

Our Ref: R/5117/01/ac/ESM

14 June 2022

Best Practicable Environmental Option

Introduction

Since the original capital dredge in 2011, hydrographic surveys completed at Loch Ryan Port have indicated that there has been a reduction in depth in the approaches to the Port. Scotland's National Marine Plan states that *"Dredging is an essential activity to maintain existing shipping channels, establish safe approaches to new ports or open up routes to old ports."* A Marine Licence was issued in March 2019 (Licence Number: 06758/19/0) to undertake maintenance dredging at the Port as required and disposal at sea under the Marine (Scotland) Act 2010. This licence expired in February 2022 and even though there was no requirement to maintenance dredge between 2019 and 2022, the licence now needs to be renewed to allow for maintenance dredging at the Port should this be required over the next three years. To support the Marine Licence there is a need for a Best Practicable Environmental Option (BPEO) assessment. The following sections provide this BPEO assessment.

Dredge Material Characterisation

Sediment sampling has been conducted in support of this Marine Licence application. Samples were obtained from eight of the ten locations throughout the proposed dredge area as shown in Figure 1. Eight of these locations were also sampled in 2018 in support of the previous Marine Licence application at that time. In 2022, samples could not be obtained from Stations 3 and 8 within the berths and the approach channel, respectively, despite several attempts being made. The nature of the seabed at those stations was hard substrate with very little surficial sediment which prevented the extraction of any material by the grab. Table 1 details the percentage of each material type for the different samples obtained.

Table 1 Sample material characteristics

Sample ID	Date and Time Collected	Gravel (>2 mm) (%)	Sand (63-2000 µm) (%)	Silt (<63 µm) (%)
1	22/03/2022 08:52	0.2	75.7	24.2
2	22/03/2022 08:59	7.6	41.9	50.5
4	22/03/2022 09:09	0.5	65.7	33.8
5	22/03/2022 09:19	3.5	94.8	1.7
6	22/03/2022 09:35	26.9	32.1	41.0
7	22/03/2022 13:02	1.0	97.1	1.9
9	22/03/2022 08:32	95.2	3.6	1.2
10	22/03/2022 08:43	53.6	45.5	0.9

Sediment at the berth pocket (Samples 1 and 2) is made up of predominantly silt and sand. Recent hydrographic surveys undertaken in 2021 show that these areas at the rear of the berth or on the eastern side of the quay are subject to accretion and are likely to require dredging to maintain depths for the ferries.

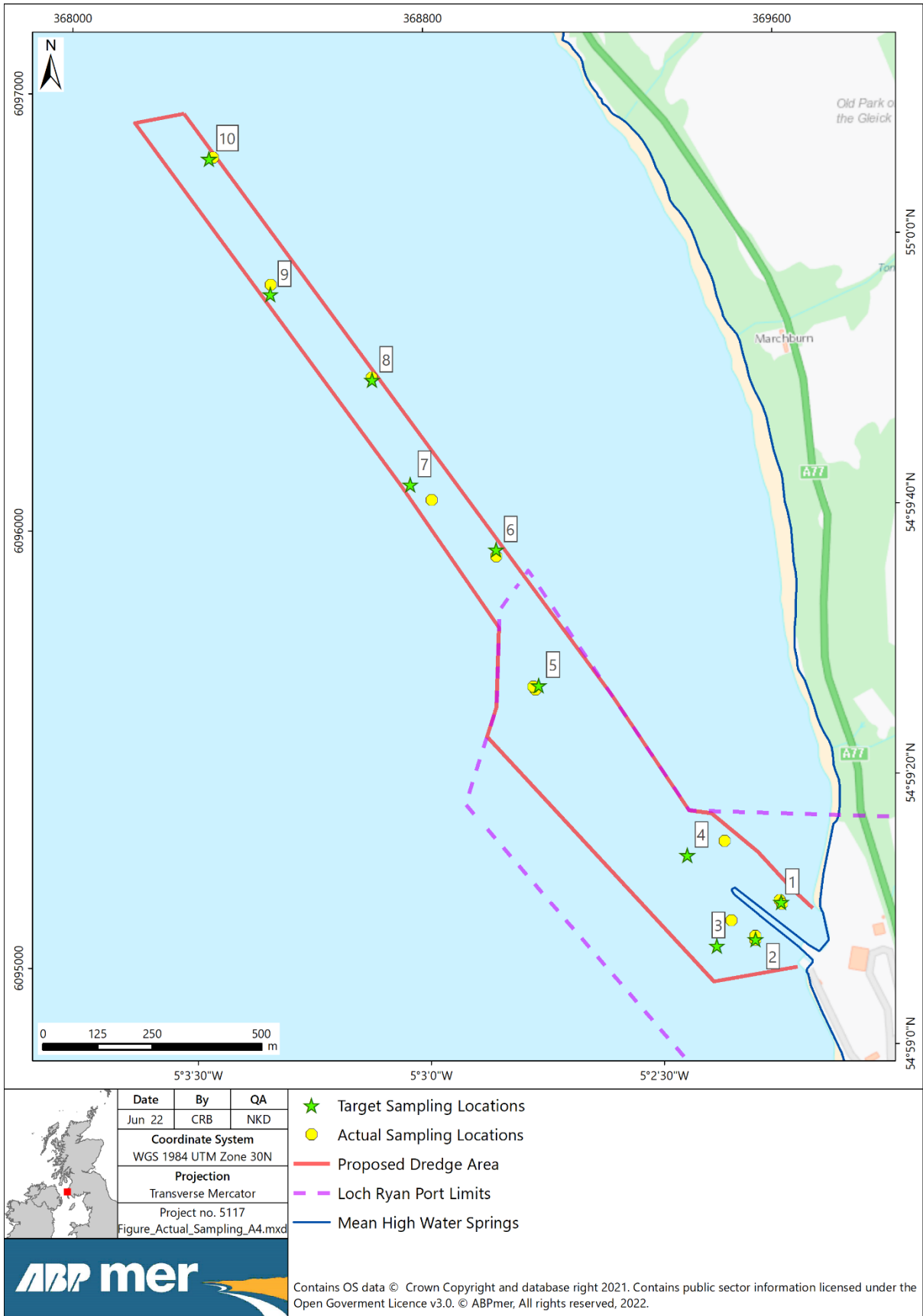


Figure 1. Sediment Sample Locations

Sediment at the turning circle areas (Samples 4 and 5) contain silty sand at the end closer to the berth pocket and mainly sand at the end closer to the approach channel. These areas remain deeper as a result of the scour caused by the vessel manoeuvres and propellers and are therefore unlikely to require dredging.

Sediments at the south-eastern end of the approach channel (Sample 6) comprise roughly equal parts silt, sand and gravel. Located further out within the approach channel, Sample 7, comprises mainly sand, with Sample 9 containing predominantly gravel and Sample 10 indicating sediments made up of roughly equal parts sand and gravel. Recent hydrographic surveys show that these areas also remain deeper and will likely not require dredging in the short term

Samples exceeding Action Levels

Analysis of sediment collected during grab sampling in 2022, indicated that Chromium and Nickel exceeded the respective Action Level (AL) 1 in all eight tested samples. Figure 2 and Figure 3 show the levels of Chromium and Nickel identified in the sediment samples against AL1 and AL2 in 2022. The 2018 measured levels of these metals are presented alongside those of 2022 for comparison.

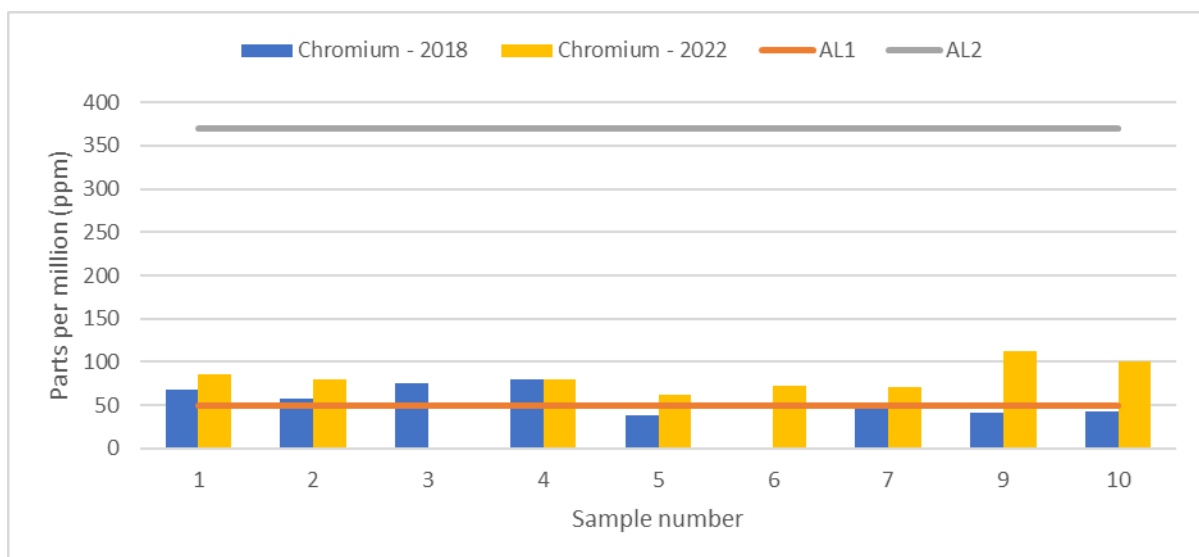


Figure 2. Chromium levels in samples – 2018 and 2022

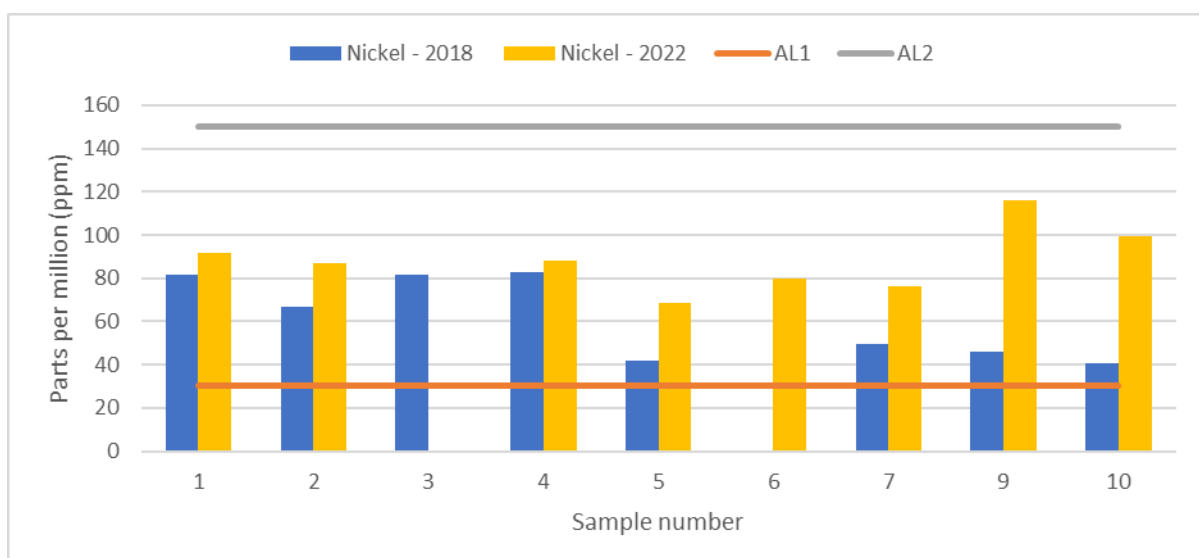


Figure 3. Nickel levels in samples – 2018 and 2022.

It can be seen from Figure 2 that although seven of the samples recorded higher concentrations of Chromium in 2022 compared to those measured in 2018, these were still only marginally above AL1 and significantly lower than AL2. The highest level of Chromium in a sample was 113 ppm which is approximately 20% between AL1 and AL2. The majority of samples recorded Chromium concentrations below 87 ppm which is approximately 11% between AL1 and AL2.

Figure 3 also shows increases in Nickel concentrations across all samples in 2022 compared to 2018. The highest increases were recorded at Samples 9 and 10 which represent sediments from the outer end of the approach channel. The highest Nickel concentration recorded was 116 ppm (72% between AL1 and AL2), compared to a maximum of 82.9 ppm (44% between AL1 and AL2) recorded in 2018.

To identify the cause of the increased levels of Chromium and Nickel in the sediment samples, results of the previous sampling completed in 2008 were also investigated. This sampling included boreholes and Hamon grab samples with results for Chromium and Nickel presented in Figure 4 and Figure 5.

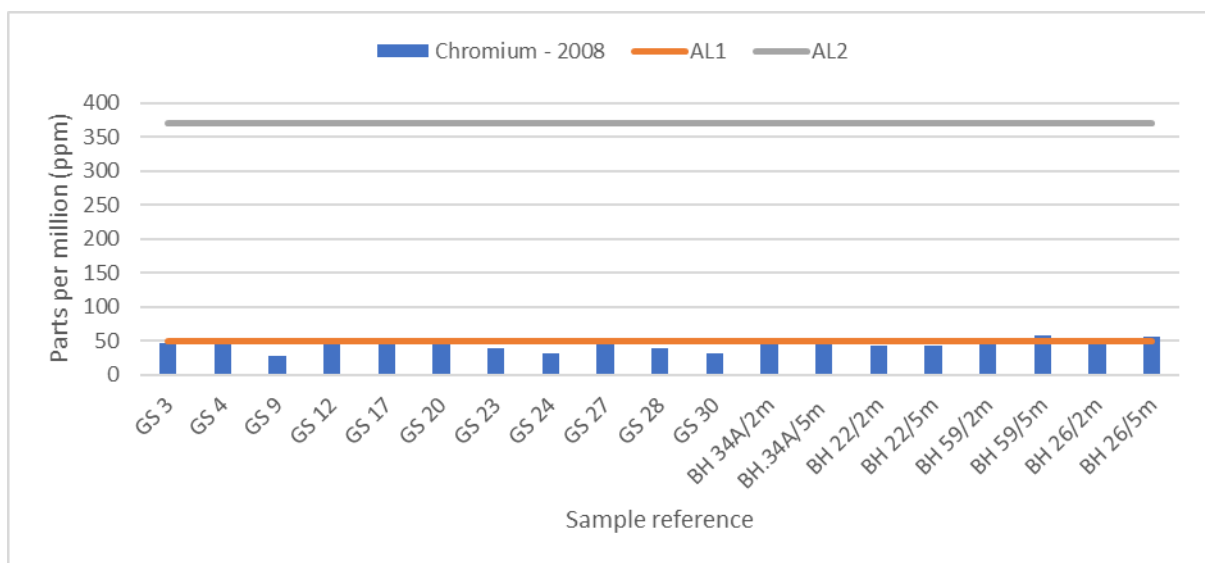


Figure 4. Chromium levels in samples 2008

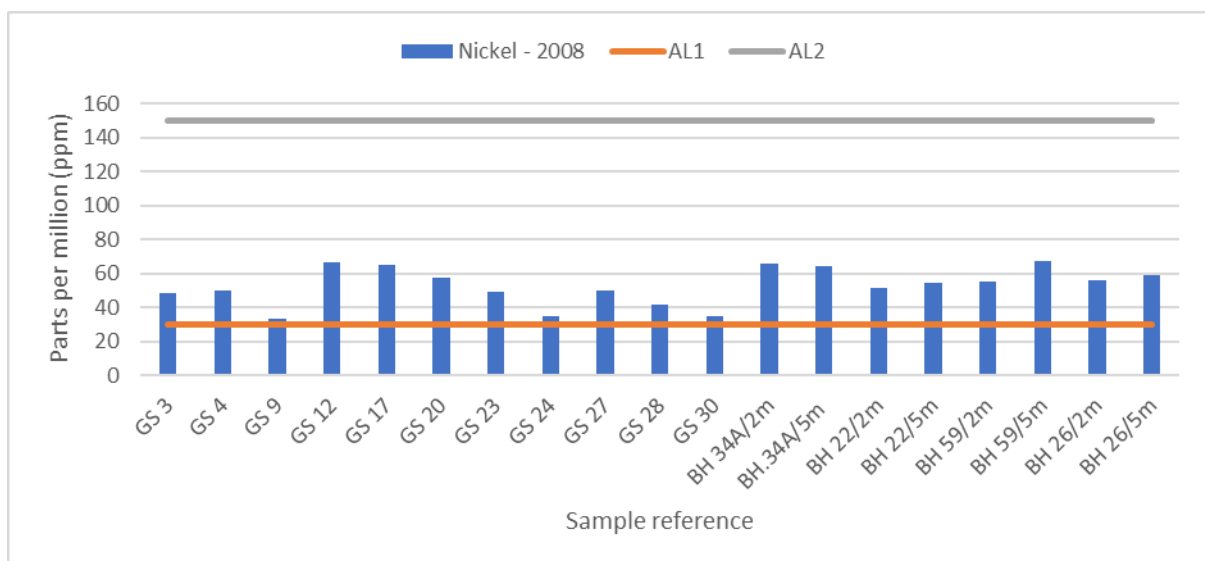


Figure 5. Nickel levels in samples 2008

Figure 4 and Figure 5 show that there are historic levels of Chromium and Nickel above AL1 in the dredge area. The levels of both Chromium and Nickel are higher in the 2018 and 2022 sediment samples across all stations sampled compared to 2008. The area close to the berthing pocket has been subject to accretion and so it is likely that the higher levels of Chromium and Nickel are due to the disturbance of sediment due to either vessel movements or previous plough dredging which has subsequently been deposited in the area around the berthing location. Additionally, Stations 9 and 10 contained a significantly higher proportion of gravel in 2022 compared to 2018, indicating increased scouring and sediment mobilisation in these areas which could have resulted in exposing deeper sediments with potentially higher concentrations of these metals. The vessels that use Loch Ryan Port (Ro-Ro ferries) are not associated with increased levels of Chromium or Nickel in sediment adjacent to their operation. The presence of AL1 exceedances in the 2008 sediment samples both from surface and from depth could potentially indicate that elevated concentrations of these metals are historic and naturally occurring in the area.

Prevention

There are three main alternatives for the prevention of generating waste material, including:

- Do Nothing (i.e. do not undertake maintenance dredging);
- Reduce the dredging requirement; and
- Reduce the disposal requirement.

The main approach to avoiding the generation of waste would be to not undertake the proposed maintenance dredging. Lack of maintenance dredging would mean that the accretion in the navigation channel, approaches and berths would continue and would affect the ability for vessels to navigate to and from the Port. Maintenance dredging is therefore concluded to be essential for the ongoing operations of the Port. The 'do nothing' scenario is therefore not appropriate.

Dredging will be carried out in response to planned and timely hydrographic surveys, determined by recorded accretion rates. The requirement to dredge is a direct cost to the operation of Port facilities and is not undertaken without sufficient business need. As described in the previous paragraph, the need to keep navigation channels, approaches and berths at a safe navigable depth is the overriding priority. This is linked to the size of vessels and careful consideration of available water depths. Stena Line Ports use proactive monitoring in the form of hydrographic survey, with scientific evaluation of deposition rates to predict future short-term, and long-term dredging trends. The objective is to reduce the dredge burden whilst maintaining safe navigational access. In this way, the dredge requirement is reduced where possible through optimisation of campaigns.

It should be noted, that dredging has not been required in the previous three years (2019 – 2022) and therefore Stena Line Ports did not make use of their maintenance dredge licence during this period.

In summary, all measures to prevent and/or reduce the volume of waste generated by the maintenance activities have been fully considered.

Re-use, recycling and other recovery

Few cost-effective re-use and/or recycling options have been identified due to the nature of much of the material arising from maintenance dredging in Loch Ryan. The dredge area locations which have experienced the largest levels of accretion and so would be the most likely to require maintenance dredging are areas around the berthing pockets (Stations 1 – 3) which predominantly comprise of mixed sand and silts (Table 1). Sand presents the most advantageous material for beneficial use from the material types that will be extracted by the maintenance dredging. It is considered that when dredging of this material is required, this could represent a resource for general fill material that could

be used as backfill in the local area. In general, the material does not meet the standards for beach nourishment purposes or good quality aggregate.

There are not currently any planned developments in the local area which would be able to use the material from the Port. The Stranraer Marina Development, also within Loch Ryan and located approximately 5 miles south of Loch Ryan Port, is currently at the pre-application stage. Works for this development will include land reclamation, however, it has been proposed that material from the project's own dredging operations will be used as infill. In any case, this project is still in the very early stages and is unlikely to be in a position to receive dredge material from Loch Ryan Port in the short term. Stena Line Ports will continually look to re-use a proportion of this material wherever possible to minimise the dredging requirement and also reduce the need of using a more valuable natural aggregate resource in any future developments. No other practical methods for cost effective recovery of the material have been identified at this time, given to the type of material and the known developments in the area.

Beach Nourishment/Recharge

Consideration of Rennie *et al.* (2017) shows that in the vicinity of the Port there are areas currently experiencing erosion (Cairnryan Old Pier (Site 88)). Detailed sediment mapping data for this location has not been found; however, the available evidence (including aerial photographs) suggests that the frontage comprises predominantly coarse-grained material. Importantly, this material differs in character from that in the area of the dredge licence application, with several of the grab samples containing a high proportion of muddy material. This material is not considered suitable for beach recharge. It is noted here that whilst some of the grab samples did contain coarse material (which may potentially be more suitable for recharge), this material was not identified in those areas of the Port which would be targeted by the maintenance dredging.

In addition, dredge arisings comprising gravel and larger material will fall from suspension once entering the dredge hopper and resuspension for pumping would not be possible. This means that to discharge this material ashore, a grab or conveyor would be required at a quay. The dredge material would then need to be transported to a beach location for discharge. This would require the quay to be out of use during the dredge campaigns causing significant disruption to the ferry service.

For dredge arisings comprising sand and mud, pumping ashore direct from the dredge location is not practical as the dredger would have to be connected to a pipe, either from a quay or a mooring point which would need to be maintained during discharge. This would mean that the navigation channel would not be accessible to the regular ferry service operating at the Port. If the dredger were to take material to a beach for recharge, a pipe would be required to run along the foreshore and be deployed and removed each time the replenishment was required. Intervention of this kind would significantly damage the existing beach and restrict recreational use beyond the area of replenishment. The infrastructure required for the deployment would also be significant and costly to implement.

Disposal

The above assessment has considered the options available for management of the maintenance dredged arisings from Loch Ryan Port. No beneficial use options have been identified and therefore the BPEO for the material is considered to be disposal. However, the context in which disposal is achieved has been further considered in the following sections.

Disposal ashore

The nature of the dredged material (a mixture of sand, silt and gravel) is unsuitable for sacrificial landfill without involving an extensive transport and treatment process. Disposal to landfill would involve a complicated material handling operation involving sea to land transfer, de-watering, loading to trucks and transport to site. In addition, there would need to be a change in dredger type, for example from a vessel designed for maintenance dredging to one designed for aggregate recovery or a change to a mechanical form of dredger, unless a settling lagoon could be constructed.

Each existing dredger load would produce *circa* 1,000 m³ of 'semi- wet' material after water has been 'weired-off' from the dredger or de-watered in a settling lagoon on land. This volume equates to *circa* 50-60 lorry loads of material produced at the quayside in a time of 1 – 2 hours to several hours depending on the method of de-watering the dredge arisings. This transport requirement is impractical and very costly as a significant fleet of lorries would be required to prevent significant delays in dredging operations.

Disposal at sea

The identified deposit ground MA010 (North Channel Scotland) is located 25 km away and is the nearest to the area where dredging will take place; thus, relocation in terms of distance is minimised. The main effects of the disposal are all short term and transient in nature. Continuing the current disposal practice will not change the current minimal impacts on other uses and users, marine habitats and ecology of the disposal area.

Summary

The BPEO assessment has not identified any immediate opportunities for the re-use of the dredge material. Without any suitable uses available at the present time, disposal in the marine environment at a licenced disposal ground is considered the BPEO. The optimum disposal location is determined through consideration of practical, environmental and economic parameters. The site has been selected to be as close as practical to the dredge site. This minimises transport time to each site and reduces the carbon footprint whilst minimising transportation cost. The disposal site is characterised for the material present at the proposed dredge location.

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Figure

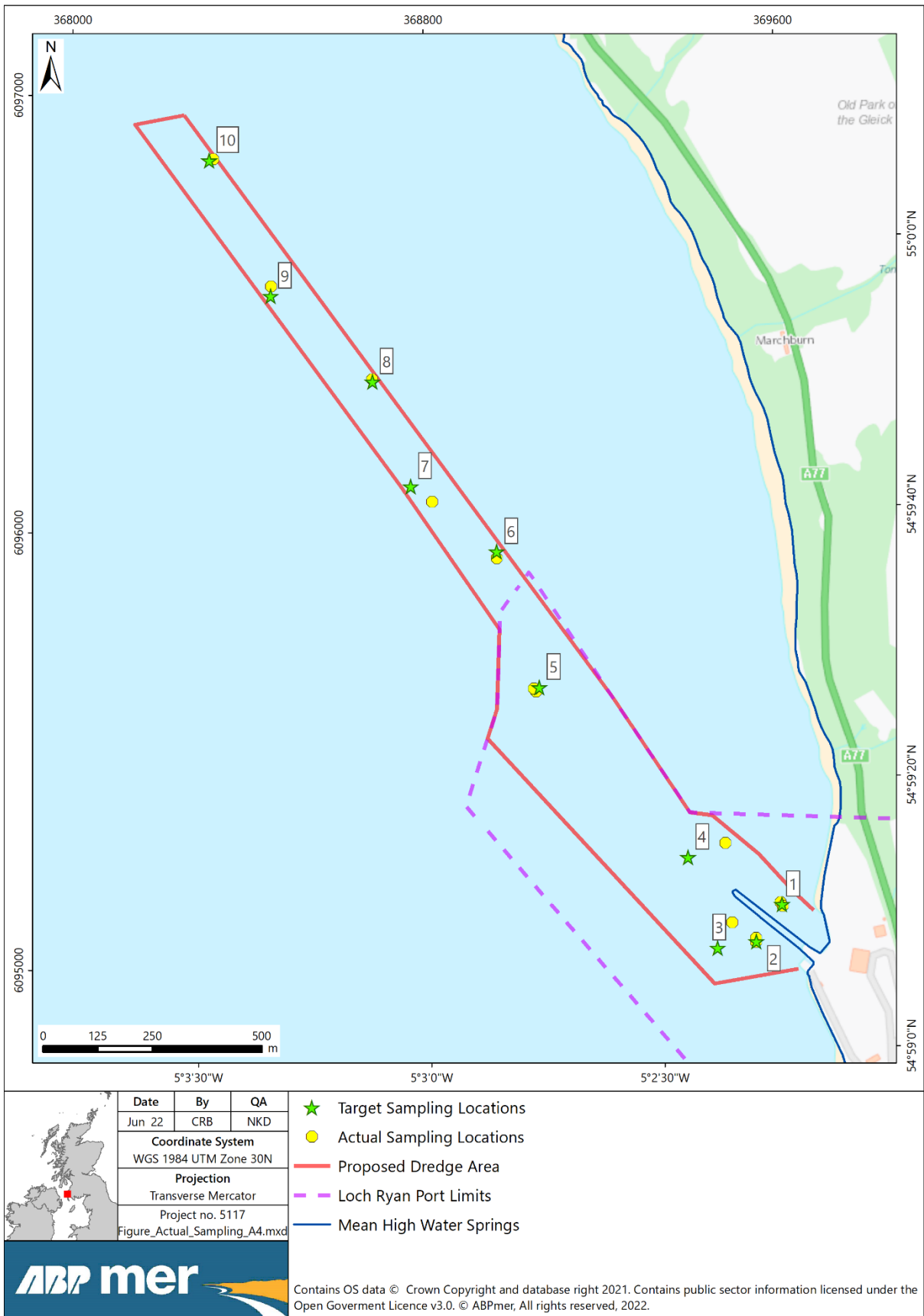


Figure 1. Sediment Sample Locations