Ardrossan Harbour
Best Practicable Environmental Options Report

December 2019

Ardrossan Harbour
Best Practicable Environmental Options Report

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1 INTRODUCTION

1.1 Scope of Report

Clydeport Operations Limited appointed EnviroCentre Ltd to undertake the pre-dredge sampling and reporting for the associated dredging of three areas within Ardrossan Harbour, North Ayrshire. The samples were collected to inform proposed dredging and associated disposal or re-use options. This report supports the requirements for the dredging licence application. The dredging works will be undertaken as part of the wider Ardrossan Harbour redevelopment and specifically to accommodate the MV Glen Sannox - the new ferry for the Caledonian MacBrayne (CalMac) Ardrossan to Brodick route.

The purpose of the BPEO report is to review each of the available potential disposal options for the dredged materials. The options which are not considered to be practicable are rejected and the reasons for doing so are explained. In this instance, all of the dredged material is proposed to be reused on land at an adjacent site at the former Shell terminal as part of up filling for site redevelopment. Options are normally screened against environmental, strategic and cost considerations, but due to the requirement for the reuse of the material, it is proposed that that the usual BPEO format is abbreviated to cover key potential environmental impacts and also the water framework directive assessment.

1.2 Background to Application

The works, as outlined above, are being undertaken as a wider redevelopment of the ferry terminal and harbour. This development necessitates three dredge areas with volumes as shown in Table 1.1.

Table 1.1: Proposed Marine Dredge Sites and Approximate Dredge Volumes

Dredge Area	Dredge Volume (m^3)	Target Dredge Level (m CD)
Arran Berth & Northern Approach	3,500 (approx.)	-4.9
Winton Pier	677	-4.9
Irish Berth	99	-4.9

Given the nature and volume of materials the marine dredging is planned to be carried out by Back-hoe Dredger. Further details will be available once a Contractor is appointed.

In addition to the traditional marine sediment dredging described above, approximately 27,000m^3 of material is to be removed which currently forms the Arran Berth. This area is identified in Ramboll Drawing 1620005121-RAM-ARN-00-DR-CW-1001 as Stage 5 within Appendix A. The exact details of how this will be removed will be provided when there is an appointed Contractor. However, it is expected that in principle this area will be removed as follows:

- Begin demolition of the existing berth, working using long reach excavators operating from the quayside surface. The excavator will work backwards from the outer perimeter towards the new quay wall line while excavating the quayside in benches to form the new berth. The contractor may choose to leave the perimeter sheet piles in place for as long as he can to protect the works before breaking these down. The excavation may be on a single work front (likely to be progressing south to north) or multiple work fronts.
- On completion the existing perimeter piles will either be cut off at bed level or removed completely by the excavation of the shallow trench that the toe of the piles are concreted into.
- Finally, the excavators will trim the excavation to the face of the new quay wall and within the linkspan recess.

Drawings are included in Appendix A detailing the proposed dredge areas and accompanying sediment quality data and report is present in Appendix B.

1.3 Nature of Marine Sediments

Samples from the proposed dredge area were collected during September 2019 and submitted for analysis in line with Marine Scotland's Guidance. The results from this exercise are provided in Appendix B within the Sediment Sampling Report.

Sediment sample recovery was limited for both proposed grab and core samples due to the hard nature of the sea bed in the sample areas. Large cobbles and boulders were also encountered within the sampling areas.

Surface sediment encountered generally comprised cobbles and gravel with sand in the Northern Approach and Winton Pier areas; and sandy silt in the Irish Berth.

The limited sample recovery was discussed with Marine Scotland and communicated that all the material was proposed to be dredged and reused at an adjacent site. Marine Scotland reviewed historic sampling data and concluded that contamination had not been recorded previously at levels of concern, so no further sampling would be required for the dredging, but sufficient data should be collected to satisfy SEPAs requirements as the material is to be reused of on land..

The following exceedances of the Sediment Action Levels were noted for all 4 samples tested:

Table 1.2: Summary of Exceedances

Contaminant	No. of Exceedances		Samples in Exceedance of RAL 1	Samples in Exceedance of RAL 2
	RAL 1	RAL 2		
Arsenic	0	0	-	-
Cadmium	0	0	-	-
Copper	4	0	SS1, SS2, SS5 & SS6	-
Chromium	0	0	-	-
Lead	2	1	SS1 & SS3	SS3
Mercury	0	0	-	-
Nickel	3	0	SS1, SS3 & SS5	-
Zinc	2	0	SS1 & SS3	-
PAH (All Species)	4	-	SS1, SS2, SS5 & SS6	
PCBs	0	0	-	-
TBT	0	0	-	-
TPH	4	0	SS1, SS3, SS5 & SS6	-

In summary, all samples failed for one or more metal as well as PAHs. One sample, SS3 recorded lead in excess of RAL2. More detailed information is available for review within Appendix B.

2 DISCUSSION OF AVAILABLE DISPOSAL OPTIONS

The BPEO process is geared towards identifying a preferred overall strategy from the perspective of the environment as a whole, as opposed to detailed optimisation of any one selected scheme. It is a structured and systematic process to identify and compare strategic options in a transparent manner. Alternatives are evaluated in terms of their projected implications for the environment together with consideration of practicability, social and economic issues as well as within a wider strategic context.

Normally the key stages of a BPEO are:

- Identification of options;
- Screening of options;
- Selection of assessment criteria;
- Analysis and evaluation of criteria; and
- Evaluation of BPEO.

A number of options are generally available for disposal of dredged sediments. During the evolution of the project it has become evident that the North Ayrshire council proposed new school site close to the construction and dredging works has a requirement for material to upfill the site (of circa 70,000m^3). This therefore presents an opportunity for beneficial re-use and is considered to be the BPEO.

The normal process of BPEO described above is not considered to apply when such a clear beneficial re-use is available.

Although beneficial re-use is clearly the most desirable option we have provided in Table 2.1 some narrative to show the advantages over the other options which normally would be screened to establish the BPEO.

Table 2.1: Commentary on Other Options

Options	Relative Demerits to BPEO
Landfill	From this site haulage would be significant to nearest licenced facility compared to the Ardrossan School Site; Uses up valuable landfill capacity; and High cost option.
Beach Nourishment or Habitat Creation in Marine Environment	These types of options can have their own significant environmental effects, so they require long term planning with the Regulators and cannot be implemented in the short term. We are not aware of any such consented opportunities in the West of Scotland.
Sea Disposal	Would involve significant vessel movements to the disposal ground with associated carbon emissions. Lost opportunity to use suitable material for capping/aggregate.

It is therefore proposed that all of the dredged material will be brought ashore for reuse across at the former Shell terminal site. The dredging arisings and excavations of the existing quay area (Stage 5) will be subjected to the necessary testing to satisfy SEPA of its acceptability for reuse, through sampling during the works.

3 FURTHER ASSESSMENT

Typically, when it is intended that dredged sediments are to be disposed of at licensed spoil grounds, further assessment of exceedances of revised Action Level 1 or AL 2 are required. However, since it is intended that all of this material is to be beneficially reused no further assessment of potential risks associated with the dredged material is required for the marine environment. Appropriate review and assessment of contaminant levels will however be carried out for the re-use of material on land and screened against relevant human health generic assessment criteria specific for its intended use and also Environmental Quality Standards to ensure that potential risks to the water environment can be appropriately assessed. Re-use of material will be undertaken in line with relevant waste legislation.

A Water Framework Directive Risk Assessment has been undertaken with regards to the dredging of material and is detailed in section 3.1.

3.1 Water Framework Directive Assessment

As outlined in the Water Framework Directive Assessment: estuarine and coastal waters, there are several key receptors which can be impacted upon including the following:

- Hydromorphology
- Biology – habitats
- Biology – fish
- Water quality
- Protected areas

Each of these points are considered in Table 3.1 below:

Table 3.1: Receptor Risk Assessment

Key Receptor	Brief Summary of Potential Effects on Receptor	Further Consideration Required?	Comment
Hydromorphology (Source Area and Disposal Site)	Morphological conditions, for example depth variation, the seabed and intertidal zone structure tidal patterns, for example dominant currents, freshwater flow and wave exposure	No	The proposed dredge works are within an already modified part of the coastline due to the presence of a harbour, ferry terminal with associated infrastructure and sheet piled quay walls. No indirect effects are predicted as a result of dredging.
Biology - habitats	Included to assess potential impacts to sensitive/high value habitats.	No	The proposed dredge site is not located within 2km of an SAC or SPA, marine protected area or RAMSAR sites.

Biology – fish	Consideration of fish both within the estuary and also potential effects on migratory fish in transit through the estuary.	No	Contaminant levels are considered to be low and all material will be brought to land. Key risk, as per any dredge project, will be from increases in suspended solids and underwater noise during the dredging works. Width of the channel adjacent to the development is 1Km at the narrowest point and all dredged material is being brought to land. It is therefore considered that sufficient water, out with the area of localised impact, will be available to migratory species to enable them to pass freely. The material is to be brought to land, so will not have an impact at the sea disposal site.
Water Quality	Consideration must be given to water quality when contaminants are present in exceedance of CEFAS RAL1.	Yes	Contaminants noted to exceed CEFAS RAL1 and one exceedance of RAL 2 for lead within sediment samples.
Protected Areas	If your activity is within 2km of any WFD protected area, include each identified area in your impact assessment. • special areas of conservation (SAC) • special protection areas (SPA) • shellfish waters • bathing waters • nutrient sensitive areas	Yes	The proposed dredge site is not located within 2km of an SAC or SPA, marine protected area or RAMSAR sites. The dredge site is located approximately 1 Km from the closest designated bathing water at Saltcoats/Ardrossan (NS23454199). The bathing waters are classified as “sufficient”. The dredge sites are not designated as shellfish water, with no designated sites recorded within 2Km of the proposed dredge site. On this basis there are not considered to be any significant risks to these protected areas.

Source: Taken from https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters

3.2 Potential Risk to Water Quality and Marine Life

The potential risks to water quality including bathing waters in proximity to the dredge sites are further considered as all other receptors have been screened out of the assessment.

The coastal classification of this area of water by SEPA in and around the dredge site Seamill and Ardrossan is"good" in 2018 as detailed on Scotland's Environment (http://www.environment.scotland.gov.uk/). The adjoining classification for Irvine bay is reported as "moderate" in 2018.

Although there are contaminants of concern above the RAL1, and a single lead concentration above RAL 2 it is considered that these levels will not contribute to an overall degradation of water quality as the potential for dilution and attenuation in the Firth of Clyde is very considerable.

The key contaminants for impacting water quality are considered to be metals as these have the potential to dissolve/desorb from sorption sites, whereas the organic contaminants (e.g. PCBs and PAHs) have a greater affinity for the organic materials which they are bound to, and are more likely to remain strongly bound to the sediment, or if become dissolved, quickly adsorbed onto organic matter within the water column or sediments. Lead was recorded in excess of RAL2 in a single sample. Lead has low aqueous solubility under normal conditions and readily forms precipitates, or is adsorbed onto suspended material.

The key risk is considered to be an increase in turbidity/suspended solids during the dredging activity, although this is likely to cause localised degradation in water quality, it is considered that this will be a short term event and mitigation measures could be put in place if deemed necessary.

On this basis, the associated risk with degradation of water quality directly associated with the proposed disposal is considered to be Low i.e. unlikely to cause a significant adverse effect on the overall water quality.

4 CONCLUSIONS AND RECOMMENDATIONS

Review of available information has highlighted that although several chemical contaminants exceed RAL1 and a single exceedance of lead for RAL2, assessment of key receptors identified from the Water Framework Directive assessment for estuarine and coastal waters concluded that there is a low risk to the key receptor of Water Quality. The chemical levels in the sediment are considered to be generally low and the intention is to re-use the sediment as part of the wider project rather than the more traditional sea based disposal route.

The Best Practicable Environmental Option for disposal of the dredge material has been identified as re-use as part of the development at the former Shell Terminal. It should be noted that additional sampling is planned to support this option. Should any material be tested and not meet SEPAs re-use criteria it will either be treated or disposed of in an appropriately licenced facility.

5 REFERENCES

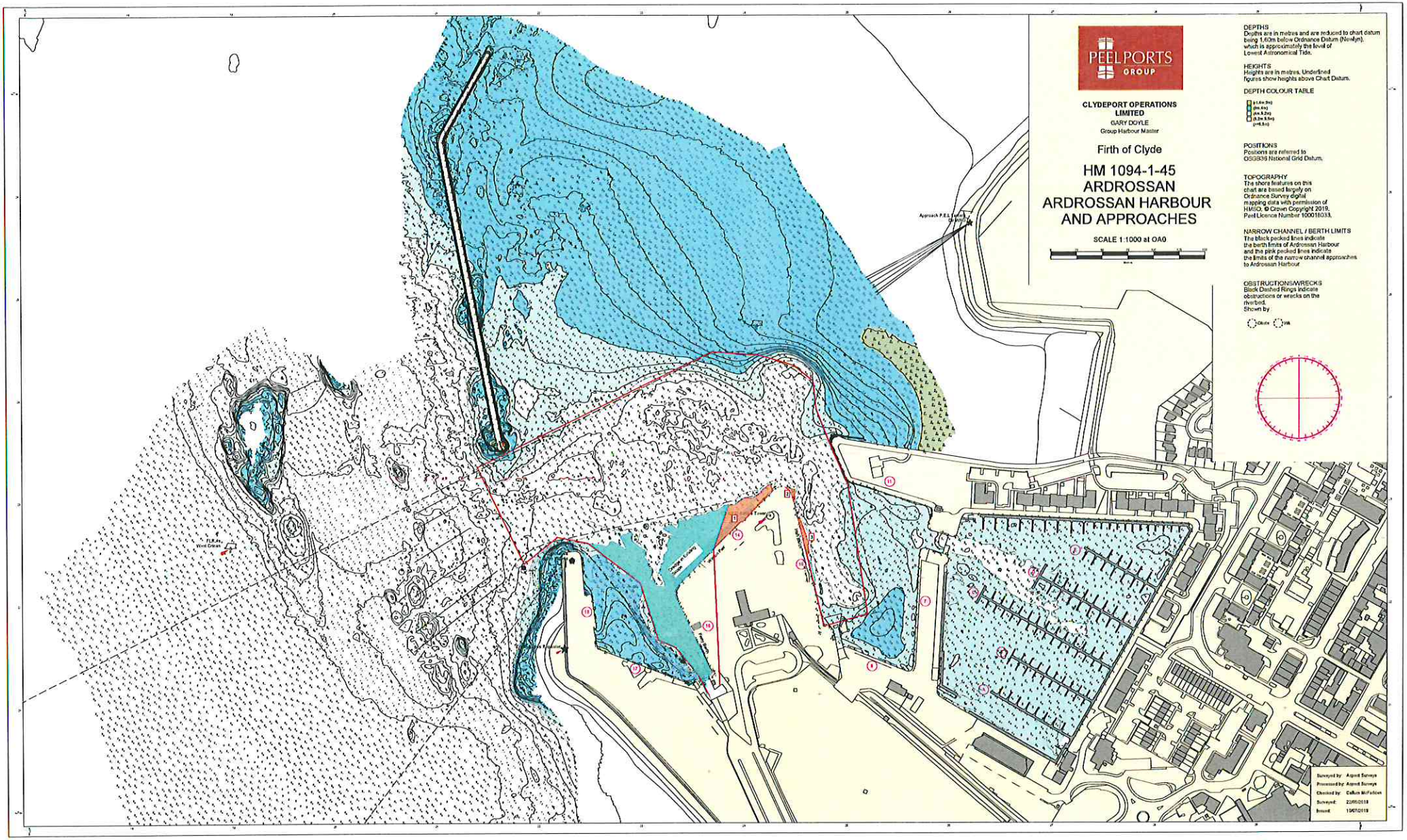
Marine Scotland (2017). *Pre-DredgeSampling Guidance Version 2*: Scottish Government.

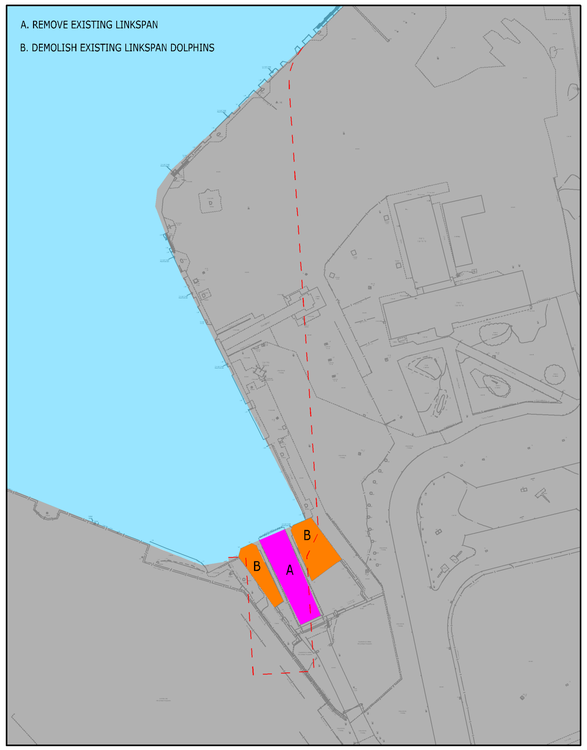
Marine Scotland (2015). *Guidance for Marine Licence Applicants Version 2*: Scottish Government.

Marine Scotland National Marine Plan Interactive Viewer - https://marinescotland.atkinsgeospatial.com/nmpi/

APPENDICES

A FIGURES


PEEL PORTS GROUP
CLYDEPORT OPERATIONS LIMITED
GARY DOYLE
Group Harbour Master
Firth of Clyde
HM 1094-1-45
ARDROSSAN
ARDROSSAN HARBOUR AND APPROACHES
SCALE 1:1000 at OA0
DEPTHS
Depths are in metres and are reduced to chart datum being 1.60m below Ordnance Datum (Newlyn), which is approximately the level of Lowest Astronomical Tide.
HEIGHTS
Heights are in metres. Underlined figures show heights above Chart Datum.
DEPTH COLOUR TABLE
POSITIONS
Positions are referred to OSGB36 National Grid Datum.
TOPOGRAPHY
The shore features on this chart are based largely on Ordnance Survey digital mapping data with permission of HMSO. © Crown Copyright 2019. Peel Licence Number 100018033.
NARROW CHANNEL / BERTH LIMITS
The black pecked lines indicate the berth limits of Ardrossan Harbour and the pink pecked lines indicate the limits of the narrow channel approaches to Ardrossan Harbour
OBSTRUCTIONS/WRECKS
Black Dashed Rings indicate obstructions or wrecks on the riverbed.
Shown by
Obstr
Wk
Surveyed by: Aspect Surveys
Processed by: Aspect Surveys
Checked by: Callum McFarlane
Surveyed: 22/05/2019
Issued: 19/07/2019



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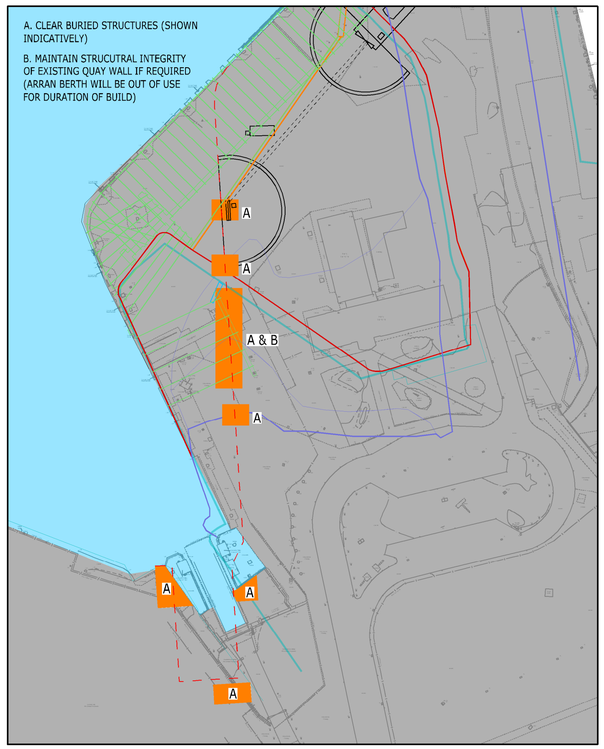

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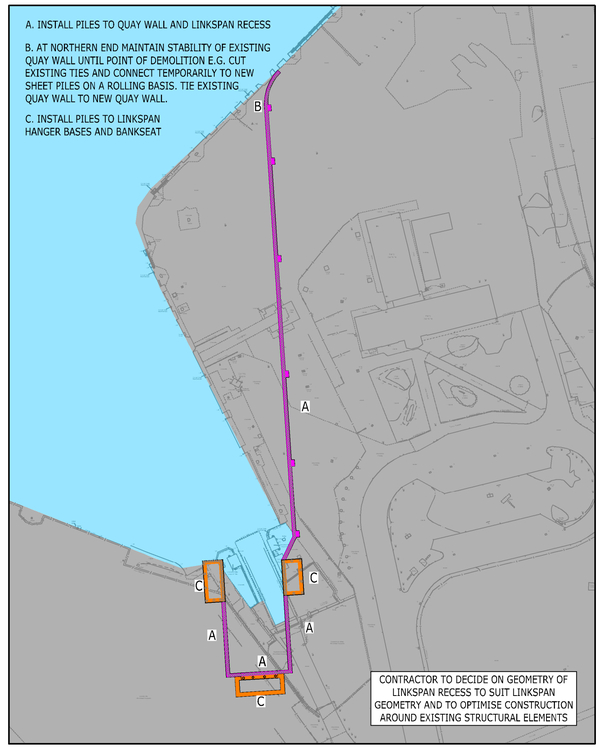

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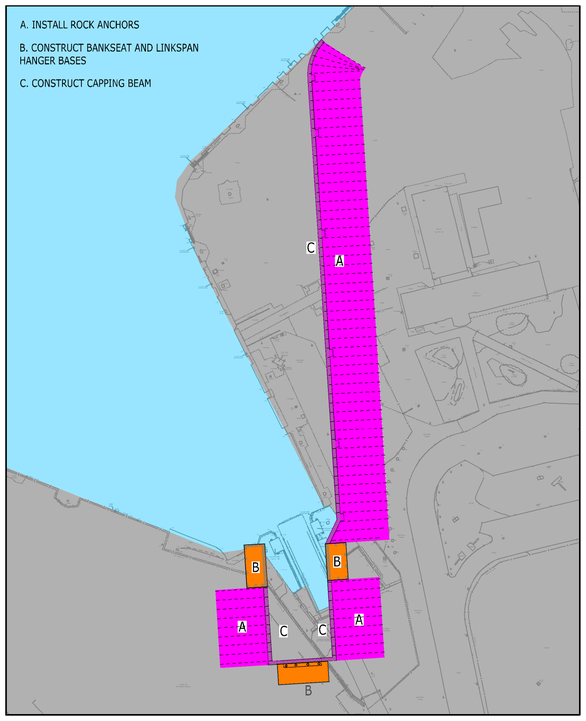

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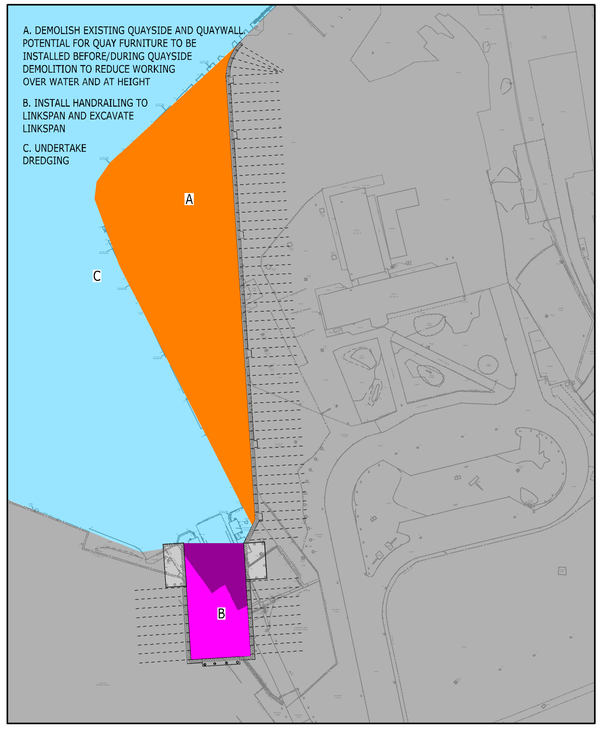

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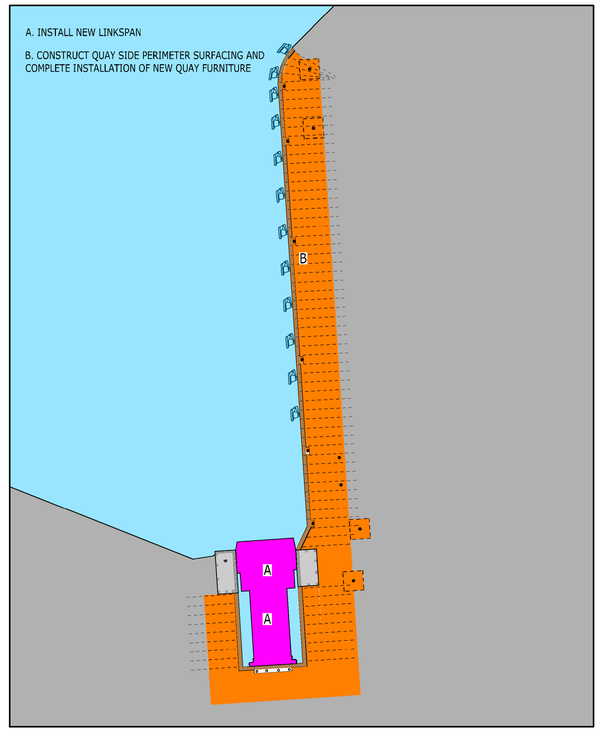

STAGE 6

Notes

1. DO NOT SCALE FROM THIS DRAWING.
2. ALL DIMENSIONS ARE IN METRES (m) UNLESS NOTED OTHERWISE
3. ALL LEVELS IN METRES RELATIVE TO CHART DATUM UNLESS NOTED OTHERWISE. ORDNANCE DATUM IS 1.6m BELOW CHART DATUM.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
5. BATHYMETRIC SURVEY BY ASPECT SURVEYS 22.05.2019
6. CO-ORDINATES ARE TO LOCAL GRID. TOPOGRAPHICAL SURVEY BY L & M SURVEY SERVICES MAY 2017 AND JULY 2019.
7. OUTLINE EXEMPLAR DESIGN CONSTRUCTION SEQUENCE SHOWN. CONTRACTOR IS RESPONSIBLE FOR DEVELOPING A CONSTRUCTION SEQUENCE TO SUIT HIS PROPOSED METHOD OF CONSTRUCTION.

Rev	Description	Date	By	Chk	App
P01	FOR COMMENT	2019	HL	RK	LBB

FOR COMMENT

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ARDROSSAN HARBOUR REDEVELOPMENT ARRAN BERTH CONSTRUCTION SEQUENCE

Scale:	Date:	Drawn:	Checked:
NTS	JULY 2019	HL	LBB

Drawing No.: 1620005121-RAM-ARN-00-DR-CW-10010

Rev: P01

B SEDIMENT REPORT

Ardrossan Harbour
Sediment Sampling Report

December 2019

Ardrossan Harbour
Sediment Sampling Report

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Document number:	8724
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1 INTRODUCTION

1.1 Background

Clydeport Operations Limited appointed EnviroCentre Ltd to undertake the collection of samples within three dredge areas within Ardrossan Harbour, North Ayrshire. The samples were collected to inform proposed dredging and associated disposal or re-use options. The dredging works will be undertaken as part of the wider Ardrossan Harbour redevelopment and specifically to accommodate the MV Glen Sannox - the new ferry for the Caledonian MacBrayne (CalMac) Ardrossan to Brodick route.

The purpose of these samples is to provide supporting information to Marine Scotland during the licensing process on sediment quality within the proposed dredge areas. The dredging and disposal activities are regulated by Marine Scotland under the Marine (Scotland) Act 2010. The licensing conditions require representative samples to be collected and the nature (i.e. physical composition), quality and contamination status to be determined.

The samples were sub-sampled for analysis in accordance with best practice, as described in the Sampling Plan and Method Statement (EnviroCentre Report No. 8841, dated 09/09/2019).

There are three separate dredge areas within the harbour which are proposed take the bed level to -4.9m below Chart Datum. Sample locations are detailed in Drawing No. 169719-006 in Appendix A. Proposed dredge volumes from each area are detailed in Table 1-1 below along with the planned sampling for each area.

Table 1-1: Dredge Area, Volumes and Samples

Dredge Area	Dredge Volume (m^3)	Target Dredge Level (m CD)	No. of Dredge Samples
Arran Berth & Northern Approach	3,500 (approx.)	-4.9	1 core & 3 grabs
Winton Pier	677	-4.9	1 core & 1 grab
Irish Berth	99	-4.9	1 core & 2 grabs

1.2 Action Levels – AL1 Vs AL2

Two action levels are currently used to assess the suitability of sea based disposal of dredged sediment material Revised Action Level 1 (RAL1) and Revised Action Level 2 (RAL2).

Sediment with contaminant concentrations below RAL1 is generally considered to be below background levels for contamination and is suitable for disposal at sea.

For samples between RAL1 and RAL2, additional risk assessment is generally required which may include further sampling and testing to fully identify pockets of contamination or implementation of bioassays to assess the materials suitability for sea disposal.

Material above RAL2 is generally considered to be unsuitable for disposal to sea. If the sea disposal route is to be pursued, further testing along the lines of bioassay accompanied by a robust justification for selecting sea disposal as the BPEO may be required. This would need to be supported further with additional information regarding any mitigation measures which could be put in place as part of these works. Further discussion and agreement with Marine Scotland would also be required.

1.3 Scope of Report

The following report details the sampling methodology, field and laboratory analysis and provides a summary of the sediment types and quality present within the proposed dredge areas.

1.4 Report Usage

The information and recommendations contained within this report have been prepared in the specific context stated above and should not be utilised in any other context without prior written permission from EnviroCentre.

If this report is to be submitted for regulatory approval more than 12 months following the report date, it is recommended that it is referred to EnviroCentre for review to ensure that any relevant changes in data, best practice, guidance or legislation in the intervening period are integrated into an updated version of the report.

EnviroCentre accept no liability for use of the report for purposes other than those for which it was originally provided, or where EnviroCentre have confirmed it is appropriate for the new context.

2 SAMPLING LOCATIONS AND METHODOLOGY

Sampling works were undertaken between 23rd and 24th September 2019. The following sections detail the sampling methodology used to retrieve sediment samples from the site, including deviations from the proposed sampling plan.

All sample locations were screened for the presence of Unexploded Ordnance (UXO) by an UXO engineer from Fellowes International. Sampling was only undertaking following approval from the engineer to proceed.

2.1 Sample Locations

Sample locations are outlined in Table 2-1.

Table 2-1: Final Sample Station Locations

Dredge Area	Sample Station ID	Latitude	Longitude
Arran Berth & Northern Approach	SS1	55°38.46264'	-004°49.46526'
Winton Pier	SS3	55°38.50536'	-004°49.39109'
Irish Berth	SS5	55°38.49216'	-004°49.35486'
	SS6	55°38.48358'	-004°49.35139'

2.2 Survey Vessel

The marine plant used to undertake the sampling works was the multi-cat “Challenger of Leith”, operated by Coastworks Ltd.

2.3 Navigation and Sample Location

Positions were navigated to using a Trimble GPS. Once on position, the on-board spud legs were deployed to keep the vessel in position to enable sampling to commence.

2.4 Sample Collection

All achieved samples were collected by a 0.045m² stainless steel Van Veen grab sampler. Recovered material was emptied into a plastic bucket ready for sub-sampling.

Where required, the grab was deployed multiple times to ensure enough material was recovered for testing.

Once enough material was recovered, or where after several attempts a sample could not be obtained, the vessel moved to the next sampling station.

2.5 Deviations from the Sampling Plan

Seabed conditions encountered during the sampling exercise were different than expected. Therefore, there was significant deviation from the sampling accepted by Marine Scotland.

A combination of a hard seabed in places and extraneous material including cobbles meant that vibrocoring was unsuccessful at all proposed sampling locations. Sample locations were moved slightly where difficulties were encountered, but repeat attempts were similarly unsuccessful.

Grab samples were attempted at all locations. Sufficient material for sampling and analysis was recovered only from four locations.

Table 2-2: Sampling Constraints by Location

Sample Station ID	Sample Submitted for Analysis?	Notes
SS1	✓	Grab sample successful. Limited core penetration.
SS2	X	Grab recovered cobbles and gravel – unsuitable/insufficient material for analysis. Core unsuccessful.
SS3	✓	Grab sample successful. Core unsuccessful.
SS4	X	No returns in grab. Core unsuccessful.
SS5	✓	Grab sample successful. Core unsuccessful.
SS6	✓	Grab sample successful. Core unsuccessful.
SS7	X	No returns in grab. Core unsuccessful.
SS8	X	Grab recovered some sand – insufficient material for analysis. Core unsuccessful.
SS9	X	Grab recovered gravel –insufficient/unsuitable material for analysis. Core unsuccessful.

The proposed sampling locations are shown on Drawing No. 169719-003 in Appendix A. Given the requirement to move locations in attempts to retrieve samples the actual locations where material was able to be recovered are shown on Drawing No. 169719-006.

2.6 Field Information

The following field data was recorded for each sample obtained:

- A unique sample ID;
- Sample location;
- Sample co-ordinates in latitude and longitude in degrees, minutes and decimals of minutes;
- Date, time and depth of collection;
- Sampler's ID;
- Sediment description;
- Sample photograph(s); and
- Details of any deviation from sampling protocol.

2.7 Sample Preparation

Samples for metals and particle size analysis were sub-sampled using a plastic spoon and stored in plastic tubs. Samples for organic analysis were collected using stainless steel spoons and stored in amber glass jars.

Sampling equipment was cleaned with sea water between samples. The sample bucket was washed with sea water between samples.

Once samples had been placed within appropriate containers, they were labelled and placed immediately into cool boxes. Samples were stored on ice and dispatched to the project laboratory the next working day.

2.8 Analysis Requirements

The laboratory analysis required by Marine Scotland (MS-LOT), and undertaken as part of this investigation, was as follows:

- Metals - As, Cr, Cd, Cu, Hg, Ni, Pb, Zn;
- Organotins - Tributyl Tin & Dibutyl Tin (TBT);
- Polycyclic Aromatic Hydrocarbons (PAH USEPA 16);
- Polychlorinated Biphenyls (PCB ICES 7);
- Total Hydrocarbons (TPH);
- Moisture Content;
- Total Organic Carbon (TOC);
- Particle Size Analysis (PSA); and
- Asbestos (presence/absence).

Samples were sent to Socotec's Marine Laboratory for analysis.

3 RESULTS

Results are described in this section. Sample logs are given in Appendix B. Summary tables highlighting exceedances and the laboratory certificates are provided in Appendix C.

3.1 Geology Summary

Surface sediment encountered generally comprised cobbles and gravels with some sand in the Northern Approach and Winton Pier areas; and sandy silt in the Irish Berth overlying a harder substrate.

The seabed was noted to be hard across much of the works area, with the grab recovering cobbles and anthropogenic material in some instances (e.g roofing slate at SS5 only and slag at SS6 only).

As no cores could be obtained, no information was obtained on the sediment type beneath the near surface.

Field descriptions of the sediments encountered are included within the sample logs in Appendix B.

3.2 Physical Analysis

3.2.1 Particle Size Analysis (PSA)

The Particle Size Analysis data set for each sample is included within Appendix C. SS1 and SS3 comprised predominantly sand sized particles, with SS5 and SS6 comprising predominantly gravel sized particles. It should be noted that large gravel and cobbles were excluded from the PSA analysis.

3.3 Chemical Analysis

3.3.1 Chemical Analysis Assessment Criteria

All chemical analytical results were assessed against Revised Action Levels (RAL) criteria as adopted by Marine Scotland. The results are summarised in sections 3.3 and 3.4.

Where contaminants have RALs as adopted by Marine Scotland, recorded exceedances above these criteria are summarised in Table 3-1.

Table 3-1: Exceedances of Revised Action Levels

Contaminant	No. of Exceedances		Samples in Exceedance of RAL 1	Samples in Exceedance of RAL 2
	RAL 1	RAL 2		
Arsenic	0	0	-	-
Cadmium	0	0	-	-
Copper	4	0	SS1, SS3, SS5 & SS6	-
Chromium	0	0	-	-
Lead	2	1	SS1 & SS3	SS3
Mercury	0	0	-	-
Nickel	3	0	SS1, SS3 & SS5	-
Zinc	2	0	SS1 & SS3	-

Contaminant	No. of Exceedances		Samples in Exceedance of RAL 1	Samples in Exceedance of RAL 2
	RAL 1	RAL 2		
PAH (All Species)	4	-	*See Table 3-2 for details.*	
PCBs	0	0	-	-
TBT	0	0	-	-
TPH	4	0	SS1, SS3, SS5 & SS6	-

Several exceedances above RAL 1 were noted for metals (Cu, Pb, Ni & Zn). One exceedance of RAL 2 was recorded for lead at SS3. All four samples exceeded RAL 1 for TPH. There were no exceedances of the RALs for PBCs or TBT.

Exceedances above RAL 1 were noted for most PAH species. Exceedances for specific PAH species for each sample are detailed in Table 3-2.

Table 3-2: Exceedances of Revised Action Levels for PAHs

PAH Species	No. of Exceedances		Samples in Exceedance of RAL 1	Samples in Exceedance of RAL 2
	RAL 1	RAL 2		
Acenaphthene	3	0	SS1, SS3 & SS6	-
Acenaphthylene	0	0	-	-
Anthracene	4	0	SS1, SS3, SS5 & SS6	-
Benz(a)anthracene	4	0	SS1, SS3, SS5 & SS6	-
Benzo(a)pyrene	4	0	SS1, SS3, SS5 & SS6	-
Benzo(b)fluoranthene	4	0	SS1, SS3, SS5 & SS6	-
Benzo(ghi)perylene	4	0	SS1, SS3, SS5 & SS6	-
Benzo(k)fluoranthene	4	0	SS1, SS3, SS5 & SS6	-
Chrysene	4	0	SS1, SS3, SS5 & SS6	-
Diben(ah)anthracene	4	0	SS1, SS3, SS5 & SS6	-
Fluoranthene	4	0	SS1, SS3, SS5 & SS6	-
Fluorene	3	0	SS1, SS5 & SS6	-
Indeno(1,2,3-cd)pyrene	4	0	SS1, SS3, SS5 & SS6	-
Naphthalene	4	0	SS1, SS3, SS5 & SS6	-
Phenanthrene	4	0	SS1, SS3, SS5 & SS6	-
Pyrene	4	0	SS1, SS3, SS5 & SS6	-

3.4 Contaminants of Concern without Current Action Levels

Asbestos

Asbestos was not detected in any of the samples analysed.

4 SUMMARY

A pre-dredge sediment sampling exercise was undertaken at Ardrossan Harbour in September 2019. Challenging seabed conditions resulted in a reduced number of samples being successfully recovered.

Four grab samples were recovered from across the three dredge areas, which were submitted for analysis for the standard Marine Scotland suite of analyses.

Surface sediment encountered generally comprised cobbles, gravel and some sand and silt, with the seabed noted to be hard across much of the working area. Anthropogenic material such as roofing slate and slag were recovered by the grab sampler at SS5 and SS6 respectively.

Exceedances above the Revised Action Levels (RALs) can be summarised as follows:

- Concentrations of copper, lead, nickel and zinc exceeded RAL 1 in one or more samples;
- Concentration of lead exceeded RAL 2 at SS3;
- Concentrations of several PAH species exceeded RAL 1 in all samples; and
- Concentrations of TPH exceeded RAL 1 in all samples.

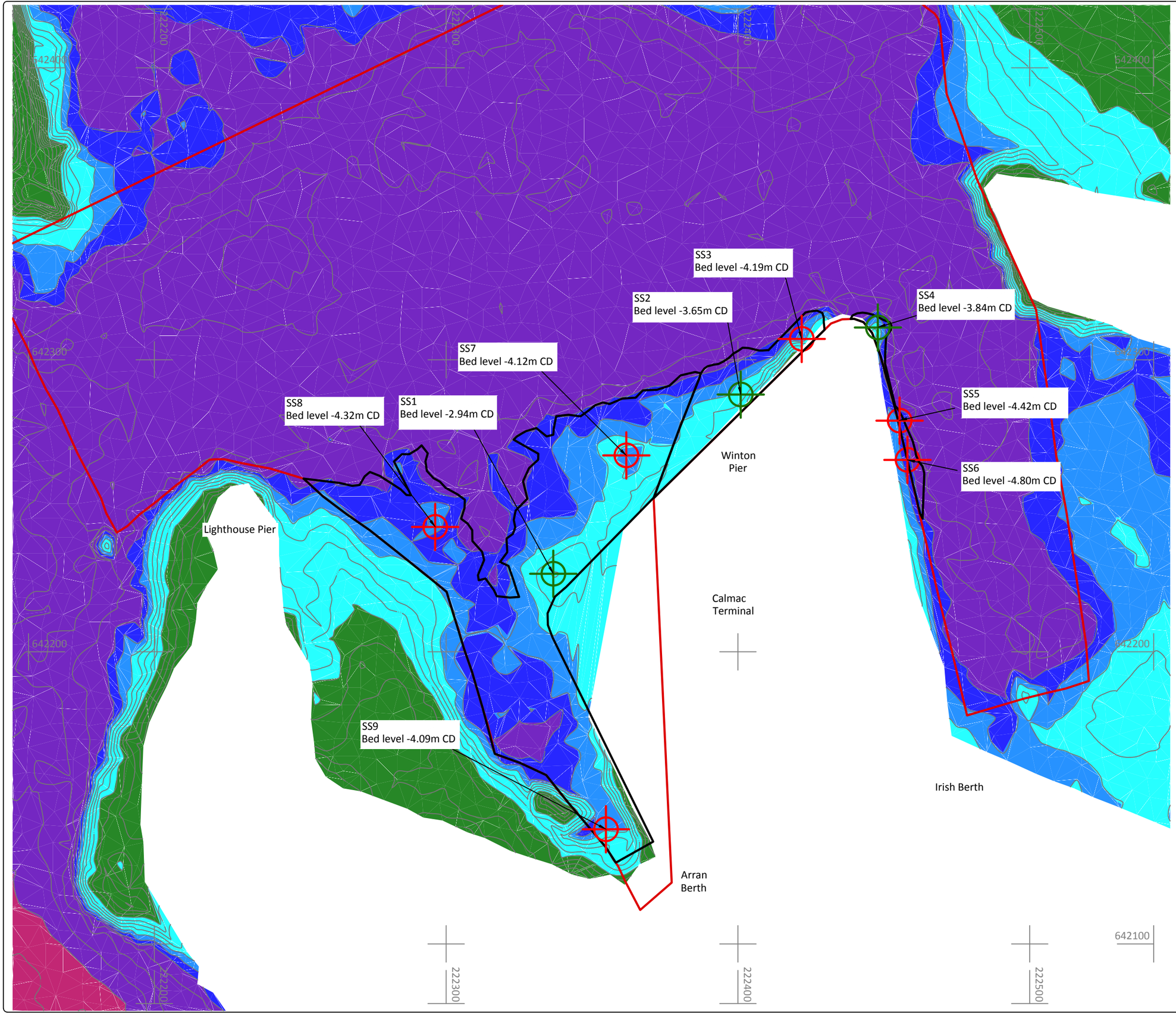
REFERENCES

EnviroCentre Ltd (2019). *Ardrossan Harbour – Pre-Dredge Sampling Plan and Method Statement*, Document No. 8841, 9 September 2019.

Marine Scotland (2017). *Pre-Dredge Sampling Guidance Version 2*: Scottish Government.

APPENDICES

A FIGURES



Legend

- Site Boundary
- Dredge Areas
- Grab Sample
- Core Sample

Bathymetric Data Height Ranges (mCD)

-11 - -7	
- 7 - -5	
- 5 - -4.5	
-4.5 - -4	
- 4 - -2	
< -2	

Sample Locations (Degrees, Decimal Minutes)

SS1 55°38.461284' -004°49.464069'

SS2 55°38.495719' -004°49.405309'

SS3 55°38.506438' -004°49.386147'

SS4 55°38.509135' -004°49.361442'

SS5 55°38.492108' -004°49.353144'

SS6 55°38.48494' -004°49.350046'

SS7 55°38.483639' -004°49.447618'

SS8 55°38.469011' -004°49.441837'

SS9 55°38.414546' -004°49.443490'

Do not scale this drawing

Rev	Date	Amendment	Initials

ENVIRO Centre
Craighall Business Park, Eagle Street, Glasgow, G4 9XA
Tel: 0141 341 5040
Fax: 0141 341 5045

Client: Peel Ports Group

Project: Ardrossan Harbour

Title: Proposed Sediment Sample Locations

Status: FOR INFORMATION

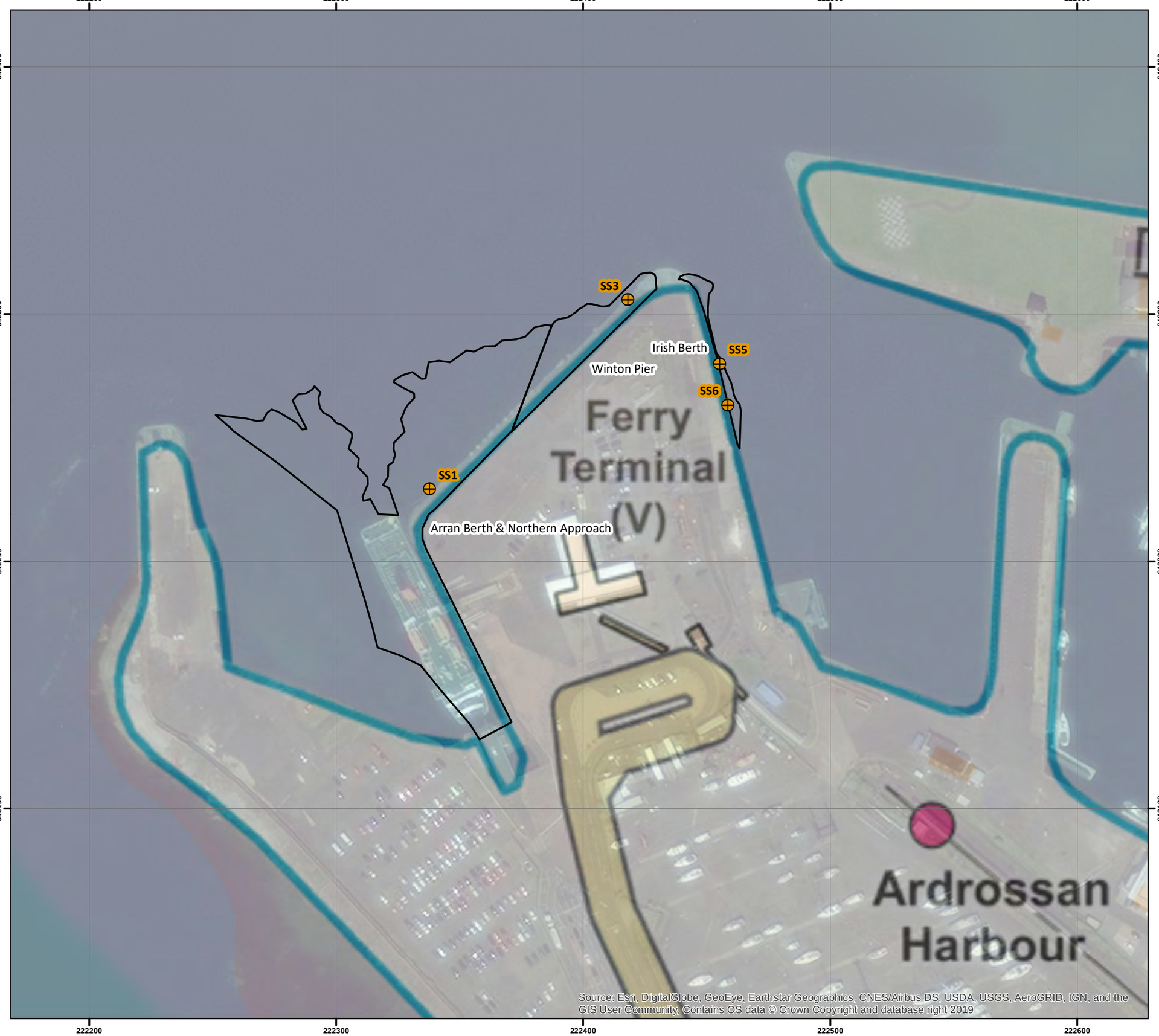
Drawing No.: 169719-003

Revision:

File path:s:\169719 - ardrossan harbour\drgs\cad

Scale		Date
1:1,250	A3	04 Sept 2019

Drawn	Checked	Approved
SMC	FR	CCAS



Legend

- Grab Sample
- Indicative Dredge Areas

Notes:

1. Dredge areas shown assume the "TQ12" dredge option, with a dredge depth of -4.9m below CD.
2. Sample locations are shown only where material was recovered and submitted for analysis.

Do not scale this map

Client: Peel Ports Group

Project: Ardrossan Harbour

Title: Sediment Sampling Locations September 2019

Status: Final

Drawing No.: 169719-006

Revision:

Scale: 1:1,500

A3

Date: 05 Nov 2019

Drawn	Checked	Approved
FR	SMC	CCAS

ENVIRO Centre
Craighall Business Park, Eagle Street, Glasgow, G4 9XA
Tel: 0141 341 5040
Fax: 0141 341 5045

B SEDIMENT LOGS

ENVIRO Centre	8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	Ardrossan Harbour	**Location ID**
		Project No.	169719	**SS1**
		Client	Clydeport Operations Ltd	

GRAB SAMPLE LOG

Date/Time	23/09/2019	**Latitude**	55°38.46264'
Dredge Area	Arran Berth & Northern Approach	**Longitude**	-004°49.46526'
Method	0.045m^2 Van Veen Grab Sampler	**Sampled/logged by**	AK/CCAS

Remarks: Soft slightly silty coarse brown sand with shells.

Biota: None noted.

Odours: None noted.

Anthropogenic Inputs: None noted.

Notes: -

ENVIRO Centre	8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	Ardrossan Harbour	**Location ID**
		Project No.	169719	**SS3**
		Client	Clydeport Operations Ltd	

GRAB SAMPLE LOG

Date/Time	23/09/2019	**Latitude**	55°38.50536‘
Dredge Area	Winton Pier	**Longitude**	-004°49.39109'
Method	0.045m^2 Van Veen Grab Sampler	**Sampled/logged by**	AK/CCAS

Remarks: Soft dark brown and grey silty gravelly sand with angular cobbles. Frequent seaweed.

Biota: None noted.

Odours: None noted.

Anthropogenic Inputs: None noted.

Notes: -

ENVIRO Centre	8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	Ardrossan Harbour	**Location ID**
		Project No.	169719	**SS5**
		Client	Clydeport Operations Ltd	

GRAB SAMPLE LOG

Date/Time	23/09/2019 13:09	**Latitude**	55°38.49216'
Dredge Area	Irish Berth	**Longitude**	-004°49.35486'
Method	0.045m^2 Van Veen Grab Sampler	**Sampled/logged by**	AK/CCAS

Remarks: Soft black silty sand with shells.

Biota: None noted.

Odours: Faint odour.

Anthropogenic Inputs: Fragments of roofing slate.

Notes: -

ENVIRO Centre	8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	Ardrossan Harbour	**Location ID**
		Project No.	169719	**SS6**
		Client	Clydeport Operations Ltd	

GRAB SAMPLE LOG

Date/Time	23/09/2019	**Latitude**	55°38.48358'
Dredge Area	Irish Berth	**Longitude**	-004°49.35139'
Method	0.045m^2 Van Veen Grab Sampler	**Sampled/logged by**	AK/CCAS

Remarks: Soft black sandy silt with angular gravel.

Biota: None noted.

Odours: None noted.

Anthropogenic Inputs: Fragments of slag noted.

Notes: -

C LABORATORY DATA AND SUMMARY TABLES

Applicant Information

Applicant:	
Description of dredging:	
Total amount to be dredged (wet tonnes)	

Sample Details & Physical Properties

Explanatory Notes:
An example of a 'Dredge area' is: 'Dock A, Harbour X'
Provide description of the dredge area and the latitude and longitude co-oridnates (WGS84) for each sample location. Co-ordinates taken from GPS equipment should be set to WGS84.
Note for sample depth that the seabed is 0 metres.
Gravel is defined as >2mm, **Sand** is defined as >63um<2mm, **Silt** is deinfed as <63um).

Sample information:

Sample ID	Dredge area	Latitude										Longitude										Type of sample	Sample depth (m)	Total solids (%)	Gravel (%)	Sand (%)	Silt (%)	TOC (%)	Specific gravity	Asbestos
SS1	Arran Bth & N Approach	5	5	°	3	8	.	4	6	3	'N		-	4	°	4	9	.	4	6	5	'W	Grab	0.0-0.15	66.8	10.6	72.5	16.9	1.04		No
SS3	Winton Pier	5	5	°	3	8	.	5	0	5	'N		-	4	°	4	9	.	3	9	1	'W	Grab	0.0-0.15	59.3	33.9	46.1	20	1		No
SS5	Irish Berth	5	5	°	3	8	.	4	9	2	'N		-	4	°	4	9	.	3	5	5	'W	Grab	0.0-0.15	57.2	53.9	28.9	17.2	1.16		No
SS6	Irish Berth	5	5	°	3	8	.	4	8	4	'N		-	4	°	4	9	.	3	5	1	'W	Grab	0.0-0.15	68.3	58.4	24.9	16.7	0.4		No
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Trace Metals & Organotins

Explanatory Notes:
Results above Action Level 1 will be highlighted in blue and above Action Level 2 in red.

Sample information:

Sample ID	Dredge area	Type of sample	Sample depth (m)	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Copper (Cu)	Mercury (Hg)	Nickel (Ni)	Lead (Pb)	Zinc (Zn)	Dibutyltin (DBT)	Tributyltin (TBT)
				mg/kg dry weight									
SS1	Arran Bth & N Approach	Grab	0.0-0.15	8.5	0.31	32.6	37.7	0.01	37.6	70.4	156	<0.005	<0.005
SS3	Winton Pier	Grab	0.0-0.15	11.4	0.21	41.3	49.8	0.01	42.6	409	152	0.01	<0.005
SS5	Irish Berth	Grab	0.0-0.15	8.5	0.18	41.7	43.7	0.02	50.4	45.7	108	<0.005	0.025
SS6	Irish Berth	Grab	0.0-0.15	8.3	0.2	26.2	50.5	0.02	26	18	73.7	<0.005	<0.005
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Polyaromatic Hydrocarbons (PAH)

Explanatory Notes:
Results above Action Level 1 will be highlighted in blue and above Action Level 2 in red.

Definitions:

ACENAPTH	Acenaphthene
ACENAPHY	Acenaphthylene
ANTHRACN	Anthracene
BAA	Benz(a)anthracene
BAP	Benzo(a)pyrene
BBF	Benzo(b)fluoranthene
BEP	Benzo(e)pyrene
BENZGHIP	Benzo(ghi)perylene
BKF	Benzo(K)fluoranthene
C1N	C1-naphthalenes
C1PHEN	C1-phenanthrene
C2N	C2-naphthalenes
C3N	C3-naphthalenes
CHRYSENE	Chrysene
DBENZAH	Diben(ah)anthracene
FLUORANT	Fluoranthene
FLUORENE	Fluorene
INDPYR	Indeno(1,2,3-cd)pyrene
NAPTH	Naphthalene
PERYLENE	Perylene
PHENANT	Phenanthrene
PYRENE	Pyrene
THC	Total Hydrocarbon Content

Sample information:

		Type of	Sample depth	µg/kg																								
Sample ID	Dredge area	sample	(m)	ACENAPTH	ACENAPHY	ANTHRACN	BAA	BAP	BBF	BEP	BENZGHIP	BKF	C1N	C1PHEN	C2N	C3N	CHRYSENE	DBENZAH	FLUORANT	FLUORENE	INDPYR	NAPTH	PERYLENE	PHENANT	PYRENE	THC
SS1	Arran Bth & N Approach	Grab	0.0-0.15	150	22.7	640	2470	2760	2340		1500	1320					2730	350	6480	130	1770	55.7		2550	5400	125000
SS3	Winton Pier	Grab	0.0-0.15	105	24.1	269	935	1110	979		680	600					1040	138	2270	78.2	758	57.6		1110	1950	225000
SS5	Irish Berth	Grab	0.0-0.15	89.3	35.6	199	426	533	467		337	211					500	68.1	1090	114	341	69		807	1110	258000
SS6	Irish Berth	Grab	0.0-0.15	156	25.6	386	1130	1350	1160		809	698					1190	148	4460	118	856	43.9		1400	3810	213000
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Organohalogens

Explanatory Notes:
Results above Action Level 1 will be highlighted in blue and above Action Level 2 in red.
ICES7 is the sum of PCB 28,52,101,138,153,180 and 118.

Definitions:

AHCH	alpha-Hexachlorcyclohexane
BHCH	beta-Hexachlorcyclohexane
GHCH	gamma-Hexachlorcyclohexane
DIELDRIN	Dieldrin
HCB	Hexachlorobenzene
PPDDE	p,p'-Dichorodiphenyldicloroethylene
PPDDT	p,p'-Dichorodiphenyltrichloroethane
PPTDE	p,p'-Dichorodiphenyldicloroethane

Sample information:

Sample ID	Dredge area	Type of sample	Sample depth (m)	PCB28	PCB52	PCB101	PCB118	PCB138	PCB153	PCB18	PCB105	PCB110	PCB128	PCB141	PCB149	PCB151	PCB156	PCB158	PCB170	PCB180	PCB183	PCB187	PCB194	PCB31	PCB44	PCB47	PCB49	PCB66	ICES7	AHCH	BHCH	GHCH	DIELDRIN	HCB	DDE	DDT	TDE	BDE100	BDE138	BDE153	BDE154	BDE17	BDE183	BDE209	BDE28	BDE47	BDE66	BDE85	BDE99
				µg/kg																																															
SS1	Arran Bth & N Approach	Grab	0.0-0.15	0.224	0.3	0.332	0.349	0.436	0.429											0.191								2.621																								
SS3	Winton Pier	Grab	0.0-0.15	0.278	0.296	0.235	0.267	0.349	0.332											0.109								1.866																								
SS5	Irish Berth	Grab	0.0-0.15	0.282	0.328	0.265	0.243	0.348	0.328											0.124								1.918																								
SS6	Irish Berth	Grab	0.0-0.15	<0.08	0.09	<0.08	<0.08	<0.08	<0.08											<0.08								0.57																								
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Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Specialist Chemistry, Etwall House, Bretby Business Park, Ashby Road, Bretby, Burton-upon-Trent DE15 0YZ

Test Report ID	**MAR00412**	
Issue Version	1	
Customer	Envirocentre	
Customer Reference	Ardrossan	
Date Sampled	23-Sep-19	
Date Received	27-Sep-19	
Date Reported	18-Oct-19	
Condition of samples	Cold	Satisfactory

[Redacted]

Authorised by:	Marya Hubbard
Position:	Laboratory Manager

Any additional opinions or interpretations found in this report, are outside the scope of UKAS accreditation.

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Specialist Chemistry, Etwall House, Bretby Business Park, Ashby Road, Bretby, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR00412
Issue Version	1
Customer Reference	Ardrossan

		Units	%	%	%	%	%	N/A
		Method No	ASC/SOP/303	ASC/SOP/303	SUB_01*	SUB_01*	SUB_01*	SUB_02*
		Limit of Detection	0.2	0.2	N/A	N/A	N/A	N/A
		Accreditation	UKAS	UKAS	N	N	N	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Total Moisture @ 120°C**	**Total Solids**	**Gravel (>2mm)**	**Sand (63-2000 µm)**	**Silt (<63 µm)**	**Asbestos**
SS1 - Surface	MAR00412.001	Sediment	33.2	66.8	10.6	72.5	16.9	NADIS
SS3 - Surface	MAR00412.002	Sediment	40.7	59.3	33.9	46.1	20.0	NADIS
SS5 - Surface	MAR00412.003	Sediment	42.8	57.2	53.9	28.9	17.2	NADIS
SS6 - Surface	MAR00412.004	Sediment	31.7	68.3	58.4	24.9	16.7	NADIS
		Reference Material (% Recovery)	N/A	N/A	N/A	N/A	N/A	N/A
		QC Blank	N/A	N/A	N/A	N/A	N/A	N/A

* See Report Notes

NADIS - No Asbestos Detected In Sample

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Specialist Chemistry, Etwall House, Bretby Business Park, Ashby Road, Bretby, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR00412
Issue Version	1
Customer Reference	Ardrossan

		Units	% M/M
		Method No	SOCOTEC Env Chem*
		Limit of Detection	0.02
		Accreditation	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**TOC**
SS1 - Surface	MAR00412.001	Sediment	1.04
SS3 - Surface	MAR00412.002	Sediment	1.00
SS5 - Surface	MAR00412.003	Sediment	1.16
SS6 - Surface	MAR00412.004	Sediment	0.40
		Reference Material (% Recovery)	102
		QC Blank	<0.02

* See Report Notes

NADIS - No Asbestos Detected In Sample

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Specialist Chemistry, Etwall House, Bretby Business Park, Ashby Road, Bretby, Burton-upon-Trent DE15 0YZ

Test Report ID MAR00412
Issue Version 1
Customer Reference Ardrossan

		Units	mg/Kg (Dry Weight)							
		Method No	SOCOTEC Env Chem*							
		Limit of Detection	0.5	0.04	0.5	0.5	0.01	0.5	0.5	2
		Accreditation	UKAS	UKAS	UKAS	UKAS	N	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Arsenic**	**Cadmium**	**Chromium**	**Copper**	**Mercury**	**Nickel**	**Lead**	**Zinc**
SS1 - Surface	MAR00412.001	Sediment	8.5	0.31	32.6	37.7	0.01	37.6	70.4	156
SS3 - Surface	MAR00412.002	Sediment	11.4	0.21	41.3	49.8	0.01	42.6	409	152
SS5 - Surface	MAR00412.003	Sediment	8.5	0.18	41.7	43.7	0.02	50.4	45.7	108
SS6 - Surface	MAR00412.004	Sediment	8.3	0.2	26.2	50.5	0.02	26.0	18.0	73.7
Certified Reference Material SETOC 774 (% Recovery)			102	106	101	108	101	103	100	106
QC Blank			<0.5	<0.04	<0.5	<0.5	<0.01	<0.5	<0.5	<2

* See Report Notes

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Specialist Chemistry, Etwall House, Bretby Business Park, Ashby Road, Bretby, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR00412
Issue Version	1
Customer Reference	Ardrossan

		Units	µg/Kg (Dry Weight)	
		Method No	ASC/SOP/301	
		Limit of Detection	1	1
		Accreditation	N	N
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Dibutyltin (DBT)**	**Tributyltin (TBT)**
SS1 - Surface	MAR00412.001	Sediment	<5	<5
SS3 - Surface	MAR00412.002	Sediment	9.86	<5
SS5 - Surface	MAR00412.003	Sediment	<5	25.4
SS6 - Surface	MAR00412.004	Sediment	<5	<5
In House Reference Material (% Recovery)			100~	102~
QC Blank			<1	<1

* See Report Notes

~ Indicates result is for an In-house Reference Material

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Specialist Chemistry, Etwall House, Bretby Business Park, Ashby Road, Bretby, Burton-upon-Trent DE15 0YZ

Test Report ID MAR00412
Issue Version 1
Customer Reference Ardrossan

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304
		Limit of Detection	1	1	1	1	1	1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**ACENAPTH**	**ACENAPHY**	**ANTHRACN**	**BAA**	**BAP**	**BBF**
SS1 - Surface	MAR00412.001	Sediment	150	22.7	640	2470	2760	2340
SS3 - Surface	MAR00412.002	Sediment	105	24.1	269	935	1110	979
SS5 - Surface	MAR00412.003	Sediment	89.3	35.6	199	426	533	467
SS6 - Surface	MAR00412.004	Sediment	156	25.6	386	1130	1350	1160
Certified Reference Material CRM180013 1941b (% Recovery)			67	109	73	66	63	88
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries
~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are avaliable.
As the method uses surrogate standards to correct for losses, the RM results are reported as percentage trueness, not recovery.

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Specialist Chemistry, Etwall House, Bretby Business Park, Ashby Road, Bretby, Burton-upon-Trent DE15 0YZ

Test Report ID MAR00412
Issue Version 1
Customer Reference Ardrossan

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304
		Limit of Detection	1	1	1	1	1	1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**BENZGHIP**	**BKF**	**CHRYSENE**	**DBENZAH**	**FLUORANT**	**FLUORENE**
SS1 - Surface	MAR00412.001	Sediment	1500	1320	2730	350	6480	130
SS3 - Surface	MAR00412.002	Sediment	680	600	1040	138	2270	78.2
SS5 - Surface	MAR00412.003	Sediment	337	211	500	68.1	1090	114
SS6 - Surface	MAR00412.004	Sediment	809	698	1190	148	4460	118
Certified Reference Material CRM180013 1941b (% Recovery)			67	98	90	99	85	57
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries
~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are avaliable.
As the method uses surrogate standards to correct for losses, the RM results are reported as percentage trueness, not recovery.

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Test Report ID MAR00412
Issue Version 1
Customer Reference Ardrossan

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/306
		Limit of Detection	1	1	1	1	100
		Accreditation	UKAS	UKAS	UKAS	UKAS	N
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**INDPYR**	**NAPTH**	**PHENANT**	**PYRENE**	**THC**
SS1 - Surface	MAR00412.001	Sediment	1770	55.7	2550	5400	125000
SS3 - Surface	MAR00412.002	Sediment	758	57.6	1110	1950	225000
SS5 - Surface	MAR00412.003	Sediment	341	69.0	807	1110	258000
SS6 - Surface	MAR00412.004	Sediment	856	43.9	1400	3810	213000
Certified Reference Material CRM180013 1941b (% Recovery)			72	66	81	78	87~
		QC Blank	<1	<1	<1	<1	<100

For full analyte name see method summaries
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As the method uses surrogate standards to correct for losses, the RM results are reported as percentage trueness, not recovery.

Certificate of Analysis

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		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
		Limit of Detection	0.08	0.08	0.08	0.08	0.08	0.08	0.08
		Date Analysed	03/03/2018	03/03/2018	03/03/2018	03/03/2018	03/03/2018	03/03/2018	03/03/2018
		Accreditation	N	N	N	N	N	N	N
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**PCB28**	**PCB52**	**PCB101**	**PCB118**	**PCB138**	**PCB153**	**PCB180**
SS1 - Surface	MAR00412.001	Sediment	0.22	0.30	0.33	0.35	0.44	0.43	0.19
SS3 - Surface	MAR00412.002	Sediment	0.28	0.30	0.24	0.27	0.35	0.33	0.11
SS5 - Surface	MAR00412.003	Sediment	0.28	0.33	0.27	0.24	0.35	0.33	0.12
SS6 - Surface	MAR00412.004	Sediment	<0.08	0.09	<0.08	<0.08	<0.08	<0.08	<0.08
Certified Reference Material SRM 1941b (% Recovery)			54	86	70	75	108	77	74
QC Blank			<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08

For full analyte name see method summaries

~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are avaliable.

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Test Report ID MAR00412
Issue Version 1
Customer Reference Ardrossan

REPORT NOTES

Method Code	Sample ID	The following information should be taken into consideration when using the data contained within this report
SOCOTEC Env Chem*	MAR00412.001-004	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
SUB_01*	MAR00412.001-004	Analysis was conducted by an approved subcontracted laboratory.
SUB_02*	MAR00412.001-004	Analysis was conducted by an approved subcontracted laboratory.
ASC/SOP/301	MAR00412.001-004	The matrix of this sample has been found to interfere with the result for this test. The sample has therefore been diluted, but in doing so, the detection limit for this test has been elevated.
ASC/SOP/303/304	MAR00412.001-004	Chrysene is known to coelute with Triphenylene and these peaks can not be resolved. It is believed Triphenylene is present in these samples therefore it is suggested that the Chrysene results should be taken as a Chrysene (inc. Triphenylene).This should be taken into consideration when utilising the data.

DEVIATING SAMPLE STATEMENT

Deviation Code	Devation Definition	Sample ID	Deviation Details. The following information should be taken into consideration when using the data contained within this report
D1	Holding Time Exceeded	N/A	N/A
D2	Handling Time Exceeded	N/A	N/A
D3	Sample Contaminated through Damaged Packaging	N/A	N/A
D4	Sample Contaminated through Sampling	N/A	N/A
D5	Inappropriate Container/Packaging	N/A	N/A
D6	Damaged in Transit	N/A	N/A
D7	Insufficient Quantity of Sample	N/A	N/A
D8	Inappropriate Headspace	N/A	N/A
D9	Retained at Incorrect Temperature	N/A	N/A
D10	Lack of Date & Time of Sampling	N/A	N/A
D11	Insufficient Sample Details	N/A	N/A
D12	Sample integrity compromised or not suitable for analysis	N/A	N/A

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Test Report ID	MAR00412
Issue Version	1
Customer Reference	Ardrossan

Method	Sample and Fraction Size	Method Summary
Total Solids	Wet Sediment	Calculation (100%-Moisture Content).Moisture content determined by drying a portion of the sample at 105°C to constant weight.
Asbestos	Air Dried	Qualitative analysis of samples for determination of presence/type of Asbestos
Particle Size Analysis	Wet Sediment	Wet and dry sieving followed by laser diffraction analysis.
Total Organic Carbon (TOC)	Wet Sediment	Carbonate removal and sulphurous acid/combustion at 800°C/NDIR.
Metals	Air dried and seived to <63µm	Aqua-regia extraction followed by ICP analysis.
Polychlorinated Biphenyls (PCBs)	Air dried and seived to <2mm	Solvent extraction and clean up followed by GC-MS-MS analysis.
Polyaromatic Hydrocarbons (PAH)	Wet Sediment	Solvent extraction and clean up followed by GC-MS analysis.
Total Hydrocarbon Content (THC)	Wet Sediment	Solvent extraction and clean up followed by GC-FID analysis.

Analyte Definitions

Analyte Abbreviation	Full Analyte name	Analyte Abbreviation	Full Analyte name	Analyte Abbreviation	Full Analyte name
ACENAPTH	Acenaphthene	C2N	C2-naphthalenes	THC	Total Hydrocarbon Content
ACENAPHY	Acenaphthylene	C3N	C3-naphthalenes	AHCH	alpha-Hexachlorcyclohexane
ANTHRACN	Anthracene	CHRYSENE	Chrysene	BHCH	beta-Hexachlorcyclohexane
BAA	Benzo[a]anthracene	DBENZAH	Diben[ah]anthracene	GHCH	gamma-Hexachlorcyclohexane
BAP	Benzo[a]pyrene	FLUORANT	Fluoranthene	DIELDRIN	Dieldrin
BBF	Benzo[b]fluoranthene	FLUORENE	Fluorene	HCB	Hexachlorobenzene
BEP	Benzo[e]pyrene	INDPYR	Indeno[1,2,3-cd]pyrene	DDE	p,p'-Dichorodiphenyldicloroethylene
BENZGHIP	Benzo[ghi]perylene	NAPTH	Naphthalene	DDT	p,p'-Dichorodiphenyltrichloroethane
BKF	Benzo[k]fluoranthene	PERYLENE	Perylene		
C1N	C1-naphthalenes	PHENANT	Phenanthrene		
C1PHEN	C1-phenanthrene	PYRENE	Pyrene		