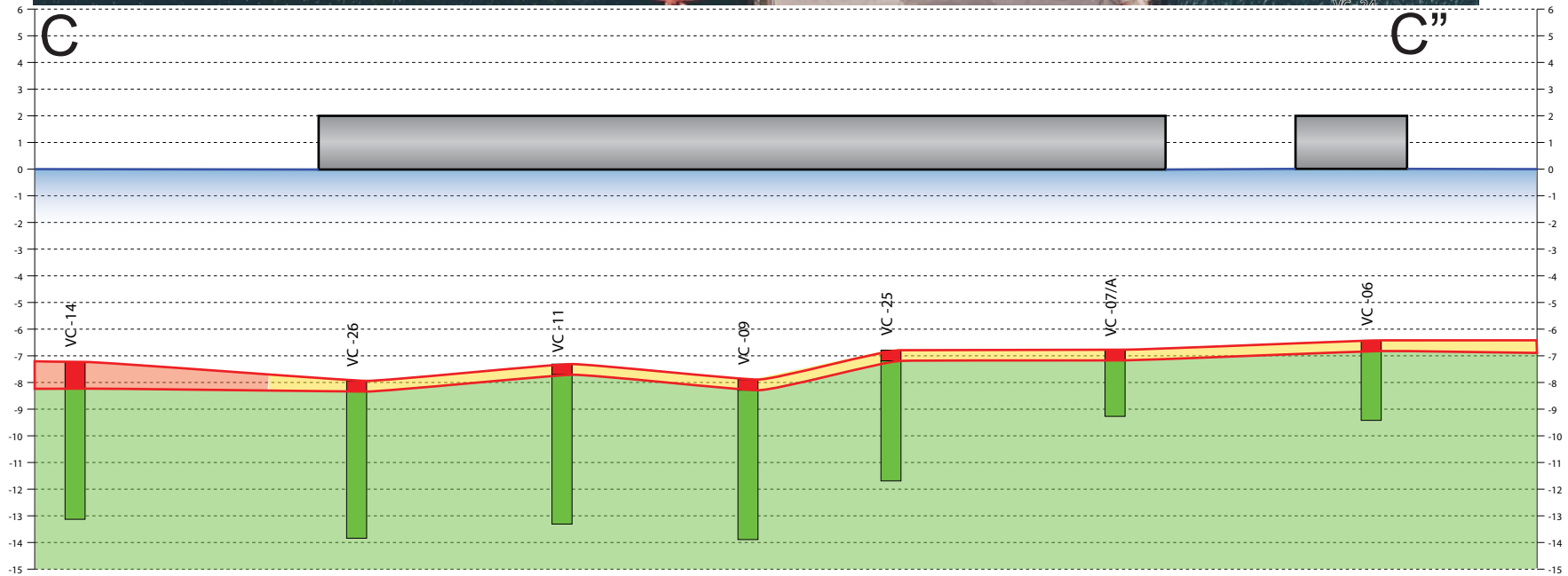
Material deemed suitable for disposal to sea

Depth of material unsuitable for disposal at sea (m)

0.4

1.0





Chainage (m)	0.0	7.6	113.1	190.1	259.8	313.4	397.3	493.3
Depth (m)	-7.2		-7.9	-7.3	-7.9	-6.8	-6.8	-6.4

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Figure Title
Scenario 2 (northern area): vertical and lateral extent of materials assumed unsuitable for disposal to sea

Project Name
Falmouth Docks EIA

Date
Sep 2024

Figure No.
5D

Project Number
1620015743 / REH2023N00104

Client
Falmouth Docks and Engineering Company

Vertical Scale 1:60

Horizontal Scale 1:600

Coordinate System:Great Britain National Grid with additional Helmert Corrections

Appendix 2
Legislative Context and Methodology

LEGISLATIVE CONTEXT

The regime for contaminated land was set out in Part 2A (ss.78A-78YC) of the Environmental Protection Act 1990 (EPA), as inserted by S.57 of The Environment Act 1995 and came into effect in England on 1st April 2000 as The Contaminated Land (England) Regulations 2000 (SI 2000/227). These regulations were subsequently revoked with the provision of The Contaminated Land (England) Regulations 2006 (SI 2006/1380) (as amended), which came into force in August 2006, and consolidated the previous regulations and amendments. Revised statutory guidance ("the Guidance") for local authorities on how to implement the regime, including the decision-making process on whether land is contaminated land in the legal sense, has been published by Defra and entered into force in April 2012.

Under Part 2A of the EPA Section 78A(2), "contaminated land" is defined as "land which appears… to be in such a condition, by reason of substances in, on or under the land, that:

a) significant harm is being caused or there is a significant possibility of such harm being caused[1]; or
b) significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused".

"Significant harm" is defined in the Guidance on risk-based criteria and must be the result of one or more relevant 'contaminant linkages' relating to the land. The presence of a contaminant linkage relies on the Source-Pathway-Receptor concept, where all three factors must be present and potentially or actually linked for a potential risk to exist. Under the Guidance, a 'significant contaminant linkage' is one which gives rise to a level of risk sufficient to justify a piece of land being determined as contaminated land. Should the authority consider that there is an unacceptably high probability, supported by robust science-based evidence that significant harm would occur if no action is taken to stop it, the land should be deemed a Category 1: Human Health. Land should be placed into Category 2 if the authority concludes, on the basis that there is a strong case for considering that the risks from the land are of sufficient concern, that the land poses a significant possibility of significant harm. Both Category 1 and Category 2 cases would be capable of being determined as contaminated land under Part 2A on the grounds of significant possibility of significant harm to human health. If the legal test for significant possibility of significant harm is not met, the authority should place the land into Category 3. If the local authority considers that there is no risk or that the level of risk posed is low, the land should be placed into Category 4.

The pollution of controlled waters is defined in Section 78A(9) of the Act as "the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter". The new Guidance stresses that the Part 2A regime is designed to identify and deal with 'significant pollution' and not lesser levels of pollution. As with human health risk, Categories 1 and 2 comprise land where the local authority considers that a significant possibility of significant pollution of controlled waters exists and Categories 3 and 4 comprises cases where the authority considers that a significant possibility of such pollution does not exist. The local authority should be satisfied that a substance is continuing to enter controlled waters or is likely to enter controlled waters.

Risk Assessment Framework

"Significant harm" or "significant pollution of controlled waters" is defined in the Guidance on risk-based criteria and must be the result of one or more relevant 'contaminant linkages' relating to the land.

The presence of a contaminant linkage relies on the Source-Pathway-Receptor concept, where all three factors must be present and potentially or actually linked for a potential risk to exist. For a risk

[1] Water Act 2003 (Commencement No. 11) Order 2012

of pollution or environmental harm to occur as a result of ground contamination, all of the following elements must be present:

- A source - a substance that is capable of causing pollution or harm;
- A receptor - something which could be adversely affected by the contaminant; and
- A pathway - a route by which the contaminant can reach the receptor.

If one of these elements is absent there can be no significant risk. If all are present then the magnitude of the risk is a function of the magnitude and mobility of the source, the sensitivity of the receptor and the nature of the migration pathway.

The Land Contamination: Risk Management[2] (LCRM) provides the technical framework for structured decision making about land contamination. LCRM advocates a phased approach, commencing with Stage 1 Risk Assessment comprising:

- Preliminary Risk Assessment (PRA) – desk study and qualitative assessment to develop of an outline Conceptual Site Model (CSM);
- Generic Quantitative Risk Assessment (GQRA) – an estimation of risk through assessment of contaminant concentrations against generic assessment criteria; and
- Detailed Quantitative Risk Assessment (DQRA) – an estimation of risk through detailed site-specific risk assessment and development of site-specific assessment criteria (SSAC) and site-specific risk assessment.

Each stage of assessment is focussed upon the development and refinement of a conceptual site model, which identifies Source-Pathway-Receptor linkages. The conceptual site model has been developed with consideration to guidance including BS EN ISO 21365:2020 Soil quality – Conceptual site models for potentially contaminated sites.

RISK ESTIMATION

An assessment of environmental risks is made for each potential pollutant linkage identified.

Risk estimation has been completed in accordance with the guidance provided in:

- NHBC and Environment Agency 2008. Guidance for the Safe Development of Housing on Land Affected by Contamination. R&D Publication 66: 2008.

The following is taken directly from NHBC/EA 2008. The key to the classification is that the designation of risk is based upon the consideration of both:

- the magnitude of the potential consequence (i.e. severity) [takes into account both the potential severity of the hazard and the sensitivity of the receptor]; and
- the magnitude of probability (i.e. likelihood) [takes into account both the presence of the hazard and receptor and the integrity of the pathway].

Table 1: Classification of Consequence (after NHBC/EA 2008)

Category	Definition
Severe	Highly elevated concentrations **likely** to result in "significant harm" to human health as defined by the EPA 1990, Part 2A, if exposure occurs.

[2] Land Contamination: Risk Management (LCRM), published by the Environment Agency on 8 October 2020

Category	Definition
	Equivalent to **EA Category 1** pollution incident including persistent and/or extensive effects on water quality; leading to closure of a potable abstraction point; major impact on amenity value or major damage to agriculture or commerce. Major damage to aquatic or other ecosystems, which is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long-term maintenance of the population. Catastrophic damage to crops, buildings or property.
Medium	Elevated concentrations which could result in "significant harm" to human health as defined by the EPA 1990, Part 2A if exposure occurs. Equivalent to **EA Category 2** pollution incident including significant effect on water quality; notification required to abstractors; reduction in amenity value or significant damage to agriculture or commerce. Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long-term maintenance of the population. Significant damage to crops, buildings or property.
Mild	Exposure to human health **unlikely** to lead to "significant harm". Equivalent to **EA Category 3** pollution incident including minimal or short-lived effect on water quality; marginal effect on amenity value, agriculture or commerce. Minor or short lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse change in its functioning or harm to a species of special interest that would endanger the long-term maintenance of the population. Minor damage to crops, buildings or property.
Minor	No measurable effect on humans. Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems. Repairable effects of damage to buildings, structures and services.

* For these purposes, disease is to be taken to mean an unhealthy condition of the body or a part of it and can include, for example, cancer, liver dysfunction or extensive skin ailments. Mental dysfunction is included only insofar as it is attributable to the effects of a pollutant on the body of the person concerned.

The likelihood of an event (probability) takes into account both the presence of the hazard and target and the integrity of the pathway and has been assessed based on the categories given below.

Table 2: Classification of Probability (after NHBC/EA 2008)

Category	Definition
High Likelihood	There is pollutant linkage and an event would appear very likely in the short-term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution.
Likely	There is pollutant linkage and all the elements are present and in the right place which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over the long-term.
Low Likelihood	There is pollutant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a long period such an event would take place and is less likely in the shorter term.
Unlikely	There is pollutant linkage, but circumstances are such that it is improbable that an event would occur even in the very long-term.

The potential severity of the risk and the probability of the risk occurring have been combined in accordance with the following matrix in order to give a level of risk for each potential hazard.

Table 3: The Classification of Risk (after NHBC/EA 2008)

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High Likelihood**	**Very high**	High	Moderate	Low
	Likely	High	Moderate	Moderate/Low	Low
	Low Likelihood	Moderate	Moderate/ Low	Low	Very low
	Unlikely	Moderate/ Low	Low	Very low	Very low

Very high risk
There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without remediation action OR there is evidence that severe harm to a designated receptor is already occurring. Realisation of that risk is likely to present a substantial liability to be site owner/or occupier. Investigation is required as a matter of urgency and remediation works likely to follow in the short-term.

High risk
Harm is likely to arise to a designated receptor from an identified hazard at the site without remediation action. Realisation of the risk is likely to present a substantial liability to the site owner/or occupier. Investigation is required as a matter of urgency to clarify the risk. Remediation works may be necessary in the short-term and are likely over the longer term.

Moderate risk
It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely, that the harm would be relatively mild. Further investigative work is normally required to clarify the risk and to determine the potential liability to site owner/occupier. Some remediation works may be required in the longer term.

Low risk
It is possible that harm could arise to a designated receptor from identified hazard, but it is likely at worst, that this harm if realised would normally be mild. It is unlikely that the site owner/or occupier would face substantial liabilities from such a risk. Further investigative work (which is likely to be limited) to clarify the risk may be required. Any subsequent remediation works are likely to be relatively limited.

Very low risk
It is a low possibility that harm could arise to a designated receptor, but it is likely at worst, that this harm if realised would normally be mild or minor.

No potential risk
There is no potential risk if no pollution linkage has been established.

GQRA METHODOLOGIES

In order to assess the significance of contaminant concentrations, Ramboll has derived Generic Assessment Criteria (GAC) for screening purposes. GAC are derived for each critical receptor identified. Receptors are considered in relation to:

- Human health receptors (e.g. site users); and
- The water environment (e.g. groundwater and surface water).

Potential risks to human health are considered primarily using measured concentrations of contaminants in soil. Potential risks to the water environment are considered primarily using groundwater and soil leachate (most commonly in the absence of groundwater) concentrations as indicative of the potentially mobile fraction of any soil impact.

Additional receptors may be relevant, dependent on the site e.g. flora/fauna, agricultural use, water supply pipes, buried concrete etc. These are considered separately on a site specific basis if relevant.

Assessment of Impact to Waters

Assessment of risks to water resources (referred to as "controlled waters" in England & Wales) is completed in general accordance with guidance provided in the Environment Agency's Approach to groundwater protection (2018[3]).

Generic assessment criteria for waters have been selected by Ramboll to assess potential risks to the identified environmental receptors. A hierarchical approach has been taken to the use of assessment criteria based on adoption of published water quality standards at European level and UK specific standards, with those standards being chosen based on the conceptual site model and identified critical receptors. For those determinants included in the analytical suite which do not have a corresponding UK drinking water or environmental screening criteria, reference is made to international guidance in accordance with Environment Agency recommendations.

Where such standards are unavailable, standards taken from other organisations, for example the World Health Organisation or OSPAR, have been used.

The list of critical legislation used in this approach is described below.

European Assessment Criteria:
- 2000/60/EC: Water Framework Directive;
- 2006/118/EC: On the Protection of Groundwater Against Pollution and Deterioration; and
- 2013/39/EU: Priority Substances in the Field of Water Policy Directive.

UK Assessment Criteria:
- UKTAG Groundwater Hazardous Substances Standards 2016, annex 2018.

English and Welsh Criteria:
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017;
- The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015;
- The Groundwater (Water Framework Directive) (England) Direction 2016; and
- The Water Supply (Miscellaneous Amendments) Regulations (England and Wales) 2010.

Other Criteria:
- World Health Organisation (WHO) Drinking Water Regulations 4th edition 2011;
- World Health Organisation (WHO): Petroleum Products in Drinking-water. Background document for development of WHO Guidelines for Drinking-water Quality 2008;
- USEPA National Primary Drinking Water Regulations; and
- OSPAR: Establishment of a List of Predicted No Effect Concentrations (PNECs) for Naturally Occurring Substances in Produced Water. OSPAR Agreement 2014-2015.

[3] The Environment Agency's approach to groundwater protection; February 2018; Version 1.2.

Minimum reporting values are also considered for hazardous substances for assessment of risks to groundwater resources in order to comply with the requirements of the guidance to 'prevent' input of hazardous substances to groundwater.

Assessment of Water Impact to Human Health

A methodology for the generation of the GAC for groundwater vapours (GACgwvap) was published by the Society of Brownfield Risk Assessment (SoBRA) in February 2017[4], which is based on the CLEA model. Ramboll has adopted SoBRA's approach and modified the model input parameters to reflect site conditions and generate site SSAC for groundwater contaminant sources designed to be protective of site users for a residential and/or commercial/industrial scenario as appropriate.

The SoBRA (GACgwvap) methodology uses the Environment Agency's CLEA software model. The CLEA software was originally provided for deriving assessment criteria for soils, not groundwater; however, groundwater assessment criteria can be extracted from the calculations within CLEA. CLEA assumes a steady state equilibrium between the sorbed, water and vapour phase concentrations in soil. Consequently, as part of the process of calculating soil phase concentrations, the software also calculates the vapour phase concentration and the pore water dissolved concentration (soil solution concentration) at the soil GAC. Therefore, for given soil assessment criteria derived to be protective of health, a soil solution concentration is also available within the CLEA calculations which would give rise to this vapour concentration at the tolerable risk level. This soil solution concentration is used as an inferred groundwater SSAC.

The proprietary risk assessment model, the ASTM RBCA[5] Tool Kit Version 2.6 for Chemical Releases, has been used for compounds which could not be run in CLEA. The RBCA model has been altered where necessary to reflect the current UK approach to human health risk assessment, as appropriate.

Contaminant Distribution Assessment

Concentrations above the GAC are considered further in relation to vertical and lateral distribution across the site. Where relevant, statistical analysis has been used with consideration to guidance provided in CL:AIRE statistical assessment guidance[6].

[4] SoBRA (2017) Development of Generic Assessment Criteria for Assessing Vapour Risks to Human Health from Volatile Contaminants in Groundwater. Version 1.0

[5] American Society for Testing Materials – Risk Based Corrective Action Model, Version 2.6

[6] CL:AiRE (2020) Professional Guidance: Comparing Soil Contamination Data with a Critical Concentration

Appendix 3

Surface Water and Marine Sediment Leachate – Screening Tables

Surface Water Analytical Results - Risk to the Controlled Waters

Analyte	Units	Saltwater AA EQS	Saltwater MAC EQS	Other Surface Waters - AA	Maximum Concentration	Location on site	East	East	North	West	West	West	North	North	East	East	North
						Laboratory ID:	24032944-001	24032944-002	24032944-003	24032970-001	24032970-002	24032970-003	24032970-004	24032970-005	24032954-001	24032954-002	24032954-003
						Sample ID:	VC01	VC05	VC06	VC-12	VC-15	VC-16	VC-14	VC-26	VC22	VC24	VC25
pH	pH units	-	6 - 8.5	-	8.1		8	8	8	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1
BOD (5 day)	mg O2/l	5	-	-	2.3		1.3	1.1	1.5	2.3	1.4	2.2	1.3	1.7	1.1	1.4	<1.0
Total Alkalinity	mg/l	-	-	-	118		117	107	113	113	118	113	112	113	109	112	115
Total Suspended Solids	mg/l	-	-	-	22		22	15	16	<5	<5	<5	<5	<5	<5	<5	<5
TDS as mg/L	mg/l	-	-	-	59400		36800	43500	46600	52300	37700	37700	37100	39500	59400	35900	39700
Total Organic Carbon	mg/l	-	-	-	1.53		1.31	1.29	1.17	1.53	1.39	1.03	1.05	1.11	1.18	1.18	1.05
Dissolved Organic Carbon	mg/l	-	-	-	1.13		1.01	0.97	0.89	1.09	1.05	1.04	1	1.04	1.13	1.11	1.03
Ammoniacal Nitrogen as N	mg/l	0.6[2]	-	-	0.7		0.7	0.6	0.7	0.2	0.2	0.2	0.2	0.33	0.32	0.32	0.2
Chloride as Cl	mg/l	-	-	-	13700		12900	11500	13300	10300	12200	13400	12800	13100	13500	11100	13700
Total Cyanide	mg/l	0.001	0.005	-	0.03		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	0.02
Metals																	
Arsenic as As	mg/l	0.025	-	-	0.005		0.005	0.005	0.003	0.003	0.003	0.004	0.002	0.003	0.003	0.004	0.003
Beryllium as Be	mg/l	-	-	-	<LOD		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron as B	mg/l	7	-	-	4.11		4.02	3.72	3.98	4.05	4.04	3.97	4.11	3.86	3.78	3.89	3.94
Cadmium as Cd	mg/l	-	-	0.0002	0.0001		<0.0001	<0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Chromium as Cr	mg/l	-	-	-	0.002		0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	0.001
Chromium (III)	mg/l	-	-	0.0006	<LOD		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Chromium (VI) as Cr	mg/l	0.0006	0.032	-	0.003		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	<0.003	<0.003
Copper as Cu	mg/l	0.0046[1]	-	-	0.008		0.008	0.005	0.003	0.003	0.003	0.004	0.003	0.003	0.004	0.004	0.003
Lead as Pb	mg/l	-	-	0.0013	0.104		0.104	0.019	0.013	0.049	0.032	0.037	0.024	0.029	0.05	0.043	0.019
Mercury as Hg	mg/l	-	-	0.00007	0.0006		0.0006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel as Ni	mg/l	-	-	0.0086	0.014		0.014	0.005	0.003	0.005	0.004	0.004	0.004	0.005	0.007	0.005	0.004
Selenium as Se	mg/l	-	-	-	0.04		0.031	0.034	0.029	0.017	0.021	0.02	0.017	0.028	0.04	0.027	0.02
Total Sulphur as SO4	mg/l	-	-	-	2520		2450	2270	2450	2490	2470	2430	2520	2340	2300	2380	2390
Vanadium as V	mg/l	0.1	-	-	0.003		0.003	0.002	0.002	0.002	0.002	0.002	0.001	0.002	0.002	0.001	0.002
Zinc as Zn	mg/l	0.0068	-		0.075		0.064	0.045	0.075	0.025	0.05	0.041	0.048	0.064	0.051	0.054	0.062
Total Hardness as CaCO3	mg/l	-	-	-	5690		5550	5100	5510	5620	5560	5480	5690	5280	5190	5370	5400
BTEX																	
Benzene	µg/l	-	-	8	<LOD		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Toluene	µg/l	74	370	-	<LOD		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Ethylbenzene	µg/l	-	-	10	<LOD		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
m/p-Xylene	µg/l	30	-	-	<LOD		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
o-Xylene	µg/l	30	-	-	<LOD		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
TPHs																	
Total GRO C5-C10	mg/l	-	-	-	<LOD		<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
C5-C6 Aliphatic	mg/l	-	-	-	<LOD		<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
>C6-C7 Aliphatic	mg/l	-	-	-	<LOD		<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
>C7-C8 Aliphatic	mg/l	-	-	-	<LOD		<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
>C8-C10 Aliphatic	mg/l	-	-	-	<LOD		<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
C5-C7 Aromatic	mg/l	-	-	-	<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
>C7-C8 Aromatic	mg/l	-	-	-	<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
>C8-C10 Aromatic	mg/l	-	-	-	<LOD		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Total TPH >C8-C40 (Aliphatic)	mg/l	-	-	-	0.09		0.04	<0.04	<0.04	0.04	0.05	<0.01	0.01	<0.01	0.09	<0.01	0.07
>C10-C12 (Aliphatic)	mg/l	-	-	-	<LOD		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>C12-C16 (Aliphatic)	mg/l	-	-	-	<LOD		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>C16-C21 (Aliphatic)	mg/l	-	-	-	<LOD		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>C21-C35 (Aliphatic)	mg/l	-	-	-	0.08		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	0.08	<0.01	0.06
Total TPH >C8-C40 (Aromatic)	mg/l	-	-	-	0.05		0.05	<0.04	<0.04	<0.04	<0.04	0.01	0.02	0.02	0.03	0.02	0.04
>C10-C12 (Aromatic)	mg/l	-	-	-	<LOD		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>C12-C16 (Aromatic)	mg/l	-	-	-	<LOD		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>C16-C21 (Aromatic)	mg/l	-	-	-	<LOD		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
>C21-C35 (Aromatic)	mg/l	-	-	-	0.05		0.05	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	0.02	0.03	0.01	0.02
PAHs																	
Acenaphthene	µg/l			0.38	<LOD		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	µg/l			0.13	<LOD		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	µg/l			0.1	<LOD		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo[a]anthracene	µg/l				<LOD		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo[a]pyrene	µg/l			0.00017	<LOD		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo[b]fluoranthene	µg/l				<LOD		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo[g,h,i]perylene	µg/l				<LOD		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo[k]fluoranthene	µg/l				<LOD		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	µg/l				<LOD		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenzo[a,h]anthracene	µg/l				<LOD		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	µg/l				<LOD		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	µg/l				<LOD		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno[1,2,3-cd]pyrene	µg/l				<LOD		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Naphthalene	µg/l				<LOD		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	µg/l				<LOD		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	µg/l				<LOD		<0.04	<0.04	<0.04	<0.04	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total PAH 16	µg/l				<LOD		<0.64	<0.64	<0.64	<0.64	<0.64	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16
Phenols																	
Phenol	mg/l	0.0077	0.046	-	<LOD		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Methylphenols	mg/l				<LOD		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dimethylphenols	mg/l				<LOD		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Trimethylphenols	mg/l				<LOD		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Phenols	mg/l				<LOD		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
1,2,4-Trichlorobenzene	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichlorobenzene	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,3-Dichlorobenzene	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,4-Dichlorobenzene	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1-Methylnaphthalene	mg/l				<LOD		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
2,4,5-Trichlorophenol	mg/l				<LOD		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
2,4,6-Trichlorophenol	mg/l				<LOD		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
2,4-Dichlorophenol	mg/l				<LOD		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
2,4-Dimethylphenol	mg/l				<LOD		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
2,4-Dinitrophenol	mg/l				<LOD		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
2,4-Dinitrotoluene	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2,6-Dinitrotoluene	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Chloronaphthalene	mg/l				<LOD		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
2-Chlorophenol	mg/l				<LOD		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
2-Methylnaphthalene	mg/l				<LOD		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
2-Methylphenol	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Nitroaniline	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Nitrophenol	mg/l				<LOD		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
3- & 4-Methylphenol	mg/l				<LOD		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
3-Nitroaniline	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4,6-Dinitro-2-methylphenol	mg/l				<LOD		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
4-Bromophenyl-phenylether	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4-Chloro-3-methylphenol	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4-Chloroaniline	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4-Chlorophenol	mg/l				<LOD		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
4-Chlorophenyl-phenylether	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4-Nitroaniline	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4-Nitrophenol	mg/l				<LOD		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Acenaphthene	mg/l				<LOD		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Acenaphthylene	mg/l				<LOD		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Anthracene	mg/l				<LOD		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Azobenzene	mg/l				<LOD		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo[a]anthracene	mg/l				<LOD		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Benzo[a]pyrene	mg/l				<LOD		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Benzo[b]fluoranthene	mg/l				<LOD		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Benzo[g,h,i]perylene	mg/l				<LOD		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Benzo[k]fluoranthene	mg/l				<LOD		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Benzoic Acid	mg/l				<LOD		<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Benzyl alcohol	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Biphenyl	mg/l				<LOD		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
bis(2-Chloroethoxy)methane	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
bis(2-Chloroethyl)ether	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
bis(2-Chloroisopropyl)ether	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
bis(2-Ethylhexyl)phthalate	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Butylbenzylphthalate	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbazole	mg/l				<LOD		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Chrysene	mg/l				<LOD		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Coronene	mg/l				<LOD		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dibenzo[a,h]anthracene	mg/l				<LOD		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Dibenzofuran	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Diethylphthalate	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Dimethylphthalate	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Di-n-butylphthalate	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Di-n-octylphthalate	mg/l				<LOD		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Diphenyl ether	mg/l				<LOD		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Fluoranthene	mg/l				<LOD		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Fluorene	mg/l				<LOD		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Hexachlorobenzene	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hexachlorobutadiene	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hexachlorocyclopentadiene	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hexachloroethane	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Indeno[1,2,3-cd]pyrene	mg/l				<LOD		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Isophorone	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Naphthalene	mg/l				<LOD		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nitrobenzene	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
N-Nitroso-di-n-propylamine	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
N-Nitrosodiphenylamine	mg/l				<LOD		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Pentachlorophenol	mg/l				<LOD		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Phenanthrene	mg/l				<LOD		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Phenol	mg/l				<LOD		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Pyrene	mg/l				<LOD		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,1,2-Tetrachloroethane	µg/l	-	-		<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,1-Trichloroethane	µg/l	100	-		<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2,2-Tetrachloroethane	µg/l	-	-		<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2-Trichloroethane	µg/l	300	-		<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethane	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Surface Water Analytical Results - Risk to the Controlled Waters

Analyte	Units	Saltwater AA EQS	Saltwater MAC EQS	Other Surface Waters - AA	Maximum Concentration	Location on site	East	East	North	West	West	West	North	North	East	East	North
						Laboratory ID:	24032944-001	24032944-002	24032944-003	24032970-001	24032970-002	24032970-003	24032970-004	24032970-005	24032954-001	24032954-002	24032954-003
						Sample ID:	VC01	VC05	VC06	VC-12	VC-15	VC-16	VC-14	VC-26	VC22	VC24	VC25
1,1-Dichloropropene	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2,3-Trichlorobenzene	µg/l				<LOD		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3-Trichloropropane	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2,4-Trichlorobenzene	µg/l				<LOD		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2,4-Trimethylbenzene	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dibromo-3-chloropropane	µg/l				<LOD		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2-Dibromoethane	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichlorobenzene	µg/l				<LOD		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2-Dichloroethane	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloropropane	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,3,5-Trimethylbenzene	µg/l				<LOD		<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
1,3-Dichlorobenzene	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,3-Dichloropropane	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,4-Dichlorobenzene	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2-Dichloropropane	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-Chlorotoluene	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
4-Chlorotoluene	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzene	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bromobenzene	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bromochloromethane	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bromodichloromethane	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bromoform	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bromomethane	µg/l				<LOD		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Carbon Tetrachloride	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chlorobenzene	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	µg/l				<LOD		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloroform	µg/l				<LOD		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloromethane	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
cis 1,2-Dichloroethene	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
cis 1,3-Dichloropropene	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dibromochloromethane	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dibromomethane	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dichlorodifluoromethane	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	µg/l				<LOD		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobutadiene	µg/l				<LOD		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
iso-Propylbenzene	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
m and p-Xylene	µg/l	**30**	-		<LOD		**<1**	**<1**	**<1**	**<1**	**<1**	<1	**<1**	**<1**	**<1**	**<1**	**<1**
MTBE	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Naphthalene	µg/l				<LOD		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
n-Butylbenzene	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
o-Xylene	µg/l	**30**	-		<LOD		**<1**	**<1**	**<1**	**<1**	**<1**	**<1**	**<1**	**<1**	**<1**	**<1**	**<1**
p-Isopropyltoluene	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Propylbenzene	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
sec-Butylbenzene	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Styrene	µg/l	**50**	**500**		<LOD		**<1**	**<1**	**<1**	**<1**	**<1**	**<1**	**<1**	**<1**	**<1**	**<1**	**<1**
tert-Butylbenzene	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	µg/l				<LOD		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Toluene	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
trans 1,2-Dichloroethene	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
trans 1,3-Dichloropropene	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	µg/l				<LOD		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Trichlorofluoromethane	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Vinyl Chloride	µg/l				<LOD		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dibutyltin as Sn	ng Sn/l				<LOD		<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Tributyltin as Sn	ng Sn/l				<LOD		<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Triphenyltin as Sn	ng Sn/l	-	**0.008**		<LOD		**<50**	**<50**	**<50**	**<50**	**<50**	**<50**	**<50**	**<50**	**<50**	**<50**	**<50**

Notes

Exceeding concentrations against the GAC are highlighted

[1] Copper Saltwater AA GAC is: 3.76 µg/l dissolved, where DOC ≤1mg/l; OR

3.76 + (2.677 x ((DOC/2) – 0.5)) µg/l dissolved, where DOC >1mg/l. Average SW DOC at the site is 1.03 mg/l.

[2] Ammoniacal Nitrogen as N GAC based on the Type 7 and 'Good' water quality.

WAC Chemical Results

Analyte	Units	Saltwater AA EQS	Saltwater MAC EQS	Other Surface Waters - AA	Location on site	North	West	West	West	North	East	North	North	East	East
					Maximum Concentration	24040697-001	24040697-002	24040692-001	24040692-002	24040692-003	24033590-001	24032970-006	24033090-001	24033090-002	24033090-003
						VC-7A	VC-16	VC-12A	VC-19	VC-26	VC-01	VC-09	VC-07	VC-024	VC-03
						0.00-2.20	0.00-5.10	0.00-5.20	0.00-5.60	0.00-5.20	0.00-3.65	0.0-5.6	0.00-1.30	0.00-2.10	0.00-3.10
						26/03/2024	26/03/2024	26/03/2024	27/03/2024	27/03/2024	25/03/2024	19/03/2024	20/03/2024	21/03/2024	22/03/2024
Total Moisture at 35°C	%	-	-	-		13.5	36.1	40.5	34.8	32.3	26.9	36.7	19.9	23	41.7
Total Organic Carbon	% m/m	-	-	-		0.26	1.6	1.97	2	1.6	1.2	1.76	0.79	0.24	2.94
pH	pH units	-	6 - 8.5	-	8.8	8.4	8.3	8.2	8.1	8.2	8.4	8.2	8.4	8	8.8
TDS as mg/l	mg/l	-	-	-	3070	1230	2620	3070	2350	2200	1670	2280	1150	1610	2780
Leached Organic Carbon	mg/l	-	-	-	16.4	2.72	15.1	16.4	15	13.3	5.04	10.7	1.74	2.27	11.8
Chloride as Cl	mg/l	-	-	-	1380	454	1070	1380	974	923	655	1030	435	624	1230
Fluoride as F	mg/l	5	-	-	1.5	1.2	0.4	0.4	0.4	0.4	0.3	0.3	1.2	1.5	0.7
Phenol Index	mg/l				<LOD	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Metals															
Antimony as Sb	mg/l	-	-	-	0.114	0.009	0.028	0.012	0.012	0.013	0.011	0.007	0.114	<0.001	0.024
Arsenic as As	mg/l	0.025	-	-	0.014	0.003	0.003	0.005	0.003	0.007	0.005	0.009	0.003	<0.001	0.014
Barium as Ba	mg/l	-	-	-	0.03	<0.01	0.01	0.02	0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.03
Cadmium as Cd	mg/l	-	-	0.0002	0.00004	<0.00002	0.00004	<0.00002	0.00004	0.00004	<0.00002	0.00003	<0.00002	<0.00002	0.00003
Total Chromium as Cr	mg/l	-	-	-	0.002	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.002	<0.001	<0.001	<0.001
Copper as Cu	mg/l	0.0046[1]	-	-	0.003	0.003	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001
Lead as Pb	mg/l	-	-	0.0013	<LOD	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mercury as Hg	mg/l	-	-	0.00007	0.00004	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	0.00004
Molybdenum as Mo	mg/l	-	-	-	0.347	0.038	0.096	0.054	0.347	0.195	0.051	0.2	0.031	0.015	0.067
Nickel as Ni	mg/l	-	-	0.0086	0.002	<0.001	<0.001	<0.001	0.002	0.002	0.002	0.002	<0.001	<0.001	<0.001
Selenium as Se	mg/l	-	-	-	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.002	<0.001	<0.001	<0.001
Total Sulphur as SO4	mg/l	-	-	-	320	135	178	155	320	181	214	188	109	116	38
Zinc as Zn	mg/l	0.0068	-		0.016	0.002	<0.002	0.003	0.005	0.003	<0.002	0.016	<0.002	<0.002	0.003

Notes

Exceeding concentrations against the GAC are highlighted

[1] Copper Saltwater AA GAC is: 3.76 µg/l dissolved, where DOC ≤1mg/l; OR 3.76 + (2.677 x ((DOC/2) – 0.5)) µg/l dissolved, where DOC >1mg/l. Average SW DOC at the site is 1.03 mg/l.

Appendix 4

MMO Correspondence Letter

Marine
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Mr Drystan Jones
A&P
The Docks
Falmouth
TR11 4NR

Our reference: ENQ/2024/00120

12 August 2024

Dear Mr Jones

Falmouth Docks Development - sediment contamination level

On 9 July 2024 the MMO received an enquiry requesting a consultation to be carried out with Cefas regarding the levels of sediment contamination identified in the data from the GI works and to seek approval regarding the approach to dispose of dredged material at Falmouth Bay (B) disposal site (PL075).

Consultation was carried out with Cefas and the comments, together with the MMO, are below for your review:

1. The sampling undertaken comprises the results from 21 vibrocore sample stations, with interval samples taken to a range of depths ranging from 2 metres (m) to 5m, these are summarised in Table 1. All samples were analysed for trace metals, organotins, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), organochlorine pesticides (OCPs), polybrominated diphenyl ethers (PBDEs) and particle size (PSA). Analyses were undertaken by SOCOTEC and Ocean Ecology (PSA only). The locations of the samples are depicted in Figure 1.

Table 1. Sediment sampling specification including maximum coring depth, core interval and total number of discreet samples per vibrocore station.

Site	Area	Max depth	Core interval	# Samples
VC1	EAST	3.65m	0.5 – 1m	5
VC2	EAST	1m	1m	2
VC2A	EAST	1.5m	0.5 – 1m	3
VC3	EAST	3m	1m	4
VC5	EAST	4m	1m	5
VC22	EAST	1m	1m	2

VC24	EAST	2m	1m	3
VC6	NORTH	2.65m	0.5 – 1m	4
VC7	NORTH	1.3m	0.2 – 1m	3
VC7A	NORTH	2.1m	1m	3
VC9	NORTH	5m	1m	6
VC11	NORTH	5.3m	0.3 – 1m	7
VC14	NORTH	3m	1m	4
VC25	NORTH	4m	1m	5
VC26	NORTH	3m	1m	4
VC12A	WEST	5m	1m	6
VC13A	WEST	0m	-	1
VC15	WEST	1m	1m	2
VC16	WEST	2m	1m	3
VC17	WEST	5.2m	1m	6
VC19	WEST	3m	1m	4

Figure 1. Sample locations in relation to the proposed EIA working area.

2. The results of the sample analysis show a range of concentrations between the limit of detection and exceeding Action Level 2 (AL) for every contaminant. The full results are too comprehensive to concisely tabulate in this advice minute, however, to summarise, every VC station had at least one (with many having multiple) discreet sample(s) exceeding AL2 for either trace metals, organotins or ∑25 PCBs except for VC2, VC11, VC24 and VC25 (located in the North and East). There was a broadly consistent trend with respect to depth too, as shown in Table 2, indicating that the contamination concerns are largely associated with the surface material, except in some stations at 1m to 2m in the East and West.

Table 2. Summary of the number of VC stations denoting an exceedance of AL2 mapped out by depth interval in the East, North and West sections of the dredge area (see Table 1 for corresponding VC stations numbers).

Depth interval	**East**	**North**	**West**
0 – 1m (surface)	5 VCs >AL2	6 VCs >AL2	All (6) VCs >AL2
1 – 2m	1 VC >AL2		3 VCs >AL2
2 – 3m			
3 – 4m	1 VC >AL2		
>4m			

3. In the meeting (29 July 2024), the applicant confirmed their awareness that this would likely result in much of the material to be dredged being restricted from disposal at sea, and confirmed that they are seeking clarification from Cefas as to what proportion of all material to be dredged would likely be restricted from disposal at sea, to enable them to undertake sediment modelling ahead of producing an EIA.

4. As depicted in the meeting held on 29 July 2024, material will be excluded in accordance with the distribution of AL2 exceedances, e.g., exclusion of all surface material in the Western area from disposal at sea. Whilst the ALs are a good starting point, they represent the minimum standard for assessing contaminant levels to determine risk. This is especially salient when considering that the current ALs were established almost 30 years ago, and every Action Levels Review (ALR) since their establishment (in 2003, 2005, 2015 and 2020[1]) all point to a range of limitations. To summarise these, it is generally considered that most UK AL1 values are overly restrictive compared to other OSPAR states, whilst most UK AL2 values are not sufficiently restrictive, if the aim of the ALs is to protect the marine environment from significant risk of pollution.

5. On this basis, use of criteria other than the agreed UK ALs is more appropriate to determine risk for an EIA than sole use of the ALs alone, particularly for organic contaminants such as PAHs, OCPs, PBDEs, and individual PCBs, for which no ALs currently exist. The best available other criteria to use are recommended in Mason *et al*

[1] ALR 2003 and 2005 – Defra (2003; 2005); ALR 2015 – MMO (2015); ALR 2020 – Mason *et al*. (2022).

(2022) and comprise the use of the German ALs for PCBs and OCPs, the use of the Canadian Federal Environmental Quality Guidelines for PBDEs, and the use of the effect-range approach outlined in Long *et al* (1995; 1998).

6. The PAHs effects-range approach calculates the sum total of low- (LMW) and high- (HMW) molecular weight PAHs and compares these to observed effect-ranges. If a total value (for either LMW or HMW selection of PAHs) does not exceed the effects-range low (ERL), the indication is that the sediment in the sample can be considered low risk. If a total value exceeds the effects-range median (ERM) for either the LMW or the HMW total values, it can be considered higher risk, with more likelihood of harm occurring.

7. Many samples showed exceedances of other criteria for all organic contaminants, most of which seem to show the same spatial trend as the AL2 exceedances for trace metals, organotins and ∑25 PCBs. There are some exceptions however, ranging from a single contaminant exceeding the other criteria, to multiple in the same sample. This is detailed in Table 3.

*Table 3. Summary of the number of VC stations denoting an exceedance of AL2 and other criteria[2]. The "other criteria" column details where a sample exceeds other criteria but **not** any UK AL2. Cells coloured orange denote a single exceedance of one criterion, whereas red denotes exceedances of multiple criteria. "deAL2" = German Action Level 2.*

Site	Area	Depth >AL2	Depth >other	Other criteria with no >AL2
VC1	E	0 - 0.1 & 3.55 - 3.65	0 - 1.1	One exceedance of deAL2 for γ-HCH
VC2	E			
VC2A	E	0 - 0.1		
VC3	E	0 - 2.1	0 - 2.1	
VC5	E	0 - 1.1	0 - 0.1	
VC22	E	0 - 0.1	0 - 0.1	
VC24	E		0 - 0.1	Multiple exceedances of PAHs, PCBs and OCPs
VC6	N	0 - 0.05	0 - 0.05	
VC7	N	0 - 0.1		
VC7A	N	0 - 0.1	0 - 0.1	
VC9	N	0 - 0.1		
VC11	N		0 - 0.1	One exceedance of deAL2 for TDE

[2] γ-HCH = gammahexachlorocyclohexane; TDE = p,p'-dichlorodiphenyldichloroethane; PCB101 = 2,2',4,5,5'-Pentachlorobiphenyl; PCB52 = 2,2',5,5'-Tetrachlorobiphenyl.

VC14	N	0 - 0.1		
VC25	N			
VC26	N	0 - 0.1	0 - 1.1	Multiple exceedances of different OCPs
VC12A	W	1 - 1.1	0 - 0.1	Multiple exceedances of PAHs and PCBs
VC13A	W	0 - 0.8	0 - 0.8	
VC15	W	0 - 0.1	0 - 1.1	One exceedance of PCB101 deAL2
VC16	W	0 - 1.1	0 - 1.1	
VC17	W	0 - 1.1	0 - 2.1	One exceedance of TDE deAL2
VC19	W	0 - 0.1	0 - 1.1	One exceedance of PCB52 deAL2

8. Where a sample already exceeds an AL2, this already deems the sample to be unacceptable for disposal to sea, and so any additional exceedances of other criteria only further increase the risk.

9. The MMO recommends a scenario-based approach:

- **Scenario A (Least conservative):** Consider only material showing any exceedance of an AL2 only.
- **Scenario B (Moderate conservative):** Consider material showing any exceedance of an AL2, and any **multiple** exceedances of criteria other than the AL2 (e.g. German Thresholds. This would result in excluding (additional to Scenario A):
  - VC24 down to 1m rather than no exclusion.
  - VC12A down to 2m rather than only 1m to 2m.
- **Scenario C (Most conservative):** Consider all material showing **any** exceedance of an AL2 and/or other criteria (i.e., single or multiple) as unacceptable. This would result in excluding (additional to Scenario B):
  - VC1 down to 2m rather than only to 1m.
  - VC11 down to 1m rather than no exclusion.
  - VC15 down to 2m rather than only to 1m.
  - VC17 to 3m rather than only to 2m.
  - VC19 to 2m rather than only to 1m.

Table 4. Exclusion scenarios per vibrocore station including Key.

Site	Area	Max depth	Scenario A	Scenario B	Scenario C
VC1	E	3.65m	0 to 1m	0 to 1m	0 to 2m
VC2	E	1m	Acceptable	Acceptable	Acceptable
VC2A	E	1.5m	0 to 1m	0 to 1m	0 to 1m
VC3	E	3m	0 to 3m	0 to 3m	0 to 3m
VC5	E	4m	0 to 2m	0 to 2m	0 to 2m
VC22	E	1m	0 to 1m	0 to 1m	0 to 1m
VC24	E	2m	Acceptable	0 to 1m	0 to 1m
VC6	N	2.65m	0 to 1m	0 to 1m	0 to 1m
VC7	N	1.3m	0 to 1m	0 to 1m	0 to 1m
VC7A	N	2.1m	0 to 1m	0 to 1m	0 to 1m
VC9	N	5m	0 to 1m	0 to 1m	0 to 1m
VC11	N	5.3m	Acceptable	Acceptable	0 to 1m
VC14	N	3m	0 to 1m	0 to 1m	0 to 1m
VC25	N	4m	Acceptable	Acceptable	Acceptable
VC26	N	3m	0 to 1m	0 to 1m	0 to 1m
VC12A	W	5m	1 - 2m	0 to 2m	0 to 2m
VC13A	W	0m	0 to 1m	0 to 1m	0 to 1m
VC15	W	1m	0 to 1m	0 to 1m	0 to 2m
VC16	W	2m	0 to 2m	0 to 2m	0 to 2m
VC17	W	5.2m	0 to 2m	0 to 2m	0 to 3m
VC19	W	3m	0 to 1m	0 to 1m	0 to 2m

Key	Colour
Acceptable	
Excluded to 1m	
Excluded to 2m	
Excluded to 3m	

10. The above approach would provide a sufficient range of risk to enable appropriate assessment in the EIA. Exclusion of scenario B may be acceptable so long as scenario C is included, however scenario C represents an unlikely level of risk, as this includes single exceedances of other criteria such as pesticides and PCBs. Single exceedances have on occasion been considered acceptable for disposal at sea as they may not be representative of the material (i.e., anomalous) or can be traced quite clearly to man-made materials.

Your feedback

We are committed to providing excellent customer service and continually improving our standards and we would be delighted to know what you thought of the service you have received from us. Please help us by taking a few minutes to complete the following short survey (https://www.surveymonkey.com/r/MMOMLcustomer).

If you require any further information please do not hesitate to contact me using the details provided below.

Yours Sincerely,

Y. Golightly

Yvonne Golightly
Marine Case Officer

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References

Defra, 2003. Background Levels and the Anthropogenic Component, of Naturally Occurring Elements in Marine Sediments Subject to Dredging and Disposal; Report to Defra Project AE0257; Centre for Environment, Fisheries and Aquaculture Science: Lowestoft, UK.

Defra, 2005. The Use Of Action Levels in The Assessment of Dredged Material Placement at Sea and in Estuarine Areas under FEPA (II). Report to Defra Project AE0258. Centre for Environment, Fisheries and Aquaculture Science, Burnham-on-Crouch, UK.

Gorham-Test, C., Wade, T., Engle, V., Summers, K., & Hornig, E. (1999). Regional Environmental Monitoring and Assessment Program — Galveston Bay 1993. Proceedings, Galveston Bay Estuary Program, State of the Bay Symposium IV, January 28–29, Galveston, TX, 97–109.

Long, E.R., Field, L.J., and MacDonald, D.D. (1998). Predicting toxicity in marine sediments with numerical sediment quality guidelines. Environmental Toxicology and Chemistry. 17, 714-727

Long, E.E., MacDonald, D.D., Smith, S.L., and Calder, F.D. (1995). Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environmental management, 19(1):81-97.

Marine Management Organisation (MMO), 2015. High Level Review of Current UK Action Level Guidance. A Report Produced for the Marine Management Organisation; MMO Project No: 1053; Marine Management Organisation (MMO): Newcastle, UK, 2015; 73p, ISBN 978-1-909452-350

Mason, C., Vivian, C., Griffith, A., Warford, L., Hynes, C., Barber, J., Sheahan, D., Bersuder, P., Bakir, A. and Lonsdale, J.A., 2022. Reviewing the uk's action levels for the management of dredged material. *Geosciences*, *12*(1), p.3.

Appendix 5

Marine Sediment Assessment Methodology

SEDIMENT ASSESSMENT CRITERIA

								Reference	Marine Management Organisation, 2014. Guidance. Marine Licensing: sediment analysis and sample plans.	USEPA, 1996. USEPA Ecotox thresholds. Publication 9345.0-12FSI, 1996. Lynda Webster and Rob Fryer, 2018. Status and trends of polycyclic aromatic hydrocarbons concentrations in sediment. Long, E.R. et al, 1995. Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments. Environmental Management, 19(1). pp.81–97. OSPAR EAC, 2010. Background Document on CEMP Assessment Criteria for QSR 2010.	Canadian Council of Ministers of the Environment (CCME), 1999. Canadian sediment quality guidelines for the protection of aquatic life: Summary tables. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers for the Environment, Winnipeg. Listed on UKMarine SACs Project website in absence of UK values.	Government of Canada, 2013. Canadian Environmental Protection Act, 1999. Federal Environmental Quality Guidelines. Polybrominated Diphenyl Ethers (PBDEs).	OSPAR Commission, 2009. Background Document on CEMP Assessment Criteria for QSR 2010. ISBN: 978-1-907390-08-1. Publication Number: 461/2009/.	OSPAR Commission, 2008. Overview of Contracting Parties' National Action Levels for Dredged Material (2008 Update).ISBN: 978-1-906840-02-0. Publication Number: 2008/363.	Marine Management Organisation, 2014. Guidance. Marine Licensing: sediment analysis and sample plans.	USEPA, 1996. USEPA Ecotox thresholds. Publication 9345.0-12FSI, 1996. Long, E.R. et al, 1995. Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments. Environmental Management, 19(1), pp.81–97.	USEPA, 1996. USEPA Ecotox thresholds. Publication 9345.0-12FSI, 1996.	Probable effect levels (PELs; dry weight) (from CCME 1999). Listed on UKMarine SACs Project website in absence of UK values.	OSPAR Commission, 2008. Overview of Contracting Parties' National Action Levels for Dredged Material (2008 Update).ISBN: 978-1-906840-02-0. Publication Number: 2008/363.
		Values selected from references in the next columns to represent Low, Moderate and High risk in relation to sediment disposal to sea.						**Source**	https://www.gov.uk/guidance/marine-licensing-sediment-analysis-and-sample-plans	[Ecotox Thresholds (epa.gov) https://moat.cefas.co.uk/pressures-from-human-activities/contaminants/pahs-in-sediment	Marine sediment quality standards (marinebiodiversity.org) refering to 1997 study Grimwood and Dixon 1997.	https://www.canada.ca/en/environment-climate-change/services/evaluating-existing-substances/canadian-environmental-protection-act-1999-9.html	Microsoft Word - 461_Background Doc CEMP_Assessmt Criteria_Haz_Subs.doc (ospar.org)	https://www.ospar.org/documents?v=7113	https://www.gov.uk/guidance/marine-licensing-sediment-analysis-and-sample-plans	Long et al 1995. Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments	[Ecotox Thresholds (epa.gov) https://moat.cefas.co.uk/pressures-from-human-activities/contaminants/pahs-in-sediment/	Marine sediment quality standards (marinebiodiversity.org) refering to 1997 study Grimwood and Dixon 1997.	https://www.ospar.org/documents?v=7113
		References			**Screening Values**															
Analyte	Unit	SQG1: No/Low effects anticipated. Measured conc >SQG1 = low risk, potentially suitable for disposal to sea. Further consideration of the CSM required for proportionate decision making in UK context.	SG2: probable effects. Measured conc>SQG2 = unlikely to be suitable for disposal to sea. Further consideration of the CSM may be appropriate for proportionate decision making in UK context.	SG3: probable effects. Measured conc>SQG3 = cannot be disposed to sea	SQG1: No/Low effects anticipated. Measured conc >SQG1 = low risk, potentially suitable for disposal to sea. Further consideration of the CSM required for proportionate decision making in UK context.	SG2: probable effects. Measured conc>SQG2 = unlikely to be suitable for disposal to sea. Further consideration of the CSM may be appropriate for proportionate decision making in UK context.	SG3: probable effects. Measured conc>SQG3 = cannot be disposed to sea	**Assessment Criteria / Notes**	**CEFAS Action Level 1**	**USEPA ERL (effects range low) from Publication 9345.0-12FSI, 1996 * as quoted in OSPAR 2010. **as quoted in Long et al 1995.**	**Canadian Sediment Quality Criteria**	**Canadian Federal Environmental Quality Guidelines for PBDEs (normalised to 1% organic carbon**	**OSPAR Sediment Environmental Assessment Criteria (normalised to 2.5%TOC)**	**OSPAR Overview German AL1 Values quoted for organics only**	**CEFAS Action Level 2**	**USEPA ERM (effects range median). **as quoted in Long et al 1995.**	**USEPA Marine Sediment Quality Criteria**	**Canadian probable effects levels**	**OSPAR Overview German AL2 Values quoted for organics only**
		Low Risk	**Moderate Risk**	**High Risk**	**Low Risk**	**Moderate Risk**	**High Risk**										**Effects Range Median (ERM)**		**Probable effects levels**	
Arsenic (As)	mg/kg	USEPA ERL	CEFAS AL1	CEFAS AL2	8.2	20	100		20	8.2	7.2				100	70		41.6	
Cadmium (Cd)	mg/kg	CEFAS AL1	CEFAS AL2	USEPA ERM	0.4	5	9.6		0.4	1.2	0.7		0.06		5	9.6		4.2	
Chromium (Cr)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	40	370	400		40	81	52.3				400	370		160	
Copper (Cu)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	40	270	400		40	34	18.7				400	270		108	
Mercury (Hg)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	0.3	0.71	3		0.3	0.15	0.13		0.22		3	0.71		0.7	
Nickel (Ni)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	20	51.6	200		20	20.9	15.9 (1997 TEL)				200	51.6		42.8 (1997 PEL)	
Lead (Pb)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	50	218	500		50	46.7	30.2		2.2		500	218		112	
Zinc (Zn)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	130	150	410		130	150	124				800	410		271	
Dibutyltin (DBT)	mg/kg	CEFAS AL1	-	CEFAS AL2	0.1	-	1		0.1						1				
Tributyltin (TBT)	mg/kg	German AL1	German AL2	CEFAS AL2	0.02	0.06	1		0.1					0.02	1				0.06
Acenaphthene	µg/kg	USEPA ERL	USEPA ERM	-	16	500			100	16	7					500	1100	88.9	
Acenaphthylene	µg/kg	USEPA ERL	USEPA ERM	-	44	640			100	44**	6					640		128	
Anthracene	µg/kg	USEPA ERL	USEPA ERM	-	85	1100			100	85.3	47		78			1100		245	
Benz[a]anthracene	µg/kg	USEPA ERL	USEPA ERM	-	261	1600			100	261*	75		1.5			1600		693	
Benzo[a]pyrene	µg/kg	USEPA ERL	USEPA ERM	-	430	1600			100	430	89		625			1600		763	
benzo(b)fluoranthene	µg/kg	-	-	-					100										
Benzo[ghi]perylene	µg/kg	USEPA ERL	USEPA ERM	-	85				100	85*			2.1						
Benzo[e]pyrene	µg/kg	-	-	-					100										
benzo(k)fluoranthene	µg/kg	-	-	-					100										
C1-Naphthalene	µg/kg	USEPA ERL	USEPA ERM	-	155				100	155*									
C1-Phenanthrene	µg/kg	USEPA ERL	USEPA ERM	-	170				100	170*									
C2-Naphthalene	µg/kg	USEPA ERL	USEPA ERM	-	150				100	150*									
C3-Naphthalene	µg/kg	-	-	-					100										
Chrysene	µg/kg	USEPA ERL	USEPA ERM	-	384	2800			100	384*	108					2800		846	
Dibenzoahanthracene	µg/kg	USEPA ERL	USEPA ERM	-	63	260			100	63.4**	6					260		135	
Fluoranthene	µg/kg	USEPA ERL	USEPA ERM	-	600	5100			100	600	113		250			5100	1400	1 494	
Fluorene	µg/kg	USEPA ERL	USEPA ERM	-	19	540			100	19**	21					540	540(SQB)	144	
Indeno[1,2,3- cd]pyrene	µg/kg	USEPA ERL	USEPA ERM	-	240				100	240*			1.5						
Naphthalene	µg/kg	USEPA ERL	USEPA ERM	-	160	2100			100	160	35		43			2100	480(SQB)	391	
Perylene	µg/kg	-	-	-					100										
Phenanthrene	µg/kg	USEPA ERL	USEPA MSQG	-	240	1100			100	240	87		1250				1100	544	
Pyrene	µg/kg	USEPA ERL	USEPA ERM	-	665	2600			100	665**	153		350			2600		1 398	
LMW PAH	µg/kg	USEPA ERL	USEPA ERM	-	552	3160				552						3160			
HMW PAH	µg/kg	USEPA ERL	USEPA ERM	-	1700	9600				1700						9600			
THC	mg/kg	German AL1	German AL2	-	300	1000			100					300					1000
PCB 101	mg/kg	German AL1	German AL2	-	0.002	0.006							0.003	0.002					0.006
PCB 105	mg/kg	see Sum of 25 congeners	see Sum of 25 congeners	-															
PCB 110	mg/kg	see Sum of 25 congeners	see Sum of 25 congeners	-															
PCB 118	mg/kg	German AL1	German AL2	-	0.003	0.01							0.0006	0.003					0.01
PCB 128	mg/kg	see Sum of 25 congeners	see Sum of 25 congeners	-															
PCB 138	mg/kg	German AL1	German AL2	-	0.004	0.012							0.008	0.004					0.012
PCB 141	mg/kg	see Sum of 25 congeners	see Sum of 25 congeners	-															
PCB 149	mg/kg	see Sum of 25 congeners	see Sum of 25 congeners	-															
PCB 151	mg/kg	see Sum of 25 congeners	see Sum of 25 congeners	-															
PCB 153	mg/kg	German AL1	German AL2	-	0.005	0.015							0.04	0.005					0.015
PCB 156	mg/kg	see Sum of 25 congeners	see Sum of 25 congeners	-															
PCB 158	mg/kg	see Sum of 25 congeners	see Sum of 25 congeners	-															
PCB 170	mg/kg	see Sum of 25 congeners	see Sum of 25 congeners	-															
PCB 18	mg/kg	see Sum of 25 congeners	see Sum of 25 congeners	-															
PCB 180	mg/kg	German AL1	German AL2	-	0.002	0.006							0.012	0.002					0.006
PCB 183	mg/kg	see Sum of 25 congeners	see Sum of 25 congeners	-															
PCB 187	mg/kg	see Sum of 25 congeners	see Sum of 25 congeners	-															
PCB 194	mg/kg	see Sum of 25 congeners	see Sum of 25 congeners	-															
PCB 28	mg/kg	German AL1	German AL2	-	0.002	0.006							0.002	0.002					0.006
PCB 31	mg/kg	see Sum of 25 congeners	see Sum of 25 congeners	-															
PCB 44	mg/kg	see Sum of 25 congeners	see Sum of 25 congeners	-															
PCB 47	mg/kg	see Sum of 25 congeners	see Sum of 25 congeners	-															
PCB 49	mg/kg	see Sum of 25 congeners	see Sum of 25 congeners	-															
PCB 52	mg/kg	German AL1	German AL2	-	0.001	0.003							0.003	0.001					0.003
PCB 66	mg/kg	see Sum of 25 congeners	see Sum of 25 congeners	-															
PCB SUM of ICES 7	mg/kg	CEFAS AL1	see Sum of 25 congeners	-	0.01				0.01	0.0115*	0.021								
PCBs – sum of 25 congeners	mg/kg	CEFAS AL1 / USEPA ERL	USEPA ERM/ CEFAS AL2	USEPA ERM/ CEFAS AL2	0.02	0.18**	0.18**		0.02	0.0227**					0.2	0.18**			
AHCH	mg/kg	German AL1	German AL2	-	0.0004	0.001								0.0004					0.001
BHCH	mg/kg	-	-	-															
GHCH	mg/kg	German AL1	German AL2	-	0.0002	0.0006								0.0002					0.0006
DIELDRIN	mg/kg	CEFAS AL1	Canadian SQG	-	0.005	0.71			0.005		0.71							4.3	
HCB	mg/kg	German AL1	German AL2	-	0.002	0.006								0.002					0.006
PPTDE	mg/kg	German AL1	German AL2	-	0.003	0.01								0.003					0.01
PPDDE	mg/kg	German AL1	German AL2	-	0.001	0.003					2.07			0.001				374	0.003
PPDDT	mg/kg	CEFAS AL1	German AL2	USEPA ERM	0.001	0.003	0.046		0.001	0.0016	1.19			0.001		0.046		4.77	0.003
BDE17	mg/kg	Canadian FEQG	-	-	0.044							0.044							
BDE28	mg/kg	Canadian FEQG	-	-	0.044							0.044							
BDE47	mg/kg	Canadian FEQG	-	-	0.039							0.039							
BDE66	mg/kg	Canadian FEQG	-	-	0.039							0.039							
BDE85	mg/kg	Canadian FEQG	-	-	0.0004							0.0004							
BDE99	mg/kg	Canadian FEQG	-	-	0.0004							0.0004							
BDE100	mg/kg	Canadian FEQG			0.0004							0.0004							
BDE138	mg/kg	Canadian FEQG	-	-	0.44							0.44							
BDE153	mg/kg	Canadian FEQG	-	-	0.44							0.44							
BDE154	mg/kg	Canadian FEQG	-	-	0.44							0.44							
BDE183	mg/kg	Canadian FEQG	-	-															
BDE209	mg/kg	Canadian FEQG	-	-	0.019							0.019							

Notes

LMW PAH - low molecular weight PAHs: sum of Naphthalene, Acenaphthene, Fluorene, Anthracene, C1-naphtha-lenes, Acenaphthylene,Phenanthrene

HMW PAH - high molecular weight PAHs: sum of Fluoranthene, Pyrene, Benz[a]anthracene, Chrysene, Benzo(a)pyrene,Dibenz[a,h][a,b] anthracene

Appendix 6

Marine Sediment – Screening Tables

North Area

Analyte	Units	Reference			Low Risk	Moderate Risk	High Risk	Sample ID	VC-06	VC-06	VC-06	VC-06	VC-07	VC-07	VC-07	VC-07A	VC-07A	VC-07A
		SQG1: No/low effects anticipated. Measured conc >SQG1 = low risk, potentially suitable for disposal to sea. Further consideration of the CSM required for proportionate decision making in	SG2: probable effects. Measured conc>SQG2 = unlikely to be suitable for disposal to sea. Further consideration of the CSM may be appropriate for proportionate	SG3: probable effects. Measured conc>SQG3 = cannot be disposed to sea	SQG1: No/low effects anticipated. Measured conc >SQG1 = low risk, potentially suitable for disposal to sea. Further consideration of the CSM required	SG2: probable effects. Measured conc>SQG2 = unlikely to be suitable for disposal to sea. Further consideration of the CSM may be appropriate for proportionate	SG3: probable effects. Measured conc>SQG3 = cannot be disposed to sea	Depth (m)	0.00-0.05	1.00-1.10	2.00-2.10	2.55-2.65	0.00-0.10	1.00-1.10	1.20-1.30	0.00-0.10	1.00-1.10	2.00-2.10
Arsenic (As)	mg/kg	USEPA ERL	CEFAS AL1	CEFAS AL2	8.2	20	100		16.7	9.6	5.1	3.2	19.4	19.8	11.4	16.9	11.1	8.2
Cadmium (Cd)	mg/kg	CEFAS AL1	CEFAS AL2	USEPA ERM	0.4	5	9.6		0.11	<LOD	<LOD	<LOD	0.23	0.08	0.06	0.23	0.08	0.08
Chromium (Cr)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	40	370	400		15.5	20.4	27.7	14	19.3	34.4	15.2	18.6	19.6	31
Copper (Cu)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	40	270	400		89.7	17.7	49.8	30.5	175	88.8	34.3	154	19.3	31.9
Mercury (Hg)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	0.3	0.71	3		1.35	0.05	0.02	0.02	10.4	0.16	0.02	1.2	0.03	0.02
Nickel (Ni)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	20	51.6	200		19.4	24.6	50.1	28.2	33.7	53.8	27.1	18.8	24.1	44.6
Lead (Pb)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	50	218	500		65.2	13.2	12.4	10.5	109	49.1	22.9	96.1	23.9	43.6
Zinc (Zn)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	130	410	800		242	105	86.7	61.7	361	146	66	294	64.1	74.5
Dibutyltin (DBT)	mg/kg	CEFAS AL1	-	CEFAS AL2	0.1		1		0.154	<LOD	<LOD	<LOD	0.147	<LOD	<LOD	0.349	<LOD	<LOD
Tributyltin (TBT)	mg/kg	German AL1	German AL2	CEFAS AL2	0.02	0.06	1		0.5	<LOD	<LOD	<LOD	0.454	<LOD	<LOD	1.52	0.024	<LOD
Acenaphthene	µg/kg	USEPA ERL	USEPA ERM	-	16	500			89.4	<LOD	<LOD	<LOD	46.6	<LOD	<LOD	541	<LOD	<LOD
Acenaphthylene	µg/kg	USEPA ERL	USEPA ERM	-	44	640			46.2	<LOD	<LOD	<LOD	35.3	<LOD	2.34	157	<LOD	<LOD
Anrthacene	µg/kg	USEPA ERL	USEPA ERM	-	85	1100			141	<LOD	<LOD	<LOD	90.1	<LOD	1.46	470	<LOD	<LOD
Benz[a]anthracene	µg/kg	USEPA ERL	USEPA ERM	-	261	1600			686	<LOD	<LOD	<LOD	240	<LOD	6.32	1600	2.64	<LOD
Benzo[a]pyrene	µg/kg	USEPA ERL	USEPA ERM	-	430	1600			1760	<LOD	<LOD	<LOD	455	<LOD	9.74	1670	4.01	<LOD
benzo(b)fluoranthene	µg/kg	-	-	-					1590	<LOD	<LOD	<LOD	441	<LOD	8.28	1590	4.27	<LOD
Benzo[ghi]perylene	µg/kg	USEPA ERL	USEPA ERM	-	85				1300	<LOD	<LOD	<LOD	340	<LOD	5.18	984	2.87	<LOD
Benzo[e]pyrene	µg/kg	-	-	-					1010	<LOD	<LOD	<LOD	293	<LOD	5.55	1090	2.88	<LOD
benzo(k)fluoranthene	µg/kg	-	-	-					1380	<LOD	<LOD	<LOD	364	<LOD	9.57	1500	3.79	<LOD
C1-Naphthalene	µg/kg	USEPA ERL	USEPA ERM	-	155				74.2	<LOD	<LOD	<LOD	181	<LOD	<1	384	3.02	<LOD
C1-Phenanthrene	µg/kg	USEPA ERL	USEPA ERM	-	170				306	<LOD	<LOD	<LOD	274	<LOD	7.5	1290	2.16	<LOD
C2-Naphthalene	µg/kg	USEPA ERL	USEPA ERM	-	150				107	<LOD	<LOD	<LOD	217	<LOD	1.7	445	3.49	<LOD
C3-Naphthalene	µg/kg	-	-	-					84	<LOD	<LOD	<LOD	154	<LOD	1.49	441	1.81	<LOD
Chrysene	µg/kg	USEPA ERL	USEPA ERM	-	384	2800			751	<LOD	<LOD	<LOD	295	<LOD	12.2	1720	3.11	<LOD
Dibenzoahanthracene	µg/kg	USEPA ERL	USEPA ERM	-	63	260			296	<LOD	<LOD	<LOD	77.9	<LOD	1.2	247	<LOD	<LOD
Fluoranthene	µg/kg	USEPA ERL	USEPA ERM	-	600	5100			1020	<LOD	<LOD	<LOD	422	<LOD	29.7	3750	4.3	<LOD
Fluorene	µg/kg	USEPA ERL	USEPA ERM	-	19	540			88.2	<LOD	<LOD	<LOD	58.7	<LOD	2.62	316	<LOD	<LOD
Indeno[1,2,3- cd]pyrene	µg/kg	USEPA ERL	USEPA ERM	-	240				1380	<LOD	<LOD	<LOD	354	<LOD	6	1060	2.93	<LOD
Naphthalene	µg/kg	USEPA ERL	USEPA ERM	-	160	2100			80.9	<LOD	<LOD	<LOD	90.5	<LOD	<LOD	158	1.58	<LOD
Perylene	µg/kg	-	-	-					298	<LOD	<LOD	<LOD	78.7	<LOD	1.36	366	<LOD	<LOD
Phenanthrene	µg/kg	USEPA ERL	USEPA MSQG	-	240	1100			486	<LOD	<LOD	<LOD	322	<LOD	25.1	2250	2.06	<LOD
Pyrene	µg/kg	USEPA ERL	USEPA ERM	-	665	2600			941	<LOD	<LOD	<LOD	460	<LOD	21.4	3380	4.3	<LOD
LMW PAH - low molecular weight PAHs[1]	µg/kg	USEPA ERL	USEPA ERM	-	552	3160			1005.9	0	0	0	824.2	0	31.52	4276	6.66	0
HMW PAH - high molecular weight PAHs[2]	µg/kg	USEPA ERL	USEPA ERM	-	1700	9600			5454	0	0	0	1949.9	0	80.56	12367	18.36	0
THC	mg/kg	German AL1	German AL2	-	300	1000			421	<LOD	1	<LOD	123	<LOD	<LOD	743	16.9	<LOD
PCB 101	mg/kg	German AL1	German AL2	-	0.002	0.006			0.02204	0.00034	<LOD	<LOD	0.00308	<LOD	<LOD	0.01163	<LOD	<LOD
PCB 105	mg/kg	-	-	-					0.00545	<LOD	<LOD	<LOD	0.00053	<LOD	<LOD	0.00344	<LOD	<LOD
PCB 110	mg/kg	-	-	-					0.01825	0.00026	<LOD	<LOD	0.00234	<LOD	<LOD	0.01208	<LOD	<LOD
PCB 118	mg/kg	German AL1	German AL2	-	0.003	0.01			0.01767	0.0003	<LOD	<LOD	0.00265	<LOD	<LOD	0.01142	<LOD	<LOD
PCB 128	mg/kg	-	-	-					0.00644	<LOD	<LOD	<LOD	0.00071	<LOD	<LOD	0.00385	<LOD	<LOD
PCB 138	mg/kg	German AL1	German AL2	-	0.004	0.012			0.02381	0.00018	<LOD	<LOD	0.00391	<LOD	<LOD	0.01445	0.00011	<LOD
PCB 141	mg/kg	-	-	-					0.00509	<LOD	<LOD	<LOD	0.00077	<LOD	<LOD	0.00265	<LOD	<LOD
PCB 149	mg/kg	-	-	-					0.02149	0.0003	<LOD	<LOD	0.00362	<LOD	<LOD	0.01196	<LOD	<LOD
PCB 151	mg/kg	-	-	-					0.00682	0.00008	<LOD	<LOD	0.00102	<LOD	<LOD	0.00345	<LOD	<LOD
PCB 153	mg/kg	German AL1	German AL2	-	0.005	0.015			0.03385	0.00031	<LOD	<LOD	0.00436	<LOD	<LOD	0.01699	0.00008	<LOD
PCB 156	mg/kg	-	-	-					0.00384	<LOD	<LOD	<LOD	0.00044	<LOD	<LOD	0.00226	<LOD	<LOD
PCB 158	mg/kg	-	-	-					0.00463	<LOD	<LOD	<LOD	0.00051	<LOD	<LOD	0.0023	<LOD	<LOD
PCB 170	mg/kg	-	-	-					0.00956	<LOD	<LOD	<LOD	0.00146	<LOD	<LOD	0.00417	<LOD	<LOD
PCB 18	mg/kg	-	-	-					0.00153	<LOD	<LOD	<LOD	0.00028	<LOD	<LOD	0.00048	<LOD	<LOD
PCB 180	mg/kg	German AL1	German AL2	-	0.002	0.006			0.02037	0.00014	<LOD	<LOD	0.00252	<LOD	<LOD	0.00805	0.00009	<LOD
PCB 183	mg/kg	-	-	-					0.00569	<LOD	<LOD	<LOD	0.00086	<LOD	<LOD	0.00227	<LOD	<LOD
PCB 187	mg/kg	-	-	-					0.01112	0.00014	<LOD	<LOD	0.00172	<LOD	<LOD	0.00471	<LOD	<LOD
PCB 194	mg/kg	-	-	-					0.00434	<LOD	<LOD	<LOD	0.00064	<LOD	<LOD	0.00239	<LOD	<LOD
PCB 28	mg/kg	German AL1	German AL2	-	0.002	0.006			0.0022	<LOD	<LOD	<LOD	0.0004	<LOD	<LOD	0.00076	<LOD	<LOD
PCB 31	mg/kg	-	-	-					0.0016	<LOD	<LOD	<LOD	0.00026	<LOD	<LOD	0.0008	<LOD	<LOD
PCB 44	mg/kg	-	-	-					0.00591	0.00008	<LOD	<LOD	0.00082	<LOD	<LOD	0.00212	<LOD	<LOD
PCB 47	mg/kg	-	-	-					0.00199	<LOD	<LOD	<LOD	0.00039	<LOD	<LOD	0.00063	<LOD	<LOD
PCB 49	mg/kg	-	-	-					0.00766	0.00011	<LOD	<LOD	0.00127	<LOD	<LOD	0.00213	<LOD	<LOD
PCB 52	mg/kg	German AL1	German AL2	-	0.001	0.003			0.01061	0.00014	<LOD	<LOD	0.00156	<LOD	<LOD	0.00449	<LOD	<LOD
PCB 66	mg/kg	-	-	-					0.00725	0.00012	<LOD	<LOD	0.00107	<LOD	<LOD	0.0022	<LOD	<LOD
PCB SUM of ICES 7	mg/kg	CEFAS AL1	-	-	0.01				0.13055	0.00141	<LOD	<LOD	0.01848	<LOD	<LOD	0.06779	0.00028	<LOD
PCBs – sum of 25 congeners	mg/kg	CEFAS AL1 / USEPA ERL	USEPA ERM/ CEFAS AL2	USEPA ERM/ CEFAS AL2	0.02	0.18**	0.18**		0.25921	0.0025	<LOD	<LOD	0.03719	<LOD	<LOD	0.13168	0.00028	<LOD
AHCH	mg/kg	German AL1	German AL2	-	0.0004	0.001			<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BHCH	mg/kg	-	-	-					<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
GHCH	mg/kg	German AL1	German AL2	-	0.0002	0.0006			<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
DIELDRIN	mg/kg	CEFAS AL1	Canadian SQG	-	0.005	0.71			<LOD	<LOD	<LOD	<LOD	0.0002	<LOD	<LOD	<LOD	<LOD	<LOD
HCB	mg/kg	German AL1	German AL2	-	0.002	0.006			<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.0001	<LOD	<LOD
PPDDE	mg/kg	German AL1	German AL2	-	0.003	0.01			0.0048	<LOD	<LOD	<LOD	0.0009	<LOD	<LOD	0.0037	<LOD	<LOD
PPDDT	mg/kg	German AL1	German AL2	-	0.001	0.003			0.0066	<LOD	<LOD	<LOD	0.0006	<LOD	<LOD	0.0035	<LOD	<LOD
PPTDE	mg/kg	CEFAS AL1	German AL2	USEPA ERM	0.001	0.003	0.046		0.0185	0.0003	<LOD	<LOD	0.0033	<LOD	<LOD	0.016	<LOD	<LOD
BDE17	mg/kg	Canadian FEQG	-	-	0.044				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE28	mg/kg	Canadian FEQG	-	-	0.044				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE47	mg/kg	Canadian FEQG	-	-	0.039				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE66	mg/kg	Canadian FEQG	-	-	0.039				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE85	mg/kg	Canadian FEQG	-	-	0.0004				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE99	mg/kg	Canadian FEQG	-	-	0.0004				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE100	mg/kg	Canadian FEQG			0.0004				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE138	mg/kg	Canadian FEQG	-	-	0.44				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE153	mg/kg	Canadian FEQG	-	-	0.44				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE154	mg/kg	Canadian FEQG	-	-	0.44				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE183	mg/kg	Canadian FEQG	-	-					<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE209	mg/kg	Canadian FEQG	-	-	0.019				0.0003	0.0001	0.0001	0.0001	0.0019	0.0008	<LOD	0.0254	0.0008	0.0006

Analyte	VC-09	VC-09	VC-09	VC-09	VC-09	VC-09	VC-11	VC-11	VC-11	VC-11	VC-11	VC-11	VC-11
Depth (m)	0.00-0.10	1.00-1.10	2.00-2.10	3.00-3.10	4.00-4.10	5.00-5.10	0.00-0.10	1.00-1.10	2.00-2.10	3.00-3.10	4.00-4.10	5.00-5.10	5.30-5.37
Arsenic (As)	30.1	11.5	12.1	10.3	8.2	16.6	17.2	4.9	6.8	7.2	8.9	9.5	7.9
Cadmium (Cd)	0.22	0.23	0.23	0.22	0.13	0.08	0.11	0.16	0.2	0.17	0.3	0.32	0.25
Chromium (Cr)	22	27.5	31	25.8	17.7	13.2	18.2	21.7	20.6	23.5	31.7	28.3	23.5
Copper (Cu)	200	13.8	13.9	11.3	8.4	65.5	17.6	8.7	8.4	8.8	12.6	12.8	10.4
Mercury (Hg)	1.53	0.05	0.04	0.03	0.02	0.3	0.02	0.02	0.02	0.02	0.03	0.03	0.02
Nickel (Ni)	23.9	27.3	28.5	24.8	17.8	12.8	28.7	23.5	23.6	21.1	28.3	26.1	22.5
Lead (Pb)	145	13	13.8	11.4	8.5	36.8	14.2	11.5	10.8	10	14.4	14.8	11.9
Zinc (Zn)	736	73.2	83.6	70.5	57.5	130	77	53.3	51.7	58.7	75.1	75.7	65.9
Dibutyltin (DBT)	0.361	<LOD	<LOD	<LOD	<LOD	<LOD	0.19	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Tributyltin (TBT)	1.458	<LOD	<LOD	<LOD	<LOD	<LOD	0.811	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Acenaphthene	108	<LOD	<LOD	<LOD	<LOD	<LOD	53.5	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Acenaphthylene	129	<LOD	<LOD	<LOD	<LOD	<LOD	39.6	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Anrthacene	240	<LOD	<LOD	<LOD	<LOD	<LOD	53	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Benz[a]anthracene	1040	<LOD	<LOD	<LOD	<LOD	<LOD	180	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Benzo[a]pyrene	1620	<LOD	<LOD	<LOD	<LOD	<LOD	312	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
benzo(b)fluoranthene	1380	<LOD	<LOD	<LOD	<LOD	<LOD	310	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Benzo[ghi]perylene	1060	<LOD	<LOD	<LOD	<LOD	<LOD	249	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Benzo[e]pyrene	947	<LOD	<LOD	<LOD	<LOD	<LOD	222	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
benzo(k)fluoranthene	1230	<LOD	<LOD	<LOD	<LOD	<LOD	278	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
C1-Naphthalene	145	<LOD	<LOD	<LOD	<LOD	<LOD	131	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
C1-Phenanthrene	459	<LOD	<LOD	<LOD	<LOD	<LOD	106	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
C2-Naphthalene	177	30.8	37	28.4	17.9	1.45	161	27.4	17.1	28.9	41.1	25.7	26.4
C3-Naphthalene	155	<LOD	<LOD	<LOD	<LOD	<LOD	96.3	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Chrysene	1080	<LOD	<LOD	<LOD	<LOD	<LOD	219	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Dibenzoahanthracene	221	<LOD	<LOD	<LOD	<LOD	<LOD	49.4	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Fluoranthene	1890	<LOD	<LOD	<LOD	<LOD	<LOD	293	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Fluorene	108	<LOD	<LOD	<LOD	<LOD	<LOD	47	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Indeno[1,2,3- cd]pyrene	1180	<LOD	<LOD	<LOD	<LOD	<LOD	256	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Naphthalene	101	<LOD	<LOD	<LOD	<LOD	<LOD	57.1	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Perylene	306	151	405	402	222	6.2	82.8	72.1	30	99	379	675	409
Phenanthrene	629	<LOD	<LOD	<LOD	<LOD	<LOD	162	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Pyrene	1820	<LOD	<LOD	<LOD	<LOD	<LOD	342	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
LMW PAH - low molecular weight PAHs[1]	1460	0	0	0	0	0	543.2	0	0	0	0	0	0
HMW PAH - high molecular weight PAHs[2]	7671	0	0	0	0	0	1395.4	0	0	0	0	0	0
THC	103	<LOD	<LOD	<LOD	<LOD	<LOD	101	<LOD	<LOD	<LOD	<LOD	1.26	<LOD
PCB 101	0.01244	<LOD	<LOD	<LOD	<LOD	<LOD	0.00346	<LOD	<LOD	<LOD	0.00015	<LOD	<LOD
PCB 105	0.00239	<LOD	<LOD	<LOD	<LOD	<LOD	0.00061	<LOD	<LOD	<LOD	0.00011	<LOD	<LOD
PCB 110	0.00939	<LOD	<LOD	<LOD	<LOD	<LOD	0.00218	<LOD	<LOD	<LOD	0.00014	<LOD	<LOD
PCB 118	0.01193	<LOD	<LOD	<LOD	<LOD	<LOD	0.00259	<LOD	<LOD	<LOD	0.00012	<LOD	<LOD
PCB 128	0.00285	<LOD	<LOD	<LOD	<LOD	<LOD	0.00091	<LOD	<LOD	<LOD	0.00014	<LOD	<LOD
PCB 138	0.01046	0.00008	<LOD	<LOD	<LOD	<LOD	0.00547	<LOD	<LOD	<LOD	0.00016	<LOD	<LOD
PCB 141	0.00147	<LOD	<LOD	<LOD	<LOD	<LOD	0.00131	<LOD	<LOD	<LOD	0.00016	<LOD	<LOD
PCB 149	0.01202	<LOD	<LOD	<LOD	<LOD	<LOD	0.00567	<LOD	<LOD	<LOD	0.00014	<LOD	<LOD
PCB 151	0.00342	<LOD	<LOD	<LOD	<LOD	<LOD	0.00191	<LOD	<LOD	<LOD	0.00016	<LOD	<LOD
PCB 153	0.01517	0.00014	<LOD	<LOD	<LOD	<LOD	0.00794	<LOD	<LOD	<LOD	0.00015	<LOD	<LOD
PCB 156	0.00146	<LOD	<LOD	<LOD	<LOD	<LOD	0.00064	<LOD	<LOD	<LOD	0.00018	<LOD	<LOD
PCB 158	0.00177	<LOD	<LOD	<LOD	<LOD	<LOD	0.00076	<LOD	<LOD	<LOD	0.00018	<LOD	<LOD
PCB 170	0.00297	<LOD	<LOD	<LOD	<LOD	<LOD	0.0027	<LOD	<LOD	<LOD	0.00011	<LOD	<LOD
PCB 18	0.00057	<LOD	<LOD	<LOD	<LOD	<LOD	0.0004	<LOD	<LOD	<LOD	0.00012	<LOD	<LOD
PCB 180	0.00589	0.0001	<LOD	<LOD	<LOD	<LOD	0.00586	<LOD	<LOD	<LOD	0.00011	<LOD	<LOD
PCB 183	0.00186	<LOD	<LOD	<LOD	<LOD	<LOD	0.00132	<LOD	<LOD	<LOD	0.00017	<LOD	<LOD
PCB 187	0.00435	0.00009	<LOD	<LOD	<LOD	<LOD	0.00312	<LOD	<LOD	<LOD	0.00018	<LOD	<LOD
PCB 194	0.00167	<LOD	<LOD	<LOD	<LOD	<LOD	0.0013	<LOD	<LOD	<LOD	0.0002	<LOD	<LOD
PCB 28	0.00117	<LOD	<LOD	<LOD	<LOD	<LOD	0.00077	<LOD	<LOD	<LOD	0.00012	<LOD	<LOD
PCB 31	0.00081	<LOD	<LOD	<LOD	<LOD	<LOD	0.00058	<LOD	<LOD	<LOD	0.00013	<LOD	<LOD
PCB 44	0.00219	<LOD	<LOD	<LOD	<LOD	<LOD	0.00084	<LOD	<LOD	<LOD	0.00015	<LOD	<LOD
PCB 47	0.00102	<LOD	<LOD	<LOD	<LOD	<LOD	0.00037	<LOD	<LOD	<LOD	0.00013	<LOD	<LOD
PCB 49	0.00343	<LOD	<LOD	<LOD	<LOD	<LOD	0.00107	<LOD	<LOD	<LOD	0.00013	<LOD	<LOD
PCB 52	0.00435	<LOD	<LOD	<LOD	<LOD	<LOD	0.00132	<LOD	<LOD	<LOD	0.00011	<LOD	<LOD
PCB 66	0.00315	<LOD	<LOD	<LOD	<LOD	<LOD	0.00113	<LOD	<LOD	<LOD	0.00015	<LOD	<LOD
PCB SUM of ICES 7	0.06141	0.00032	<LOD	<LOD	<LOD	<LOD	0.02741	<LOD	<LOD	<LOD	0.00092	<LOD	<LOD
PCBs – sum of 25 congeners	0.1182	0.00041	<LOD	<LOD	<LOD	<LOD	0.05423	<LOD	<LOD	<LOD	0.0036	<LOD	<LOD
AHCH	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BHCH	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.0001	<LOD	<LOD
GHCH	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.0002	<LOD	<LOD
DIELDRIN	<LOD	0.0002	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.0003	<LOD	<LOD
HCB	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
PPDDE	0.0023	<LOD	<LOD	<LOD	<LOD	<LOD	0.0017	<LOD	<LOD	<LOD	0.0001	<LOD	<LOD
PPDDT	0.0021	<LOD	<LOD	<LOD	<LOD	<LOD	0.0019	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
PPTDE	0.0078	<LOD	<LOD	<LOD	<LOD	<LOD	0.015	<LOD	<LOD	<LOD	0.0001	<LOD	<LOD
BDE17	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE28	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE47	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE66	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE85	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE99	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE100	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE138	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE153	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE154	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE183	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE209	0.0094	<LOD	<LOD	<LOD	0.0002	<LOD	0.0022	0.0011	0.0004	0.0005	0.0009	0.0018	0.0007

Analyte	VC-14	VC-14	VC-14	VC-14	VC-25	VC-25	VC-25	VC-25	VC-25	VC-26	VC-26	VC-26	VC-26
Depth (m)	0.00-0.10	1.00-1.10	2.00-2.10	3.00-3.10	0.00-0.10	1.00-1.10	2.00-2.10	3.00-3.10	3.90-4.00	0.00-0.10	1.00-1.10	2.00-2.10	3.00-3.10
Arsenic (As)	13.6	13	10.9	11.8	6.2	5.9	13.9	11.3	7.1	47.8	11.9	10.9	10.8
Cadmium (Cd)	0.16	0.31	0.23	0.26	0.15	0.27	0.34	0.27	0.11	0.31	0.16	0.17	0.22
Chromium (Cr)	9.3	34.2	24.7	28.3	15.7	26.5	33.2	31.3	18	26.6	28	26.4	30.1
Copper (Cu)	106	21.4	14.8	13.5	14.2	12.9	16.5	15.3	18.5	283	15.2	11.4	14
Mercury (Hg)	0.61	0.08	0.05	0.05	0.23	0.04	0.05	0.06	0.02	3.07	0.1	0.07	0.07
Nickel (Ni)	11.3	35.9	26.1	28.2	14.2	25.1	33.3	34.5	30	31	50.4	29.8	32
Lead (Pb)	513	31.9	17.9	15.4	15.1	14.5	18	16.2	21.3	294	18.5	13	15.5
Zinc (Zn)	313	101	75.7	84.2	63.8	70.7	105	90.7	113	632	117	77.5	81
Dibutyltin (DBT)	0.118	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.12	<LOD	<LOD	<LOD
Tributyltin (TBT)	0.469	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.212	<LOD	<LOD	<LOD
Acenaphthene	93.7	<LOD	<LOD	<LOD	4.58	<LOD	<LOD	<LOD	<LOD	64.6	<LOD	<LOD	2.37
Acenaphthylene	112	<LOD	<LOD	<LOD	34.6	<LOD	<LOD	<LOD	<LOD	86.6	<LOD	<LOD	<LOD
Anrthacene	121	<LOD	<LOD	<LOD	57.4	<LOD	<LOD	<LOD	<LOD	135	<LOD	<LOD	<LOD
Benz[a]anthracene	718	<LOD	<LOD	<LOD	110	<LOD	<LOD	<LOD	<LOD	481	2.68	<LOD	<LOD
Benzo[a]pyrene	1010	<LOD	<LOD	<LOD	665	<LOD	<LOD	<LOD	<LOD	1010	6.51	<LOD	<LOD
benzo(b)fluoranthene	783	<LOD	<LOD	<LOD	649	<LOD	<LOD	<LOD	<LOD	945	5.61	<LOD	<LOD
Benzo[ghi]perylene	588	<LOD	<LOD	<LOD	356	<LOD	<LOD	<LOD	<LOD	739	5.78	<LOD	<LOD
Benzo[e]pyrene	569	<LOD	<LOD	<LOD	366	<LOD	<LOD	<LOD	<LOD	701	4.68	<LOD	<LOD
benzo(k)fluoranthene	823	<LOD	<LOD	<LOD	532	<LOD	<LOD	<LOD	<LOD	815	4.93	<LOD	<LOD
C1-Naphthalene	133	<LOD	<LOD	<LOD	14.1	<LOD	<LOD	<LOD	<LOD	64.2	2.93	1.92	<LOD
C1-Phenanthrene	371	<LOD	<LOD	<LOD	55.2	<LOD	<LOD	<LOD	<LOD	231	3.51	1.85	2.16
C2-Naphthalene	140	27.4	30.1	55.7	24.5	52.8	48.7	47.2	21.7	84	20.5	19	22.8
C3-Naphthalene	84.1	<LOD	<LOD	<LOD	12.4	<LOD	<LOD	9.53	<LOD	62.4	1.99	2.55	2.66
Chrysene	756	<LOD	<LOD	<LOD	194	<LOD	<LOD	<LOD	<LOD	571	3.62	<LOD	<LOD
Dibenzoahanthracene	149	<LOD	<LOD	<LOD	88.5	<LOD	<LOD	<LOD	<LOD	172	1.18	<LOD	<LOD
Fluoranthene	850	<LOD	<LOD	<LOD	148	<LOD	<LOD	<LOD	<LOD	916	4.96	<LOD	<LOD
Fluorene	118	<LOD	<LOD	<LOD	8.95	<LOD	<LOD	<LOD	<LOD	67.1	<1	<LOD	<LOD
Indeno[1,2,3- cd]pyrene	637	<LOD	<LOD	<LOD	399	<LOD	<LOD	<LOD	<LOD	804	4.97	<LOD	<LOD
Naphthalene	103	<LOD	<LOD	<LOD	11.1	<LOD	<LOD	<LOD	<LOD	47.8	1.86	<LOD	2.49
Perylene	191	356	377	587	72.1	88.6	363	567	30.4	185	231	317	456
Phenanthrene	365	<LOD	<LOD	<LOD	40.1	<LOD	<LOD	<LOD	<LOD	442	3.68	<LOD	<LOD
Pyrene	887	<LOD	<LOD	<LOD	139	<LOD	<LOD	<LOD	<LOD	1310	6.99	<LOD	<LOD
LMW PAH - low molecular weight PAHs[1]	1045.7	0	0	0	170.83	0	0	0	0	907.3	8.47	1.92	4.86
HMW PAH - high molecular weight PAHs[2]	4370	0	0	0	1344.5	0	0	0	0	4460	25.94	0	0
THC	40.5	7.02	8.76	10.2	245	12.6	<LOD	<LOD	<LOD	741	4.09	2.6	3.02
PCB 101	0.0047	<LOD	<LOD	<LOD	0.00022	<LOD	<LOD	<LOD	<LOD	0.03053	0.00016	<LOD	<LOD
PCB 105	0.00086	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.00736	<LOD	<LOD	<LOD
PCB 110	0.00358	<LOD	<LOD	<LOD	0.00018	<LOD	<LOD	<LOD	<LOD	0.02391	0.00014	<LOD	<LOD
PCB 118	0.00416	<LOD	<LOD	<LOD	0.00021	<LOD	<LOD	<LOD	<LOD	0.02787	0.00011	<LOD	<LOD
PCB 128	0.00101	<LOD	<LOD	<LOD	0.00008	<LOD	<LOD	<LOD	<LOD	0.00723	<LOD	<LOD	<LOD
PCB 138	0.00511	<LOD	<LOD	<LOD	0.00035	<LOD	<LOD	<LOD	<LOD	0.04885	0.00017	0.00009	<LOD
PCB 141	0.00068	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.01576	<LOD	<LOD	<LOD
PCB 149	0.0057	<LOD	<LOD	<LOD	0.00028	<LOD	<LOD	<LOD	<LOD	0.07221	0.00011	<LOD	<LOD
PCB 151	0.00134	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.02679	<LOD	<LOD	<LOD
PCB 153	0.00786	<LOD	<LOD	<LOD	0.0004	<LOD	<LOD	<LOD	<LOD	0.09972	0.00013	<LOD	<LOD
PCB 156	0.00062	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.00509	<LOD	<LOD	<LOD
PCB 158	0.00079	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.00714	<LOD	<LOD	<LOD
PCB 170	0.00181	<LOD	<LOD	<LOD	0.00011	<LOD	<LOD	<LOD	<LOD	0.04149	<LOD	<LOD	<LOD
PCB 18	0.00084	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.00013	<LOD	0.0039	0.00012	<LOD	<LOD
PCB 180	0.00367	<LOD	<LOD	<LOD	0.00022	<LOD	<LOD	<LOD	<LOD	0.11332	<LOD	<LOD	<LOD
PCB 183	0.00098	<LOD	<LOD	<LOD	0.00012	<LOD	<LOD	<LOD	<LOD	0.02935	<LOD	<LOD	<LOD
PCB 187	0.00233	<LOD	<LOD	<LOD	0.0002	<LOD	<LOD	<LOD	<LOD	0.06331	<LOD	<LOD	<LOD
PCB 194	0.00103	<LOD	<LOD	<LOD	0.00008	<LOD	<LOD	<LOD	<LOD	0.03555	<LOD	<LOD	<LOD
PCB 28	0.00124	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.00547	0.00011	<LOD	<LOD
PCB 31	0.00108	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.00525	0.00012	<LOD	<LOD
PCB 44	0.00168	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.00861	0.00014	<LOD	<LOD
PCB 47	0.00077	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.00338	<LOD	<LOD	<LOD
PCB 49	0.0023	<LOD	<LOD	<LOD	0.00009	<LOD	<LOD	<LOD	<LOD	0.01096	0.00012	<LOD	<LOD
PCB 52	0.00284	<LOD	<LOD	<LOD	0.00011	<LOD	<LOD	<LOD	<LOD	0.01353	0.00016	<LOD	<LOD
PCB 66	0.00221	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.01343	0.00009	<LOD	<LOD
PCB SUM of ICES 7	0.02958	<LOD	<LOD	<LOD	0.00151	<LOD	<LOD	<LOD	<LOD	0.33929	0.00084	0.00009	<LOD
PCBs – sum of 25 congeners	0.05919	<LOD	<LOD	<LOD	0.00265	<LOD	<LOD	0.00013	<LOD	0.72001	0.00168	0.00009	<LOD
AHCH	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BHCH	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
GHCH	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
DIELDRIN	0.0014	0.0001	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
HCB	0.0002	0.0001	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
PPDDE	0.0007	0.0013	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.0044	<LOD	<LOD	<LOD
PPDDT	<LOD	0.0011	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.0036	<LOD	<LOD	<LOD
PPTDE	0.0051	0.0035	<LOD	<LOD	0.0004	<LOD	<LOD	<LOD	<LOD	0.0113	<LOD	<LOD	<LOD
BDE17	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE28	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE47	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE66	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE85	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE99	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE100	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE138	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE153	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE154	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE183	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE209	0.0085	0.001	0.0007	0.0009	0.0017	0.0002	0.0018	0.0026	0.0044	0.0032	0.0024	0.0024	0.0014

Notes

[1] LMW = sum of Naphthalene, Acenaphthene, Fluorene, Anthracene, C1-naphtha-lenes, Acenaphthylene,Phenanthrene

[2] HMW = sum of Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo(a)pyrene,Dibenz(a,h)[a,b]anthracene

										East Area																			
		Reference			Low Risk	Moderate Risk	High Risk	Sample ID	VC-01	VC-01	VC-01	VC01	VC-01	VC-02	VC-02	VC-02A	VC-02A	VC-02A	VC03	VC03	VC03	VC03	VC-05	VC-05	VC-05	VC-05	VC-05	VC-22	VC-22	VC-24	VC-24	VC-24
Analyte	Units	SQG1: No/low effects anticipated. Measured conc >SQG1 = low risk, potentially suitable for disposal to sea. Further consideration of the CSM required for proportionate decision making is	SG2: probable effects. Measured conc>SQG2 = unlikely to be suitable for disposal to sea. Further consideration of the CSM may be appropriate for proportionate	SG3: probable effects. Measured conc>SQG3 = cannot be disposed to sea	SQG1: No/low effects anticipated. Measured conc >SQG1 = low risk, potentially suitable for disposal to sea. Further consideration of the CSM required	SG2: probable effects. Measured conc>SQG2 = unlikely to be suitable for disposal to sea. Further consideration of the CSM may be appropriate for proportionate	SG3: probable effects. Measured conc>SQG3 = cannot be disposed to sea	Depth (m)	0.00-0.10	1.00-1.10	2.00-2.10	3.00-3.10	3.55-3.65	0.05-0.15	0.90-1.00	0.00-0.10	1.00-1.10	1.40-1.50	0.00-0.10	1.00-1.10	2.00-2.10	3.00-3.10	0.00-0.10	1.00-1.10	2.00-2.10	3.00-3.10	3.90-4.00	0.00-0.10	1.00-1.10	0.00-0.10	1.00-1.10	1.90-2.00
Arsenic (As)	mg/kg	USEPA ERL	CEFAS AL1	CEFAS AL2	8.2	20	100		52.9	5.8	12.5	13.4	54.5	4.5	3.9	4.8	1.5	5.5	29.8	38.3	48.5	6.5	41.8	29.3	11.2	16.6	4.3	19.6	9.4	19.3	20.1	20.4
Cadmium (Cd)	mg/kg	CEFAS AL1	CEFAS AL2	USEPA ERM	0.4	5	9.6		0.50	0.19	0.50	0.48	0.52	0.09	0.05	0.1	0.07	0.09	0.28	0.27	0.4	0.06	0.25	0.26	0.17	0.72	0.16	0.17	0.08	0.16	0.14	0.26
Chromium (Cr)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	40	370	400		43.4	8.8	26.2	24.4	22.7	26.5	45	14.2	44.7	25.9	21	21.6	21.7	24.8	33.1	20.7	38.4	31.2	28.3	19.7	17.3	32.5	36.1	33.5
Copper (Cu)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	40	270	400		1306	17.4	14.6	12.4	44.6	16.8	31.1	49.6	18.4	25.2	456	300	341	58.5	794	106	17.2	14.8	25.3	260	48.8	33.2	18.5	27
Mercury (Hg)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	0.3	0.71	3		2.56	0.08	0.05	0.04	0.09	0.04	0.04	0.35	0.04	0.04	1.51	8.43	17.8	0.84	3.32	0.38	0.04	0.03	0.06	1.65	0.48	0.39	0.05	0.04
Nickel (Ni)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	20	51.6	200		34.9	8.2	22.0	21.0	31.0	25.6	57.5	18.4	49.8	37.6	18.3	25	25	49.6	31.4	23.2	26.7	31.9	28.5	25.8	27.5	20.9	19	23.3
Lead (Pb)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	50	218	500		193	7.5	15.3	14.4	27.6	15.6	20.8	25.6	13.6	21.4	107	194	317	25.4	166	64.1	17.7	18.9	20.2	97.5	42.3	39.1	21	24.3
Zinc (Zn)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	130	410	800		767	65.8	128	120	183	125	122	186	88.5	102	468	494	364	434	615	160	91.5	115	103	479	123	129	108	124
Dibutyltin (DBT)	mg/kg	CEFAS AL1		CEFAS AL2	0.1		1		1.24	<LOD	<LOD	<LOD	0.176	<LOD	<LOD	0.222	<LOD	<LOD	3.04	0.067	0.013	0.019	2.12	0.019	<LOD	<LOD	<LOD	1.22	<LOD	0.173	<LOD	<LOD
Tributyltin (TBT)	mg/kg	German AL1	German AL2	CEFAS AL2	0.02	0.06	1		13.6	0.015	0.013	<LOD	2.49	<LOD	<LOD	3.58	<LOD	0.029	17.6	0.506	0.052	0.236	10.4	0.327	<LOD	<LOD	0.023	12.2	0.013	0.757	<LOD	<LOD
Acenaphthene	µg/kg	USEPA ERL	USEPA ERM	-	16	500			786	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	7.61	<LOD	<LOD	267	312	237	1.86	459	23.8	<LOD	<LOD	<LOD	341	2	76.3	<LOD	<LOD
Acenaphthylene	µg/kg	USEPA ERL	USEPA ERM	-	44	640			131	<LOD	<LOD	<LOD	<LOD	1.72	<LOD	11.7	<LOD	<LOD	157	144	228	2.62	132	35.3	<LOD	<LOD	<LOD	97.3	5.65	119	<LOD	<LOD
Anrthacene	µg/kg	USEPA ERL	USEPA ERM	-	85	1100			319	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	20.1	<LOD	<LOD	258	286	655	6.26	370	78.1	<LOD	<LOD	<LOD	573	5.8	205	<LOD	<LOD
Benz[a]anthracene	µg/kg	USEPA ERL	USEPA ERM	-	261	1600			1490	<LOD	<LOD	<LOD	6.79	5.48	<LOD	70.1	<LOD	<LOD	1070	1260	2540	21	1660	344	<LOD	<LOD	<LOD	2010	25.7	802	<LOD	<LOD
Benzo[a]pyrene	µg/kg	USEPA ERL	USEPA ERM	-	430	1600			2700	17.8	<LOD	<LOD	11	9.45	1.66	229	<LOD	<LOD	2200	2420	4600	37.1	2580	603	<LOD	<LOD	8.4	2670	53.6	1880	<LOD	2.25
benzo(b)fluoranthene	µg/kg	-	-	-					2540	16.6	<LOD	<LOD	11	8.26	1.16	231	<LOD	<LOD	2120	2400	4100	31.1	2290	533	<LOD	<LOD	8.14	1900	45.7	1660	<LOD	1.74
Benzo[ghi]perylene	µg/kg	USEPA ERL	USEPA ERM	-	85				1740	16.1	<LOD	<LOD	7.66	6.21	<LOD	203	<LOD	<LOD	1630	1830	3100	23.4	1650	330	<LOD	<LOD	<LOD	1710	34.6	1400	<LOD	1.85
Benzo[e]pyrene	µg/kg	-	-	-					1710	13.8	<LOD	<LOD	7.48	5.67	<LOD	175	<LOD	<LOD	1460	1660	3050	22	1580	315	<LOD	<LOD	6.33	1590	27.4	1050	<LOD	1.37
benzo(k)fluoranthene	µg/kg	-	-	-					2220	13.3	<LOD	<LOD	10.1	8.29	1.66	216	<LOD	<LOD	1840	2170	3720	29.9	2070	497	<LOD	<LOD	7.48	2170	42.5	1470	<LOD	1.97
C1-Naphthalene	µg/kg	USEPA ERL	USEPA ERM	-	155				352	<LOD	<LOD	<LOD	<LOD	1.5	1.26	14.1	<LOD	<LOD	231	278	358	7.63	384	35.6	<LOD	<LOD	<LOD	186	5.23	132	<LOD	<LOD
C1-Phenanthrene	µg/kg	USEPA ERL	USEPA ERM	-	170				884	<LOD	<LOD	<LOD	<LOD	4.89	<LOD	39.9	<LOD	<LOD	586	576	1410	10.1	851	168	<LOD	<LOD	<LOD	776	12.4	490	<LOD	<LOD
C2-Naphthalene	µg/kg	USEPA ERL	USEPA ERM	-	150				389	13.6	9.08	9.52	<LOD	2.11	1.36	24	<LOD	1.22	234	285	392	6.85	336	43.1	<LOD	<LOD	<LOD	192	5.63	161	1.38	1.55
C3-Naphthalene	µg/kg	-	-	-					210	<LOD	<LOD	<LOD	<LOD	1.66	<LOD	6.81	<LOD	<LOD	204	231	351	5.09	284	39.2	<LOD	<LOD	<LOD	192	4.46	132	<LOD	<LOD
Chrysene	µg/kg	USEPA ERL	USEPA ERM	-	384	2800			1760	<LOD	<LOD	<LOD	9.2	8.07	1.21	81.8	<LOD	<LOD	1260	1550	2820	25.7	1870	387	<LOD	<LOD	<LOD	2160	28.3	880	<LOD	<LOD
Dibenzoahanthracene	µg/kg	USEPA ERL	USEPA ERM	-	63	260			359	<LOD	<LOD	<LOD	<LOD	1.47	<LOD	44.4	<LOD	<LOD	378	463	745	6.3	407	93.6	<LOD	<LOD	<LOD	332	7.92	273	<LOD	<LOD
Fluoranthene	µg/kg	USEPA ERL	USEPA ERM	-	600	5100			3560	8.36	<LOD	<LOD	11.6	16.4	1.84	123	<LOD	<LOD	2010	2290	4660	30.8	3240	592	<LOD	<LOD	<LOD	4100	41.9	1460	<LOD	2.75
Fluorene	µg/kg	USEPA ERL	USEPA ERM	-	19	540			418	<LOD	<LOD	<LOD	<LOD	1.52	<LOD	8.74	<LOD	<LOD	167	155	265	3.35	269	33.4	<LOD	<LOD	<LOD	277	2.42	89.7	<LOD	<LOD
Indeno[1,2,3- cd]pyrene	µg/kg	USEPA ERL	USEPA ERM	-	240				1900	14.1	<LOD	<LOD	7.37	6.2	1.17	195	<LOD	<LOD	1760	2000	3320	25.8	1790	310	<LOD	<LOD	<LOD	1820	36.9	1450	<LOD	1.79
Naphthalene	µg/kg	USEPA ERL	USEPA ERM	-	160	2100			141	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	9.37	<LOD	<LOD	145	152	271	6.49	261	33.1	<LOD	<LOD	<LOD	95	4.58	84.8	<LOD	<LOD
Perylene	µg/kg	-	-	-					550	71.1	76.8	83.7	35	1.66	<LOD	47.8	<LOD	<LOD	474	531	919	6.97	535	97.5	<LOD	<LOD	<LOD	560	8.68	263	<LOD	<LOD
Phenanthrene	µg/kg	USEPA ERL	USEPA MSQG	-	240	1100			1910	<LOD	<LOD	<LOD	<LOD	12.9	<LOD	59	<LOD	<LOD	972	1080	2180	13	1650	240	<LOD	<LOD	<LOD	2080	13.7	669	<LOD	<LOD
Pyrene	µg/kg	USEPA ERL	USEPA ERM	-	665	2600			3840	21.6	<LOD	<LOD	15.1	14.3	1.89	204	<LOD	1.19	2470	2900	6000	41.5	3270	588	<LOD	<LOD	8.3	4080	45.3	1400	<LOD	2.39
LMW PAH - low molecular weight PAHs[1]	µg/kg	USEPA ERL	USEPA ERM	-	552	3160			4057	0	0	0	0	17.64	1.26	130.62	0	0	2197	2407	4194	41.21	3525	479.3	0	0	0	3649.3	39.38	1375.8	0	0
HMW PAH - high molecular weight PAHs[2]	µg/kg	USEPA ERL	USEPA ERM	-	1700	9600			13709	47.76	0	0	53.69	55.17	6.6	752.3	0	1.19	9388	10883	21365	162.4	13027	2607.6	0	0	16.7	15352	202.72	6695	0	7.39
THC	mg/kg	German AL1	German AL2	-	300	1000			471	5.86	4.4	3.11	45.5	1.17	<LOD	509	<LOD	100	37.7	1270	1220	24.8	1228	741	<LOD	<LOD	<LOD	1870	36.2	1470	<LOD	<LOD
PCB 101	mg/kg	German AL1	German AL2	-	0.002	0.006			0.0124	0.00099	<LOD	<LOD	0.0012	<LOD	0.00016	0.00277	<LOD	<LOD	0.01295	0.06051	0.00102	<LOD	0.04177	0.0017	<LOD	<LOD	0.00013	0.02309	0.00013	0.01576	0.00009	0.00014
PCB 105	mg/kg	-	-	-					0.00266	0.00024	<LOD	<LOD	0.00029	<LOD	<LOD	0.00085	<LOD	<LOD	0.00323	0.01795	0.00031	<LOD	0.01084	<LOD	<LOD	<LOD	<LOD	0.00856	<LOD	0.00365	<LOD	<LOD
PCB 110	mg/kg	-	-	-					0.01154	0.00095	<LOD	0.0001	0.0014	<LOD	0.00018	0.003	<LOD	<LOD	0.01384	0.05711	0.00104	<LOD	0.03853	0.00018	<LOD	<LOD	0.00012	0.02051	0.00012	0.01363	0.00009	0.0001
PCB 118	mg/kg	German AL1	German AL2	-	0.003	0.01			0.01162	0.00091	<LOD	0.00009	0.0014	<LOD	0.00015	0.00261	<LOD	<LOD	0.01255	0.05065	0.00094	<LOD	0.03674	0.00011	<LOD	<LOD	0.00009	0.03149	0.00018	0.01447	0.00009	<LOD
PCB 128	mg/kg	-	-	-					0.00323	0.00041	<LOD	<LOD	0.00037	<LOD	<LOD	0.00091	<LOD	<LOD	0.00438	0.01059	0.00036	<LOD	0.0105	<LOD	<LOD	<LOD	<LOD	0.01296	<LOD	0.00471	<LOD	<LOD
PCB 138	mg/kg	German AL1	German AL2	-	0.004	0.012			0.01566	0.00124	<LOD	<LOD	0.00125	<LOD	0.00022	0.00374	<LOD	<LOD	0.01624	0.04764	0.00093	<LOD	0.03505	0.0001	<LOD	<LOD	0.00011	0.04324	0.00008	0.01934	<LOD	0.00017
PCB 141	mg/kg	-	-	-					0.00298	0.00017	<LOD	<LOD	0.00031	<LOD	<LOD	0.00064	<LOD	<LOD	0.00358	0.01313	0.00027	<LOD	0.00776	<LOD	<LOD	<LOD	<LOD	0.00877	<LOD	0.00362	<LOD	<LOD
PCB 149	mg/kg	-	-	-					0.01418	0.00117	<LOD	0.0001	0.00115	<LOD	0.00019	0.00319	<LOD	<LOD	0.01544	0.05518	0.00086	<LOD	0.03216	0.00011	<LOD	<LOD	0.00011	0.03007	0.00012	0.01799	0.0001	0.00011
PCB 151	mg/kg	-	-	-					0.00454	0.00032	<LOD	<LOD	0.00032	<LOD	0.00009	0.0007	<LOD	<LOD	0.00402	0.01733	0.0002	<LOD	0.00873	<LOD	<LOD	<LOD	<LOD	0.00698	<LOD	0.00562	<LOD	<LOD
PCB 153	mg/kg	German AL1	German AL2	-	0.005	0.015			0.01853	0.00166	<LOD	0.00012	0.0013	<LOD	0.00027	0.00327	<LOD	<LOD	0.0203	0.06568	0.00106	<LOD	0.03469	0.00022	<LOD	<LOD	0.0001	0.04701	0.00013	0.02404	0.00011	0.00017
PCB 156	mg/kg	-	-	-					0.00213	0.00015	<LOD	<LOD	0.00023	<LOD	<LOD	0.00071	<LOD	<LOD	0.00271	0.00782	0.00014	<LOD	0.00689	<LOD	<LOD	<LOD	<LOD	0.01054	<LOD	0.00301	<LOD	<LOD
PCB 158	mg/kg	-	-	-					0.00228	0.00018	<LOD	<LOD	0.00025	<LOD	<LOD	0.00063	<LOD	<LOD	0.00275	0.00865	0.00017	<LOD	0.0069	<LOD	<LOD	<LOD	<LOD	0.00953	<LOD	0.00285	<LOD	<LOD
PCB 170	mg/kg	-	-	-					0.00478	0.00046	<LOD	<LOD	0.00031	<LOD	<LOD	0.0008	<LOD	<LOD	0.00497	0.021	0.00059	<LOD	0.00897	0.00009	<LOD	<LOD	<LOD	0.01128	<LOD	0.0059	<LOD	<LOD
PCB 18	mg/kg	-	-	-					0.00036	0.00014	<LOD	<LOD	<LOD	<LOD	<LOD	0.00015	<LOD	<LOD	0.00058	0.00988	0.00038	<LOD	0.00212	<LOD	0.00017	<LOD	0.00045	0.00038	<LOD	0.00078	<LOD	<LOD
PCB 180	mg/kg	German AL1	German AL2	-	0.002	0.006			0.01117	0.00101	<LOD	<LOD	0.0006	<LOD	0.00009	0.00146	<LOD	<LOD	0.01016	0.04126	0.00142	<LOD	0.01815	0.00016	<LOD	<LOD	<LOD	0.01699	<LOD	0.01211	<LOD	0.00012
PCB 183	mg/kg	-	-	-					0.00319	0.0003	<LOD	<LOD	0.00015	<LOD	<LOD	0.00038	<LOD	<LOD	0.00289	0.01134	0.00032	<LOD	0.00557	<LOD	<LOD	<LOD	<LOD	0.00447	<LOD	0.00405	<LOD	<LOD
PCB 187	mg/kg	-	-	-					0.00714	0.00063	<LOD	<LOD	0.00029	<LOD	<LOD	0.0009	<LOD	<LOD	0.00602	0.02222	0.00052	<LOD	0.01097	0.0001	<LOD	<LOD	<LOD	0.00707	<LOD	0.00748	<LOD	0.00012
PCB 194	mg/kg	-	-	-					0.00308	0.00021	<LOD	<LOD	0.00014	<LOD	<LOD	0.00032	<LOD	<LOD	0.00244	0.00976	0.00035	<LOD	0.00398	<LOD	<LOD	<LOD	<LOD	0.00299	<LOD	0.00342	<LOD	<LOD
PCB 28	mg/kg	German AL1	German AL2	-	0.002	0.006			0.00077	0.00021	<LOD	<LOD	0.00012	<LOD	<LOD	0.00025	<LOD	<LOD	0.00085	0.01482	0.00044	<LOD	0.0023	<LOD	0.00009	<LOD	0.00038	0.00058	<LOD	0.00147	<LOD	<LOD
PCB 31	mg/kg	-	-	-					0.00074	0.00021	<LOD	<LOD	0.00012	<LOD	<LOD	0.00023	<LOD	<LOD	0.00088	0.01578	0.00049	<LOD	0.00266	<LOD	0.00008	<LOD	0.0004	0.00053	<LOD	0.00101	<LOD	<LOD
PCB 44	mg/kg	-	-	-					0.00198	0.00034	<LOD	<LOD	0.0004	<LOD	<LOD	0.00071	<LOD	<LOD	0.00288	0.03363	0.00085	<LOD	0.0089	<LOD	<LOD	<LOD	0.00023	0.00179	<LOD	0.00304	<LOD	<LOD
PCB 47	mg/kg	-	-	-					0.00077	0.00013	<LOD	<LOD	0.00012	<LOD	0.00009	0.00019	<LOD	<LOD	0.00101	0.01141	0.00029	<LOD	0.0017	<LOD	<LOD	<LOD	0.00009	0.00055	<LOD	0.0012	<LOD	<LOD
PCB 49	mg/kg	-	-	-					0.00265	0.00038	<LOD	<LOD	0.00037	<LOD	0.00008	0.00067	<LOD	<LOD	0.00355	0.03727	0.00093	<LOD	0.00715	<LOD	<LOD	<LOD	0.00028	0.00218	<LOD	0.00436	0.00008	<LOD
PCB 52	mg/kg	German AL1	German AL2	-	0.001	0.003			0.00428	0.00051	<LOD	<LOD	0.00069	<LOD	0.00009	0.00114	<LOD	<LOD	0.00587	0.05013	0.00118	<LOD	0.01987	<LOD	<LOD	<LOD	0.00028	0.00356	<LOD	0.00549	0.00008	<LOD
PCB 66	mg/kg	-	-	-					0.00262	0.0004	<LOD	<LOD	0.00036	<LOD	<LOD	0.00076	<LOD	<LOD	0.00296	0.04218	0.00087	<LOD	0.00688	<LOD	<LOD	<LOD	0.00013	0.00258	<LOD	0.0049	<LOD	<LOD
PCB SUM of ICES 7	mg/kg	CEFAS AL1	-	-	0.01				0.07443	0.00653	<LOD	0.00021	0.00656	<LOD	0.00098	0.01524	<LOD	<LOD	0.07892	0.33069	0.00699	<LOD	0.18857	0.00076	0.00009	<LOD	0.00109	0.16596	0.00052	0.09268	0.00037	0.0006
PCBs – sum of 25 congeners	mg/kg	CEFAS AL1 / USEPA ERL	USEPA ERM/ CEFAS AL2	USEPA ERM/ CEFAS AL2	0.02	0.18**	0.18**		0.14528	0.01332	<LOD	0.00041	0.01314	<LOD	0.00161	0.03098	<LOD	<LOD	0.15705	0.73292	0.01593	<LOD	0.36978	0.00124	0.00034	<LOD	0.0029	0.3077	0.00076	0.1839	0.00064	0.00093
AHCH	mg/kg	German AL1	German AL2	-	0.0004	0.001			<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.0001	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BHCH	mg/kg	-	-	-					0.0003	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.0002	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
GHCH	mg/kg	German AL1	German AL2	-	0.0002	0.0006			0.0025	0.0008	0.0004	0.0002	0.0002	0.0001	<LOD	0.0002	<LOD	<LOD	0.0001	0.0003	<LOD	<LOD	0.0002	0.0003	0.0003	0.0002	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
DIELDRIN	mg/kg	CEFAS AL1	Canadian SQG	-	0.005	0.71			<LOD	0.0004	0.0003	<LOD	0.0001	<LOD	<LOD	0.0006	0.0001	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.0001	<LOD	<LOD	0.0003	<LOD	<LOD	<LOD	<LOD	<LOD
HCB	mg/kg	German AL1	German AL2	-	0.002	0.006			0.0001	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.0001	<LOD	<LOD	<LOD	0.0002	<LOD	<LOD	<LOD	<LOD	0.001	<LOD	<LOD	<LOD	<LOD	<LOD
PPDDE	mg/kg	German AL1	German AL2	-	0.003	0.01			0.0056	0.0002	<LOD	<LOD	0.0009	<LOD	<LOD	0.0014	<LOD	<LOD	0.0055	0.0068	0.0005	<LOD	0.0054	<LOD	<LOD	<LOD	<LOD	0.0047	<LOD	0.0042	<LOD	<LOD
PPDDT	mg/kg	German AL1	German AL2	-	0.001	0.003			0.003	0.0001	<LOD	<LOD	0.0025	<LOD	<LOD	0.0002	<LOD	<LOD	0.0371	0.0087	0.0002	<LOD	0.0118	0.0001	<LOD	0.0001	<LOD	0.0109	<LOD	0.0037	<LOD	<LOD
PPTDE	mg/kg	CEFAS AL1	German AL2	USEPA ERM	0.001	0.003	0.046		0.0197	0.0009	<LOD	<LOD	0.0047	<LOD	<LOD	0.0056	0.0001	<LOD	0.0271	0.0311	0.0014	<LOD	0.0241	0.0005	<LOD	<LOD	0.0001	0.0347	0.0002	0.0204	0.0002	<LOD
BDE17	mg/kg	Canadian FEQG	-	-	0.044				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE28	mg/kg	Canadian FEQG	-	-	0.044				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE47	mg/kg	Canadian FEQG	-	-	0.039				0.00031	0.00011	0.00024	<LOD	0.00015	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.00012	0.00005	0.0001	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE66	mg/kg	Canadian FEQG	-	-	0.039				0.00018	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE85	mg/kg	Canadian FEQG	-	-	0.0004				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE99	mg/kg	Canadian FEQG	-	-	0.0004				0.00036	0.00013	0.00044	<LOD	0.00035	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.00023	0.00009	0.00016	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE100	mg/kg	Canadian FEQG			0.0004				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE138	mg/kg	Canadian FEQG	-	-	0.44				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE153	mg/kg	Canadian FEQG	-	-	0.44				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE154	mg/kg	Canadian FEQG	-	-	0.44				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE183	mg/kg	Canadian FEQG	-	-					<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE209	mg/kg	Canadian FEQG	-	-	0.019				0.0898	0.0027	0.0011	0.0009	0.0008	0.0012	0.0004	0.0023	0.0003	0.0009	0.016	0.0011	0.0008	0.0007	0.0435	0.001	0.001	0.0019	0.001	0.0035	0.0002	0.0028	0.0012	0.0018

Notes

[1] LMW = sum of Naphthalene, Acenaphthene, Fluorene, Anthracene, C1-naphtha-lenes, Acenaphthylene,Phenanthrene

[2] HMW = sum of Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo(a)pyrene,Dibenz(a,h)[a,b]anthracene

										West Area																					
		Reference			Low Risk	Moderate Risk	High Risk	Sample ID	VC-12A	VC-12A	VC-12A	VC-12A	VC-12A	VC-12A	VC-13A	VC-15	VC-15	VC-16	VC-16	VC-16	VC-17	VC-17	VC-17	VC-17	VC-17	VC-17	VC-19	VC-19	VC-19	VC-19
Analyte	Units	SQG1: No/low effects anticipated. Measured conc >SQG1 = low risk, potentially suitable for disposal to sea. Further consideration of the CSM required for proportionate decision making is	SG2: probable effects. Measured conc>SQG2 = unlikely to be suitable for disposal to sea. Further consideration of the CSM may be appropriate for proportionate	SG3: probable effects. Measured conc>SQG3 = cannot be disposed to sea	SQG1: No/low effects anticipated. Measured conc >SQG1 = low risk, potentially suitable for disposal to sea. Further consideration of the CSM required	SG2: probable effects. Measured conc>SQG2 = unlikely to be suitable for disposal to sea. Further consideration of the CSM may be appropriate for proportionate	SG3: probable effects. Measured conc>SQG3 = cannot be disposed to sea	Depth (m)	0.00-0.10	1.00-1.10	2.00-2.10	3.00-3.10	4.00-4.10	5.00-5.10	0.00-0.80	0.00-0.10	1.00-1.10	0.00-0.10	1.00-1.10	2.00-2.10	0.00-0.10	1.00-1.10	2.00-2.10	3.00-3.10	4.00-4.10	5.10-5.20	0.00-0.10	1.00-1.10	2.00-2.10	3.00-3.10
Arsenic (As)	mg/kg	USEPA ERL	CEFAS AL1	CEFAS AL2	8.2	20	100		51.4	62.6	10.1	9.9	9.4	7.2	30.7	43.0	7.0	93.4	40	5.4	44.4	90.6	13	9.9	10.4	9.7	49.9	13	12	21.7
Cadmium (Cd)	mg/kg	CEFAS AL1	CEFAS AL2	USEPA ERM	0.4	5	9.6		0.3	0.94	0.3	0.38	0.34	0.37	0.62	0.45	0.17	0.8	0.62	0.13	0.36	0.84	0.18	0.25	0.23	0.17	1.02	0.29	0.26	0.29
Chromium (Cr)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	40	370	400		30.8	33.2	30.9	32.4	28.1	23.7	27.6	33.2	20.5	87.2	32.6	17.6	34.8	34.6	15.1	28.4	29.8	24	165	32.6	25.9	28.6
Copper (Cu)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	40	270	400		268	390	21.8	15.9	14.1	13.6	290	704	38.6	938	275	10.1	374	403	64	14.8	13.8	12.8	1349	92	18.6	14
Mercury (Hg)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	0.3	0.71	3		1.82	8.96	0.16	0.05	0.06	0.05	1.31	2.15	0.07	3.24	5.98	0.09	1.92	10.6	0.96	0.14	0.12	0.11	1.9	0.25	0.14	0.13
Nickel (Ni)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	20	51.6	200		25.6	30.8	28.4	29.7	26.5	24.5	29.6	79.1	32.7	191	37	19.5	35.8	46.3	17.4	30	31.7	27.3	83	32.8	29.6	30.9
Lead (Pb)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	50	218	500		169	586	23.7	18.7	17.5	16	337	643	30.9	1428	495	13	328	779	69.9	18.5	16.9	12.7	926	64.7	20.4	16.5
Zinc (Zn)	mg/kg	CEFAS AL1	USEPA ERM	CEFAS AL2	130	410	800		416	1369	125	102	78.3	76.2	1126	2653	156	4011	1163	51.8	813	761	110	80	80.5	66.2	8784	553	112	97.3
Dibutyltin (DBT)	mg/kg	CEFAS AL1		CEFAS AL2	0.1		1		0.172	<LOD	<LOD	<LOD	<LOD	<LOD	0.352	0.072	<LOD	0.132	<LOD	<LOD	0.269	<LOD	<LOD	<LOD	<LOD	<LOD	0.385	<LOD	<LOD	<LOD
Tributyltin (TBT)	mg/kg	German AL1	German AL2	CEFAS AL2	0.02	0.06	1		0.479	0.011	<LOD	<LOD	<LOD	<LOD	2.32	0.205	<LOD	1.24	<LOD	<LOD	0.689	<LOD	<LOD	<LOD	<LOD	<LOD	1.84	0.009	<LOD	<LOD
Acenaphthene	µg/kg	USEPA ERL	USEPA ERM		16	500			95.6	426	<LOD	<LOD	<LOD	<LOD	42600	50.7	<LOD	115	215	<LOD	77.6	784	31.1	<LOD	<LOD	<LOD	51.7	3.25	1.77	<LOD
Acenaphthylene	µg/kg	USEPA ERL	USEPA ERM	-	44	640			217	955	<LOD	<LOD	<LOD	<LOD	1430	197	<LOD	171	283	<LOD	173	796	43	<LOD	<LOD	<LOD	62.5	5.64	<LOD	<LOD
Anrthacene	µg/kg	USEPA ERL	USEPA ERM	-	85	1100			312	1770	<LOD	<LOD	<LOD	<LOD	16100	174	<LOD	283	492	<LOD	343	4540	125	<LOD	<LOD	<LOD	90.6	8.54	<LOD	<LOD
Benz[a]anthracene	µg/kg	USEPA ERL	USEPA ERM	-	261	1600			854	7780	15.5	<LOD	<LOD	<LOD	8190	572	1.39	857	1710	<LOD	830	6100	516	<LOD	<LOD	<LOD	316	30.1	2.19	<LOD
Benzo[a]pyrene	µg/kg	USEPA ERL	USEPA ERM	-	430	1600			1770	10600	14.1	<LOD	<LOD	<LOD	4780	1260	3.14	1650	3300	<LOD	1770	7270	775	<LOD	<LOD	<LOD	651	59.7	3.27	<LOD
benzo(b)fluoranthene	µg/kg	-	-	-					1670	8360	13.1	<LOD	<LOD	<LOD	5510	1140	2.89	1550	2910	<LOD	1700	6700	601	<LOD	<LOD	<LOD	600	49	2.78	<LOD
Benzo[ghi]perylene	µg/kg	USEPA ERL	USEPA ERM	-	85				1220	6320	9.72	<LOD	<LOD	<LOD	1750	933	2.27	1210	2120	<LOD	1190	4290	450	<LOD	<LOD	<LOD	468	42.2	2.54	<LOD
Benzo[e]pyrene	µg/kg	-	-	-					1180	6060	8.82	<LOD	<LOD	<LOD	3230	871	2.3	1170	2090	<LOD	1170	5020	424	<LOD	<LOD	<LOD	429	35.5	2.11	<LOD
benzo(k)fluoranthene	µg/kg	-	-	-					1440	8160	11.5	<LOD	<LOD	<LOD	4730	991	3.71	1470	2680	<LOD	1450	6000	577	<LOD	<LOD	<LOD	536	46.1	2.87	<LOD
C1-Naphthalene	µg/kg	USEPA ERL	USEPA ERM	-	155				166	691	<LOD	<LOD	<LOD	<LOD	44000	90.9	<LOD	139	285	<LOD	101	818	54.5	<LOD	<LOD	<LOD	60.2	5.72	1.91	2.35
C1-Phenanthrene	µg/kg	USEPA ERL	USEPA ERM	-	170				520	3420	<LOD	<LOD	<LOD	<LOD	19600	400	<LOD	520	969	8.9	458	3480	228	<LOD	<LOD	<LOD	153	17.5	4.68	1.68
C2-Naphthalene	µg/kg	USEPA ERL	USEPA ERM	-	150				220	933	24.6	33.7	39	41.5	22000	154	1.77	210	394	30.9	116	1520	72.1	27.6	25.4	39.7	71.8	63.6	42.5	37.5
C3-Naphthalene	µg/kg	-	-	-					150	835	<LOD	<LOD	<LOD	<LOD	9690	95.4	<LOD	214	535	<LOD	113	1490	50.2	<LOD	<LOD	<LOD	46.7	7.85	3.12	3.77
Chrysene	µg/kg	USEPA ERL	USEPA ERM	-	384	2800			965	8500	9.56	<LOD	<LOD	<LOD	8300	664	1.86	983	2150	<LOD	941	6540	528	<LOD	<LOD	<LOD	359	32.4	2.89	<LOD
Dibenzoahanthracene	µg/kg	USEPA ERL	USEPA ERM	-	63	260			248	1230	<LOD	<LOD	<LOD	<LOD	383	200	<LOD	231	497	<LOD	272	1000	122	<LOD	<LOD	<LOD	109	10.3	<LOD	<LOD
Fluoranthene	µg/kg	USEPA ERL	USEPA ERM	-	600	5100			1640	13100	14.6	<LOD	<LOD	<LOD	43600	1140	2.66	1700	3210	<LOD	1530	12800	1080	<LOD	<LOD	<LOD	536	47.8	3.28	<LOD
Fluorene	µg/kg	USEPA ERL	USEPA ERM	-	19	540			140	717	<LOD	<LOD	<LOD	<LOD	38400	93.2	<LOD	140	247	<LOD	99.2	1000	47.2	<LOD	<LOD	<LOD	51.7	3.1	<LOD	<LOD
Indeno[1,2,3- cd]pyrene	µg/kg	USEPA ERL	USEPA ERM	-	240				1290	6880	<LOD	<LOD	<LOD	<LOD	1700	994	2.52	1240	2270	<LOD	1330	4410	519	<LOD	<LOD	<LOD	509	45.5	2.54	<LOD
Naphthalene	µg/kg	USEPA ERL	USEPA ERM	-	160	2100			152	688	<LOD	<LOD	<LOD	<LOD	47000	80.1	<LOD	127	230	<LOD	79.6	701	49.1	<LOD	<LOD	<LOD	44.9	4.35	<LOD	1.81
Perylene	µg/kg	-	-	-					319	2300	422	895	720	576	1260	198	1.9	346	707	375	340	1840	182	447	400	422	136	662	658	629
Phenanthrene	µg/kg	USEPA ERL	USEPA MSQG	-	240	1100			692	4200	<LOD	<LOD	<LOD	<LOD	95100	434	1.39	683	1400	<LOD	645	4830	313	<LOD	<LOD	<LOD	232	16.7	<LOD	<LOD
Pyrene	µg/kg	USEPA ERL	USEPA ERM	-	665	2600			2350	14900	22.2	<LOD	<LOD	<LOD	31100	1690	4.86	2390	4790	<LOD	2830	27800	1260	<LOD	<LOD	<LOD	656	63.1	3.46	<LOD
LMW PAH - low molecular weight PAHs[1]	µg/kg	USEPA ERL	USEPA ERM	-	552	3160			1763.6	9447	0	0	0	0	284630	1119.9	1.39	1658	3152	0	1518.4	13469	662.9	0	0	0	593.6	47.3	3.68	4.16
HMW PAH - high molecular weight PAHs[2]	µg/kg	USEPA ERL	USEPA ERM	-	1700	9600			7827	56110	75.96	0	0	0	96353	5526	13.91	7811	15657	0	8173	61510	4281	0	0	0	2627	243.4	15.09	0
THC	mg/kg	German AL1	German AL2	-	300	1000			427	3850	36	19.4	4.47	6.72	4620	646	4.27	619	882	25.3	798	491	115	16.5	6.54	4.52	26.5	48.3	8.35	6.24
PCB 101	mg/kg	German AL1	German AL2	-	0.002	0.006			0.01203	0.00073	0.00013	<LOD	<LOD	<LOD	0.02228	0.06611	0.0061	0.03201	0.00283	<LOD	0.00642	0.00148	<LOD	<LOD	<LOD	<LOD	0.00445	0.00055	<LOD	<LOD
PCB 105	mg/kg	-	-	-					0.0047	0.00018	<LOD	<LOD	<LOD	<LOD	0.00995	0.02427	0.00277	0.01343	0.00043	<LOD	0.00134	0.00033	<LOD	<LOD	<LOD	<LOD	0.00104	0.00019	<LOD	<LOD
PCB 110	mg/kg	-	-	-					0.01067	0.00073	0.00011	<LOD	<LOD	<LOD	0.12381	0.07163	0.00755	0.0367	0.002	<LOD	0.00576	0.00125	<LOD	<LOD	<LOD	<LOD	0.00008	0.0045	0.00087	0.00009	<LOD
PCB 118	mg/kg	German AL1	German AL2	-	0.003	0.01			0.01057	0.00072	0.00011	<LOD	<LOD	<LOD	0.08546	0.06446	0.00892	0.03785	0.00199	<LOD	0.00524	0.00103	<LOD	<LOD	<LOD	0.0001	0.0038	0.00038	<LOD	<LOD
PCB 128	mg/kg	-	-	-					0.00149	0.0002	<LOD	<LOD	<LOD	<LOD	0.00382	0.01305	0.00245	0.01152	0.00079	<LOD	0.00156	0.00041	<LOD	<LOD	<LOD	<LOD	0.0011	0.00008	<LOD	<LOD
PCB 138	mg/kg	German AL1	German AL2	-	0.004	0.012			0.00795	0.00103	0.0001	<LOD	<LOD	<LOD	0.02085	0.04581	0.00831	0.03426	0.00444	<LOD	0.00727	0.00212	0.00019	<LOD	<LOD	<LOD	0.00428	0.00044	<LOD	<LOD
PCB 141	mg/kg	-	-	-					0.0011	0.00017	<LOD	<LOD	<LOD	<LOD	0.00528	0.00913	0.00144	0.00629	0.00164	<LOD	0.00115	0.00049	<LOD	<LOD	<LOD	<LOD	0.00076	<LOD	<LOD	<LOD
PCB 149	mg/kg	-	-	-					0.01073	0.00119	0.00012	<LOD	<LOD	<LOD	0.10291	0.04591	0.00582	0.02649	0.00977	0.00009	0.00767	0.00234	0.00018	<LOD	<LOD	<LOD	0.0049	0.00064	<LOD	<LOD
PCB 151	mg/kg	-	-	-					0.0031	0.00019	<LOD	<LOD	<LOD	<LOD	0.00643	0.00809	0.00121	0.00473	0.00165	<LOD	0.0022	0.00092	<LOD	<LOD	<LOD	<LOD	0.00141	0.00019	<LOD	<LOD
PCB 153	mg/kg	German AL1	German AL2	-	0.005	0.015			0.01498	0.0017	0.00017	<LOD	<LOD	<LOD	0.02759	0.05209	0.00715	0.03827	0.01395	0.00012	0.01158	0.00372	0.00016	<LOD	<LOD	0.00009	0.00542	0.00066	0.00009	<LOD
PCB 156	mg/kg	-	-	-					0.00095	0.00015	<LOD	<LOD	<LOD	<LOD	0.00253	0.00916	0.00157	0.00699	0.00048	<LOD	0.00079	0.00015	<LOD	<LOD	<LOD	<LOD	0.00052	<LOD	<LOD	<LOD
PCB 158	mg/kg	-	-	-					0.00146	0.00009	<LOD	<LOD	<LOD	<LOD	0.00356	0.00865	0.00169	0.00601	0.00051	<LOD	0.00113	0.00013	<LOD	<LOD	<LOD	<LOD	0.00071	0.0001	<LOD	<LOD
PCB 170	mg/kg	-	-	-					0.00394	0.00056	<LOD	<LOD	<LOD	<LOD	0.01014	0.01327	0.00146	0.00733	0.00801	<LOD	0.00269	0.00107	<LOD	<LOD	<LOD	<LOD	0.0015	0.00033	<LOD	<LOD
PCB 18	mg/kg	-	-	-					0.00228	0.00025	<LOD	<LOD	<LOD	<LOD	0.0056	0.01911	0.00077	0.00247	0.00019	<LOD	0.00065	0.00015	<LOD	<LOD	<LOD	0.00019	0.00381	0.00188	0.00025	<LOD
PCB 180	mg/kg	German AL1	German AL2	-	0.002	0.006			0.00784	0.00214	0.0001	<LOD	<LOD	<LOD	0.02412	0.02704	0.00261	0.01458	0.03891	0.00023	0.00534	0.00335	<LOD	<LOD	<LOD	<LOD	0.00327	0.0009	<LOD	<LOD
PCB 183	mg/kg	-	-	-					0.00194	0.00049	<LOD	<LOD	<LOD	<LOD	0.00592	0.00789	0.00076	0.00414	0.01037	<LOD	0.00157	0.00094	<LOD	<LOD	<LOD	<LOD	0.0008	0.00017	<LOD	<LOD
PCB 187	mg/kg	-	-	-					0.00484	0.00132	<LOD	<LOD	<LOD	<LOD	0.01277	0.01465	0.00143	0.00866	0.03039	0.00016	0.00377	0.00279	<LOD	<LOD	<LOD	<LOD	0.0023	0.00035	<LOD	<LOD
PCB 194	mg/kg	-	-	-					0.00201	0.00129	<LOD	<LOD	<LOD	<LOD	0.00734	0.0061	0.00048	0.00317	0.03074	0.00011	0.00153	0.00168	<LOD	<LOD	<LOD	<LOD	0.00083	0.00025	<LOD	<LOD
PCB 28	mg/kg	German AL1	German AL2	-	0.002	0.006			0.00268	0.00023	<LOD	<LOD	<LOD	<LOD	0.0059	0.02102	0.00111	0.00372	0.00029	<LOD	0.00115	0.00015	<LOD	<LOD	<LOD	0.00009	0.00446	0.00226	0.00025	<LOD
PCB 31	mg/kg	-	-	-					0.0034	0.0002	<LOD	<LOD	<LOD	<LOD	0.00871	0.02584	0.00119	0.00397	0.00027	<LOD	0.00112	0.00017	<LOD	<LOD	<LOD	0.00012	0.00545	0.00315	0.00034	<LOD
PCB 44	mg/kg	-	-	-					0.01151	0.00024	<LOD	<LOD	<LOD	<LOD	0.00527	0.05583	0.00192	0.00895	0.0005	<LOD	0.00228	0.00027	<LOD	<LOD	<LOD	<LOD	0.00598	0.00285	0.00026	<LOD
PCB 47	mg/kg	-	-	-					0.0036	0.00012	<LOD	0.00012	<LOD	<LOD	0.00334	0.01698	0.00051	0.00231	0.00017	<LOD	0.00084	0.00011	<LOD	<LOD	<LOD	<LOD	0.00191	0.0008	0.00012	0.00021
PCB 49	mg/kg	-	-	-					0.01224	0.00039	<LOD	<LOD	<LOD	<LOD	0.01368	0.05609	0.00174	0.00814	0.00062	<LOD	0.003	0.00038	<LOD	<LOD	<LOD	<LOD	0.00558	0.00237	0.00023	<LOD
PCB 52	mg/kg	German AL1	German AL2	-	0.001	0.003			0.01588	0.00058	0.00011	<LOD	<LOD	<LOD	0.0292	0.07819	0.00269	0.01527	0.00135	<LOD	0.00399	0.00065	<LOD	<LOD	<LOD	0.0001	0.00747	0.00332	0.00033	<LOD
PCB 66	mg/kg	-	-	-					0.01109	0.00028	<LOD	<LOD	<LOD	<LOD	<LOD	0.058	0.00217	0.00987	0.00054	<LOD	0.00266	0.00032	<LOD	<LOD	<LOD	<LOD	0.00431	0.00131	0.00012	<LOD
PCB SUM of ICES 7	mg/kg	CEFAS AL1	-	-	0.01				0.07193	0.00713	0.00072	<LOD	<LOD	<LOD	0.2154	0.35472	0.03689	0.17596	0.06376	0.00035	0.04099	0.0125	0.00035	<LOD	<LOD	0.00038	0.03315	0.00851	0.00067	<LOD
PCBs – sum of 25 congeners	mg/kg	CEFAS AL1 / USEPA ERL	USEPA ERM/ CEFAS AL2	USEPA ERM/ CEFAS AL2	0.02	0.18**	0.18**		0.16298	0.01517	0.00095	0.00012	<LOD	<LOD	0.54646	0.81837	0.07382	0.34713	0.16283	0.00071	0.0827	0.0264	0.00053	<LOD	<LOD	0.00077	0.08056	0.02404	0.00208	0.00021
AHCH	mg/kg	German AL1	German AL2	-	0.0004	0.001			<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.0001	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BHCH	mg/kg	-	-	-					<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
GHCH	mg/kg	German AL1	German AL2	-	0.0002	0.0006			<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.0002	0.0001	0.0001	0.0001	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
DIELDRIN	mg/kg	CEFAS AL1	Canadian SQG	-	0.005	0.71			<LOD	<LOD	<LOD	0.0001	<LOD	<LOD	<LOD	0.0019	0.0003	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.0001	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
HCB	mg/kg	German AL1	German AL2	-	0.002	0.006			<LOD	<LOD	0.0002	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.0005	<LOD	<LOD	<LOD	0.0005	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
PPDDE	mg/kg	German AL1	German AL2	-	0.003	0.01			<LOD	0.0014	0.0005	<LOD	<LOD	<LOD	<LOD	0.0063	0.0003	0.0046	0.0032	<LOD	0.0072	0.0103	<LOD	<LOD	<LOD	<LOD	0.0011	<LOD	<LOD	<LOD
PPDDT	mg/kg	German AL1	German AL2	-	0.001	0.003			<LOD	0.0012	<LOD	<LOD	0.0003	<LOD	<LOD	0.0034	0.0002	0.0008	0.0002	<LOD	0.0012	0.0022	<LOD	<LOD	<LOD	<LOD	0.0012	<LOD	<LOD	<LOD
PPTDE	mg/kg	CEFAS AL1	German AL2	USEPA ERM	0.001	0.003	0.046		<LOD	0.003	0.0002	<LOD	<LOD	<LOD	<LOD	0.0293	0.0027	0.014	0.0047	<LOD	0.0064	0.0063	<LOD	<LOD	<LOD	<LOD	0.0017	<LOD	<LOD	<LOD
BDE17	mg/kg	Canadian FEQG	-	-	0.044				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE28	mg/kg	Canadian FEQG	-	-	0.044				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE47	mg/kg	Canadian FEQG	-	-	0.039				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE66	mg/kg	Canadian FEQG	-	-	0.039				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE85	mg/kg	Canadian FEQG	-	-	0.0004				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE99	mg/kg	Canadian FEQG	-	-	0.0004				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE100	mg/kg	Canadian FEQG			0.0004				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE138	mg/kg	Canadian FEQG	-	-	0.44				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE153	mg/kg	Canadian FEQG	-	-	0.44				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE154	mg/kg	Canadian FEQG	-	-	0.44				<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE183	mg/kg	Canadian FEQG	-	-					<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BDE209	mg/kg	Canadian FEQG	-	-	0.019				0.0477	0.0036	0.0039	0.0013	0.0008	<LOD	0.0102	0.0005	0.0009	0.0203	0.0009	0.0004	0.0153	0.0015	0.0008	0.0007	0.0042	0.0043	0.0207	0.0041	0.0023	0.0027

Notes

[1] LMW = sum of Naphthalene, Acenaphthene, Fluorene, Anthracene, C1-naphtha-lenes, Acenaphthylene,Phenanthrene

[2] HMW = sum of Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo(a)pyrene,Dibenz(a,h)[a,b]anthracene

Appendix 7

Risk-based Scenarios to Assess Suitability of Marine Sediment Disposal to Sea

Risk Assessment to define volumes of sediment suitable for disposal to sea

Sample Reference	Scenario 1 - Risk-based approach. Least conservative.	Scenario 2 - Risk-based approach. More conservative.
Northern Area		
VC-06 0.00-0.05	High risk. No further consideration needed.	High risk. No further consideration needed.
VC-06 1.00-1.10	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-06 2.00-2.10	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-06 2.55-2.65	Low risk, minor exceedance of low risk level for 1 metal, all below moderate risk level.	Low risk, minor exceedance of low risk level for 1 metal, all below moderate risk level.
VC-07 0.00-0.10	High risk. No further consideration needed.	High risk. No further consideration needed.
VC-07 1.00-1.10	Low risk, minor exceedance of low risk level for 4 metals, 1 very marginally above the USEPA ERM and 4x lower than AL2.	Minor exceedance of low risk level for 4 metals, 1 very marginally above the USEPA ERM and 4x lower than AL2.
VC-07 1.20-1.30	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-07A 0.00-0.10m	High risk. No further consideration needed.	High risk. No further consideration needed.
VC-07A 1.00-1.10m	Low risk, minor exceedance of low risk level for 3 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 3 metals, all below moderate risk level.
VC-07A 2.00-2.10m	Low risk, minor exceedance of low risk level for 1 metal, all below moderate risk level.	Low risk, minor exceedance of low risk level for 1 metal, all below moderate risk level.
VC-09 0.00-0.10	High risk. No further consideration needed.	High risk. No further consideration needed.
VC-09 1.00-1.10	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-09 2.00-2.10	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-09 3.00-3.10	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-09 4.00-4.10	Very low risk, all below low risk level.	Very low risk, all below low risk level.
VC-09 5.00-5.10	Low risk, minor exceedance of low risk level for 4 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 4 metals, all below moderate risk level.
VC-11 0.00-0.10	TBT, DDT above moderate risk levels, 2 metals, several individual PAHs, and PCBs above low risk levels. In combination considered unsuitable for disposal to sea.	TBT, DDT above moderate risk levels, 2 metals , several individual PAHs, and PCBs above low risk levels. In combination considered unsuitable for disposal to sea.
VC-11 1.00-1.10	Low risk, minor exceendnce of low risk level for 1 metal, all below moderate risk level.	Low risk, minor exceendnce of low risk level for 1 metal, all below moderate risk level.
VC-11 2.00-2.10	Low risk, minor exceedance of low risk level for 1 metal, all below moderate risk level.	Low risk, minor exceedance of low risk level for 1 metal, all below moderate risk level.
VC-11 3.00-3.10	Low risk, minor exceedance of low risk level for 1 metal, all below moderate risk level.	Low risk, minor exceedance of low risk level for 1 metal, all below moderate risk level.
VC-11 4.00-4.10	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-11 5.00-5.10	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-11 5.30-5.37	Low risk, minor exceedance of low risk level for 1 metal, all below moderate risk level.	Low risk, minor exceedance of low risk level for 1 metal, all below moderate risk level.
VC-14 0.00-0.10m	High risk. No further consideration needed.	High risk. No further consideration needed.
VC-14 1.00-1.10m	Pesticides slightly above moderate risk level, decreasing with depth. Minor exceedance of low risk level for 2 metals. Considered potential outer extent of impact in western area.	Pesticides slightly above moderate risk level, decreasing with depth. Minor exceedance of low risk level for 2 metals. Considered potential outer extent of impact in western area.
VC-14 2.00-2.10m	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-14 3.00-3.10m	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-25 0.00-0.10	Low risk, minor exceendnce of low risk level for 4 individual PAHs, total LMW and HWM below low risk levels. All below moderate risk level.	Low risk, minor exceendnce of low risk level for 4 individual PAHs, total LMW and HWM below low risk levels. All below moderate risk level.
VC-25 1.00-1.10	Low risk, minor exceedance of low risk level for 1 metal, all below moderate risk level.	Low risk, minor exceedance of low risk level for 1 metal, all below moderate risk level.
VC-25 2.00-2.10	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-25 3.00-3.10	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-25 3.90-4.00	Low risk, minor exceedance of low risk level for 1 metal, all below moderate risk level.	Low risk, minor exceedance of low risk level for 1 metal, all below moderate risk level.
VC-26 0.00-0.10m	High risk. No further consideration needed.	High risk. No further consideration needed.
VC-26 1.00-1.10m	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-26 2.00-2.10m	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-26 3.00-3.10m	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
Eastern Area		
VC-01 0.00-0.10m	High risk. No further consideration needed.	High risk. No further consideration needed.
VC-01 1.00-1.10m	GHCH at moderate risk level in this sample, profile shows concs reducing with depth in this location. Not identifed in surrounding locations at these concs. Data suggest low level impacts but no widespread moderate risk level impacts. No other compounds above low risk level in this sample.	GHCH at moderate risk level in this sample, profile shows concs reducing with depth in this location. Not identifed in surrounding locations at these concs. Data suggest low level impacts but no widespread moderate risk level impacts. No other compounds above low risk level in this sample.
VC-01 2.00-2.10m	Low risk, minor exceedance of low risk level for 3 metals and GHCH, all below moderate risk level.	Low risk, minor exceedance of low risk level for 3 metals and GHCH, all below moderate risk level.
VC-01 3.00-3.10m	Low risk, minor exceedance of low risk level for 3 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 3 metals, all below moderate risk level.
VC-01 3.55-3.65m	Potentially high risk due to TBT and elevated concs. of other compounds, however result anomalous, no impacts in sediment above, impacts considered more likely to be entrained contamination from high in sediment column.	Potentially high risk due to TBT and elevated concs. of other compounds, however result anomalous, no impacts in sediment above, impacts considered more likely to be entrained contamination from high in sediment column.
VC-02 0.05-0.15	Low risk, minor exceedance of low risk level for 1 metal, all below moderate risk level.	Low risk, minor exceedance of low risk level for 1 metal, all below moderate risk level.
VC-02 0.90-1.00	Low risk, minor exceedance of low risk level for 2 metals, 1 very marginally above the USEPA ERM. Overall this sediment strata is considered low risk.	Low risk, minor exceedance of low risk level for 2 metals, 1 very marginally above the USEPA ERM. Overall this sediment strata is considered low risk.
VC-02A 0.00-0.10m	High risk. No further consideration needed.	High risk. No further consideration needed.
VC02A 1.00-1.10m	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-02A 1.40-1.50m	Low risk, minor exceedance of low risk level for 1 metal and TBT, all below moderate risk level.	Low risk, minor exceedance of low risk level for 1 metal and TBT, all below moderate risk level.
VC-03 0.00-0.10	High risk. No further consideration needed.	High risk. No further consideration needed.
VC-03 1.00-1.10	High risk. No further consideration needed.	High risk. No further consideration needed.
VC-03 2.00-2.10	High risk. No further consideration needed.	High risk. No further consideration needed.
VC-03 3.00-3.10	TBT, zinc, mercury above moderate risk levels. Copper and nickel above low risk concentrations. Sediment above all significantly impacted. Sample of slate gravel. Above sediment clay with hydrocarbon odours. Resonable to assume low risk from lower natural slate strata, impacts recorded likely to reduce rapidly with depth or may reflect some sampling cross contamination.	TBT, zinc, mercury above moderate risk levels. Copper and nickel above low risk concentrations. Sediment above all significantly impacted. Sample of slate gravel. Above sediment clay with hydrocarbon odours. Resonable to assume low risk from lower natural slate strata, impacts recorded likely to reduce rapidly with depth or may reflect some sampling cross contamination.
VC-05 0.00-0.10m	High risk. No further consideration needed.	High risk. No further consideration needed.
VC-05 1.00-1.10m	Arsenic and TBT above moderate risk levels, several metals, several individual PAHs, HMW PAH, and GHCH above low risk levels. In combination considered unsuitable for disposal to sea.	Arsenic and TBT above moderate risk levels, several metals, several individual PAHs, HMW PAH, and GHCH above low risk levels. In combination considered unsuitable for disposal to sea.
VC-05 2.00-2.10m	Low risk, minor exceedance of low risk level for 2 metals and GHCH, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals and GHCH, all below moderate risk level.
VC-05 3.00-3.10m	Low risk, minor exceedance of low risk level for 3 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 3 metals, all below moderate risk level.
VC-05 3.90-4.00m	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-22 0.00-0.10	High risk. No further consideration needed.	High risk. No further consideration needed.
VC-22 1.00-1.10	Low risk, minor exceedance of low risk level for 4 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 4 metals, all below moderate risk level.
VC-24 0.00-0.10	Numerous compounds above moderate risk level, considered unsuitable for disposal to sea.	Numerous compounds above moderate risk level, considered unsuitable for disposal to sea.
VC-24 1.00-1.10	Low risk, minor exceedance of moderate risk level for 1 metal.	Low risk, minor exceedance of moderate risk level for 1 metal.
VC-24 1.90-2.00	Low risk, minor exceedance of low risk level for 2 metals, 1 marginally above moderate risk level. Overall considered low risk.	Low risk, minor exceedance of low risk level for 2 metals, 1 marginally above moderate risk level. Overall considered low risk.
Western Area		
VC-12A 0.00-0.10m	Numerous compounds above moderate risk level, considered unsuitable for disposal to sea.	Numerous compounds above moderate risk level, considered unsuitable for disposal to sea.
VC-12A 1.00-1.10m	High risk. No further consideration needed.	High risk. No further consideration needed.
VC-12A 2.00-2.10m	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-12A 3.00-3.10	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-12A 4.00-4.10m	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-12A 5.00-5.10m	Low risk, minor exceedance of low risk level for 1 metal, below moderate risk level.	Low risk, minor exceedance of low risk level for 1 metal, below moderate risk level.
VC-13A 0.00-0.80m	High risk. No further consideration needed.	High risk. No further consideration needed.
VC-15 0.00-0.10m	High risk. No further consideration needed.	High risk. No further consideration needed.
VC-15 1.00-1.10m	Low risk, minor exceedence of low risk level for DDT, various PAHs and 2 metals, all below moderate risk level. PCB 101 slightly above moderate risk concentration.	Low risk, minor exceedence of low risk level for DDT, various PAHs and 2 metals, all below moderate risk level. PCB 101 slightly above moderate risk concentration.
VC-16 0.00-0.10m	High risk. No further consideration needed.	High risk. No further consideration needed.
VC-16 1.00-1.10m	High risk. No further consideration needed.	High risk. No further consideration needed.
VC-16 2.00-2.10m	Very low risk, all below low risk level.	Very low risk, all below low risk level.
VC-17 0.00-.0.10m	High risk. No further consideration needed.	High risk. No further consideration needed.
VC-17 1.00-1.10m	High risk. No further consideration needed.	High risk. No further consideration needed.
VC-17 2.00-2.10m	Mercury and pesticides above moderate risk level. Numerous compounds above low risk level. Overall considered unsuitable for disposal to sea.	Mercury and pesticides above moderate risk level. Numerous compounds above low risk level. Overall considered unsuitable for disposal to sea.
VC-17 3.00-3.10m	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-17 4.00-4.10m	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-17 5.10-5.20m	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-19 0.00-0.10m	High risk. No further consideration needed.	High risk. No further consideration needed.
VC-19 1.00-1.10m	PCB-52 and zinc above moderate risk level. Various metals and pesticides above low risk level.	PCB-52 and zinc above moderate risk level. Various metals and pesticides above low risk level.
VC-19 2.00-2.10m	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.	Low risk, minor exceedance of low risk level for 2 metals, all below moderate risk level.
VC-19 3.00-3.10m	Low risk. Minor exceedance of low risk level for 2 metals, 1 marginally above moderate risk level. Overall considered low risk.	Low risk. Minor exceedance of low risk level for 2 metals, 1 marginally above moderate risk level. Overall considered low risk.

Notes

Highlighted cells indicating the following information (in line with the Marine Sediment Screening Sheets (Appendix 6):

1 or more compound > high risk SQG
1 or more compound > moderate risk SQG
1 or more compound > low risk SQG
All compounds <low risk SQGs
High risk to marine life - unsuitable for disposal to sea.
Low risk to marine life - suitable for disposal to sea.