It is also uncertain whether these existing disposal sites would be suited to accept the dredged material from Uig Harbour based on sediment type, as well as the known levels of contamination within the sediments, specifically chromium and nickel (see Table 5 and Table 6). Therefore, it is considered impracticable, both economically and environmentally, to pursue the use of an existing disposal site as part of the Proposed Development and a new disposal site is required to be designated.

5.2 Disposal site search area

The site selection process used to identify a proposed new disposal site initially focussed in on a pre-defined search area, as discussed with Marine Scotland during a teleconference on 07 December 2017. The teleconference was used to discuss the reasoning behind the location of the disposal site search area and to agree a sampling plan to characterise the whole area, from which a sub-section would be selected for a proposed new disposal site. Coordinates for the disposal site search area are provided in Table 8, covering an area of approximately 1,000 m x 750 m in the west of Uig Bay (Figure 9).

Table 8. Disposal site search area coordinates

Point	Coordinates (WGS84; Decimal Degrees)	
	Latitude (N)	Longitude (W)
A	57.5811	-6.4088
B	57.5816	-6.3921
C	57.5748	-6.3915
D	57.5744	-6.4082

In summary, the disposal site search area was chosen given the deeper waters (up to 60 m depth) further out in the Bay, to avoid the nearby finfish farms (Uig Bay and Loch Snizort East) and to prevent any suspended sediment plumes from disposal and dredging operations to combine. A further consideration was made with regards to White-tailed eagle (*Haliaeetus albicilla*), specifically pairs breeding/nesting in the vicinity of Uig Bay. The location of the disposal site search area ensures any proposed new disposal site would be greater than 1 km from any known White-tailed eagle nest (confidential information provided by the Highland Raptor Study Group). Conversely, disposal in shallower waters within the inner Uig Bay area would likely result in greater re-distribution of sediment as a result of wave action. Marine Scotland agreed during the teleconference that the proposed disposal site search area was sensible, noting that the final disposal site would need to have similar levels of contamination to the dredged areas at Uig Harbour. Given the concentration of contaminants reported in sediment samples collected from around Uig Bay in 2016 (see Table 5 and Table 6), this was considered feasible within the disposal site search area.

To characterise the disposal site search area, supplementing data collected from around Uig Bay and at the dredge site, additional surveys were undertaken in February 2018. The disposal site search area was set out in a 3 x 4 grid of 250 m x 250 m boxes (12 in total). The survey design included grab sampling to determine sediment type (i.e. PSA), benthic infauna and contaminant concentrations, as well as the collection of drop-down video (DDV) footage using a remotely operated vehicle (ROV) to characterise epifaunal/infaunal benthic habitats and to establish the presence of any priority marine features (PMF). The sampling locations from these surveys, based on the 12 grid cells, are shown in Figure 10.

The grab sampling involved the collection of 12 randomly selected surface sediment samples within the disposal site search area (one sample per grid; methodology suggested by Marine Scotland during teleconference). Samples were collected with a 0.1 m^2 Day grab sampler, with two samples collected

per station to allow for the measurement of physical (PSA and total organic carbon), chemical (contaminants) and biological (faunal analysis) variables. Coordinates for the grab samples are provided in Table 9.

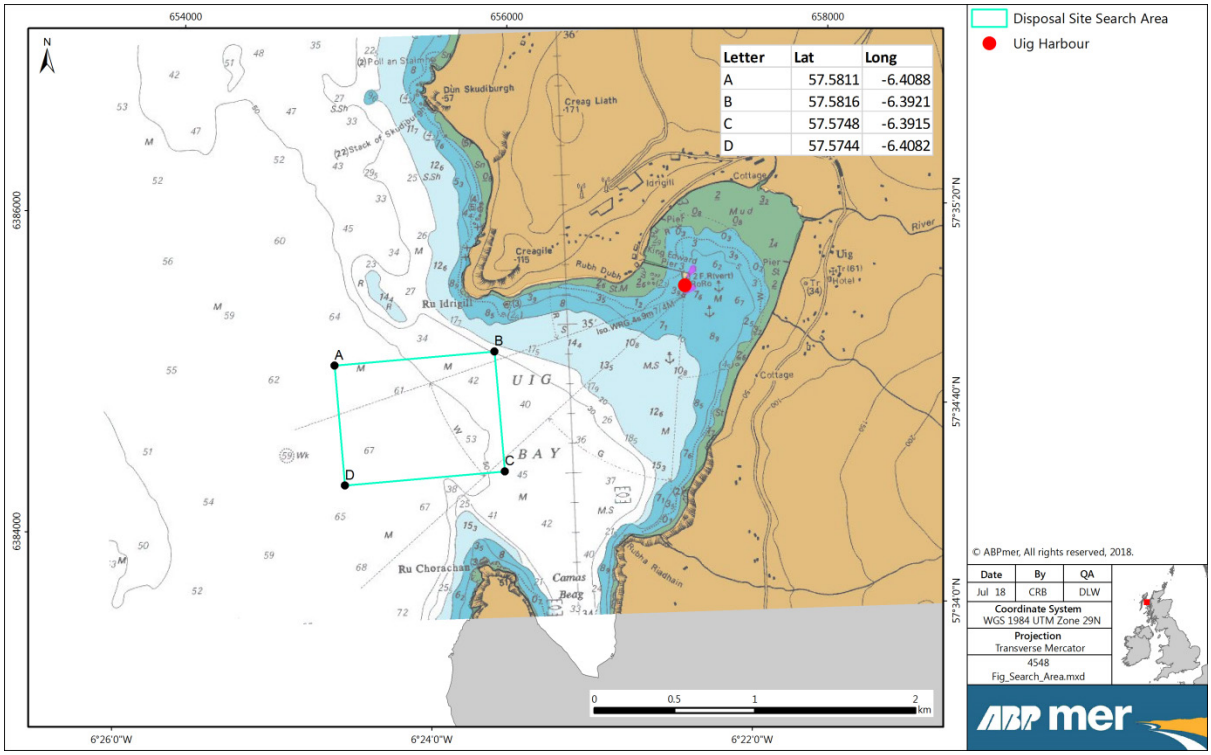


Figure 9. Location of the disposal site search area

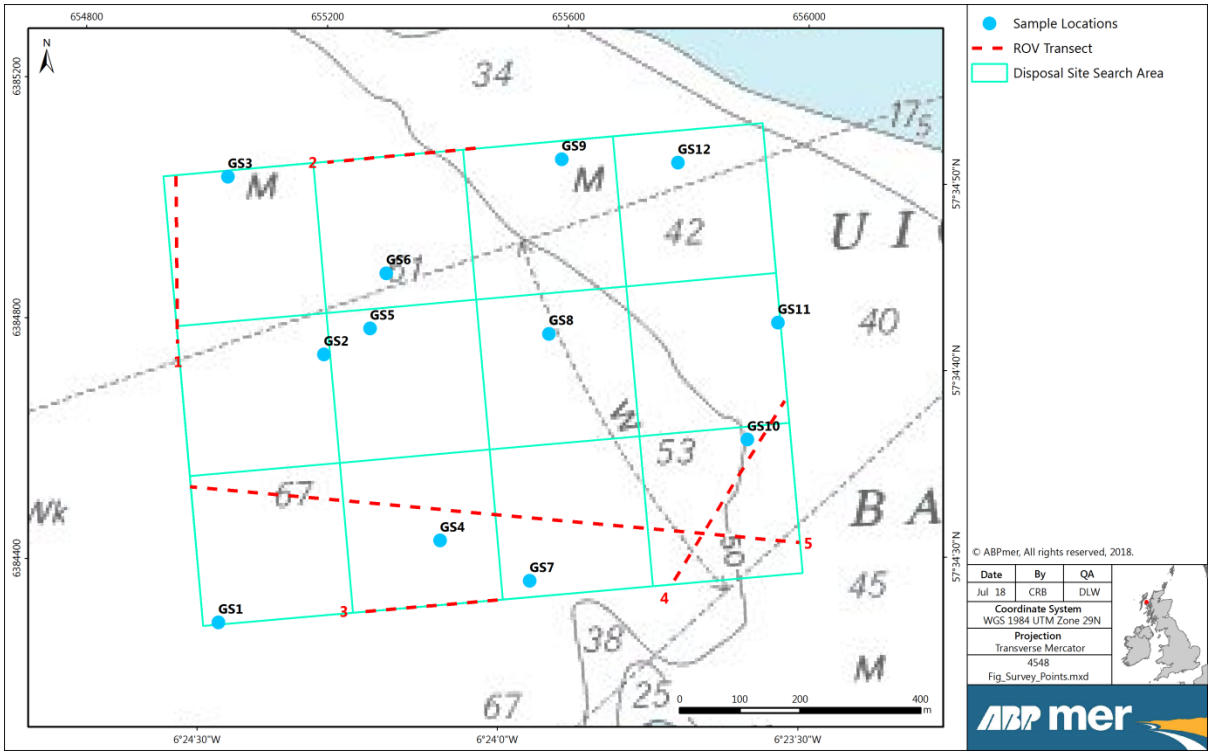


Figure 10. Location of grab sampling points and ROV transects within the disposal site search area

Table 9. Grab sample coordinates

Grab Sample	Coordinates (WGS84; Decimal Degrees)	
	Latitude	Longitude
GS1	57.5744	-6.4077
GS2	57.5784	-6.4045
GS3	57.5811	-6.4070
GS4	57.5755	-6.4015
GS5	57.5787	-6.4032
GS6	57.5795	-6.4027
GS7	57.5749	-6.3990
GS8	57.5786	-6.3983
GS9	57.5811	-6.3977
GS10	57.5769	-6.3929
GS11	57.5786	-6.3919
GS12	57.5810	-6.3945

Video footage and stills were collected using an ROV along five seabed transects within the disposal site search area. Whilst the equipment did not enable a time stamp on the resultant footage, still images were taken at regular intervals to provide a series of 'quadrats' along each transect. Additional stills were taken on an *ad hoc* basis to capture features of special interest, particularly seapens and evidence of burrowing megafauna. The data were analysed to record species present and to assign biotopes (UK Marine Habitat Classification/EUNIS). Particular attention was given to the identification of any PMF habitats. This specifically included 'Seapens and burrowing megafauna in circalittoral fine mud' as this has previously been observed within the Bay and wider area, and any evidence of the rare biotope '*Brissopsis lyrifera* and *Amphiura chiajei* in circalittoral mud' which has been observed at the site of the Loch Snizort East finfish farm to the south of the disposal site search area. Start and finish coordinates for the ROV transects are provided in Table 10.

Table 10. ROV transect start and end coordinates

Remotely Operated Vehicle (ROV) Transect	Coordinates (WGS84; Decimal Degrees)			
	Start		Finish	
	Latitude	Longitude	Latitude	Longitude
1	57.578620	-6.4085675	57.58111	-6.40843
2	57.581236	-6.4042131	57.58136	-6.40004
3	57.574512	-6.4038680	57.57462	-6.39981
4	57.574746	-6.3951075	57.57742	-6.39178
5	57.575302	-6.3915252	57.57648	-6.40837

The following sections describe the physical, chemical and biological characteristics of the disposal site search area, as well as known human uses and other sea users of the area, based on available data and the additional surveys undertaken.

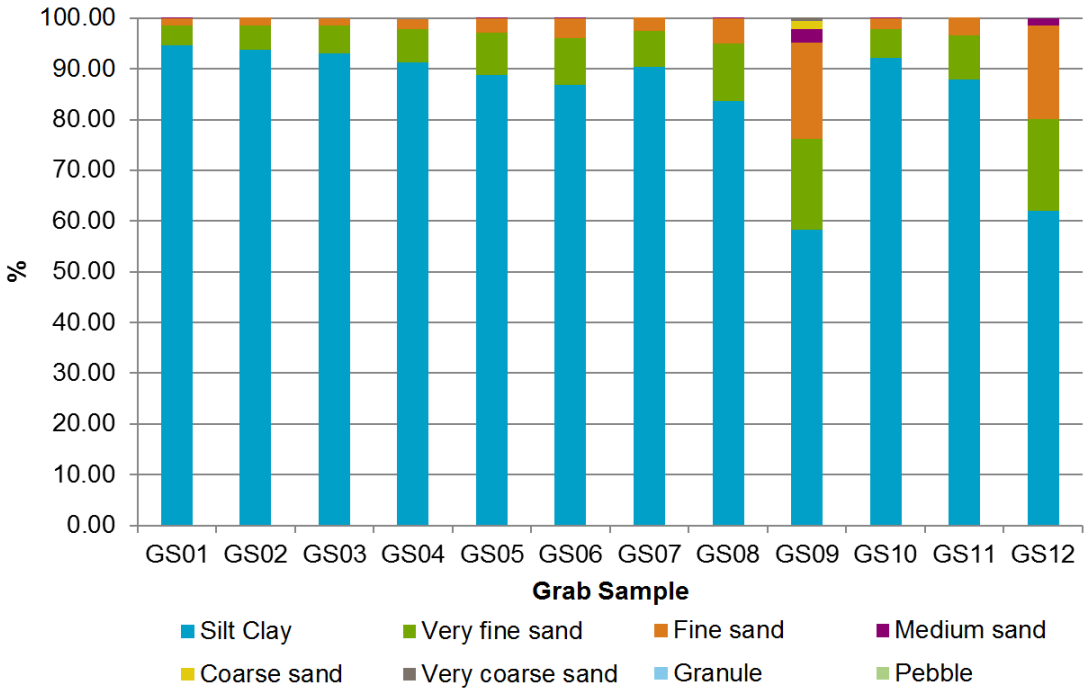
5.2.1 Physical characteristics

The bathymetry in the outer sections of Uig Bay indicates water depths of greater than 30 m, with sections within the disposal site search area as deep as 60 m towards the western margin. Such depths suggest any disposed material which reaches the seabed is unlikely to be affected by wave action and, therefore, the disposal site search area is likely to be retentive in nature (i.e. material will remain *in situ* once deposited). It was noted that increased water depths could also result in the sediment plume/finer material being suspended in the water column for extended periods prior to

settling. Therefore, dispersion modelling has been carried out to determine the fate of material disposed (see Section 7). Very low flow speeds are observed throughout Uig Bay, particularly apparent in deeper areas, which would suggest selection of a new disposal site throughout the disposal site search area would largely provide retentive properties for disposed sediment.

Dredged material would ideally be disposed of at a site with similar sediment type (i.e. like-for-like) to minimise changes in seabed habitat. The sediment type from Sample G indicated fairly coarse mud material in the surficial layer of Dredge Pocket 1, broadly comparable to Samples A and C located to the east of the disposal site search area as well as other locations around Uig Bay (see Table 2 and Figure 6). However, the sediment types recorded at depth in rotary borehole samples (BH01, BH02, BH06A, BH09 and DS01), diver-collected samples (DS02) and trial pits (TP03), all located within or immediately adjacent to Dredge Pockets 1 and 2 of the Proposed Development, indicated coarser material (sand, gravel and shell debris; see Table 3 and Figure 7). An estimation of dredged material composition is provided in Table 4. A large disposal site search area was selected to maximise the potential for locating an area with sediments that were compatible with the sediments of the dredge pockets.

PSA results from sediments collected within the disposal site search area are shown in Figure 11 (Wentworth sediment class) and size fractions are presented in Table 11.



Source: AECOM, 2018a

Figure 11. Particle size distribution (%) of sediments collected from grab samples in the disposal site search area

With the exception of GS9 (41.7% sand) and GS12 (38.0% sand), all samples indicated more than 80% of the sediment was silt/clay. None of the samples included gravel fractions (>2 mm). The difference in the physical nature of the sediments in GS9 and GS12 were also evident in a lower percentage of total organic carbon (1.0 and 1.6% respectively, compared to around 2.0% across all other stations), as would be predicted from the greater average particle size.

In summary, sediment composition in grab samples collected from the disposal site search area (Table 11) were similar to surface samples collected from around Uig Bay in 2016 (Table 2). However, it is noted that coarser material (predominantly sand) is found below the surface at the dredge sites, differing from the muddy sediment type observed at the surface throughout the disposal site search area. It is acknowledged that samples collected from GS9 and GS12 indicated relatively increased sand content compared to the rest of the disposal site search area, although these samples still comprised greater than 58% silt material. While the increased sand fraction at locations GS9 and GS12 (to the northeast of the disposal site search area) are potentially more similar to the dredged material, the surface sediment composition remains fundamentally different and the deposition of dredge material from Uig Harbour at any location within the disposal site search area will effectively result in a change in substrate type (as would be the case throughout Uig Bay). Therefore, surface sediment type around the disposal site search area does not present a key differentiator with regards to physical characteristics.

Table 11. PSA of surface sediment samples collected from grab samples in the disposal site search area

Grab Sample	Particle Size Fraction (%)			Sample Comments (Visual Inspection)	Folk Description
	Silt (<63 µm)	Sand (>63 µm-<2 mm)	Gravel (>2 mm)		
GS1	94.6	5.41	0.0	Colour - Brown; Texture - Wet Sludge; Odour - None; Biota - None; Anthropogenic Inputs - None	Mud
GS2	93.7	6.32	0.0	Colour - Brown; Texture - Wet Sludge; Odour - None; Biota - None; Anthropogenic Inputs - None	Mud
GS3	93.1	6.86	0.0	Colour - Brown; Texture - Sludge; Odour - None; Biota - None; Anthropogenic Inputs - None	Mud
GS4	91.5	8.53	0.0	Colour - Brown; Texture - Wet Sludge; Odour - None; Biota - None; Anthropogenic Inputs - None	Mud
GS5	88.9	11.2	0.0	Colour - Brown; Texture - Sludge; Odour - None; Biota - None; Anthropogenic Inputs - None	Sandy Mud
GS6	86.8	13.2	0.0	Colour - Brown; Texture - Sludge; Odour - None; Biota - None; Anthropogenic Inputs - None	Sandy Mud
GS7	90.2	9.79	0.0	Colour - Brown; Texture - Very wet Sludge; Odour - None; Biota - None; Anthropogenic Inputs - None	Mud
GS8	83.6	16.4	0.0	Colour - Brown; Texture - Sludge; Odour - None; Biota - None; Anthropogenic Inputs - None	Sandy Mud
GS9	58.3	41.7	0.0	Colour - Brown; Texture - Very Wet Sludge; Odour - None; Biota - None; Anthropogenic Inputs - None	Sandy Mud
GS10	92.1	7.88	0.0	Colour - Brown; Texture - Sludge; Odour - None; Biota - None; Anthropogenic Inputs - None	Mud
GS11	87.8	12.2	0.0	Colour - Brown; Texture - Sludge; Odour - None; Biota - None; Anthropogenic Inputs - None	Sandy Mud
GS12	62.0	38.0	0.0	Colour - Brown; Texture - Sludge; Odour - None; Biota - None; Anthropogenic Inputs - None	Sandy Mud

5.2.2 Chemical characteristics

As described in Table 5 and Table 6, sediments within Uig Bay and at the dredge site indicate high levels of contamination within sediments, particularly chromium and nickel. It is possible that historically contaminated sediments from Uig Harbour have gradually migrated along the northern shore of Uig Bay, perhaps through wave and/or tidal action. Nevertheless, it is also possible that the source of sediment contamination is natural, potentially due to the leaching of geological material. During the teleconference on 07 December 2017, Marine Scotland noted that sediment contamination levels in the harbour are quite high and, therefore, a proposed new disposal site would need to have similar contamination levels to the dredged areas. It was considered likely that contaminant concentrations within the disposal site search area would be similar to those reported around Uig Bay and at the dredge site, particularly given Samples A and C were collected within the eastern section of the disposal site search area.

Table 12 provides contaminant concentrations from 12 surface sediment samples collected from the disposal site search area (see Figure 10 for locations). The concentration of metals and TBT were below AL1, with the exception of chromium, copper and nickel. Chromium and nickel concentrations were consistently above AL1, with GS9 and GS12 above AL2. The highest concentrations for chromium (528 mg/kg dry weight) and nickel (189 mg/kg dry weight) were both from GS9. Copper concentrations were typically below AL1, except for GS10 which was marginally above AL1 (32.4 mg/kg dry weight; well below AL2). The concentration of PCBs was consistently below AL1 in all samples collected from the disposal site search area. The concentration of PAHs was also typically below AL1, with the exception of benzo(b+j)fluoranthene (GS3) and dibenzo(ah)anthracene (GS1, GS3 and GS12) which were slightly above AL1 (there is currently no AL2 for PAHs).

The level of sediment contamination in grab samples collected from the disposal site search area were similar to samples collected from around Uig Bay in 2016 (Table 5) and the dredge sites at Uig Harbour in 2017 (Table 6). Therefore, based on the range of sites sampled throughout the disposal site search area, it is considered that the entirety of disposal site search area would present a suitable new disposal site with regards to chemical characteristics due to the consistently high levels of contamination, particularly chromium and nickel.

Table 12. Concentration of contaminants in surface sediment samples collected from grab samples in the disposal site search area

Contaminant	Unit	AL1	AL2	GS1	GS2	GS3	GS4	GS5	GS6	GS7	GS8	GS9	GS10	GS11	GS12
Arsenic	mg/kg	20	70	8.66	8.1	8.11	7.89	8.08	8.98	9.16	7.92	9.72	10.6	8.69	8.79
Cadmium	mg/kg	0.4	4	0.12	0.13	0.11	0.11	0.11	0.12	0.14	0.13	0.12	0.14	0.1	0.1
Chromium	mg/kg	50	370	117	145	145	139	203	175	172	231	528	287	282	415
Copper	mg/kg	30	300	21	22.7	21.3	22.2	22.2	22.5	22	24.1	25.7	32.4	26.7	26.8
Lead	mg/kg	50	400	32.9	31.1	29.2	29.1	26.9	28	28.3	25.4	19.7	31.5	22.1	20.9
Nickel	mg/kg	30	150	52.9	60.7	59.7	59.5	73.3	68.2	68.6	91	189	106	105	158
Zinc	mg/kg	130	600	109	108	104	107	99.7	104	105	100	94.8	124	93	92.8
Mercury	mg/kg	0.25	1.5	0.08	0.07	0.07	0.08	0.07	0.07	0.07	0.06	0.04	0.06	0.05	0.05
Tributyltin (TBT)	µg/kg	100	500	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
PCB #28	µg/kg	20	180	1.4	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3
PCB #52	µg/kg	20	180	0.76	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
PCB #101	µg/kg	20	180	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
PCB #118	µg/kg	20	180	0.62	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
PCB #153	µg/kg	20	180	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
PCB #138	µg/kg	20	180	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
PCB #180	µg/kg	20	180	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Naphthalene	µg/kg	100	-	17.80	10.2	24.9	6.47	14.60	10.00	15.60	12.80	7.85	12.1	9.44	12.90
Acenaphthylene	µg/kg	100	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Acenaphthene	µg/kg	100	-	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7
Fluorene	µg/kg	100	-	7.85	<1.7	9.93	<1.7	5.65	<1.7	5.89	4.47	<1.7	4.50	<1.7	5.48
Phenanthrene	µg/kg	100	-	23.30	9.73	34.20	6.47	15.80	9.78	19.50	13.80	9.34	12.10	9.66	19.80
Anthracene	µg/kg	100	-	4.39	<2.5	5.08	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	5.28
Fluoranthene	µg/kg	100	-	21.20	7.47	33.00	9.35	14.10	8.41	18.80	13.00	8.04	10.80	8.12	27.60
Pyrene	µg/kg	100	-	14.30	5.21	24.20	5.99	10.40	6.14	14.30	10.20	6.91	9.89	7.69	25.60
Benzo(a)anthracene	µg/kg	100	-	11.80	<1.6	18.20	<1.6	6.83	3.87	9.06	6.17	4.67	6.30	<1.6	16.60
Chrysene	µg/kg	100	-	7.97	<1.7	12.00	<1.7	4.71	<1.7	6.34	4.47	3.36	4.05	<1.7	11.00
Benzo(b+j)fluoranthene	µg/kg	100	-	69.5	20.8	130	12.5	46.9	18.6	49.6	43.4	33.4	42.9	18.9	82
Benzo(k)fluoranthene	µg/kg	100	-	28.6	7.7	67.6	5.27	16.7	6.14	17.2	18.7	13.1	18.2	7.47	39.5
Benzo(a)pyrene	µg/kg	100	-	35.6	10.4	66.5	5.51	22.4	8.64	24.9	22.3	16.8	22.3	7.9	41.9
Indeno(123-cd)pyrene	µg/kg	100	-	43.9	11.5	85.2	5.51	24.5	9.55	24.7	23.4	21.1	25.2	11.9	51.5
Dibenzo(ah)anthracene	µg/kg	10	-	12.7	<1.6	22.4	<1.6	7.3	<1.6	<1.6	6.6	5.61	6.52	3.73	13.9
Benzo(ghi)perylene	µg/kg	100	-	44.1	12.7	87	6.47	28.7	10.5	28.8	24.3	21.7	27.4	14.1	48.9
Key	Below AL1														
	Above AL1 (Below AL2)														
	Above AL2														

Note: Surface sediment samples. AL1 - Action Level 1; AL2 - Action Level 2.