BAE Systems
Best Practicable Environmental Options (BPEO) Report -Scotstoun and Govan

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1 INTRODUCTION

1.1 Scope of Report

EnviroCentre have been commissioned by Arch Henderson on behalf BAE Systems Surface Ships Limited (BAE) to update the Best Practicable Environmental Option Assessment (BPEO) in support of maintenance dredging on the River Clyde, as part of their normal ship building programme under the Dredging and Deposit of Solid Waste in the Territorial Sea and UK Controlled Waters Adjacent to Scotland Marine (Scotland) Act 2010. Sediment sampling was recently undertaken to assess the quality of material at both of these sites with the results provided in Appendix B.

The dredge sites are shown in Arch Henderson Figures provided in Appendix A.

The purpose of this 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.

Those options which are practicable are examined in detail and assessed against the following considerations: -

- Environmental;
- Strategic; and
- Cost.

The report then compares the practicable disposal options and draws a conclusion on the BPEO.

1.2 Programme of Work

The programme of work involves the removal of up to 71,500m3 (143,000 tonnes) of river silts per year which are free from any significant coverings of superficial deposits of sand or clay. It is likely that the silt will require to be removed by trailer suction or grab dredger. The areas have all been dredged as part of previous maintenance dredging campaigns and most have been taken down to maintenance depth within the last five years

Chemical testing of the material has been undertaken in part to support this assessment and is included within this application. The sediment sampling summary report is provided in Appendix B.

1.3 Dredging Activities

The method of dredging at the dredge site has not been completely finalised and the specific plant will not be confirmed until a contractor has been appointed. However, the method is most likely to be a combination of using a suction cutter dredger or a grab dredger or marine based plant working in conjunction with a hopper barge.

These are all tried and tested techniques which have been ongoing on the River Clyde (and continue with other river users) for decades. There is understood to be no impact on wildlife and sedimentation patterns continue as per previous dredging exercises.

1.4 Sources of Information

In compiling this report, the following information sources have been consulted either in connection with this application or as part of the ongoing consultation process for the maintenance dredging regime:

- Peel Ports Clydeport Limited;
- Crown Estates Commissioner;
- Scottish Natural Heritage;
- Marine Scotland; and
- BAE SYSTEMS

1.5 Nature of the Marine Sediments

A further round of surface samples were undertaken in 2020. The samples were collected using a Van Veen Grab on the 24th July 2020. Given that it was a grab sampling exercise the samples relate to assessing sediment quality from surface to 1.0m below current bed level.

The locations of thee samples are detailed in EnviroCentre drawings 173920-GIS-02 and 173920-GIS-03 provided in Appendix A. The sediment sampling report is provided in Appendix B.

10 samples were collected at Scotsoun (Samples SS1-SS8 inc. supplementary samples SS2.1 and SS2.2) and 5 samples were collected from the Govan site (SS9 – SS13).

Scotstoun

- None of the samples recorded exceedances of REV AL2.
- All 10 of the samples recorded exceedances of REV AL1 for heavy metals (exceedances noted for cadmium, chromium, copper, mercury, nickel and zinc).
- All of the 10 samples recorded exceedances of REV AL1 for PAHs.
- 6 of the 10 samples recorded exceedances of REV AL1 for THC (S2, S2.2, S4, S5, S6 and S7).
- None of the samples recorded exceedances of REV AL1 for PCBs or TBT.

Govan

- None of the samples recorded exceedances of REV AL2.
- All 5 samples recorded exceedances of REV AL1 for heavy metals (exceedances noted for cadmium, chromium, copper, mercury, nickel and zinc).
- All 5 samples recorded exceedances of REV AL1 for PAHs and THC.
- None of the samples recorded exceedances of REV AL1 for PCBs or TBT.

No contaminants of concern were recorded above the REV AL2 where one is available for review.

1.6 Previous Sediment Results Summary January 2018

To further inform the dredging works and to supplement the existing chemical data set additional samples were collected from the Scotstoun and Govan sites in January 2018. The reults are summarised as follows:

Scotstoun
Three vibrocored samples were collected SS1, SS2 and SS3 between 0.92 and 2.45m. The sediment comprised primarily very coarse silt to fine sand

Govan
Two vibrocored samples were collected SS4 and SS5 1.0m and 2.85m respectively. The sediment comprised primarily medium coarse silt to fine sand.

The chemical quality is summarised as follows:

- 10 of 12 samples exceeded Rev AL1 for one or more of the metals;
- 1 of 12 samples exceeded Rev AL1 for TBT;
- All 12 samples exceeded Rev Al1 for one or more of the PAH species
- 4 of 12 samples exceeded Rev AL1 for PCBs
- 11 of 12 samples exceeded Rev AL1 for Total Hydrocarbons

- 1 sample recorded mercury, lead and zinc in exceedance of Rev AL2 at Scotstoun SS2-0.45-0.9m
- 1 Sample recorded PCBs in exceedance of Rev AL2 at Govan SS5-0-0.5m

Average concentrations of all samples exceeded AL1:

- Cadmium
- Chromium
- Copper
- Mercury
- Nickel
- Lead
- Zinc
- PAHs
- THC

No average contaminants of concern exceeded Rev AL2.

The majority of contaminants of concern, metals, THC and PAHs are still present in exceedance of AL1 in the upper layers of sediment at both sites. No exceedances of PCBs were recorded at Scotstoun site, while PCBs were noted to still be present above AL1 in the Govan site, although no exceedances of AL2 were recorded in the most recent sampling campaign.

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.

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.

Further details on methodology are provided within each section.

2.1 Identification and Screening of Available Disposal Options

A number of options are available for disposal of dredged sediments. The options considered are provided in Table 2-1 along with justification for screening out those options which have not been taken forward for further consideration.

Table 2-1: Initial Best Practicable Available Options

Location	Options	Screening Assessment	Carry forward?
Estuary/ Riverbank	Leave in situ	Not an option due to the project specific requirements to maintain the depth of the shipping channel in the River Clyde.	No
	Infilling of an existing dry dock/harbour facility/development site (re-use)	We are not aware of any potential development opportunity on the Clyde Riverbank that may be able to receive dredged material for use as infill within the confines of an old dock.	No
	Beach Nourishment	Large areas of the Firth of Clyde and Inner Estuary are designated sites (SSSI, SPA, Ramsar) and hold both national and international importance to nature conservation. Specific beach nourishment projects would require to be supported by Environmental Assessments as a minimum to inform how the project could affect the environment as a result of disturbance to the intertidal area, changes to the sediment levels, the variable composition and quality of the material and measures devised from the assessment outcomes to minimise impacts on the environment. The dredge material comprises a mixture of gravel, sand and predominately silt. Fine sediments (i.e. silt) is not suitable for beach nourishment in the traditional sense.	No
Land	Landfill Disposal	This is possible but it is unlikely that this option will offer long term solution due to lack of space at landfills. Landfill space is currently at a premium and does not offer a sustainable solution either financially or environmentally for the disposal of dredged arisings. Dredged material likely to require treatment first in a dewatering facility. Significant cost associated with set up of dewatering facility at the quayside plus transportation and additional costs associated with gaining the necessary planning and regulatory consents.	Yes
	Land Incineration	The dredged material consists of non-combustible material (silts, sands, gravels, shells) with a low combustible component and very high-water content.	No

	Application to Agricultural Land	The dredged material would need to be treated to reduce salt concentrations to acceptable levels. Would require detailed chemical analysis and assessment as well as a Waste Management License Exemption. Would require special precautions during spreading in relation to the risk of odour and watercourses / aquifers. The availability of land for this option will be limited within a reasonable haulage distance of the dredge arisings. Large volumes each year are unlikely to be viable to dispose of in this manner and would potentially have a detrimental effect on existing terrestrial habitats.	No
	Recycling	Recycling of dredged material is theoretically possible, however, due to the varied lithology there would need to be either segregation during dredging works to minimise the entrainment of fine-grained material into the sands, or energy and water rich processing on land. This is not currently understood to be an established disposal and reuse route in the Clyde estuary at present and is not likely to be something which could be established in the project timeframes due to the requirement for various permitting requirements including waste management licencing, discharge consents for process water as well as increased road transportation for delivery of waste material and collection of processed material.	No
Sea	Aquatic disposal direct to seabed.	Relatively low cost, minimal transportation requirements compared to all other options and potential for low environmental risk. The closest spoil ground Cloch Point (MA021) is located approximately 7 km from the closest proposed dredge site with an assigned licensed annual capacity of 830,000 tonnes.	Yes

2.2 Summary of Identified BPEO Options

Following review of the available options, two options were identified for further detailed BPEO assessment which are as follows:

- Landfill Disposal; and
- Sea Disposal.

A brief summary of the necessary works or methodology for each option being taken forward for detailed BPEO assessment is provided below.

2.2.1 Landfill Disposal

Dredged material is considered to be controlled waste for the purpose of transport, storage and disposal as per Section 34 (7) of the Environmental Protection Act 1990. The Landfill (Scotland) Regulations 2003 require the classification and characterisation (i.e. inert, non-hazardous or hazardous) of the dredged material to be determined prior to landfill acceptance.

Disposal to landfill would require several stages in material handling operations:

- Dredging and transport to shore;
- Transfer to shore to a dewatering facility;
- Dewatering;
- Transfer of dewatered material to storage area for stockpiling;
- Loading of lorries and transport to landfill site; and
- Disposal at Landfill site.

Transport to the shore would require the identification of an available jetty facility suitable for receiving material directly to the dewatering facility. Two options are available for off-loading; namely grabbing the spoil from the barge or hopper or pumping directly ashore.

The dewatering facility would require being purpose built and capable of receiving large quantities of bulk material. Currently no facility exists on the Clyde. Settlement tanks, with the aid of sluices and rotational management, would allow solids to settle out and the water element drain off and return to the River Clyde. Temporary mobilisation of bespoke mechanical dewatering equipment could also be utilised but at greater cost. The dewatered dredged sediment would then be removed from the facility and stockpiled for transfer via lorry to a suitably licensed landfill.

We understand that the type of vehicle most suitable for transporting the dewatered dredged material is either a rigid bodied tipper or an articulated tanker both with a 16 tonne load capacity. It is estimated that the dredge volume equates to c. 143,000 tonnes of material and would require approximately 8.900 return trips would typically be required to transport the dewatered dredged material to landfill.

The number of landfills within a viable distance of the River Clyde is considered to be low. In addition, the available capacity of each site is limited by the amount of material it can receive per annum. Due to the proposed quantity of material to be dredged it is therefore unlikely that any landfill within viable distance of the River Clyde will have the capacity to receive the dredged material.

2.2.2 Sea disposal

This option handles material in a single stage namely transport to the disposal site. The existing licensed disposal site is 1.6 nautical miles North of Cloch Point. It is located in naturally deep water with ease of access, has a large capacity and is anticipated to be active for the foreseeable future.

3 FURTHER CONSIDERATION OF REMAINING DISPOSAL OPTIONS

3.1 Detailed BPEO Assessment

Each of the identified options was assessed against the criteria detailed in Table 3.1 below.

Table 3-1: BPEO Detailed Assessment Criteria

Primary Criteria	Description and Attributes
Strategic	• Operational aspects, including handling, transport etc. • Availability of suitable sites/facilities • General Public/local acceptability • Legislative Implications • Summary of the outcome of consultation with third parties
Environmental	• Safety Implications • Public Health Implications • Pollution/ Contamination Implications • General Ecological Implications • Interference with other legitimate activities e.g. fishing • Amenity/Aesthetic Implications
Costs	• Operating costs e.g. labour, site operations, environmental monitoring • Capital e.g. Transport, equipment hire

3.1.1 BPEO Strategic Assessment

Table 3-2 below provides details of the strategic assessment for each option taken forward for the detailed BPEO assessment:

Table 3-2: BPEO Strategic Assessment

Criteria	Landfill	Sea Disposal
Operational Aspects (inc. handling and transport)	Would involve double handling of material through dewatering and transportation to landfill. A facility would need to be built for dewatering purposes. Would also increase the number of HGV's on the road network. Four jetties which could be suitable for landing the spoil have been identified within 30 km of the dredge site; these are: • BAE SYSTEMS, Clyde Yards; • Faslane, Gare Loch. Owned and operated by MoD; • James Watt Dock, Greenock. Owned and operated by Peelports Clydeport Limited; and • Inchgreen Owned and operated by Peelports Clydeport Limited. Faslane and BAE Systems have been discounted by their owners as being unavailable for this type of activity. The James Watt Dock has previously been used for the unloading of aggregates and has been confirmed as being suitable but a temporary storage area is not readily available. Inchgreen may be suitable but further discussions on availability and storage area available are required.	There would be no double handling of the dredged material. Transportation to the disposal site would be by dredger or barge(s) depending on methodology.
Availability of suitable sites/facilities	The geotechnical composition of the dewatered River Clyde dredged material is considered to be suitable for disposal via this route. However, there is typically a limit to the amount of waste that can be accepted both on a daily and annual basis at a landfill. The landfill capacity will therefore not be able to accommodate the quantity of material generated by the River Clyde dredging activities and another disposal option will be required for the surplus material.	The marine disposal site has been designed to accommodate the quantities typically generated by dredging operations and is anticipated to be active for the foreseeable future. The chemical analysis of the sediments from the proposed dredge sites would indicate that the material is likely to be acceptable for testing pending further risk assessment for contaminants present at levels between Action Level 1 and Action Level 2.

Criteria	Landfill	Sea Disposal
General Public /Local acceptability	Increase traffic on haul routes therefore potential for increase in public complaints because of danger to pedestrians and other road users, impact on the environment and interruption to traffic flow.	Traditionally accepted disposal route for dredged material and limited public impact.
Legislative Implications	Contravenes the principles of minimising waste and long-term commitments by the government to reduce land filling.	This is an accepted disposal route as long as a Marine Licence is obtained.

3.1.2 BPEO Environmental Assessment

Table 3-3 details the environmental assessment for each option taken forward for detailed BPEO assessment.

Table 3-3: BPEO Environmental Assessment

Criteria	Landfill	Sea Disposal
Safety Implications	Double handling of material increases the potential for accidents to occur. Work would be undertaken in accordance with H&S legislation.	Minimal handling of material required as it is directly placed at the disposal site. Work would be undertaken in accordance with H&S legislation.
Public Health	Measures will be required to limit human contact during transfer of material from dredger to dewatering facility and transportation to landfill. The additional lorry movements are likely to give rise to increases in noise, dust and exhaust emission levels and interference for other road users. Security measures typically employed at licensed landfills which will minimise human contact once accepted and emplaced at site.	Low potential for human contact during dredging and disposal operations. Once deposited at disposal site pathways for human contact greatly reduced.
Pollution/contamination	Pumping ashore to dewatering facility and transportation to landfill will all require energy. Road transport increases the carbon footprint of this disposal option. Potential for spillages to occur.	Pollutant concentrations in dredged material to be disposed are limited to acceptable levels through regulatory licensing processes. Information with regards to the type of disposal site with regards to its effects on sediments has not been provided. Correspondence with Marine Scotland has previously concluded that disposal sites in Scotland are Dispersive.
General Ecological Implications	Licensed landfill would be away from protected species and habitats with measures in place to prevent or minimise pollution of the surrounding environment.	Disposal at Cloch Point site has historically been used and is the closest licensed disposal site.

Criteria	Landfill	Sea Disposal
Interference with other legitimate activities	Potential from limited short term local impact to commercial operations in the area of the dredged material handling and road hauling principally related to noise and dust potential.	Designated disposal site, as such there is considered no significant impact to commercial vessels or commercial fishing.
Amenity / Aesthetic Implications	Odour release from dewatering facility. Increase traffic noise during transportation from dewatering facility to landfill facility. Potential for spillages on haul route. No significant additional visual/ odour/noise effects as using existing landfill site.	Limited short term visual / odour / noise effects as dredged material is transported by dredger and disposed of below sea level.

3.1.3 BPEO Cost Assessment

An operating cost estimate is provided in the table below. It should be noted that the rates in Table 4a are based on the dredged spoil being able to be transferred ashore in its as dug state and do not allow for placing within a bunded area, draining the material or transporting in watertight wagons. If any of these are required, the costs would increase significantly.

Table 3-4 provides details on the Cost assessment for each option taken forward for detailed BPEO assessment:

Table 3-4: BPEO Cost Analysis

Disposal Option	Activity Description	Weight (Tons)	Unit Cost (Tonne)	Cost (£)
Landfill Disposal	Excavation	143,000	1.50	214,000
	Transport by barge	143,000	3.00	429,000
	Transfer to lorry	143,000	2.00	286,000
	Transport by lorry	143,000	8.00	1,144,000
	Disposal to land	143,000	2.50	357,000
	Total	**143,000**	**17**	**2,431,000**
Sea Disposal	**Sea Disposal**	**143,000**	**4.50**	**£643,500**

3.2 BPEO Assessment Discussion

For each of the above assessment criteria, the options were qualitatively and semi-quantitatively (for costs) assessed against feasibility/preference and awarded a ranking ranging from 1 to 4; 1 being the most acceptable and 4 being the least acceptable option. The assignment of rank was on the basis of professional judgement.

The individual assessment criteria rankings for each option were added up to give an overall hierarchy of preference. Table 3-5 below provides a summary of the BPEO assessment.

Table 3-5: BPEO Summary

Criteria	Landfill Disposal	Sea Disposal
Environment	4	2
Strategic	4	2
Costs	4	1
TOTAL SCORE	**12**	**5**

Disposal to landfill is considered to be the least suitable option for the dredged material. It contravenes the principles of minimising waste and reducing landfilling. Several stages in material handling operations would be required to dispose of the material by this route. The cost associated with setting up a suitable treatment facility to dewater the dredged material is significant. Transportation of material by road is also undesirable as a result of increased traffic and the potential for accidental spillages. Landfill capacity is also typically limited and potentially unable to accommodate the quantities of material typically generated by the River Clyde dredging operations. Any surplus dredged material will therefore require to be disposed of via an alternative route.

Deposition of the dredged material at a licensed marine disposal site has traditionally been deemed acceptable. The licensed marine disposal site has been designed to allow easy access as well as being capable of accommodating the quantities of material typically generated by dredging activities. Material handling is limited to transportation thereby reducing the risk for pollution incidences occurring. Pollutant concentrations within sediments are also limited to acceptable levels through regulatory requirements. On comparison with other disposal options the cost associated with sea disposal of the dredged material is considered to be the most financially viable.

3.3 Conclusions

The Best Practicable Environmental Option for disposal of the River Clyde dredged material has therefore been assessed as sea disposal.

As identified in the sediment chemical quality section, further assessment is deemed necessary to confirm the suitability of the sediment for sea disposal. The following section details this assessment.

4 FURTHER ASSESSMENT

As detailed in Section 1, on the basis of the exceedances of Action Level 1, further assessment to determine the suitability of the material for sea disposal is deemed a requirement.

The approach for this further assessment is outlined as follows:

- Provide an overview of the proposed dredge works and the identified disposal site including existing chemical monitoring data for the site where available; and
- Compare existing chemical data with other recognised sediment assessment criteria including those listed below. Summary tables are provided in Appendix B.

Background Assessment Concentration (BAC) - BACs were developed by the OSPAR Commission (OSPAR) for testing whether concentrations are near background levels. Mean concentrations significantly below the BAC are said to be near background. However, it should be noted that river catchments have their own unique geochemical finger prints and are also governed by the geology within the catchment, so in theory one set of background level values is not applicable to all situations;

Effects Range Low (ERL) - ERLs were developed by the United States Environmental Protection Agency (USEPA) for assessing the ecological significance of sediment concentrations. Concentrations below the ERL rarely cause adverse effects in marine organisms. Concentrations above the ERL will often cause adverse effects in some marine organisms;

Probable Effects Level (PEL) – PELs (Marine) have been adopted from the Canadian Environmental Quality Guidelines http://www.ccme.ca/en/resources/canadian_environmental_quality_guidelines/) If a concentration is recorded above the PEL this is the probable effect range within which adverse effects frequently occur. The Threshold Effect levels (TELs) have been included in the summary table in Appendix C, but have not been used as part of the further assessment as they typically fall below the RAL1

Review of potential risks to the list of receptors identified in “Water Framework Directive Assessment: estuarine and coastal waters (https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters) to draw conclusions from available information and provide recommendation for proposed disposal routes.

4.1 Background Data – Dredge and Disposal Site

Cloch Point Disposal site is located in the Firth of Clyde and is licensed annually to receive close to 830,000 tonnes of dredge material. Less than half of the annual licensed capacity has been used in the past 3 years.

Marine Scotland noted that in Scotland the preference for disposal site selection is those which are dispersive, and as such it is assumed that the Cloch Point disposal ground is dispersive.

Chemical analysis data for samples collected from the disposal ground in 1995, 1997, 2003, and 2005 were provided for review by Marine Scotland, to enable an assessment of the existing conditions at the site to be undertaken. A high-level review of these data highlights the following with the summary table presented as Table C in Appendix C with observations as follows:

- Average concentrations at Cloch Point exceed the ERL for chromium, copper, mercury, lead, zinc and benzo(a)pyrene (PAHs)

- Average concentrations at Cloch Point exceed the PEL for lead and benzo(a)pyrene (PAHs)
- The maximum concentrations of the following contaminants exceed the PEL at Cloch Point chromium, copper, mercury, lead and zinc as well as PCBs (ICEs 7) and various PAH species including benzo(a)pyrene.

4.2 Analytical Data Review

Existing analytical data for the proposed dredge site is provided in Summary Table A in Appendix C. This data has been summarised against RAL 1 & 2, the BAC, ERL and PEL. As detailed previously, the data has not been reviewed against the Canadian TEL as these numbers are typically lower than RAL1.

A summary of the exceedances is detailed below:

Existing analytical data for the proposed dredge site is provided in Appendix C.

In total 5 samples from Govan and 10 samples from Scotstoun have been tested and included for assessment as well as a review of the average concentration from both sites to look at the material as a single dredge volume.

4.3 Scotstoun Dredge Site

The information can be summarised as follows:

- All 10 samples exceed RAL1 for one or more metal;
- All 10 samples record exceedances of RAL1 for various PAH species;
- 6 of 10 samples record RAL1 exceedances for THC
- 8 of 10 samples record total PCBs above RAL1;

- The ERL is exceeded in all samples by various metals and PAHs where values are available for review;
- The PEL is exceeded for chromium (2 samples), copper (2 samples), mercury (2 samples), and zinc (1 sample). The PEL is exceeded for a number of PAHs with benzo(a)pyrene having the most exceedances in all 5 samples.
- No samples recorded contaminants in exceedance of RAL 2 where one is available for review.

4.4 Govan Dredge Site

The information can be summarised as follows:

- All 5 samples exceed RAL1 for one or more metal;
- All 5 samples record exceedances of RAL1 for various PAH species;
- All 5 samples record RAL1 exceedances for THC
- 3 of 5 samples record total PCBs above RAL1;

- The ERL is exceeded in all samples by various metals and PAHs where values are available for review;
- The PEL is exceeded for lead (1 sample), and zinc (1 sample). The PEL is exceeded for a number of PAHs with acenapthene and phenanthrene having the most exceedances in 4 samples.

- No samples recorded contaminants in exceedance of RAL 2 where one is available for review.

4.5 Averages

Review of the averaged data as presented in in Appendix C for both sites i.e. considering the material as a single volume for disposal. The concentrations of the various contaminants of concern are quite variable, the review of average data against the available adopted assessment criteria are as follows:

- Averaged concentrations for both sites exceeded RAL1 for all contaminants of concern with the exception of arsenic and TBT.
- Averaged concentrations of chromium, copper, lead, zinc, and various PAH species exceed the ERL;
- Acenaphthene, fluorene, anthracene, fluoranthene, pyrenen, benzo(a)anthracene, chrysene, benzo(a)pyrene and dibenz(a,h)anthracene recorded averages which were above the PEL;
- All samples recorded average concentrations below RAL2.

4.6 Chemical Assessment Conclusions

While several contaminants of concern were recorded in exceedance of REV AL1, no exceedances of RAL 2 were recorded in any of the samples collected. The disposal site at Cloch Point has similar levels and ranges, and sometimes higher levels, of contaminants of concern as the material which is proposed to be deposited and is not considered to have an adverse effect upon the disposal site.

4.7 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 4-1 below:

Table 4-1: Receptor Risk Assessment

Key Receptor[1]	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 areas proposed to be dredged have previously been subjected to routine maintenance dredging. The dredge sites are within the Inner and Outer Clyde Estuary which is classified as a Heavily Modified Water Body (HWMB) of Moderate Status/Potential[2]. The disposal site is located within the Firth of Clyde Inner - Dunoon and Wemyss Bay area which is Classified as Good and is not considered to be heavily Modified. The classification of this water body takes into account the presence of the disposal site, so no further assessment is considered to be required.
Biology - habitats	Included to assess potential impacts to sensitive/high value habitats.	No	The inner and outer Clyde Estuary and Firth of Clyde Inner - Dunoon and Wemyss Bay are all classified as Good Potential/Status or pass for Coastal and Transitional Waters for fish. The outer Clyde Estuary has been classified as High Potential Status for macro invertebrates. There was no classification for the inner estuary. Clyde Inner - Dunoon and Wemyss Bay are all classified as Good Potential/Status or pass for Coastal waters for macro invertebrates. Proposed material to be deposited as part of dredging campaign(s) similar in nature with material previously deposited. No further assessment considered necessary.

[1] https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters
[2] https://map.environment.gov.scot/sewebmap/

Key Receptor[1]	Brief Summary of Potential Effects on Receptor	Further Consideration Required?	Comment
Biology – fish	Consideration of fish both within the estuary and also potential effects on migratory fish in transit through the estuary	No	The inner and outer Clyde Estuary and Firth of Clyde Inner - Dunoon and Wemyss Bay are all classified as Good Potential/Status or pass for Coastal and Transitional Waters for fish. Proposed material to be deposited as part of dredging campaign(s) similar in nature with material previously deposited. No further assessment considered necessary. It is noted that under periods of exceptionally hot and dry weather the potential for oxygen related issues to arise i.e. oxygen depletion and it is proposed that dredging works will be avoided as far as practicable during such times.
Water Quality	Consideration must be given to water quality when contaminants are present in exceedance of CEFAS RAL1.	No	The inner Clyde Estuary is classified as Bad potential/status or fail for “specific pollutants”. The outer estuary and Firth of Clyde Inner - Dunoon and Wemyss Bay are classified as Good potential/status or pass for “specific pollutants”. No classification is provided for the inner Clyde Estuary for status for “priority pollutants”. The Outer estuary and Firth of Clyde Inner - Dunoon and Wemyss Bay both are both classified as Good Potential/Status or pass for Coastal and Transitional Waters. Contaminants are noted to exceed CEFAS RAL1 within sediment samples. It is noted that sediments with comparable contaminant levels have been deposited at Cloch Point historically, chemical status has not been affected. Potential effects are considered to be both local and temporary. Further consideration of potential effects is discussed in section 4.8 for completeness.

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 disposal site is not located within 2km of an SAC or SPA, marine protected area or Ramsar sites. The disposal site is located approximately 4.5km from the closest designated bathing water at Lunderston Bay. The dredge and disposal sites are not designated as shellfish water. The closest Shellfish Waters Protected Areas are located at Kyles of Bute and Loch Striven over 20km to the south and west; and Loch Long located approximately 20km north of the disposal site. The locations of dredging activity area are within close proximity to (but not within) the Inner Clyde SPA and River Clyde Ramsar site. The minimum distance between any of the dredge areas and the designated SPA/Ramsar is approximately 40m. The Inner Clyde Estuary has been notified as a Special Protection Area (SPA) under the EC Wild Birds Directive and as a Ramsar site under international designation. The dredging activities are focussed to the existing and adjacent to the maintained channel area of the River Clyde. The birds of the estuary feed on the eelgrass, mussel beds, and on the abundant invertebrate fauna of the intertidal mudflats, sandflats and saltmarsh which are not included with the proposed works. However, given the close proximity of the works to the Ramsar/SPA, Scottish Natural Heritage (SNH) were consulted. Dredging works undertaken between mid-March and mid-September would have ‘no likely significant effect’ as birds would be absent. On previous correspondence with SHN they stated if dredging is to occur in the winter months then a Habitat Regulations Appraisal will be required.

4.8 Potential Risk to Water Quality and Marine Life

The potential risks to water quality at the dredge sites and disposal site are further considered as all other receptors have been screened out of the assessment.

SEPA classified the coastal water body Firth of Clyde Inner - Dunoon and Wemyss in the area of the disposal ground as "good" for both specific and priority pollutants in 2018[3]. The dredge areas are all on the Inner and Outer Clyde estuary, which has an estuarine classification of "moderate ecological potential" (SEPA, 2018). No further information was available relating to the reason for the moderate status.

Although there are contaminants of concern above the RAL1 within the sediment for disposal, it is considered that these levels will not contribute to an overall degradation of water quality in proximity to the disposal site. While any effects are considered to be both localised and temporary, the potential for dilution in the Firth of Clyde (Firth of Clyde Inner - Dunoon and Wemyss) is considerable when comparing the size of disposal site in relation to the wider Firth of Clyde. Additionally, when the sediment results are reviewed as an average to assess the sediment mass as a single unit for disposal then only the ERL for benzo(ghi)perylene is slightly exceeded. All averaged results were recorded below the PEL. On this basis the risks from the sediment are considered to be low, with the associated dilution potential providing further mitigation.

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. PAHs and PCBs) 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.

Additionally, the sediment quality within the disposal ground which is also noted to contain levels of contaminants of concern, with some recorded to exceed the PEL, does not appear to have impacted on the Water Quality classification of good in this area.

The key risk is considered to be an increase in turbidity/suspended solids during the disposal activity, although this is likely to cause localised degradation in water quality, it is considered that this will be a local and temporary event and has been factored in to the selection and location of the agreed disposal ground. The material is similar in chemical nature to material previously deposited.

The sediment material primarily ranges silt to gravel with the dominant fraction recorded as sand.

Consultation previously undertaken with Marine Scotland in November 2017 indicated there was no recent information regarding modelling or dispersion studies for the area. On this basis, there is no current information available to inform the potential for dispersion of sediment out with the disposal grounds (i.e. water current velocity, stratification in water column, weather impacts etc). The disposal site is a sacrificial disposal ground and as such there is considered to be an allowance for some lateral dispersal of materials within the area of disposal.

The dominant sediment type across both sites is silt. Considering the dredge volume as a whole using averaged particle size analysis data, the dominant sediment type is silt comprising up to 76.3% at Govan of the total and the remainder made up of sand (23-31%) and a minor content of gravel at both sites.

[3] https://map.environment.gov.scot/sewebmap/

Once deposited larger grained materials (gravel and sands) will fall quickly to the bottom, while finer grained material (silt and clay) can suspend for longer within the water column. If the finer grained material is cohesive and in clumps, the it will sink much quicker than if in a slurry.

It is noted that the Cloch Point disposal grounds have been utilised for the maintenance dredge disposal from the River Clyde for a number of previous exercises (including the period of the most recent SEPA water quality classification for chemical status of the waterbody which accommodates the disposal grounds as “good”).

On the basis of the information from dredge disposal to the Cloch Point site, it is considered that the potential for impact to the Water Environment out with the disposal grounds from the clay/silt sediment fractions is considered to be low.

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 change in status of the waterbodies in question at both the dredge and disposal sites.

4.9 Conclusions and Recommendations

Review of available information has highlighted that although several contaminants of concern exceed RAL1 in sediment samples, assessment of key receptors identified from the Water Framework Directive assessment for estuarine and coastal waters concluded that there is a low risk of the sediments impacting upon the overall ecological or chemical status. Additionally, the contaminants of concern levels recorded in the sediment are not considered likely to have a significant adverse impact on the sediment quality already located within the disposal grounds and are at similar levels previously deposited at Cloch Point.

Overall, based on the multiple lines of evidence approach adopted to further assess the exceedances identified in the sediment assessment, the recommendation for sea disposal is considered to be the preferred option.

The sea disposal option is considered to have no significant long-term impact on the marine environment; the disposal site is readily accessible from all the dredging areas and is the most cost effective option.

REFERENCES

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

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

APPENDICES

A FIGURES

NOTES

1. SOUNDINGS INDICATED ARE IN METRES REDUCED TO CHART DATUM.
2. CHART DATUM IS 2.25m BELOW ORDNANCE DATUM.
3. TIDAL INFORMATION (RELATIVE TO CHART DATUM)
   MHWS +4.30m
   MLWS +0.60m
4. ALL SLOPES PROFILED TO 1:6 UNLESS NOTED OTHERWISE

SCOTSTOUN ADDITIONAL SAMPLING STATIONS							
SAMPLE STATION REF NUMBER	LOCATION	CURRENT BED LEVEL (CD)	MAINTENANCE DREDGE LEVEL (CD)	SAMPLE DEPTH (CD)	SAMPLES TO BE TAKEN (CD)	LONGITUDE AND LATITUDE CO-ORDS	
SS1	DRY DOCK 3 APPROACH	3.8m	4.2m	3.8m, 4.2m	3.8m, 4.2m	55°53.04'N	004°22.50'W
SS2	DRY DOCK 1 APPROACH	4.0m	5.0m	4.0m, 4.5m, 5.0m	4.0m, 4.5m, 5.0m	55°52.99'N	004°22.39'W
SS3	EASY JETTY	3.0m	6.0m	3.0m, 3.5m, 4.0m, 4.5m, 5.0m, 5.5m, 6.0m	3.0m, 4.5m, 6.0m	55°52.72'N	004°21.83'W

BAE SCOTSTOUN MAINTENANCE DREDGE AREAS

- No. 3 DRY DOCK
- No. 1 & 2 DRY DOCK
- ANGLE WALL
- DEEP WATER BERTH
- EAST JETTY
- SAMPLE WORKS AREA 23/24th JANUARY
- SBH — DENOTES LOCATION OF EXISTING BOREHOLES
- SS — DENOTES LOCATION OF ADDITIONAL SAMPLE STATIONS

REV	DATE	REVISION DESCRIPTION	DRN	VER
C	11.01.18	SAMPLE WORKS AREA ADDED	KS	GB
B	20.11.17	LONGITUDE AND LATITUDE CO-ORDINATES ADDED TO ADDITIONAL SAMPLING STATIONS	KS	GB
A	30.10.17	ADDITIONAL SAMPLING STATIONS ADDED	KS	GB

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PROJECT :
BAESYSTEMS SURFACE SHIPS Ltd.
Long Term Maintenance Dredging Contract

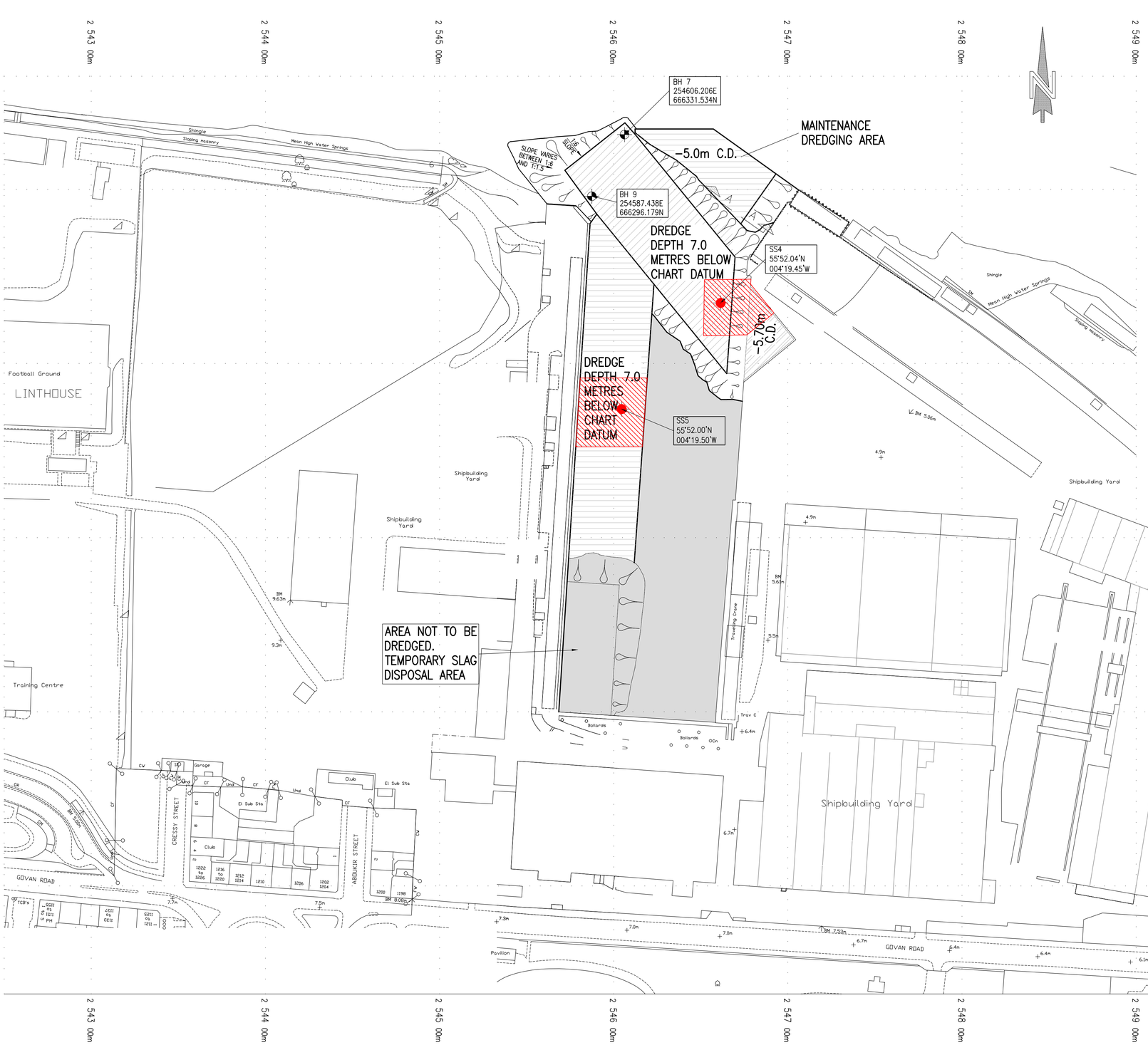
TITLE :
SCOTSTOUN
BOREHOLE LOCATIONS

DRAWN :	DATE :	VERIFIED :	APPROVED :
K.S.	07.08.17	G.B.	G.B.

SCALE : (A1)	DRAWING STATUS :
1:2500	LICENSE

DO NOT SCALE

DRAWING No : 175023/300 REV : C



NOTES

1. SOUNDINGS INDICATED ARE IN METRES REDUCED TO CHART DATUM.
2. CHART DATUM IS 2.36m BELOW ORDNANCE DATUM.
3. TIDAL INFORMATION (RELATIVE TO CHART DATUM)
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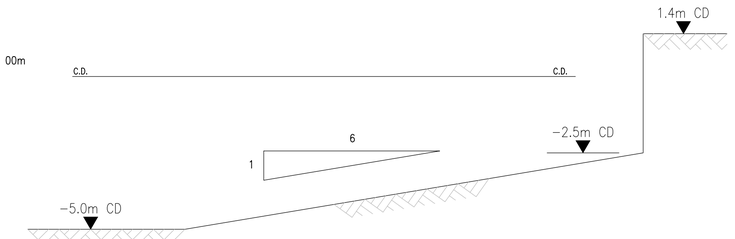
   MLWS +0.60m
4. ALL SLOPES PROFILED TO 1:6



SECTION A–A
(Scale 1:100)

REV	DATE	REVISION DESCRIPTION	DRN	VER
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B	20.11.17	LONGITUDE AND LATITUDE CO-ORDINATES ADDED TO ADDITIONAL SAMPLE STATIONS	KS	GB
A	30.10.17	ADDITIONAL SAMPLING STATIONS ADDED	KS	GB

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DREDGE DEPTH 7.0 METRES BELOW CHART DATUM

DREDGE DEPTH 5.0 METRES BELOW CHART DATUM

DREDGE DEPTH 5.7 METRES BELOW CHART DATUM

AREA NOT TO BE DREDGED.

SAMPLE WORKS AREA 23/24th JANUARY

SBH DENOTES LOCATION OF EXISTING BOREHOLES

SS DENOTES LOCATION OF ADDITIONAL SAMPLE STATIONS

GOVAN ADDITIONAL SAMPLING STATIONS							
SAMPLE STATION REF NUMBER	LOCATION	CURRENT BED LEVEL (CD)	MAINTENANCE DREDGE LEVEL (CD)	SAMPLE DEPTHS (CD)	SAMPLES TO BE TESTED (CD)	LONGITUDE AND LATITUDE CO-ORDS	
SS4	TRANSFER QUAY APPROACH	5.8m	7.0m	5.8m, 6.3m, 6.8m, 7.0m	5.8m, 6.3m, 7.0m	55°52.04'N	004°19.45'W
SS5	WEST SIDE WET BASIN	4.5m	7.0m	4.5m, 5.0m, 5.5m, 6.0m, 6.5m, 7.0m	4.5m, 6.0m, 7.0m	55°52.00'N	004°19.50'W

20 0 20 40 60 80 100
Metres

DO NOT SCALE

PROJECT :
BAE Systems Surface Ships Ltd.
Long Term Maintenance Dredging Contract

TITLE :
GOVAN
BOREHOLE LOCATIONS

DRAWN :	DATE :	VERIFIED :	APPROVED :
K.S.	07.08.17	G.B.	G.B.

SCALE : (A1) 1:1250
DRAWING STATUS : TENDER

DRAWING No : 175023/301
REV : C

B SEDIMENT SAMPLING REPORT

Scotstoun and Govan Pre-Dredge Sampling 2020
Sediment Quality Report

August 2020

Scotstoun and Govan Pre-Dredge Sampling 2020 Sediment Quality Report

Client:	Arch Henderson
Document number:	9263
Project number:	173920j
Status:	Draft
Author:	Graeme Duff
Reviewer:	[Reviewer]
Date of issue:	25 August 2020
Filename:	Document1

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Contents

Appendices

Tables

1 INTRODUCTION

1.1 Background

Arch Henderson on behalf of BAE Systems contracted EnviroCentre Ltd. to undertake the collection of grab samples at two sites on the River Clyde. The two sites operated by BAE Systems, Scotstoun on the north side of the river, and Govan on the south side of the river are detailed in Arch Henderson Drawings 175023-300c and 175023-301c in Appendix A.

The samples were collected to inform proposed dredging and associated disposal options.

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.

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 AL1 and AL2.

Sediment with contaminant concentrations below AL1 is generally considered to be below background levels for contamination and is suitable for disposal at sea.

For samples between AL1 and AL2, additional risk assessment may be required including further sampling and testing to fully identify pockets of contamination or implementation of bioassays to assess the materials suitability for sea disposal. This would need to be agreed and approved by Marine Scotland.

Material above AL2 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. This would require further discussion and agreement with Marine Scotland.

1.3 Scope of Report

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

2 SEDIMENT SAMPLING REQUIREMENTS

The following tables detail the sample locations, figures detailing the sample locations are provided in Appendix A.

Table 2-1 - Sample Information

Sample Name	Sample Location	Type of Sample
Scotstoun Samples		
S1	Latitude - 55°53.03442' Longitude -004°22.46882'	Grab
S2	Latitude - 55°52.98954' Longitude - -004°22.38933'	Grab
S2.1	Latitude - 55°52.99374' Longitude - -004°22.39726'	Grab
S2.2	Latitude - 55°52.98810' Longitude - -004°22.38061'	Grab
S3	Latitude - 55°52.94688' Longitude - -004°22.28215'	Grab
S4	Latitude - 55°52.91172' Longitude - -004°22.17447'	Grab
S5	Latitude - 55°52.88784' Longitude - -004°22.12601'	Grab
S6	Latitude - 55°52.84002' Longitude - -004°22.03291'	Grab
S7	Latitude - 55°52.74378' Longitude - -004°21.87836'	Grab
S8	Latitude - 55°52.71744' Longitude - -004°21.81728'	Grab

Govan Samples		
S9	Latitude - 55°52.08114' Longitude - -004°19.52391'	Grab
S10	Latitude - 55°52.05888' Longitude - -004°19.50340'	Grab
S11	Latitude - 55°52.01130' Longitude - -004°19.51110'	Grab
S12	Latitude - 55°51.97104' Longitude - -004°19.50103'	Grab
S13	Latitude - 55°52.03296' Longitude - -004°19.44910'	Grab

2.1 Field Information

The following field data is 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; and
- Details of any deviation from sampling protocol.

2.2 Sampling Requirements

The laboratory analysis required, and undertaken as part of this investigation, included metals, organic contaminants and particle size analysis. Samples for metals and particle size analysis were sub-sampled using a plastic spoon and stored in plastic tubs and glass jars. Samples for organic analysis were collected using stainless steel spoons and stored in glass jars. Samples were sent to Socotec for analysis.

.

3 SAMPLING METHODOLOGY

All samples were collected on 24th July 2020. The following sections detail the sampling methodology used to retrieve sediment samples from the site.

3.1 Navigation and Sample Location

Positions were navigated to using a Trimble GPS.

3.2 Sample Retrieval

Samples were recovered using a van veen grab.

Core logs are provided in Appendix B including coordinates and sample descriptions.

3.3 Sample Preparation

Grab samples,photographed and then logged prior to sub-sampling

The stainless steel (organic analysis) and plastic sampling spoons (inorganic analysis) were cleaned with river water between samples. The sample tub was washed with river water between samples.

Sub-samples were placed within appropriate containers and then placed in the refrigerator overnight prior to dispatch to the project laboratory. Samples were packed with frozen ice packs to keep them cool while in transportation to the project laboratory.

3.4 Sampling Constraints

There were no significant sampling constraints encountered during the sampling.

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3.5 Analytical Results

A summary table comparing the data to assessment criteria has been included in Appendix C.

3.6 Physical Analysis

3.6.1 Particle Size Distribution (PSD)

Particle Size Distribution data set for each sample is included within Appendix C. Sediments sampled within the proposed dredge area is reported as being predominately sandy silt.

Field descriptions of the sediments and accompanying comment on sedimentology are included within Appendix B within the sample logs.

3.7 Chemical Analysis Assessment Criteria

All chemical analytical results were assessed against Revised Action levels criteria as adopted by Marine Scotland. The results are summarised in the following sections with respect to the Marine Scotland Revised Action Levels (RAL). These exceedances are highlighted in the accompanying MS reporting table as an excel file and should be read in conjunction with this report.

3.7.1 Metals

- Arsenic –None of the samples recorded arsenic levels above REV AL1. The maximum concentration recorded was 12.6 mg/kg.
- Cadmium – 15 of 15 samples recorded cadmium levels above REV AL1. The maximum concentration recorded was 0.86 mg/kg.
- Chromium 15 of 15 samples recorded chromium levels above REV AL1. The maximum concentration recorded was 160 mg/kg.
- Copper – 15 of 15 samples recorded copper levels above REV AL1. The maximum concentration recorded was 72.6 mg/kg.
- Lead –15 of 15 samples recorded lead levels above REV AL1. The maximum concentration recorded was 119 mg/kg.
- Mercury – 12 of 15 samples recorded mercury levels above REV Al1. The maximum concentration recorded was 1mg/kg.
- Nickel – 10 of 15 samples recorded nickel levels above REV Al1. The maximum concentration recorded was 38.7 mg/kg.
- Zinc – 15 of 15 samples recorded zinc levels above REV Al1. The maximum concentration recorded was 276 mg/kg.

3.7.2 Tributyl Tin (TBT)

None of the samples recorded concentrations of TBT above AL1.

3.7.3 Polyaromatic Hydrocarbons (PAHs)

All 15 samples recorded at least one PAH species above RAL 1. The maximum concentration was 61.7mg/kg for fluoranthene.

3.7.4 Polychlorinated Biphenyls

None of the samples recorded individual PCB congeners in exceedance of RAL 1.

3.7.5 Total Hydrocarbons (THC)

11 of 15 samples collected recorded hydrocarbons above Rev AL1. The maximum concentration was 442 mg/kg.

4 SUMMARY

The sediment sampling can be summarized as follows:

- 15 grab samples were recovered.
- The sediments comprise primarily black sandy silt.
- 15 samples were submitted for chemical analysis with all samples exceeding the REV AI1 levels for certain contaminants including metals, TBT, THC and PAHs.
- No samples recorded exceedances of AL2.

Table 4-1 summarises the results of the laboratory analysis with respect to the Action Levels adopted by Marine Scotland. Any concentration recorded below the action level is noted as a pass and above the action level as a fail.

Table 4-1: Chemical Analysis Screening Summary

Sample ID	**Metals**		**TBT**		**Hydrocarbons**	**PAHs**	**PCBs**	
Action Level	**AL1**	**AL2**	**AL1**	**AL2**	**AL1**	**AL1**	**AL1**	**AL2**
S1	Fail	Pass	Pass	Pass	Pass	Fail	Pass	Pass
S2	Fail	Pass	Pass	Pass	Fail	Fail	Pass	Pass
S2.1	Fail	Pass	Pass	Pass	Pass	Fail	Pass	Pass
S2.2	Fail	Pass	Fail	Pass	Fail	Fail	Pass	Pass
S3	Fail	Pass	Pass	Pass	Pass	Fail	Pass	Pass
S4	Fail	Pass	Pass	Pass	Fail	Fail	Pass	Pass
S5	Fail	Pass	Pass	Pass	Fail	Fail	Pass	Pass
S6	Fail	Pass	Pass	Pass	Fail	Fail	Pass	Pass
S7	Fail	Pass	Pass	Pass	Fail	Fail	Pass	Pass
S8	Fail	Pass	Pass	Pass	Pass	Fail	Pass	Pass
S9	Fail	Pass	Pass	Pass	Fail	Fail	Pass	Pass
S10	Fail	Pass	Pass	Pass	Fail	Fail	Pass	Pass
S11	Fail	Pass	Pass	Pass	Fail	Fail	Pass	Pass

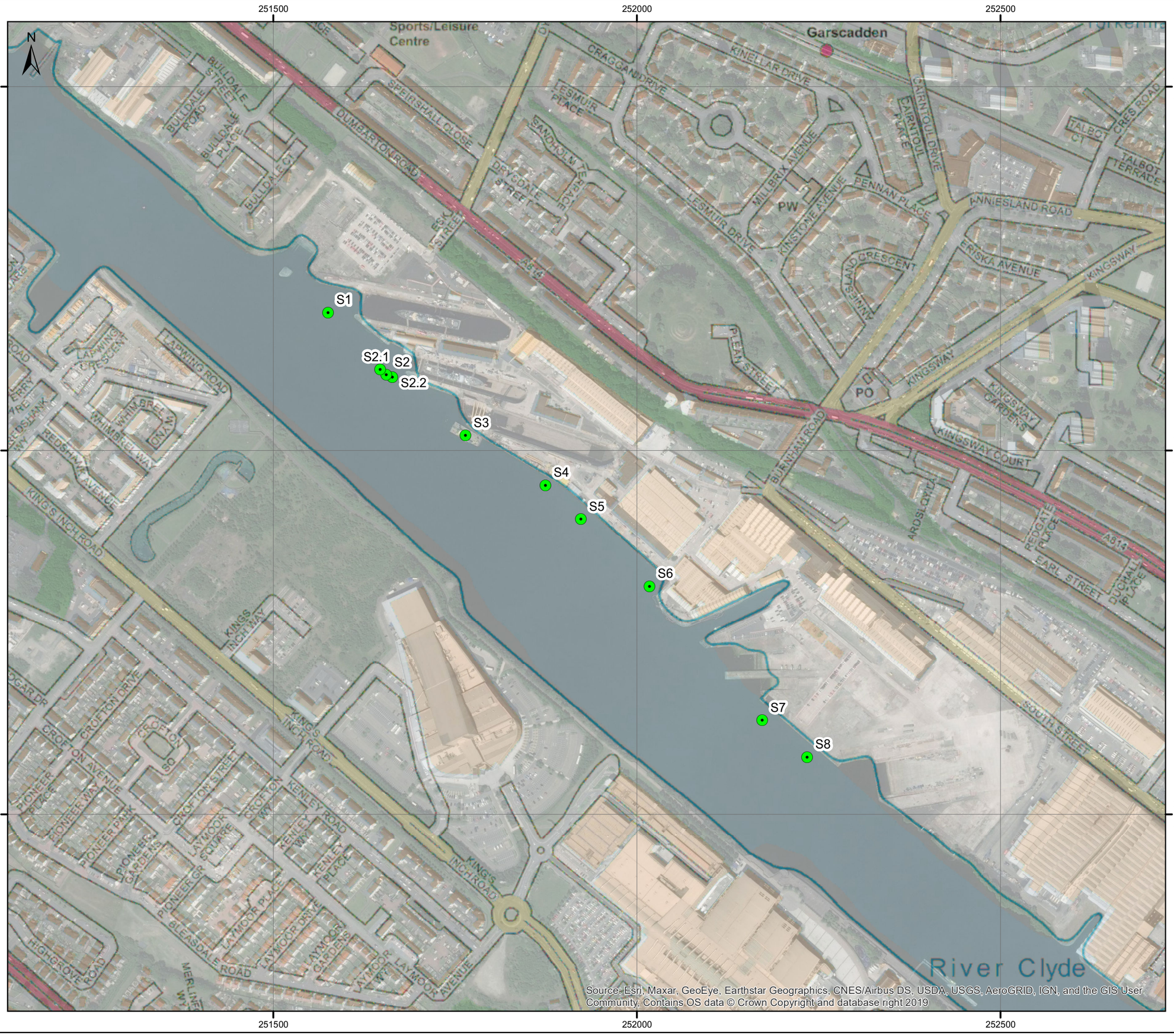
S12	Fail	Pass	Pass	Pass	Fail	Fail	Pass	Pass	
S13	Fail	Pass	Pass	Pass	Fail	Fail	Pass	Pass	

References

Marine Scotland (2017). *Pre-DredgeSampling Guidance Version 1*: Scottish Government.

APPENDICES

A FIGURES



Legend

- Sample Location

Do not scale this map

Client
BAE Systems

Project
Scotstoun Yard
Sediment Sampling

Title
Sediment Sampling Locations

Status
Final

Drawing No.	Revision	Date
173920-GIS002	-	12 Aug 2020
Drawn	**Checked**	**Approved**
FR	JAS	CCAS

Scale
1:5,000 @A3
0 25 50 100 150 Metres

Rev	Date	Amendment	Initials
-	-	-	-

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Legend

- Sample Location

Do not scale this map

Client
BAE Systems

Project
Govan Yard
Sediment Sampling

Title
Sediment Sampling Locations

Status
Final

Drawing No.	Revision	Date
173920-GIS003	-	12 Aug 2020
Drawn	**Checked**	**Approved**
FR	JAS	CCAS

Scale
1:5,000 @A3
0 25 50 100 150 Metres

Rev	Date	Amendment	Initials
-	-	-	-

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B SAMPLE LOGS AND PHOTOGRAPHS

envirocentre 8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	BAE Systems – Scotstoun & Govan	**Location ID**
	Project No.	173920	**S1**
	Client	BAE Systems	

GRAB SAMPLE LOG

Date/Time	24/07/2020	**Latitude**	55°53.03442'
Dredge Area	Scotstoun	**Longitude**	-004°22.46882'
Method	0.045m^2 Van Veen Grab Sampler	**Sampled/logged by**	AK/FR

Remarks: Soft black/dark brown slightly sandy silt. Sand is fine.

Biota: None noted.

Odours: Slight H_2S rotting odour.

Anthropogenic Inputs: None noted.

Notes: -

envirocentre 8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	BAE Systems – Scotstoun & Govan	**Location ID**
	Project No.	173920	**S2**
	Client	BAE Systems	

GRAB SAMPLE LOG

Date/Time	24/07/2020	**Latitude**	55°52.98954'
Dredge Area	Scotstoun	**Longitude**	-004°22.38933'
Method	0.045m^2 Van Veen Grab Sampler	**Sampled/logged by**	AK/FR

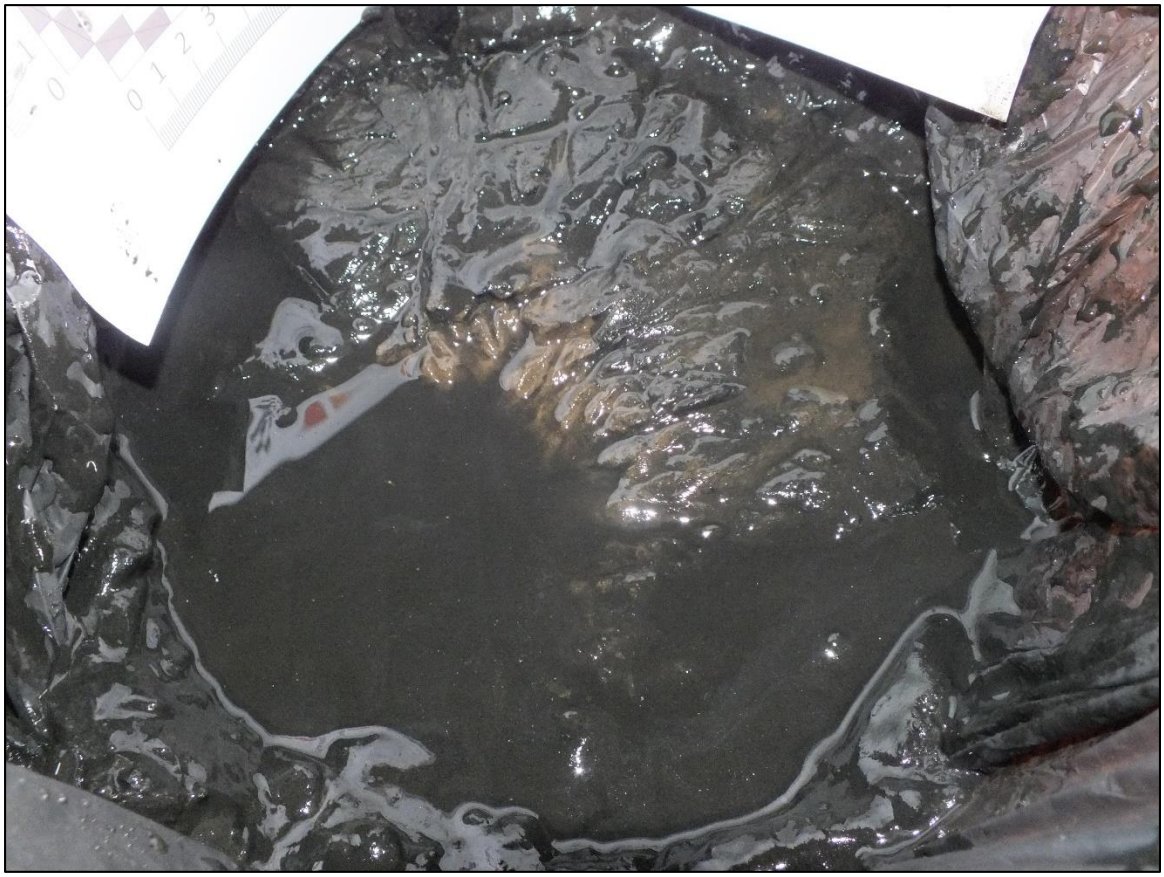
Remarks: Soft black silt.

Biota: None noted.

Odours: Slight H_2S rotting odour.

Anthropogenic Inputs: None noted.

Notes: -



envirocentre 8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	BAE Systems – Scotstoun & Govan	**Location ID**
	Project No.	173920	**S2.1**
	Client	BAE Systems	

GRAB SAMPLE LOG

Date/Time	24/07/2020	**Latitude**	55°52.99374'
Dredge Area	Scotstoun	**Longitude**	-004°22.39726'
Method	0.045m^2 Van Veen Grab Sampler	**Sampled/logged by**	AK/FR

Remarks: Soft black/dark grey silt. Rare vegetation and leaf litter.

Biota: None noted.

Odours: Slight H_2S rotting odour.

Anthropogenic Inputs: None noted.

Notes: -

envirocentre 8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	BAE Systems – Scotstoun & Govan	**Location ID**
	Project No.	173920	**S2.2**
	Client	BAE Systems	

GRAB SAMPLE LOG

Date/Time	24/07/2020	**Latitude**	55°52.98810'
Dredge Area	Scotstoun	**Longitude**	-004°22.38061'
Method	0.045m^2 Van Veen Grab Sampler	**Sampled/logged by**	AK/FR

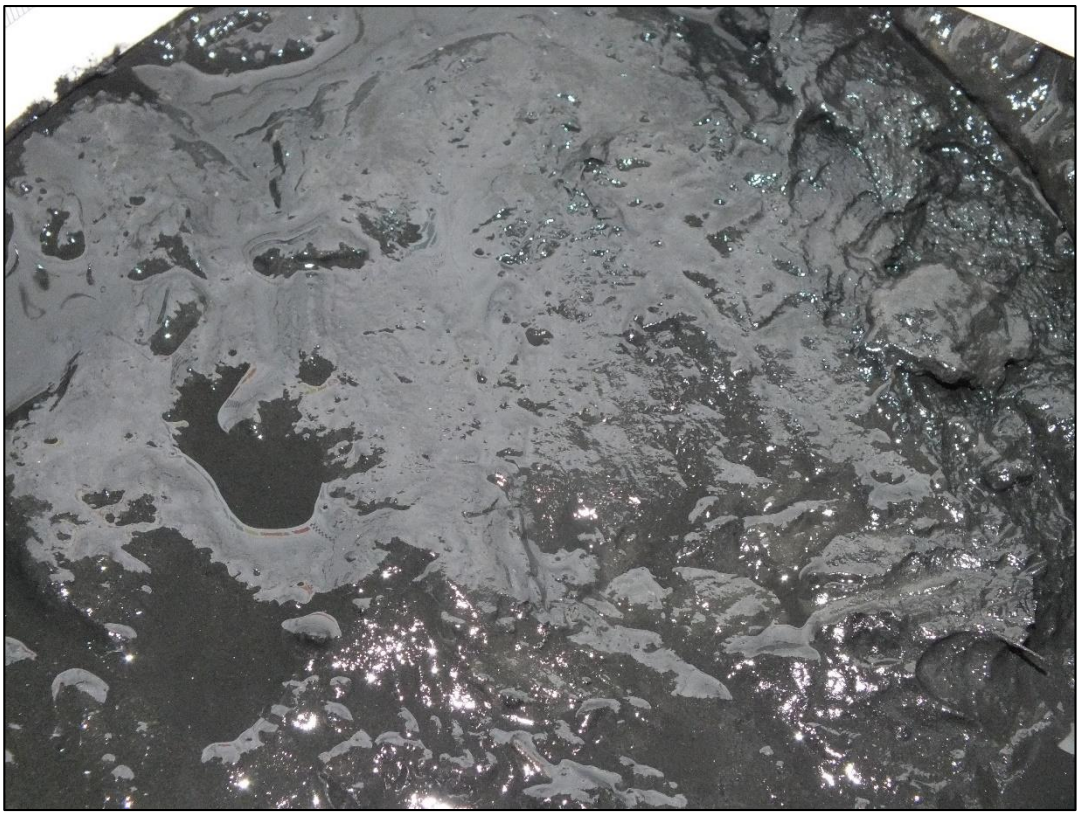
Remarks: Soft black silt. One thumb-sized rusty metal fragment.

Biota: None noted.

Odours: Strong H_2S rotting odour.

Anthropogenic Inputs: Metal fragment.

Notes: -



envirocentre 8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	BAE Systems – Scotstoun & Govan	**Location ID**
	Project No.	173920	**S3**
	Client	BAE Systems	

GRAB SAMPLE LOG

Date/Time	24/07/2020	**Latitude**	55°52.94688'
Dredge Area	Scotstoun	**Longitude**	-004°22.28215'
Method	0.045m^2 Van Veen Grab Sampler	**Sampled/logged by**	AK/FR

Remarks: Soft black silt with occasional angular coarse gravel and cobbles. Rare decomposing vegetation.

Biota: None noted.

Odours: Faint H_2S rotting odour.

Anthropogenic Inputs: None noted.

Notes: -

envirocentre 8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	BAE Systems – Scotstoun & Govan	**Location ID**
	Project No.	173920	**S4**
	Client	BAE Systems	

GRAB SAMPLE LOG

Date/Time	24/07/2020	**Latitude**	55°52.91172'
Dredge Area	Scotstoun	**Longitude**	-004°22.17447'
Method	0.045m^2 Van Veen Grab Sampler	**Sampled/logged by**	AK/FR

Remarks: Soft black silt with rare decomposing vegetation and paint and rusty metal chips.

Biota: None noted.

Odours: Faint H_2S rotting odour.

Anthropogenic Inputs: Paint and rusty metal chips

Notes: -

envirocentre 8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	BAE Systems – Scotstoun & Govan	**Location ID**
	Project No.	173920	**S5**
	Client	BAE Systems	

GRAB SAMPLE LOG

Date/Time	24/07/2020	**Latitude**	55°52.88784'
Dredge Area	Scotstoun	**Longitude**	-004°22.12601'
Method	0.045m^2 Van Veen Grab Sampler	**Sampled/logged by**	AK/FR

Remarks: Soft dark grey/black and dark brown silt.

Biota: None noted.

Odours: Faint H_2S rotting odour.

Anthropogenic Inputs: None noted.

Notes: -

envirocentre 8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	BAE Systems – Scotstoun & Govan	**Location ID**
	Project No.	173920	**S6**
	Client	BAE Systems	

GRAB SAMPLE LOG

Date/Time	24/07/2020	**Latitude**	55°52.84002'
Dredge Area	Scotstoun	**Longitude**	-004°22.03291'
Method	0.045m^2 Van Veen Grab Sampler	**Sampled/logged by**	AK/FR

Remarks: Soft black/dark brown silt.

Biota: None noted.

Odours: H_2S rotting odour.

Anthropogenic Inputs: None noted.

Notes: -

envirocentre 8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	BAE Systems – Scotstoun & Govan	**Location ID**
	Project No.	173920	**S7**
	Client	BAE Systems	

GRAB SAMPLE LOG

Date/Time	24/07/2020	**Latitude**	55°52.74378'
Dredge Area	Scotstoun	**Longitude**	-004°21.87836'
Method	0.045m^2 Van Veen Grab Sampler	**Sampled/logged by**	AK/FR

Remarks: Soft black silt with rare decomposing vegetation.

Biota: None noted.

Odours: Strong H_2S rotting odour.

Anthropogenic Inputs: None noted.

Notes: Noted to be drier and more cohesive than other similar samples.

envirocentre 8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	BAE Systems – Scotstoun & Govan	**Location ID**
	Project No.	173920	**S8**
	Client	BAE Systems	

GRAB SAMPLE LOG

Date/Time	24/07/2020	**Latitude**	55°52.71744'
Dredge Area	Scotstoun	**Longitude**	-004°21.81728'
Method	0.045m^2 Van Veen Grab Sampler	**Sampled/logged by**	AK/FR

Remarks: Soft black silt with one thumbnail-sized rusty metal fragment.

Biota: None noted.

Odours: Slight H_2S rotting odour.

Anthropogenic Inputs: Rusty metal fragment.

Notes: Noted to be drier and more cohesive than other similar samples.

envirocentre 8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	BAE Systems – Scotstoun & Govan	**Location ID**
	Project No.	173920	**S9**
	Client	BAE Systems	

GRAB SAMPLE LOG

Date/Time	24/07/2020	**Latitude**	55°52.08114'
Dredge Area	Govan	**Longitude**	-004°19.52391'
Method	0.045m^2 Van Veen Grab Sampler	**Sampled/logged by**	AK/FR

Remarks: Soft black silt with frequent decomposing vegetation and wood fragments.

Biota: None noted.

Odours: Very strong H_2S rotting odour.

Anthropogenic Inputs: None noted.

Notes: -

envirocentre 8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	BAE Systems – Scotstoun & Govan	**Location ID**
	Project No.	173920	**S10**
	Client	BAE Systems	

GRAB SAMPLE LOG

Date/Time	24/07/2020	**Latitude**	55°52.05888'
Dredge Area	Govan	**Longitude**	-004°19.50340'
Method	0.045m^2 Van Veen Grab Sampler	**Sampled/logged by**	AK/FR

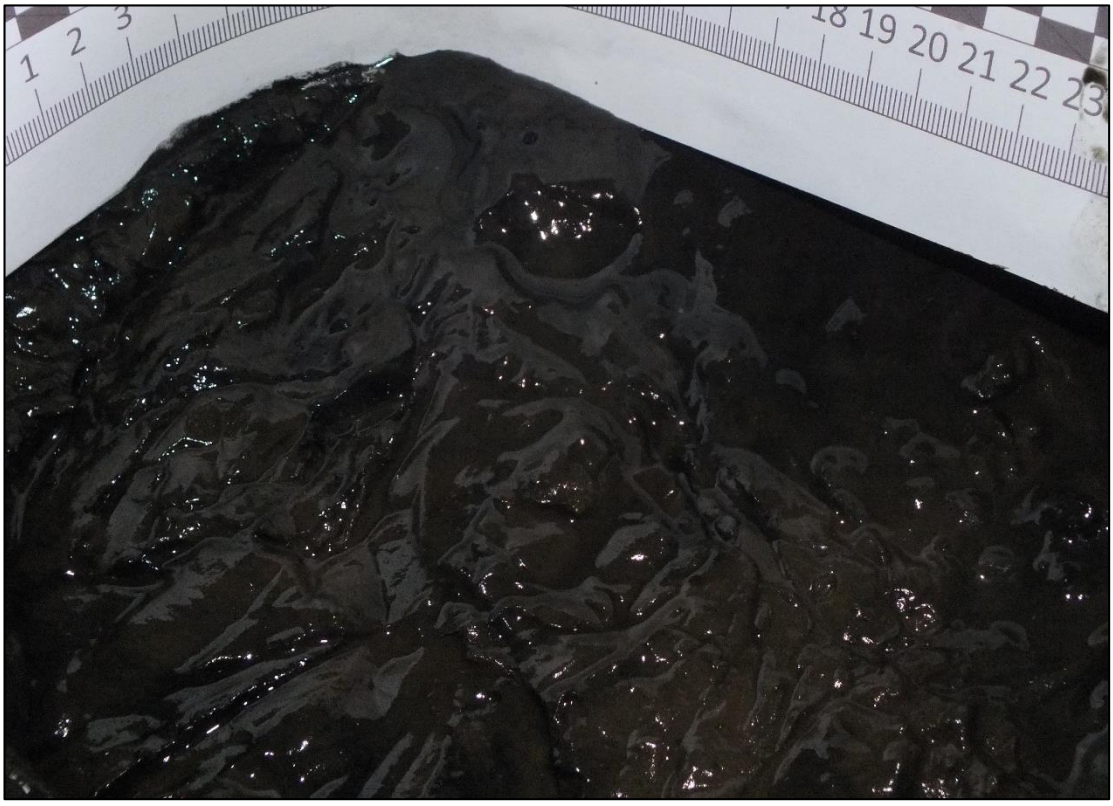
Remarks: Soft black and dark brown silt.

Biota: None noted.

Odours: Slight H_2S rotting odour.

Anthropogenic Inputs: None noted.

Notes: -



envirocentre 8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	BAE Systems – Scotstoun & Govan	**Location ID**
	Project No.	173920	**S11**
	Client	BAE Systems	

GRAB SAMPLE LOG

Date/Time	24/07/2020	**Latitude**	55°52.01130'
Dredge Area	Govan	**Longitude**	-004°19.51110'
Method	0.045m^2 Van Veen Grab Sampler	**Sampled/logged by**	AK/FR

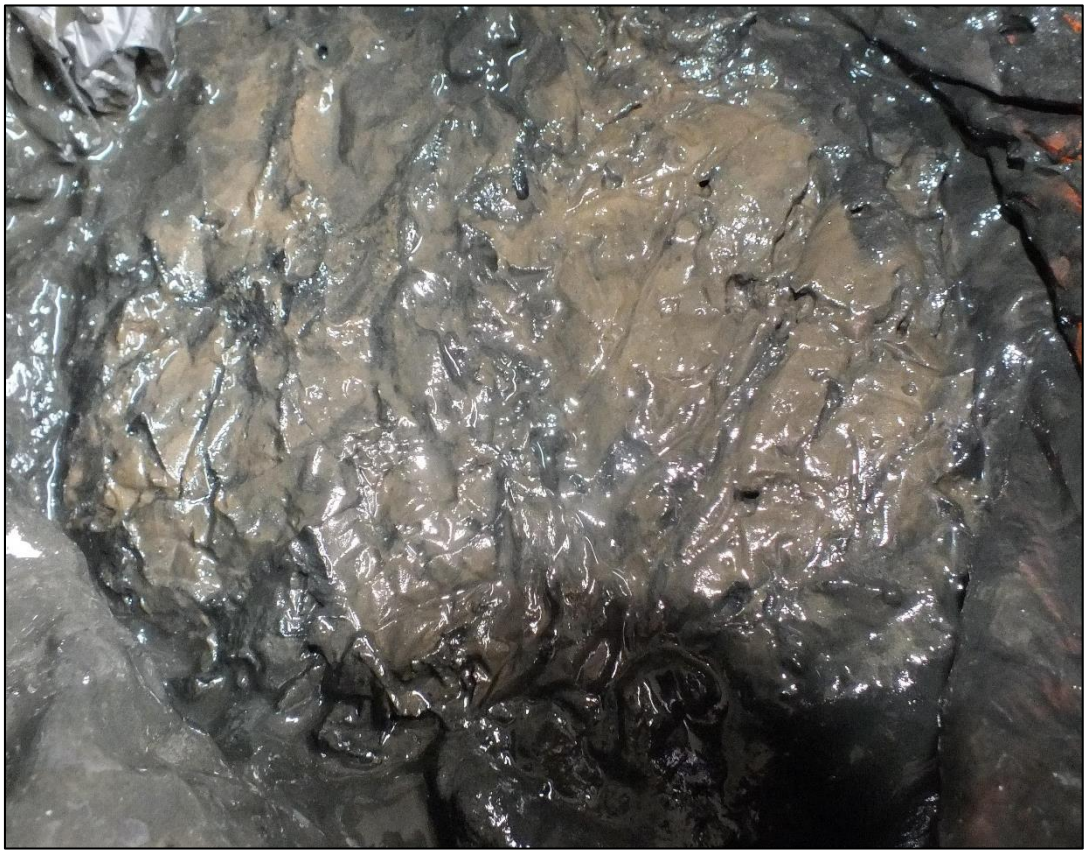
Remarks: Soft black and dark brown silt.

Biota: None noted.

Odours: Slight H_2S rotting odour.

Anthropogenic Inputs: None noted.

Notes: -



envirocentre 8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	BAE Systems – Scotstoun & Govan	**Location ID**
	Project No.	173920	**S12**
	Client	BAE Systems	

GRAB SAMPLE LOG

Date/Time	24/07/2020	**Latitude**	55°51.97104'
Dredge Area	Govan	**Longitude**	-004°19.50103'
Method	0.045m^2 Van Veen Grab Sampler	**Sampled/logged by**	AK/FR

Remarks: Soft black silt with rare leaf litter.

Biota: None noted.

Odours: Slight H_2S rotting odour.

Anthropogenic Inputs: None noted.

Notes: -

envirocentre 8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	BAE Systems – Scotstoun & Govan	**Location ID**
	Project No.	173920	**S13**
	Client	BAE Systems	

GRAB SAMPLE LOG

Date/Time	24/07/2020	**Latitude**	55°52.03296'
Dredge Area	Govan	**Longitude**	-004°19.44910'
Method	0.045m^2 Van Veen Grab Sampler	**Sampled/logged by**	AK/FR

Remarks: Soft black silt with rare vegetation and clinker.

Biota: None noted.

Odours: Slight H_2S rotting odour.

Anthropogenic Inputs: Clinker.

Notes: -

C ANALYTICAL RESULTS AND SUMMARY

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	**MAR00679**	
Issue Version	1	
Customer	EnviroCentre Ltd, Craighall Business Park, 8 Eagle Street, Glasgow, G4 9XA	
Customer Reference	BAE Govan and Scotsoun 173920	
Date Sampled	24-Jul-20	
Date Received	25-Jul-20	
Date Reported	18-Aug-20	
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 MAR00679
Issue Version 1
Customer Reference BAE Govan and Scotsoun 173920

		Units	%	%	%	%	%	N/A	% M/M
		Method No	ASC/SOP/303	ASC/SOP/303	SUB_01*	SUB_01*	SUB_01*	SUB_02*	SOCOTEC Env Chem*
		Limit of Detection	0.2	0.2	N/A	N/A	N/A	N/A	0.02
		Accreditation	UKAS	UKAS	N	N	N	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Total Moisture @ 120°C**	**Total Solids**	**Gravel (>2mm)**	**Sand (63-2000 µm)**	**Silt (<63 µm)**	**Asbestos**	**TOC**
S1	MAR00679.001	Sediment	65.7	34.3	0.0	32.4	67.6	NADIS	5.62
S2	MAR00679.002	Sediment	62.8	37.2	0.0	35.7	64.3	NADIS	3.31
S2.1	MAR00679.003	Sediment	55.3	44.7	0.0	38.6	61.4	NADIS	4.06
S2.2	MAR00679.004	Sediment	63.6	36.4	0.0	30.4	69.6	NADIS	5.19
S3	MAR00679.005	Sediment	60.6	39.4	27.8	30.7	41.4	NADIS	5.18
S4	MAR00679.006	Sediment	69.9	30.1	0.0	26.1	73.9	NADIS	6.40
S5	MAR00679.007	Sediment	88.5	11.5	0.0	22.4	77.6	NADIS	4.48
S6	MAR00679.008	Sediment	73.1	26.9	0.0	23.0	77.0	NADIS	6.80
S7	MAR00679.009	Sediment	64.1	35.9	0.0	36.0	64.0	NADIS	4.22
S8	MAR00679.010	Sediment	57.8	42.2	0.0	34.6	65.4	NADIS	3.43
S9	MAR00679.011	Sediment	76.9	23.1	3.9	37.7	58.3	NADIS	23.0
S10	MAR00679.012	Sediment	75.0	25.0	0.0	19.2	80.8	NADIS	9.00
S11	MAR00679.013	Sediment	76.0	24.0	0.0	19.0	81.0	NADIS	8.30
S12	MAR00679.014	Sediment	78.7	21.3	0.0	14.3	85.7	NADIS	8.70
S13	MAR00679.015	Sediment	67.0	33.0	0.0	24.4	75.6	NADIS	8.40
Reference Material (% Recovery)			N/A	N/A	N/A	N/A	N/A	N/A	100
QC Blank			N/A	N/A	N/A	N/A	N/A	N/A	<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 MAR00679
Issue Version 1
Customer Reference BAE Govan and Scotsoun 173920

		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**
S1	MAR00679.001	Sediment	8.3	0.62	120	50.4	0.25	31.8	79.6	200
S2	MAR00679.002	Sediment	7.1	0.52	130	48.4	0.26	28.0	66.2	169
S2.1	MAR00679.003	Sediment	8.6	0.56	132	52.4	0.32	27.6	74.3	202
S2.2	MAR00679.004	Sediment	9.5	0.60	137	57.0	0.33	28.5	81.9	205
S3	MAR00679.005	Sediment	10.9	0.67	140	72.7	1.00	32.3	99.7	275
S4	MAR00679.006	Sediment	9.9	0.66	128	57.4	0.30	32.2	90.4	223
S5	MAR00679.007	Sediment	12.6	0.67	159	72.6	0.80	38.7	105	251
S6	MAR00679.008	Sediment	12.3	0.77	160	63.8	0.38	34.0	105	243
S7	MAR00679.009	Sediment	7.8	0.54	134	51.4	0.28	28.2	72.3	183
S8	MAR00679.010	Sediment	9.8	0.70	171	62.6	0.38	35.0	93.8	236
S9	MAR00679.011	Sediment	5.4	0.65	119	46.1	0.14	29.4	69.4	183
S10	MAR00679.012	Sediment	8.6	0.76	136	61.7	0.29	35.2	107	250
S11	MAR00679.013	Sediment	9.6	0.86	145	71.2	0.28	38.0	119	276
S12	MAR00679.014	Sediment	8.1	0.71	118	59.5	0.23	34.4	103	245
S13	MAR00679.015	Sediment	6.2	0.62	90.1	51.5	0.18	34.0	90.1	222
Certified Reference Material SETOC 774 (% Recovery)			97	107	97	97	92	95	96	100
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	MAR00679
Issue Version	1
Customer Reference	BAE Govan and Scotsoun 173920

		Units	µg/Kg (Dry Weight)	
		Method No	ASC/SOP/301	
		Limit of Detection	1	1
		Accreditation	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Dibutyltin (DBT)**	**Tributyltin (TBT)**
S1	MAR00679.001	Sediment	<5	19.0
S2	MAR00679.002	Sediment	<5	13.8
S2.1	MAR00679.003	Sediment	11.9	15.1
S2.2	MAR00679.004	Sediment	14.3	23.2
S3	MAR00679.005	Sediment	<5	<5
S4	MAR00679.006	Sediment	<5	<5
S5	MAR00679.007	Sediment	<5	45.4
S6	MAR00679.008	Sediment	<5	<5
S7	MAR00679.009	Sediment	<5	<5
S8	MAR00679.010	Sediment	13.1	<5
S9	MAR00679.011	Sediment	<5	<5
S10	MAR00679.012	Sediment	<5	<5
S11	MAR00679.013	Sediment	25.6	24.1
S12	MAR00679.014	Sediment	<5	<5
S13	MAR00679.015	Sediment	<5	<5
		In House Reference Material (% Recovery)	97	99
		QC Blank	<1	<1

* See Report Notes

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

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 MAR00679
Issue Version 1
Customer Reference BAE Govan and Scotsoun 173920

		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**
S1	MAR00679.001	Sediment	117	46.7	186	579	663	635
S2	MAR00679.002	Sediment	136	71.6	219	677	784	789
S2.1	MAR00679.003	Sediment	123	51.5	197	562	673	649
S2.2	MAR00679.004	Sediment	107	60.7	204	594	765	759
S3	MAR00679.005	Sediment	114	55.2	196	565	677	656
S4	MAR00679.006	Sediment	101	57.7	177	551	683	672
S5	MAR00679.007	Sediment	248	147	454	1380	1770	1730
S6	MAR00679.008	Sediment	762	818	15100	38600	22200	25500
S7	MAR00679.009	Sediment	105	74.6	204	679	903	852
S8	MAR00679.010	Sediment	139	48.7	213	621	742	710
S9	MAR00679.011	Sediment	126	55.5	194	573	694	691
S10	MAR00679.012	Sediment	110	53.0	200	660	755	726
S11	MAR00679.013	Sediment	122	61.1	232	727	884	865
S12	MAR00679.014	Sediment	141	76.5	262	831	1020	992
S13	MAR00679.015	Sediment	74.2	43.4	153	509	627	604
Certified Reference Material CRM 1941b (% Recovery)			98	110	70	77	62	90
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 MAR00679
Issue Version 1
Customer Reference BAE Govan and Scotsoun 173920

		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**
S1	MAR00679.001	Sediment	544	298	611	110	1080	134
S2	MAR00679.002	Sediment	652	258	638	136	1160	147
S2.1	MAR00679.003	Sediment	559	287	554	114	1040	136
S2.2	MAR00679.004	Sediment	656	311	566	124	1070	132
S3	MAR00679.005	Sediment	528	297	551	111	1000	151
S4	MAR00679.006	Sediment	591	294	580	115	970	132
S5	MAR00679.007	Sediment	1520	697	1410	271	2380	284
S6	MAR00679.008	Sediment	9670	11700	35200	5880	61700	4680
S7	MAR00679.009	Sediment	736	290	637	161	1180	131
S8	MAR00679.010	Sediment	593	312	611	126	1120	146
S9	MAR00679.011	Sediment	628	314	593	123	1020	156
S10	MAR00679.012	Sediment	620	349	684	120	1180	135
S11	MAR00679.013	Sediment	733	366	770	130	1310	148
S12	MAR00679.014	Sediment	864	528	863	179	1420	173
S13	MAR00679.015	Sediment	519	244	560	88	906	101
Certified Reference Material CRM 1941b (% Recovery)			71	86	96	100	85	62
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 MAR00679
Issue Version 1
Customer Reference BAE Govan and Scotsoun 173920

		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**
S1	MAR00679.001	Sediment	511	177	609	1000	95800
S2	MAR00679.002	Sediment	634	160	513	1160	122000
S2.1	MAR00679.003	Sediment	537	144	499	991	74000
S2.2	MAR00679.004	Sediment	581	175	440	1050	112000
S3	MAR00679.005	Sediment	517	251	451	980	86900
S4	MAR00679.006	Sediment	557	144	513	939	104000
S5	MAR00679.007	Sediment	1500	323	1140	2270	264000
S6	MAR00679.008	Sediment	13300	836	31900	36900	442000
S7	MAR00679.009	Sediment	757	138	452	1140	116000
S8	MAR00679.010	Sediment	576	158	605	1080	89100
S9	MAR00679.011	Sediment	534	132	597	950	134000
S10	MAR00679.012	Sediment	597	149	593	1080	120000
S11	MAR00679.013	Sediment	669	166	603	1220	155000
S12	MAR00679.014	Sediment	781	183	694	1350	193000
S13	MAR00679.015	Sediment	509	125	492	851	111000
Certified Reference Material CRM 1941b (% Recovery)			75	65	87	75	108
QC Blank			<1	<1	<1	<1	<100

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 MAR00679
Issue Version 1
Customer Reference BAE Govan and Scotsoun 173920

		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	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**PCB28**	**PCB52**	**PCB101**	**PCB118**	**PCB138**	**PCB153**	**PCB180**
S1	MAR00679.001	Sediment	2.88	3.74	2.58	1.96	2.59	3.12	1.62
S2	MAR00679.002	Sediment	2.80	3.63	2.28	1.80	2.23	2.81	1.51
S2.1	MAR00679.003	Sediment	3.28	4.38	3.21	2.64	3.31	3.65	2.19
S2.2	MAR00679.004	Sediment	3.95	5.75	4.08	3.21	4.97	5.46	3.52
S3	MAR00679.005	Sediment	4.78	7.23	4.71	3.63	5.27	5.63	3.18
S4	MAR00679.006	Sediment	3.76	5.60	3.46	2.68	4.08	4.53	2.40
S5	MAR00679.007	Sediment	4.96	7.72	5.15	3.42	4.71	5.70	3.35
S6	MAR00679.008	Sediment	4.68	6.16	3.66	2.91	4.33	4.33	2.65
S7	MAR00679.009	Sediment	3.69	5.01	3.41	2.52	3.69	4.76	2.78
S8	MAR00679.010	Sediment	3.34	7.75	4.63	3.58	8.33	8.74	26.2
S9	MAR00679.011	Sediment	2.29	2.81	1.84	1.20	2.13	2.90	1.76
S10	MAR00679.012	Sediment	3.76	5.16	0.90	2.71	3.48	4.17	2.61
S11	MAR00679.013	Sediment	4.42	5.73	3.63	2.78	3.85	4.78	2.80
S12	MAR00679.014	Sediment	4.17	5.62	3.44	3.26	4.01	4.30	2.74
S13	MAR00679.015	Sediment	2.82	3.47	2.29	1.52	2.74	2.85	2.01
Certified Reference Material CRM 1941b (% Recovery)			76	93	92	82	134	99	87
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.

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 MAR00679
Issue Version 1
Customer Reference BAE Govan and Scotsoun 173920

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*	MAR00679.001-015	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
SUB_01*	MAR00679.001-015	Analysis was conducted by an approved subcontracted laboratory.
SUB_02*	MAR00679.001-015	Analysis was conducted by an approved subcontracted laboratory.
ASC/SOP/301	MAR00679.001-002, .005-012, .014-015	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	MAR00679.001-015	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	Deviation 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

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	MAR00679
Issue Version	1
Customer Reference	BAE Govan and Scotsoun 173920

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 120°C to constant weight.
Particle Size Analysis	Wet Sediment	Wet and dry sieving followed by laser diffraction analysis.
Total Organic Carbon (TOC)	Air Dried and Ground	Carbonate removal and sulphurous acid/combustion at 1600°C/NDIR.
Metals	Air dried and seived to <63µm	Aqua-regia extraction followed by ICP analysis.
Organotins	Wet Sediment	Solvent extraction and derivatisation followed by GC-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.
Polychlorinated Biphenyls (PCBs)	Air dried and seived to <2mm	Solvent extraction and clean up followed by GC-MS-MS analysis.
Asbestos	Air Dried	Qualitative analysis of samples for determination of presence/type of asbestos

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		
ANTHRACN	Anthracene	CHRYSENE	Chrysene		
BAA	Benzo[a]anthracene	DBENZAH	Dibenzo[ah]anthracene		
BAP	Benzo[a]pyrene	FLUORANT	Fluoranthene		
BBF	Benzo[b]fluoranthene	FLUORENE	Fluorene		
BEP	Benzo[e]pyrene	INDPYR	Indeno[1,2,3-cd]pyrene		
BENZGHIP	Benzo[ghi]perylene	NAPTH	Naphthalene		
BKF	Benzo[k]fluoranthene	PERYLENE	Perylene		
C1N	C1-naphthalenes	PHENANT	Phenanthrene		
C1PHEN	C1-phenanthrene	PYRENE	Pyrene		

C DATA SUMMARY TABLES

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	**MAR00679**
Issue Version	1
Customer	EnviroCentre Ltd, Craighall Business Park, 8 Eagle Street, Glasgow, G4 9XA
Customer Reference	BAE Govan and Scotsoun 173920
Date Sampled	24-Jul-20
Date Received	25-Jul-20
Date Reported	18-Aug-20
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 MAR00679
Issue Version 1
Customer Reference BAE Govan and Scotsoun 173920

		Units	%	%	%	%	%	N/A	% M/M
		Method No	ASC/SOP/303	ASC/SOP/303	SUB_01*	SUB_01*	SUB_01*	SUB_02*	SOCOTEC Env Chem*
		Limit of Detection	0.2	0.2	N/A	N/A	N/A	N/A	0.02
		Accreditation	UKAS	UKAS	N	N	N	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Total Moisture @ 120°C**	**Total Solids**	**Gravel (>2mm)**	**Sand (63-2000 µm)**	**Silt (<63 µm)**	**Asbestos**	**TOC**
S1	MAR00679.001	Sediment	65.7	34.3	0.0	32.4	67.6	NADIS	5.62
S2	MAR00679.002	Sediment	62.8	37.2	0.0	35.7	64.3	NADIS	3.31
S2.1	MAR00679.003	Sediment	55.3	44.7	0.0	38.6	61.4	NADIS	4.06
S2.2	MAR00679.004	Sediment	63.6	36.4	0.0	30.4	69.6	NADIS	5.19
S3	MAR00679.005	Sediment	60.6	39.4	27.8	30.7	41.4	NADIS	5.18
S4	MAR00679.006	Sediment	69.9	30.1	0.0	26.1	73.9	NADIS	6.40
S5	MAR00679.007	Sediment	88.5	11.5	0.0	22.4	77.6	NADIS	4.48
S6	MAR00679.008	Sediment	73.1	26.9	0.0	23.0	77.0	NADIS	6.80
S7	MAR00679.009	Sediment	64.1	35.9	0.0	36.0	64.0	NADIS	4.22
S8	MAR00679.010	Sediment	57.8	42.2	0.0	34.6	65.4	NADIS	3.43
S9	MAR00679.011	Sediment	76.9	23.1	3.9	37.7	58.3	NADIS	23.0
S10	MAR00679.012	Sediment	75.0	25.0	0.0	19.2	80.8	NADIS	9.00
S11	MAR00679.013	Sediment	76.0	24.0	0.0	19.0	81.0	NADIS	8.30
S12	MAR00679.014	Sediment	78.7	21.3	0.0	14.3	85.7	NADIS	8.70
S13	MAR00679.015	Sediment	67.0	33.0	0.0	24.4	75.6	NADIS	8.40
Reference Material (% Recovery)			N/A	N/A	N/A	N/A	N/A	N/A	100
QC Blank			N/A	N/A	N/A	N/A	N/A	N/A	<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 MAR00679
Issue Version 1
Customer Reference BAE Govan and Scotsoun 173920

		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**
S1	MAR00679.001	Sediment	8.3	0.62	120	50.4	0.25	31.8	79.6	200
S2	MAR00679.002	Sediment	7.1	0.52	130	48.4	0.26	28.0	66.2	169
S2.1	MAR00679.003	Sediment	8.6	0.56	132	52.4	0.32	27.6	74.3	202
S2.2	MAR00679.004	Sediment	9.5	0.60	137	57.0	0.33	28.5	81.9	205
S3	MAR00679.005	Sediment	10.9	0.67	140	72.7	1.00	32.3	99.7	275
S4	MAR00679.006	Sediment	9.9	0.66	128	57.4	0.30	32.2	90.4	223
S5	MAR00679.007	Sediment	12.6	0.67	159	72.6	0.80	38.7	105	251
S6	MAR00679.008	Sediment	12.3	0.77	160	63.8	0.38	34.0	105	243
S7	MAR00679.009	Sediment	7.8	0.54	134	51.4	0.28	28.2	72.3	183
S8	MAR00679.010	Sediment	9.8	0.70	171	62.6	0.38	35.0	93.8	236
S9	MAR00679.011	Sediment	5.4	0.65	119	46.1	0.14	29.4	69.4	183
S10	MAR00679.012	Sediment	8.6	0.76	136	61.7	0.29	35.2	107	250
S11	MAR00679.013	Sediment	9.6	0.86	145	71.2	0.28	38.0	119	276
S12	MAR00679.014	Sediment	8.1	0.71	118	59.5	0.23	34.4	103	245
S13	MAR00679.015	Sediment	6.2	0.62	90.1	51.5	0.18	34.0	90.1	222
Certified Reference Material SETOC 774 (% Recovery)			97	107	97	97	92	95	96	100
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	MAR00679
Issue Version	1
Customer Reference	BAE Govan and Scotsoun 173920

		Units	µg/Kg (Dry Weight)	
		Method No	ASC/SOP/301	
		Limit of Detection	1	1
		Accreditation	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Dibutyltin (DBT)**	**Tributyltin (TBT)**
S1	MAR00679.001	Sediment	<5	19.0
S2	MAR00679.002	Sediment	<5	13.8
S2.1	MAR00679.003	Sediment	11.9	15.1
S2.2	MAR00679.004	Sediment	14.3	23.2
S3	MAR00679.005	Sediment	<5	<5
S4	MAR00679.006	Sediment	<5	<5
S5	MAR00679.007	Sediment	<5	45.4
S6	MAR00679.008	Sediment	<5	<5
S7	MAR00679.009	Sediment	<5	<5
S8	MAR00679.010	Sediment	13.1	<5
S9	MAR00679.011	Sediment	<5	<5
S10	MAR00679.012	Sediment	<5	<5
S11	MAR00679.013	Sediment	25.6	24.1
S12	MAR00679.014	Sediment	<5	<5
S13	MAR00679.015	Sediment	<5	<5
		In House Reference Material (% Recovery)	97	99
		QC Blank	<1	<1

* See Report Notes

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

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 MAR00679
Issue Version 1
Customer Reference BAE Govan and Scotsoun 173920

		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**
S1	MAR00679.001	Sediment	117	46.7	186	579	663	635
S2	MAR00679.002	Sediment	136	71.6	219	677	784	789
S2.1	MAR00679.003	Sediment	123	51.5	197	562	673	649
S2.2	MAR00679.004	Sediment	107	60.7	204	594	765	759
S3	MAR00679.005	Sediment	114	55.2	196	565	677	656
S4	MAR00679.006	Sediment	101	57.7	177	551	683	672
S5	MAR00679.007	Sediment	248	147	454	1380	1770	1730
S6	MAR00679.008	Sediment	762	818	15100	38600	22200	25500
S7	MAR00679.009	Sediment	105	74.6	204	679	903	852
S8	MAR00679.010	Sediment	139	48.7	213	621	742	710
S9	MAR00679.011	Sediment	126	55.5	194	573	694	691
S10	MAR00679.012	Sediment	110	53.0	200	660	755	726
S11	MAR00679.013	Sediment	122	61.1	232	727	884	865
S12	MAR00679.014	Sediment	141	76.5	262	831	1020	992
S13	MAR00679.015	Sediment	74.2	43.4	153	509	627	604
Certified Reference Material CRM 1941b (% Recovery)			98	110	70	77	62	90
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 MAR00679
Issue Version 1
Customer Reference BAE Govan and Scotsoun 173920

		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**
S1	MAR00679.001	Sediment	544	298	611	110	1080	134
S2	MAR00679.002	Sediment	652	258	638	136	1160	147
S2.1	MAR00679.003	Sediment	559	287	554	114	1040	136
S2.2	MAR00679.004	Sediment	656	311	566	124	1070	132
S3	MAR00679.005	Sediment	528	297	551	111	1000	151
S4	MAR00679.006	Sediment	591	294	580	115	970	132
S5	MAR00679.007	Sediment	1520	697	1410	271	2380	284
S6	MAR00679.008	Sediment	9670	11700	35200	5880	61700	4680
S7	MAR00679.009	Sediment	736	290	637	161	1180	131
S8	MAR00679.010	Sediment	593	312	611	126	1120	146
S9	MAR00679.011	Sediment	628	314	593	123	1020	156
S10	MAR00679.012	Sediment	620	349	684	120	1180	135
S11	MAR00679.013	Sediment	733	366	770	130	1310	148
S12	MAR00679.014	Sediment	864	528	863	179	1420	173
S13	MAR00679.015	Sediment	519	244	560	88	906	101
Certified Reference Material CRM 1941b (% Recovery)			71	86	96	100	85	62
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 MAR00679
Issue Version 1
Customer Reference BAE Govan and Scotsoun 173920

		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**
S1	MAR00679.001	Sediment	511	177	609	1000	95800
S2	MAR00679.002	Sediment	634	160	513	1160	122000
S2.1	MAR00679.003	Sediment	537	144	499	991	74000
S2.2	MAR00679.004	Sediment	581	175	440	1050	112000
S3	MAR00679.005	Sediment	517	251	451	980	86900
S4	MAR00679.006	Sediment	557	144	513	939	104000
S5	MAR00679.007	Sediment	1500	323	1140	2270	264000
S6	MAR00679.008	Sediment	13300	836	31900	36900	442000
S7	MAR00679.009	Sediment	757	138	452	1140	116000
S8	MAR00679.010	Sediment	576	158	605	1080	89100
S9	MAR00679.011	Sediment	534	132	597	950	134000
S10	MAR00679.012	Sediment	597	149	593	1080	120000
S11	MAR00679.013	Sediment	669	166	603	1220	155000
S12	MAR00679.014	Sediment	781	183	694	1350	193000
S13	MAR00679.015	Sediment	509	125	492	851	111000
Certified Reference Material CRM 1941b (% Recovery)			75	65	87	75	108
QC Blank			<1	<1	<1	<1	<100

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 MAR00679
Issue Version 1
Customer Reference BAE Govan and Scotsoun 173920

		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	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**PCB28**	**PCB52**	**PCB101**	**PCB118**	**PCB138**	**PCB153**	**PCB180**
S1	MAR00679.001	Sediment	2.88	3.74	2.58	1.96	2.59	3.12	1.62
S2	MAR00679.002	Sediment	2.80	3.63	2.28	1.80	2.23	2.81	1.51
S2.1	MAR00679.003	Sediment	3.28	4.38	3.21	2.64	3.31	3.65	2.19
S2.2	MAR00679.004	Sediment	3.95	5.75	4.08	3.21	4.97	5.46	3.52
S3	MAR00679.005	Sediment	4.78	7.23	4.71	3.63	5.27	5.63	3.18
S4	MAR00679.006	Sediment	3.76	5.60	3.46	2.68	4.08	4.53	2.40
S5	MAR00679.007	Sediment	4.96	7.72	5.15	3.42	4.71	5.70	3.35
S6	MAR00679.008	Sediment	4.68	6.16	3.66	2.91	4.33	4.33	2.65
S7	MAR00679.009	Sediment	3.69	5.01	3.41	2.52	3.69	4.76	2.78
S8	MAR00679.010	Sediment	3.34	7.75	4.63	3.58	8.33	8.74	26.2
S9	MAR00679.011	Sediment	2.29	2.81	1.84	1.20	2.13	2.90	1.76
S10	MAR00679.012	Sediment	3.76	5.16	0.90	2.71	3.48	4.17	2.61
S11	MAR00679.013	Sediment	4.42	5.73	3.63	2.78	3.85	4.78	2.80
S12	MAR00679.014	Sediment	4.17	5.62	3.44	3.26	4.01	4.30	2.74
S13	MAR00679.015	Sediment	2.82	3.47	2.29	1.52	2.74	2.85	2.01
Certified Reference Material CRM 1941b (% Recovery)			76	93	92	82	134	99	87
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.

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 MAR00679
Issue Version 1
Customer Reference BAE Govan and Scotsoun 173920

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*	MAR00679.001-015	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
SUB_01*	MAR00679.001-015	Analysis was conducted by an approved subcontracted laboratory.
SUB_02*	MAR00679.001-015	Analysis was conducted by an approved subcontracted laboratory.
ASC/SOP/301	MAR00679.001-002, .005-012, .014-015	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	MAR00679.001-015	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	Deviation 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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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 120°C to constant weight.
Particle Size Analysis	Wet Sediment	Wet and dry sieving followed by laser diffraction analysis.
Total Organic Carbon (TOC)	Air Dried and Ground	Carbonate removal and sulphurous acid/combustion at 1600°C/NDIR.
Metals	Air dried and seived to <63µm	Aqua-regia extraction followed by ICP analysis.
Organotins	Wet Sediment	Solvent extraction and derivatisation followed by GC-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.
Polychlorinated Biphenyls (PCBs)	Air dried and seived to <2mm	Solvent extraction and clean up followed by GC-MS-MS analysis.
Asbestos	Air Dried	Qualitative analysis of samples for determination of presence/type of asbestos

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		
ANTHRACN	Anthracene	CHRYSENE	Chrysene		
BAA	Benzo[a]anthracene	DBENZAH	Dibenzo[ah]anthracene		
BAP	Benzo[a]pyrene	FLUORANT	Fluoranthene		
BBF	Benzo[b]fluoranthene	FLUORENE	Fluorene		
BEP	Benzo[e]pyrene	INDPYR	Indeno[1,2,3-cd]pyrene		
BENZGHIP	Benzo[ghi]perylene	NAPTH	Naphthalene		
BKF	Benzo[k]fluoranthene	PERYLENE	Perylene		
C1N	C1-naphthalenes	PHENANT	Phenanthrene		
C1PHEN	C1-phenanthrene	PYRENE	Pyrene		