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Radiological Assessment of Dredging Application for Silloth Docks, Cumbria (2012)

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RADIOLOGICAL ASSESSMENT OF DREDGING APPLICATION FOR SILLOTH DOCKS (2012)

Summary

In 2012, Associated British Ports Holdings Limited lodged a FEPA licensing application to carry out a 3 year dredging program, involving the disposal at sea of ~ 7,142 m^3 per annum of sediment from Silloth Docks (in Cumbria).

In England, the MMO administers a range of statutory controls that apply to marine works on behalf of the Secretary of State for Environment, Food and Rural Affairs (Defra), this includes issuing licences under the Food and Environmental Protection Act (FEPA), 1985 (United Kingdom - Parliament, 1985) for the disposal of dredged material at sea. Licences for disposals made in Scottish waters and around the coast of Northern Ireland are the responsibility of the Scottish Government (Marine Scotland) and the Department of Environment (NIEA), respectively. As of 1 April 2010 licences for Welsh waters are the responsibility of WAG.

Using the conservative generic radiological assessment procedure developed by the IAEA, to convert radionuclide concentrations in dumped material into radiation doses due to dumping, the total derived total doses to individual members of the crew and public were 7.5 µSv/year and 1.4 µSv/year, respectively. The total collective dose was 0.037 manSv/year. The values for individual members of the crew and public, and the collective dose, were within the *de minimis* criteria of 10 µSv/year (individual doses) and 1 manSv/year (collective dose), respectively.

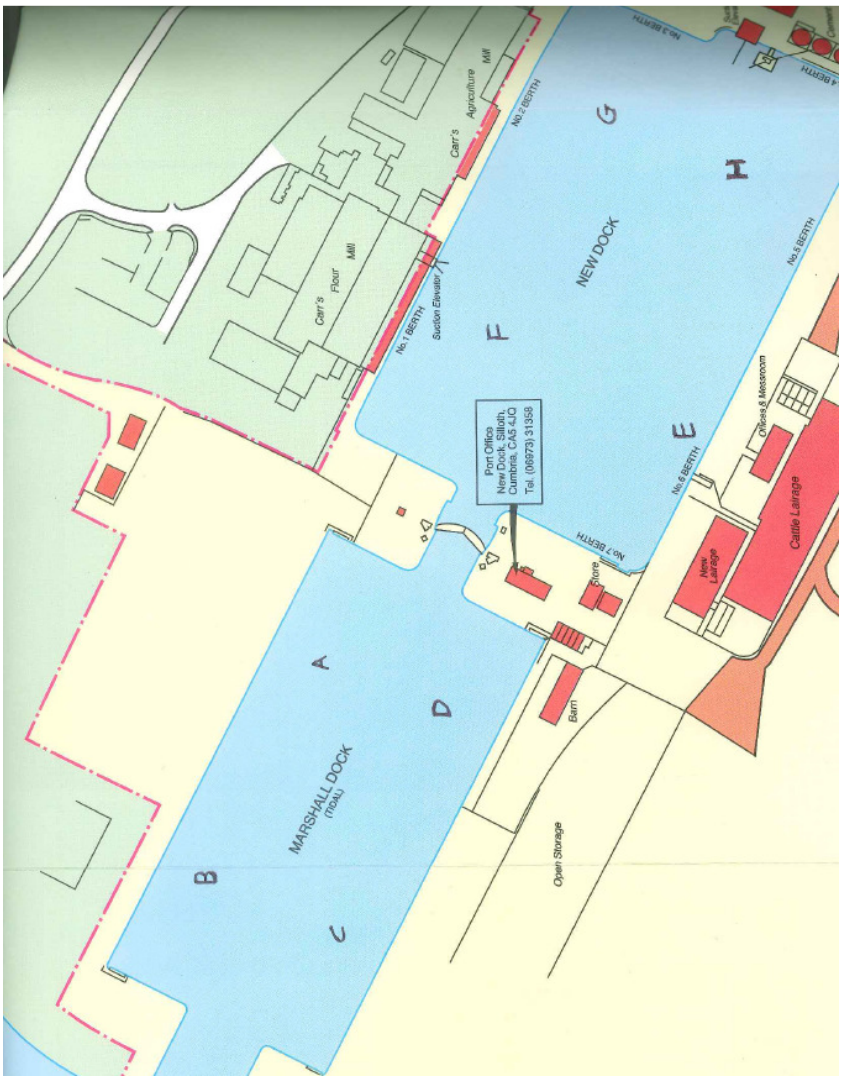
Since the conservative generic radiological assessment procedure indicated that doses received were below recommended limits, a subsequent more detailed case specific assessment was not necessary. Therefore, from radiological considerations, there is no objection to this material being dredged and dumped.

Assessment details

In 2012, Associated British Ports Holdings Limited lodged a FEPA licensing application to carry out a dredging program (3 years), involving the disposal at sea of ~ 7,142 m^3 per annum

of sediment from Silloth Docks in Cumbria. As part of the radiological assessment of the proposed operation, nine sediment samples were taken from three locations each at surface, 0.5 m and 1.0 m depth within the harbour (Site A, Marshall Dock; Site E, New Dock and Site I, at the entrance) were collected on 11 July 2012. Sampling locations for Site A and E are given in Figure 1.

Figure 1. Location Site (Silloth Docks)



Following freeze-drying and homogenisation, radionuclide assay at the Cefas Lowestoft Laboratory was achieved by γ counting samples on a high purity Ge detector. The results are summarised in Table 1.

Table 1. Radioactivity in sediment dredged from Silloth Docks, June 2012

Sample Number	Specific activity (Bq/kg, dry weight)					
	^{60}Co	^{137}Cs	^{226}Ra (via ^{214}Pb)	^{232}Th (via ^{228}Ac)	^{238}U (via ^{234}Th)	^{241}Am
Silloth MLA 1	<0.75	138.2	20.87	22.23	25.96	168.4
Silloth MLA 2	<0.62	559.7	21.07	22.03	33.46	286.0
Silloth MLA 3	<0.55	693.7	25.83	22.23	29.21	304.0
Silloth MLA 7	<0.89	230.9	19.6	32.69	32.69	291.6
Silloth MLA 8	2.23	353.4	21.18	26.64	39.42	424.9
Silloth MLA 9	2.65	509.7	26.77	33.78	53.10	549.1
Silloth MLA 13	<0.49	82.8	31.46	22.66	27.40	88.75
Silloth MLA 14	<0.58	55.5	16.65	15.68	24.45	91.86
Silloth MLA 15	<0.53	66.6	17.78	16.97	25.32	88.06
***Average**	**1**	**299**	**22**	**32**	**32**	**255**

*Average determinations use < results as positively measured values to produce a conservative estimate

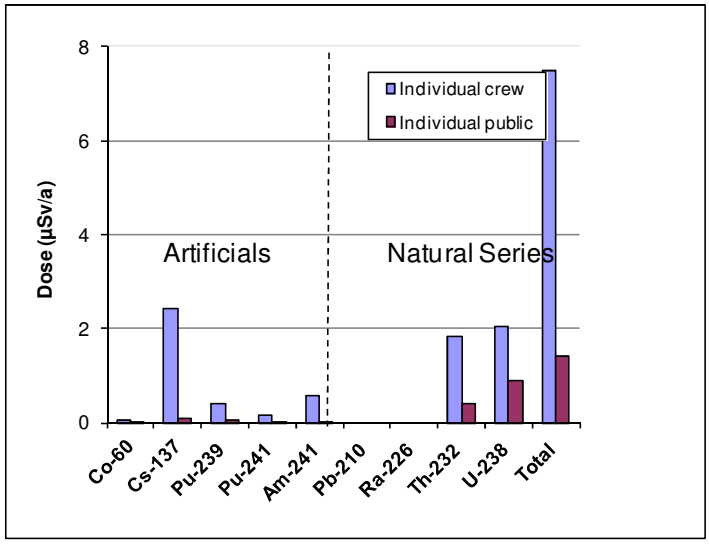
The specific activity of the artificial radionuclides (e.g. ^{137}Cs and ^{241}Am) in these samples was typical of muddy sediments along the Cumbrian coastline, being significantly enhanced above background levels outside the Irish Sea. The contamination is a legacy of large discharges from the Sellafield Limited reprocessing plant (formally British Nuclear Fuels) at Sellafield in the 1970s.

In addition to the nuclides detected by gamma spectrometry, sediments are also known to contain activities of Pu radionuclides. The ^{241}Am data were used to derive estimates for ^{239,240}Pu and ^{241}Pu, assuming their activity was proportional to the ratio in the time integrated Sellafield discharges. This approach is reasonable given that both radionuclides are highly particle-reactive, hence the fate following discharge is similar. The activity for ^{210}Pb was derived using data for ^{226}Ra and assuming secular equilibrium.

Under the London Convention, only materials with *de minimis* levels of radioactivity may be considered for dumping. Using the conservative generic radiological assessment procedure developed by the IAEA (IAEA, 2004), to convert radionuclide concentrations in dumped material into radiation doses due to dumping, the total derived total doses to individual members of the crew and public were 7.5 µSv/year and 1.4 µSv/year, respectively. The total collective dose was 0.037 manSv/year. The values for individual members of the crew and public, and the collective dose, were within the *de minimis* criteria of 10 µSv/year (individual doses) and 1 manSv/year (collective dose), respectively.

The dose estimates for individual crew/public (by nuclide), derived using the generic IAEA model, are shown in Figure 1.

Figure 1. Assessment of dose to individual members of crew and the public arising from Silloth Docks, Cumbria a) Doses were derived using average activities listed in Table 1.



Since the conservative generic radiological assessment procedure indicated that doses received were well below recommended limits, a subsequent more detailed case specific assessment was not necessary. All the derived total dose values were less than the de minimis criteria of 10 μSv/year and 1 manSv/year for individual and collective dose, respectively.

Therefore, from radiological considerations, there is no objection to this material being dredged and dumped.

References

IAEA(2004). Sediment distribution coefficients and concentration factors for biota in the marine environment. Tech. Rep. Ser. No. 422, IAEA, Vienna.

United Kingdom - Parliament, 1985. Food and Environment Protection Act, 1985. HMSO, London.

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