



Shell Island Dredging

Shell Island Maintenance Dredging and Disposal Works - Habitats Regulations Assessment:
Screening and Appropriate Assessment

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Executive Summary

This document constitutes the Habitat Regulations Assessment (HRA) Stage 1 (Screening) and Stage 2 (Appropriate Assessment) of the European sites with the potential to be affected by proposed maintenance dredging works at Shell Island (Mochras), Lagoon Llanbedr, Gwynedd. Dredging and disposal for maintenance purposes at this site has been previously undertaken over the last 20 years, most recently in 2020. The dredging and disposal activities to be undertaken in 2026 will be the same as the licenced works undertaken in 2020 (Marine licence reference DML1961).

Project works are planned for November-December 2026, and will be localised and over a short period (2 weeks). Sandy material will be dredged at low tide from the subtidal area of the entrance channel to the main tidal basin with a 'Hymak' tracked excavator and three 25 tonne capacity trucks. The depth of sandy material removed by the dredge will be approximately 0.29 m, and will allow boats to attain floatation in the water at low tide. Sandy sediments will be deposited on Bar Newydd (the existing disposal site) at low tide.

The screening opinion obtained in 2013 stated that the works were not likely to cause significant environmental impacts. Subsequent HRAs, most recently for the works undertaken in 2020, similarly concluded no Likely Significant Effects (LSEs).

This Screening and Appropriate Assessment considers potential effect pathways between the works and the qualifying interest features of three European sites identified within the dredge and disposal sites' zone of influence. These designated sites are:

- Morfa Harlech a Morfa Dyffryn SAC (Special Area of Conservation),
- Pen Llyn a'r Sarnau (PLAS) SAC; and
- Gogledd Bae Ceredigion SPA (Special Protection Area).

Potential impact pathways identified included the following:

- physical damage to species or habitats from vehicular access;
- smothering from dredge material deposition (directly or carried in suspension);
- potential beneficial impact if supply enables construction of *Sabellaria* reefs;
- general disturbance to fauna from vehicles and plant working in the intertidal zone; and,
- release of contaminants affecting aquatic flora and fauna.

The screening considered that there was potential for LSE on the following features of the Pen Llyn a'r Sarnau SAC:

- the Large Shallow Inlets and Bays feature, extending into the mouth of the Afon Artro;
- Atlantic salt meadows (*Glaucopuccinellietalia maritima*) within the Afon Artro;
- Reefs (*Sabellaria*) to the north and south of the site;
- *Salicornia* and other annuals colonizing mud and sand within the Afon Artro;
- Otter;
- Grey seal; and,
- Bottlenose dolphin.

The Appropriate Assessment considered that, on account of aspects such as the sediment quality, localised shore-based activities in the dry, short duration, low level nature of the works, and the overall existing dynamic marine environment, there is no potential for effect on site integrity. There are also no other works expected to be carried out in the vicinity, therefore there would be no effects in combination with other projects.

1. Introduction

1.1 Project Background

This document constitutes the Habitats Regulations (HRA) Stage 1 (Screening) and Stage 2 (Appropriate Assessment) of the European sites with the potential to be affected by proposed maintenance dredging works at Shell Island (Mochras), Lagoon Llanbedr, Gwynedd. Dredging and disposal for maintenance purposes at this site has been previously undertaken over the last 20 years, most recently in 2020. Because the dredging works are every three years (approximately), new consents are obtained prior to each dredging and disposal operation, to ensure any new and environmentally sensitive issues are captured and to ensure as up to date information as possible is used as part of the consenting process.

The methods for dredging and disposal of dredged materials are summarised in this document and are given in detail in the Long Term Management Plan (Halcrow, 2006). These methods were previously agreed with Natural Resources Wales (NRW) through the consenting process in 2020, after a screening opinion request, acceptance of supporting documents (including relating to HRA), and the obtaining of a marine licence (DML1961).

The screening opinion obtained in 2013 stated that the works were not likely to cause significant environmental impacts. Subsequent HRAs, most recently for the works undertaken in 2020, similarly concluded no Likely Significant Effects (LSEs). The dredging and disposal activities to be undertaken in 2026 will be the same as the licenced works undertaken in 2020.

An Environmental Report has also been produced (Jacobs, 2026) which has informed this Screening and Appropriate Assessment. This document considers potential effect pathways between the works and the qualifying interest features of three European sites identified within the dredge and disposal sites' zone of influence. These designated sites are:

- Morfa Harlech a Morfa Dyffryn Special Area of Conservation (SAC),
- Pen Llyn a'r Sarnau (PLAS) SAC; and
- Gogledd Bae Ceredigion Special Protection Area (SPA).

The purpose of this Screening and Appropriate Assessment is to reassess and identify whether the dredging and disposal works would result in LSE, alone or in combination, on the qualifying interest features of the aforementioned European sites (Figure 1).

1.2 Dredging History and Requirements

Shell Island provides marina facilities for approximately 30 boats and is a significant source of input into the local tourist economy. Maintenance dredging is required at regular intervals to return the water levels to their original depths and allow craft to navigate safely. Dredging of sandy sediments will occur in the subtidal areas of the entrance channel. It is important to note that dredging of muddy materials within the tidal basin has occurred in the past (last occurrence in 2020). Disposal of dredged materials will follow the previously consented methodology of 2020 (DML1961) and materials will be carried along existing slipways and predetermined routes over the foreshore and deposited on Bar Newydd.

The materials to be dredged required analysis for particle size analysis (PSA) only as were previously found to be predominantly sand (with no contamination), and this was undertaken in April 2026 for the purposes of the marine licence application. The results confirmed that the sediments were predominantly sand.

The works lie within the Pen Llyn a'r Sarnau SAC, but previous dredging marine licence application correspondence with NRW has confirmed that there are no SAC intertidal features under the footprint of the dredge (Jacobs, 2019). As a result, the main potential for LSE is related to the disposal of sandy materials from

the dredging operation, with the zone of influence being Bar Newydd and the coastal waters within the tidal excursion (including within Shell Island Lagoon).

1.3 Background to Habitats Regulations Assessment

The Habitats and Birds Directives provide the European legal framework for the protection of wild fauna and flora and birds. Under EC Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive') and Council Directive 79/409/EEC on the conservation of wild birds (The Birds' Directive), a network of protected areas for certain habitats and species of conservation importance (those listed on Annexes I and II of the Directives) was established by EU member states; known as European sites.

This network of European sites, previously known as the 'Natura 2000 Network', comprises SPAs and SACs and form a national site network within the UK. SACs are designated under the 'Habitats Directive' for supporting habitats or species listed on Annex I or II of the Directive. SPAs are designated under the 'Birds Directive.'

Articles 6(3) and 6(4) of the Habitats Directive require an assessment to be undertaken for plans and projects that are likely to have a significant effect, alone or in-combination with other plans and projects, on European sites.

The Conservation of Habitats and Species Regulations 2017 (as amended) (the Habitats Regulations) transpose the Habitats Directive into UK law. Section 63(1) the Habitats Regulations requires that:

'A competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which—

- (a) is likely to have a significant effect on a European Site or a European offshore marine site (either alone or in-combination with other plans or projects), and
- (b) is not directly connected with or necessary to the management of that site,

must make an appropriate assessment of the implications of the plan or project for that site in view of that site's conservation objectives.'

These requirements underlie the decision-making tests for plans and projects likely to affect European sites that have been applied in this report.

The assessment of plans or projects that may affect European sites is generally acknowledged to follow a four-stage process

- Stage 1: Screening — the process which identifies the likely impacts upon a European site from a project or plan, either alone or in-combination with other projects or plans and considers whether these impacts are likely to be significant.
- Stage 2: Appropriate Assessment — the consideration of the impact on the integrity of the European site from the project or plan, either alone or in-combination with other projects or plans, with respect to the site's structure and function and its Conservation Objectives. Additionally, where there are adverse impacts, an assessment of the potential mitigation of those impacts is undertaken.
- Stage 3: Derogation
- Assessment of Alternative Solutions — the process which examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of the European site. All reasonable alternatives must have been considered and assessed, and the least damaging option selected, to progress to Stage 4.
- Imperative Reasons of Overriding Public Interest (IROPI)/Derogation – Assessment where no alternative solutions exist, and adverse impacts remain. Assessment of compensatory measures where, in the light of an

assessment of imperative reasons of overriding public interest (IROPI), it is deemed that the project or plan should proceed.

Natural Resources Wales, as the relevant Competent Authority, will undertake a Stage 1 Screening for the HRA of the project, as required under the Habitats Regulations.

1.4 European Sites

European Sites are defined in the Habitats Regulations as Sites of Community Importance (SCIs), SACs, candidate Special Areas of Conservation (cSACs) and SPAs. In UK planning policy (NPPF paragraph 118), the term 'European site' is also deemed to include possible SACs, potential SPAs and listed or proposed Ramsar wetland sites of international importance. This wider definition is applied in this report.

2. Stage 1: Screening

2.1 Dredging and disposal activities

Project works are planned for November-December 2026, and will be localised and over a short period (2 weeks). Sandy material will be dredged at low tide from the subtidal area of the entrance channel to the main tidal basin with a 'Hymak' tracked excavator and three 25 tonne capacity trucks. The depth of sandy material removed by the dredge will be approximately 0.29 m, and will allow boats to attain flotation in the water at low tide. Sandy sediments will be deposited on Bar Newydd (the disposal site) at low tide. This will involve the use of 3 tipper trucks being driven over existing slipways from the dredge area, to avoid unnecessary damage to intertidal habitats.

Each tipper truck will carry 25 tonnes of sandy material dredged from the subtidal part of the estuary, i.e. 75 tonnes will be deposited per trip from the estuary to the disposal site. The landowner estimates that 3 trips can be made per hour of work. With a working window of 2.5 hours per tide, this will result in 7 or 8 truck loads of sand being deposited on Bar Newydd per tide, i.e. 200 tonnes per tide or 400 tonnes per day. Assuming that each truck has a volume of 15 m³, and spreads this over an area of 75 m² (3 m x 25 m), eight truck loads would cover an area of 600 m² (0.06 ha) per tide, with a depth of 0.2 m. The total amount of sandy material to be deposited in this way is 4,000 tonnes, which is the same volume of sand consented for the previous dredging of the site in 2013. At 400 tonnes per day, this will involve 10 days of works.

2.2 European Sites and impact pathways

2.2.1 Impact pathways

European sites potentially affected by the Project works, their distance away from the works area and the potential impact pathways affecting them are outlined in Table 1, with a map of the sites in relation to the works shown in Figure 1. Those features for which there are potential pathways identified are then considered in the subsequent sections.

Impact pathways from the disposal methods would be as follows (no SAC features are present under the footprint of the dredge area):

- physical damage to species or habitats from vehicular access;
- smothering from dredge material deposition (directly or carried in suspension);
- general disturbance to fauna from vehicles and plant working in the intertidal zone; and,
- depositing sandy materials adding material to eroding habitats using the littoral drift system (potential beneficial).



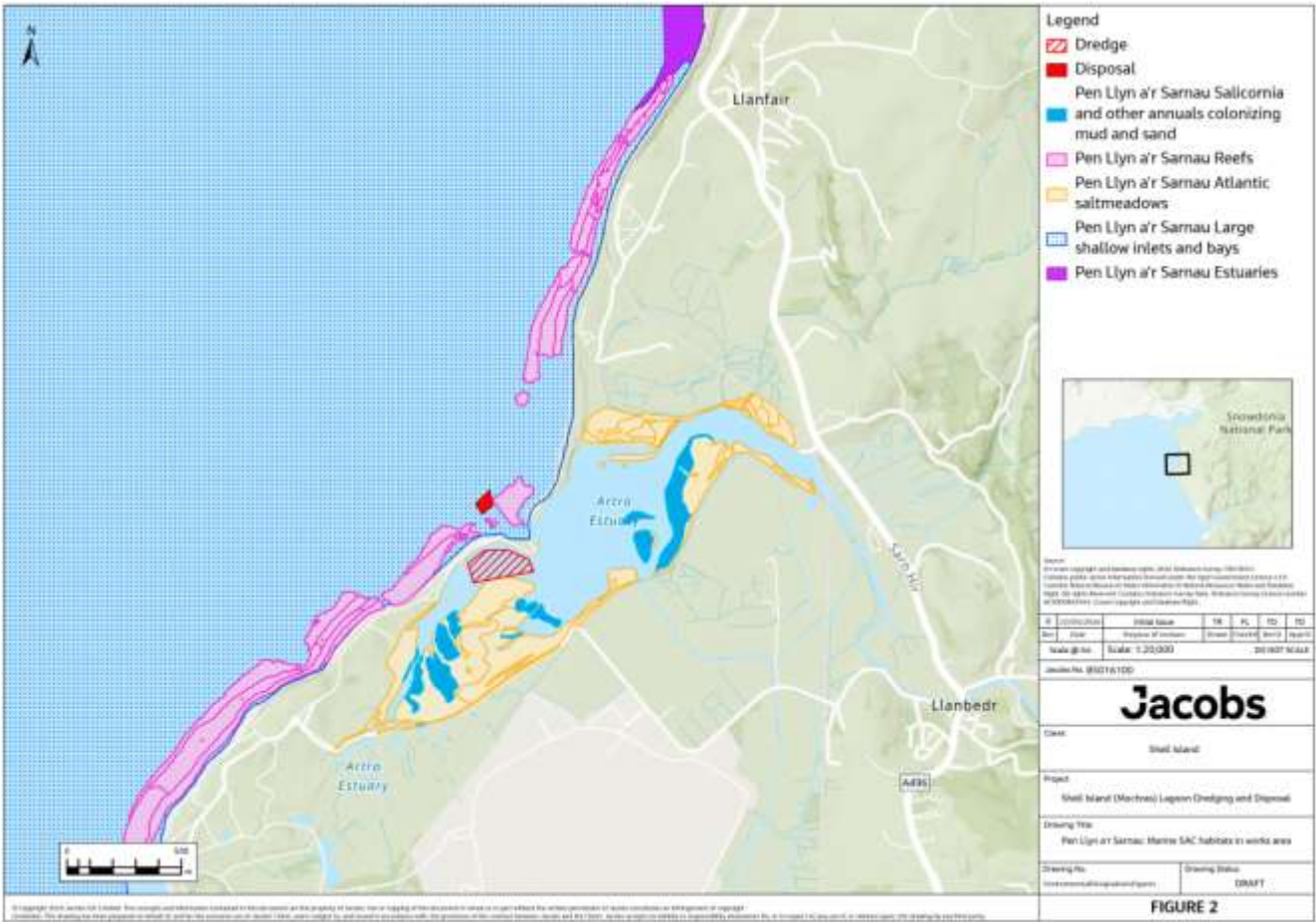


Figure 2 Pen Llyn a'r Sarnau: Marine SAC habitats in works area.

Table 1 European sites and impact pathways

Site	Designated features	Distance away	Potential Impact pathway
Morfa Harlech a Morfa Dyffryn SAC	Annex I habitats that are a primary reason for selection of this site:	400m	
	Embryonic shifting dunes Embryonic shifting dunes occur along narrow zones mainly in the Morfa Harlech part of the complex.		Potentially Beneficial: Depositing sandy materials on Bar Newydd to ensure transport into natural littoral drift system could add material to eroding dunes north of the dredge site using the littoral drift system responsible for formation of the SAC habitats.
	Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ("white dunes") The shifting dune habitat at this site are extensive where they occur, being particularly well-developed at Morfa Dyffryn.		Potentially Beneficial: Depositing sandy materials on Bar Newydd to ensure transport into natural littoral drift system could add material to eroding dunes north of the dredge site using the littoral drift system responsible for formation of the SAC habitats.
	Fixed coastal dunes with herbaceous vegetation ("grey dunes") * Priority feature Morfa Harlech a Morfa Dyffryn (Morfa Harlech and Morfa Dyffryn) is considered to be one of the best areas in the United Kingdom for fixed coastal dunes with herbaceous vegetation ("grey dunes").		Potentially Beneficial: Depositing sandy materials on Bar Newydd to ensure transport into natural littoral drift system could add material to eroding dunes north of the dredge site using the littoral drift system responsible for formation of the SAC habitats.
	Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>)		Potentially Beneficial: Depositing sandy materials on Bar Newydd to ensure transport into natural littoral drift system could add material to eroding dunes north of the dredge site using the littoral drift system responsible for formation of the SAC habitats.

Site	Designated features	Distance away	Potential Impact pathway
	Both Morfa Harlech and Morfa Dyffryn have comparatively large areas of this habitat present.		
	Humid dune slacks Examples of three different humid dune slack communities have been recorded within the complex.		Potentially Beneficial: Depositing sandy materials on Bar Newydd to ensure transport into natural littoral drift system could add material to eroding dunes north of the dredge site using the littoral drift system responsible for formation of the SAC habitats
	Annex II species that are a primary reason for selection of this site:		
	Petalwort (<i>Petalophyllum ralfsii</i>) <i>Petalophyllum ralfsii</i> is found in the dune slacks. It is most abundant in successional young dune slacks with high proportion of bare ground and a high water table. It has been recorded in dune slacks in the two dune systems at this site; it is most frequent at Morfa Dyffryn.		Potentially Beneficial: Depositing sandy materials on Bar Newydd to ensure transport into natural littoral drift system could add material to eroding dunes north of the dredge site using the littoral drift system responsible for formation of the dune system habitats.
Gogledd Bae Ceredigion SPA	The qualifying feature of the SPA is the nationally important nonbreeding population of red-throated diver (<i>Gavia stellata</i>).	100m	Individuals of this species have been recorded in the Artro Estuary in the last 5 years (5-yr average of 9 individuals ¹), therefore they are expected to be present in the waters off the works.

¹ <https://app.bto.org/webs-reporting/numbers.jsp?locid=LOC659021>

Site	Designated features	Distance away	Potential Impact pathway
			General disturbance to fauna from vehicles and plant working in the intertidal zone.
Pen Llyn a'r Sarnau SAC	Annex I habitats Sandbanks which are slightly covered by sea water all the time This is a dynamic habitat and includes the sandbanks of Devil's Ridge, Bastram Shoal, the Tripods, and areas within and to the south of Tremadog Bay.	0km	NA: This feature is not mapped in datamap.gov.wales as present in the vicinity of the dredging or disposal.
	Estuaries These include examples of bar-built estuaries in north-west Wales, with a sediment gradient from sand in the outer estuary to mud in the sheltered estuary. These along with fringing saltmarsh provide important habitats.		NA: This feature is approximately 2 km to the northeast of the disposal area.
	Coastal lagoons * Priority feature This habitat relates to Morfa Gwyllt lagoon across the mouth of the Afon Dysynni in mid Wales.		NA: This feature is not mapped in datamap.gov.wales as present in the vicinity of the dredging or disposal
	Large shallow inlets and bays Tremadog Bay is situated south of the Llyn Peninsula and contains of a mosaic of different		The works are within this feature: physical damage to species or habitats from vehicular access; and,

Site	Designated features	Distance away	Potential Impact pathway
	sediment and habitat types, and associated plant and animal communities.		smothering from dredge material deposition (directly or carried in suspension).
	Reefs This SAC contains a variety of reef habitats, including bedrock, boulders, cobbles, sandy rock, supporting diverse plant and animal communities. Reefs can be dominated by mussels e.g. <i>Modiolus modiolus</i> , ascidians, or the tube worm (<i>Sabellaria spinulosa</i>), for example.		The disposal works are adjacent to this feature (intertidal reefs) as mapped in datamap.gov.wales: - physical damage to species or habitats from vehicular access; - smothering from dredge material deposition (directly or carried in suspension); - release of contaminants affecting aquatic flora and fauna; and, - potential beneficial impact if supply enables construction of <i>Sabellaria</i> reefs.
	Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:		
	Mudflats and sandflats not covered by seawater at low tide		NA: This feature is not mapped in datamap.gov.wales as present in the vicinity of the dredging or disposal.
	Salicornia and other annuals colonizing mud and sand		The dredging works are within 150 m of this feature (<i>Salicornia</i>), present to the south west as mapped in datamap.gov.wales:

Site	Designated features	Distance away	Potential Impact pathway
			• Smothering from material disturbed by dredging resuspended on the following tide; • Smothering from dredge material deposition (directly or carried in suspension); and, • Release of contaminants affecting aquatic flora and fauna.
	Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>)		The dredging works are immediately adjacent to this feature (Atlantic salt meadows), present to the south west as mapped in datamap.gov.wales: • Smothering from material disturbed by dredging resuspended on the following tide; • Smothering from dredge material deposition (directly or carried in suspension); and, • Release of contaminants affecting aquatic flora and fauna.
	Submerged or partially submerged sea caves		NA: This feature is not mapped in datamap.gov.wales as present in the vicinity of the dredging or disposal.
	Annex II species present as a qualifying feature, but not a primary reason for site selection		

Site	Designated features	Distance away	Potential Impact pathway
	Otter (<i>Lutra lutra</i>)		It is considered that otter may be present along this area of coast: General disturbance to fauna from vehicles and plant working in the intertidal zone.
	Grey seal (<i>Halichoerus grypus</i>)		It is considered that grey seal may be present along this area of coast; the nearest breeding colony is approximately 50 km away to the west (works undertaken during the pupping season): - General disturbance to fauna from vehicles and plant working in the intertidal zone; and, - Release of contaminants affecting aquatic flora and fauna.
	Bottlenose dolphin (<i>Tursiops truncatus</i>)		It is considered that bottlenose dolphin may be present along this area of coast: Release of contaminants affecting aquatic flora and fauna.

2.3 Potential for Likely significant effects of dredging and disposal operations on Gogledd Bae Ceredigion SPA

To achieve favourable conservation status for red-throated diver, all the following, subject to natural processes, need to be fulfilled and maintained in the long-term (NRW, 2019):

- The size of the population should be stable or increasing, allowing for natural variability, and sustainable in the long term;
- The wintering population of red-throated diver should be stable or increasing, for a peak mean of 1,186 individuals (2000/01- 2003/04);
- There should be sufficient habitat, of sufficient quality, to support the population in the long term; and,
- The foraging habitat of this species should not decrease significantly, and its quality should remain unaffected by anthropogenic factors.

The Gogledd Bae Ceredigion SPA is adjacent to the dredge disposal site and will not be encroached upon by the proposed dredging operations. However, as the qualifying feature of the SPA is the red-throated diver, and as this species is highly mobile, they may forage close to the dredge disposal area and be subject to disturbance from dredging operations in the intertidal.

As all works will occur in the dry at low water, with low numbers of plant/vehicles there are no LSEs from the dredging operations on this feature.

2.4 Potential for Likely significant effects of dredging and disposal operations on Morfa Harlech a Morfa Dyffryn SAC

2.4.1 Embryonic shifting dunes

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied (CCW, 2008):

- The total extent of the embryonic shifting dunes including those areas that are considered unfavourable or currently degraded is maintained at the area present when designated.
- The strand line and embryonic dune vegetation should be made up of typical species listed in the table below.
- All factors affecting the achievement of these conditions are under control.

Depositing sandy materials on Bar Newydd to ensure transport into natural littoral drift system could add material to eroding dunes north of the dredge site using the littoral drift system responsible for formation of the habitat. Therefore, there is no LSE identified, and instead a beneficial effect.

2.4.2 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- The total extent of the shifting dunes including those areas that are considered unfavourable or currently degraded is maintained at the area present when designated, c.18.9 ha at Morfa Harlech which should be present both along the seaward dune ridge and inland within units described in CCW (2008)

and at least 82 ha of shifting dunes at Morfa Dyffryn which should be distributed throughout units described in CCW (2008).

- The shifting dunes should be vegetated by species such as those listed in CCW (2008).
- All factors affecting the achievement of these conditions are under control.

Depositing sandy materials on Bar Newydd to ensure transport into natural littoral drift system could add material to eroding dunes north of the dredge site using the littoral drift system responsible for formation of the habitat. Therefore, there is no LSE identified, and instead a beneficial effect.

2.4.3 Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*) and Humid dune slacks

The vision for these features is for them to be in a favourable conservation status, where all of the following conditions are satisfied:

- The total extent of the humid dune slacks and dunes with *Salix repens* including those areas that are considered unfavourable or currently degraded is maintained at the area present when designated, some 65.1 ha at Morfa Harlech and 43.6 ha at Morfa Dyffryn.
- All successional phases of dune slack vegetation should be present at Morfa Dyffryn.
- The humid dune slacks should be vegetated with typical and desirable species such as those outlined in the table below.
- The dune slack vegetation should be free from scrub and should have a relatively short sward.
- All factors affecting the achievement of these conditions are under control.

Depositing sandy materials on Bar Newydd to ensure transport into natural littoral drift system could add material to eroding dunes north of the dredge site using the littoral drift system responsible for formation of the habitats. Therefore, there is no LSE identified, and instead a beneficial effect on these habitats.

2.4.4 Fixed coastal dunes with herbaceous vegetation (grey dunes) * Priority feature

Although Morfa Harlech a Morfa Dyffryn is considered to be one of the best areas in the United Kingdom for grey dunes, this feature is not described in CCW (2008); however, the conservation objectives are considered likely to generally fall in line with those described in section 2.4.3 above.

Depositing sandy materials on Bar Newydd to ensure transport into natural littoral drift system could add material to eroding dunes north of the dredge site using the littoral drift system responsible for formation of the habitat. Therefore, there is no LSE identified, and instead a beneficial effect.

2.4.5 *Petalophyllum ralfsii*

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- The population of *Petalophyllum* will remain stable or increase.
- *Petalophyllum* should be present at Morfa Harlech and should be distributed across the northern part of Morfa Dyffryn sand dune system (see CCW (2008) for units).
- The successional young dune slacks that support the *Petalophyllum* should be in good condition as defined in the conservation objective for features in section 2.4.4 above.

- All factors affecting the achievement of these conditions are under control.

Depositing sandy materials on Bar Newydd to ensure transport into natural littoral drift system could add material to eroding dunes north of the dredge site using the littoral drift system responsible for formation of the dune slacks habitat supporting this species (and this species has been recorded in Morfa Harlech²). Therefore there is no LSE identified, and instead a beneficial effect on *Petalophyllum*.

2.5 Potential for Likely significant effects of dredging and disposal operations on Pen Llyn a'r Sarnau SAC

Considering the SAC features presented in Table 1, those that could be subject to LSE from the project are:

- the Large Shallow Inlets and Bays feature, extending into the mouth of the Afon Artro;
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) within the Afon Artro;
- Reefs (*Sabellaria*) to the north and south of the site;
- *Salicornia* and other annuals colonizing mud and sand within the Afon Artro;
- Otter;
- Grey seal; and,
- Bottlenose dolphin.

² <https://sac.jncc.gov.uk/site/UK0030049>

3. Stage 2: Appropriate Assessment

This section of the report provides information for the competent authority to undertake a Stage 2 of the HRA process (called the integrity test in the updated HRA Guidance). This considers whether LSE identified at Stage 1 (screening), will adversely affect the integrity of the sites in relation to their Conservation Objectives. Tyldesley and Chapman (2013) define the integrity test as “the coherence of its ecological structure and function, across its whole area, which enables it to sustain habitat, complex of habitats and/or the levels of populations of the species for which the site is (or will be) designated”

No account is taken of preventative measures where the expected benefits of the measures are not certain at the time of this assessment.

Following on from Section 2 and potential for LSE, the below sections relate to the features of Pen Llyn a'r Sarnau SAC.

3.1 Large Shallow Inlets and Bays feature Conservation Objectives and Potential Impacts

Conservation objectives (NRW, 2018) for Large Shallow Inlets and Bays include:

- The overall distribution and extent of the habitat features within the site, and each of their main component parts is stable or increasing.
- The physical biological and chemical structure and functions necessary for the long-term maintenance and quality of the habitat are not degraded. Particularly the geology, sedimentology, geomorphology, hydrography and meteorology, water and sediment chemistry and biological interactions. Contaminant levels in the water column and sediments derived from human activity to be at or below existing statutory guideline concentrations (amongst others).
- The presence, abundance, condition and diversity of typical species is such that habitat quality is not degraded. This includes: species richness, population structure and dynamics, physiological health, reproductive capacity recruitment and mobility range.

The disposal method means that the sandy materials will be deposited at low tide in such a way that they will be quickly resuspended by natural wave action and littoral drift. This will have the benefit of adding to the supply of suspended materials that maintain the sand dunes further north. Existing slipways will be used to transport materials therefore there will be no risk of vehicular damage.

As the works are proposed to occur at low tide, the pathway identified was for material to smother intertidal habitats, including the Large Shallow Inlets and Bays feature. The source-pathway would be the deposition of 200 tonnes of sand per tide on the exposed shore at low tide. However, this material will not remain deposited for more than a few hours, before being carried into suspension by the rising tide. The entire coast is subject to deposition of volumes of sand that have (1) been sufficient to establish and maintain extensive *Sabellaria* reefs (discussed further in 3.1.1) and (2) been sufficient to regularly cover historical piddock communities. Furthermore, the coast is exposed to west/southwest wave action that varies strongly in intensity with the seasons, thereby resulting in wide natural variations in the amounts of sandy material that are suspended and deposited on the Large Shallow Inlets and Bays feature at any given time or tide.

The temporary addition of 200 tonnes of sand per tide is therefore unlikely to have any observable effect on the Large Shallow Inlets and Bays feature relative to the natural variation in deposition of sandy materials along the entire coast. Further, this sand will temporarily cover 600 m² or 0.06 ha of the SAC, which is 0.00004% of the SAC's total area of 146,023.48 ha. Thus, With the design of the dredging works and timings of the operations, there would be no adverse effect on site integrity from sand deposition at Bar Newydd on the Large Shallow Inlets and Bays feature.

3.1.1 Reef Feature Conservation Objectives and Potential Impacts

Conservation objectives for *Sabellaria* reefs include:

- That the overall distribution and extent of the habitat features within the site, and each of their main component parts is stable or increasing. The physical biological and chemical structure and functions necessary for the long-term maintenance and quality of the habitat are not degraded. Particularly the geology, sedimentology, geomorphology, hydrography and meteorology, water and sediment chemistry and biological interactions.
- That the presence, abundance, condition and diversity of typical species is such that habitat quality is not degraded. This includes: species richness, population structure and dynamics, physiological health, reproductive capacity recruitment and mobility range.

The fate of extra sediment in the system following disposal of materials is also explored here, by calculating the amounts of material that will be deposited during each tide and using existing knowledge of flow routes along the coast to predict the fate of deposited materials at high tide. This will provide information on the impact of sand deposition on *Sabellaria* relative to background movement of materials on site. It will also allow for some prediction of potential beneficial effects of reintroduction of sandy materials to the drift system on *Sabellaria* reefs and dunes north of the site, at Llandanwg Beach.

Impacts that may hinder the conservation objectives for the reef feature described above would include be smothering from deposition of dredge sediments. The *Sabellaria* was therefore photographed during a walkover of the site prior to the previous works, to allow for assessment of potential impacts of sand deposition to these reefs. The deposition site is positioned at the end of a sand bar in the intertidal zone, not in any *Sabellaria* reef zones.

As with the Large Shallow Inlets and Bays feature, information on *Sabellaria* was used to determine whether there was a pathway for the access route to significantly affect reef habitats by physical damage from vehicular movements. This vehicular access route determined at the design stage was the most direct out to the sand bar forming Bar Newydd and does not cross any *Sabellaria* reef habitat, being an established corridor across sand as evidenced in Plate 1 and mapped in Figure 2.



Plate 1 Vehicular access route through the sand (centre of photograph) to the disposal site.

Sabellaria reefs occur immediately south of the estuary and within the estuary channel adjacent to Bar Newydd, and to the north of the estuary at Llandanwg Beach. The northern reefs are approximately 400 m away from Bar Newydd, which is the site for disposal of sandy materials from dredging. The reefs are supplied by sand from wave action that is predominantly from the west and southwest, and by the northerly littoral drift system that carries sand in suspension towards Llandanwg Beach and its dunes. *Sabellaria* require an adequate supply of sand in suspension to build their honeycomb reefs (Jackson, 2008; ABP Research, 2001). Thus, the wave action and drift system are essential for transporting sand in suspension to maintain the reef features. The existence of extensive living and historical reefs on Llandanwg Beach and adjacent to Bar Newydd suggests that sandy sediment transported by wave and littoral drift action has been an essential characteristic of the coast for a considerable period of time.

The coast at Bar Newydd and north of the estuary at Llandanwg Beach is exposed to winter wave heights that exceed 1 m for almost 50% of the time. Locally generated waves have 5-10 second periods, with swell waves having periods of 10-12 seconds. The intensity of wave action and the exposed nature of the coast means that materials deposited at Bar Newydd will quickly be carried into suspension when the tide comes in. Given that the working window between tides is 2.5 hours, the sandy materials deposited at the disposal sites will not remain on the Large Shallow Inlets and Bays feature for more than a few hours before being carried away. In summer, wave heights of over 1 m occur less than 25% of the time. This seasonality of wave action and the input of freshwater from the Afon Artro estuary makes for a highly dynamic system and therefore large variations in the suspended sediment levels that naturally occur in the system (ABP Research, 2001; refers to data from Cyngor Gwynedd *et al.*, 1998). Thus, there is a large amount of natural variation in sediment supply to *Sabellaria* reefs, and the exposure of the coast to intense and very variable wave action also contributes to the large amounts of sand that cover the historical piddock community, as described in a previous Appropriate Assessment (Halcrow, 2005).

As the direction of wave action along the coast is from the west and southwest, materials deposited at low tide will be carried northwards. If materials are placed on Bar Newydd, they can potentially be carried towards Llandanwg Beach with its *Sabellaria* and sand dunes. This can add to the supply of materials in the natural littoral drift system, thereby potentially helping to maintain the northern *Sabellaria* reefs and augmenting the natural supply of materials to the dunes at Llandanwg.

Given the amounts of sand that will be deposited on Bar Newydd beach (see Section 1.2), and the time for which they will remain deposited before being suspended by incoming tides, it is unlikely that *Sabellaria* reefs adjacent to the disposal sites will be affected by sand deposition. The predetermined access route (out to the sandbar and northeast along to the deposition area) does not cross the reef feature; therefore, there will be no damage to reef features. As the sand will not be deposited on the *Sabellaria* reefs directly, and that it will then be carried northwards by west/southwest wave action and littoral drift, it is predicted that potential smothering impacts of sand deposition on *Sabellaria* reefs will be negligible. Whilst some sandy material may re-enter the estuary mouth from Bar Newydd as the tide rises, this re-entry is also likely to be negligible compared to the materials that may naturally enter the estuary from offshore sources (ABP Research, 2001).

With the predetermined transport route, there will be no adverse effect on site integrity for the *Sabellaria* reefs adjacent to Bar Newydd. Furthermore, the deposition area at the outermost limit of the sand bar of Bar Newydd will mean that there would be no adverse effect on site integrity as no materials will be directly placed on top of the reefs, as this would smother the organisms. As materials will be deposited in such a way that they will be quickly resuspended by natural coastal processes, this can add to the supply of suspended sand that *Sabellaria* require to build their honeycomb reefs, thereby potentially helping to maintain the extent of this SAC feature and its associated communities.

3.1.2 Atlantic salt meadows

Conservation objectives (NRW, 2018) for Atlantic salt meadows include:

- The overall distribution and extent of the habitat within the site is stable or increasing.
- The physical biological and chemical structure and functions necessary for the long-term maintenance and quality of the habitat are not degraded. Particularly the geology, sedimentology, geomorphology, hydrography and meteorology, water and sediment chemistry and biological interactions.
- The presence, abundance, condition and diversity of typical species is such that habitat quality is not degraded. This includes: species richness, population structure and dynamics, physiological health, reproductive capacity recruitment and mobility range.

No direct pathways for effect have been identified for Atlantic salt meadows from deposition activities as the routes of transport between dredge and disposal sites are over existing roads and slipways. The only pathway possible would be if sandy material transported in suspension could initially be deposited on Atlantic salt meadow habitats, smothering plants and altering the sediment composition (or introducing contaminants).

Given the amounts of sand that will be deposited on Bar Newydd beach (see Section 1.2) or disturbed during dredging (minimal), before being suspended by incoming tides, it is unlikely that Atlantic salt meadows within the estuary will be affected by sand deposition. The direction of wave action along the coast is from the west and southwest, therefore material deposited at Bar Newydd at low tide will be carried northwards. Furthermore, sediments have been tested demonstrating no contamination and therefore will not increase contaminant burden. Therefore, there is no potential for an adverse effect on site integrity on Atlantic salt meadows.

3.1.3 *Salicornia* and other annuals colonizing mud and sand

Conservation objectives (NRW, 2018) for *Salicornia* and other annuals colonizing mud and sand include:

- The overall distribution and extent of the habitat within the site is stable or increasing.

- The physical biological and chemical structure and functions necessary for the long-term maintenance and quality of the habitat are not degraded. Particularly the geology, sedimentology, geomorphology, hydrography and meteorology, water and sediment chemistry and biological interactions.
- The presence, abundance, condition and diversity of typical species is such that habitat quality is not degraded. This includes: species richness, population structure and dynamics, physiological health, reproductive capacity recruitment and mobility range.

No direct pathways for effect have been identified for *Salicornia* and other annuals colonizing mud and sand from deposition activities as the routes of transport between dredge and disposal sites are over existing roads and slipways. The only pathway possible would be if sandy material transported in suspension could initially be deposited on *Salicornia* habitats, smothering plants and altering the sediment composition (or introducing contaminants).

Given the amounts of sand that will be deposited on Bar Newydd beach (see Section 1.2) or disturbed during dredging (minimal), before being suspended by incoming tides, it is unlikely that *Salicornia* habitats within the estuary will be affected by sand deposition. The direction of wave action along the coast is from the west and southwest, therefore material deposited at Bar Newydd at low tide will be carried northwards. Furthermore, sediments have been tested demonstrating no contamination and therefore will not increase contaminant burden. Therefore, there is no potential for adverse effect on site integrity for *Salicornia* and other annuals colonizing mud and sand.

3.1.4 Grey seal

The Conservation objectives (NRW, 2018) for grey seal are summarised as follows:

- The population is maintaining itself on a long-term basis as a viable component of its natural habitat. Important elements include: population size, structure, production and condition of the species within the site. As part of this objective, it should be noted that contaminant burdens derived from human activity are below levels that may cause physiological damage, or immune or reproductive suppression.
- Populations should not be reduced as a consequence of human activity. The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future. Their range within the SAC and adjacent inter-connected areas is not constrained or hindered. There are appropriate and sufficient food resources within the SAC and beyond.
- The sites and amount of supporting habitat used by this species are accessible and their extent and quality is stable or increasing.
- The presence, abundance, condition and diversity of habitats and species required to support this species is such that the distribution, abundance and populations dynamics of the species within the site and population beyond the site is stable or increasing.

Activities relating to the works are not within/adjacent to haul out sites for grey seal, e.g. as identified by Westcott and Stringell (2004). Works are temporary and localised in nature on the intertidal only so will not disturb foraging individuals/supporting habitat or affect the population or range of grey seal. Sediments have been tested demonstrating no contamination and therefore will not increase contaminant burden. Taking this into account there is no adverse effect on site integrity for grey seal.

3.1.5 Otter

The Conservation objectives (NRW, 2018) for otter are summarised as follows:

- The population is maintaining itself on a long-term basis as a viable component of its natural habitat. Important elements include: population size, structure, production and condition of the species within the site.

- The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future.
- The presence, abundance, condition and diversity of habitats and species required to support this species is such that the distribution, abundance and populations dynamics of the species within the site and population beyond the site is stable or increasing.
- The sites and amount of supporting habitat used by this species are accessible and their extent and quality is stable or increasing. There are sufficient sources within the SAC and beyond of high quality freshwater for drinking and bathing.

Activities relating to the works are temporary (10 days) and localised in nature with slow moving vehicles on the intertidal, therefore any foraging individuals will be able to avoid working zone. There would be no effect on individuals/populations within the site, nor the range of individual otter. Supporting habitats and freshwater sources are similarly not expected to be affected by the limited extent of the works. Taking this into account there is no adverse effect on site integrity for otter.

3.1.6 Bottlenose dolphin

The Conservation objectives (NRW, 2018) for bottlenose dolphin are summarised as follows:

- The population is maintaining itself on a long-term basis as a viable component of its natural habitat. Important elements include: population size, structure, production and condition of the species within the site. As part of this objective, it should be noted that contaminant burdens derived from human activity are below levels that may cause physiological damage, or immune or reproductive suppression.
- The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future. Their range within the SAC and adjacent inter-connected areas is not constrained or hindered. There are appropriate and sufficient food resources within the SAC and beyond.
- The sites and amount of supporting habitat used by this species are accessible and their extent and quality is stable or increasing.
- The presence, abundance, condition and diversity of habitats and species required to support this species is such that the distribution, abundance and populations dynamics of the species within the site and population beyond the site is stable or increasing.

Activities relating to the works are temporary and localised in nature on the intertidal only (i.e., not in the water column) so will not disturb foraging individuals/reduce supporting habitat/prey species or affect the population or range of bottlenose dolphin. Sediments have been tested demonstration no contamination and therefore will not increase contaminant burden in the marine environment. Taking this into account there is no adverse effect on site integrity for bottlenose dolphin.

4. Summary, mitigation and potential benefits

This section summarises the Stage 1 and 2 LSEs, any mitigation and potential benefits.

4.1 Gogledd Bae Ceredigion SPA

Although the red-throated diver is a highly mobile species and may forage close to the dredge disposal area, as all works will be short in duration, localised and occur in the dry at low water, there would be no LSE from the dredging operations on this feature. Therefore, no mitigation is proposed.

4.2 Pen Llyn a'r Sarnau SAC

4.2.1 Large Shallow Inlets and Bays feature

With the design of the dredging works and timings of the operations, no mitigation is required for the Large Shallow Inlets and Bays feature as there are no adverse effect on site integrity identified. The disposal method means that the sandy materials will be deposited at low tide in such a way that they will be quickly resuspended by natural wave action and littoral drift. This will have the benefit of adding to the supply of suspended materials that maintain the sand dunes further north. Existing slipways will be used to transport materials therefore there will be no adverse effect on site integrity from vehicular damage.

4.2.2 *Sabellaria* reefs

With the predetermined transport route, there will be no adverse effect on site integrity for the *Sabellaria* reefs adjacent to Bar Newydd. Furthermore, the deposition area at the outermost limit of the sand bar of Bar Newydd will mean that there would be no adverse effect on site integrity as no materials will be directly placed on top of the reefs, as this would smother the organisms. As materials will be deposited in such a way that they will be quickly resuspended by natural coastal processes, this can add to the supply of suspended sand that *Sabellaria* require to build their honeycomb reefs, thereby potentially helping to maintain the extent of this SAC feature and its associated communities.

4.2.3 Atlantic salt meadows

With the design of the dredging works and timings of the operations, no mitigation is required for the Atlantic salt meadow feature as there is no adverse effect on site integrity identified; transportation of suspended material is likely to be northwards rather than towards the salt meadows within the estuary and any disturbed from dredging will be minimal.

4.2.4 *Salicornia* and Other annuals colonising mud and sand

With the design of the dredging works and timings of the operations, no mitigation is required for the Atlantic salt meadow feature as there is no adverse effect on site integrity identified; transportation of suspended material is likely to be northwards rather than towards the salt meadows within the estuary and any disturbed from dredging will be minimal.

4.2.5 Grey seal

Activities relating to the works are not within/adjacent to haul out sites for grey seal and are localised/temporary in nature on the intertidal only so will not disturb foraging individuals or their habitat and nor release contamination therefore there is no adverse effect on site integrity for grey seal and no mitigation required.

4.2.6 Otter

Activities relating to the works are temporary and localised in nature and any foraging individuals will be able to avoid the working zone. There would be no effect on individuals or supporting habitats. Taking this into account there is no adverse effect on site integrity for otter and no mitigation required.

4.2.7 Bottlenose dolphin

Activities relating to the works are temporary and localised in nature on the exposed intertidal zone only (i.e., not in the water column) so will not disturb foraging individuals or reduce supporting habitat. There will not be an increase in contaminant burden in the marine environment. Taking this into account there is no adverse effect on site integrity for bottlenose dolphin and no mitigation required.

4.3 Morfa Harlech a Morfa Dryffyn SAC

For all features, depositing sandy materials on Bar Newydd would allow transport into the natural littoral drift system, adding material to eroding dunes north of the dredge site using the littoral drift system responsible for formation of the habitats which also support the species features. Therefore, there is no LSE identified, and instead a beneficial effect on the following:

- Embryonic shifting dunes
- Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)
- Dunes with *Salix repens* ssp. *argentea* (*Salicornia arenariae*) and Humid dune slacks
- Fixed coastal dunes with herbaceous vegetation ("grey dunes") * Priority feature
- *Petalophyllum ralfsii*.

5. In combination and residual effects

There are no current or planned works (June 2026) in the Artro estuary or adjacent coastline that would occur at the same time as the proposed dredging and deposition works. As the works are short term and temporary, there is no potential for LSEs and no adverse effect on site integrity, either alone or in combination with other works.

6. Conclusions

This report provides information for the relevant Competent Authority, to undertake the first two stages of a Habitats Regulations Assessment required under the Habitats Regulations with respect to projects with the potential to effect European sites.

A Stage 1 (Screening) study considered how the maintenance dredge and disposal of material at Bar Newydd might affect three European sites in the vicinity of the project. This Screening study concluded that Likely Significant Effects could not be discounted with respect to one European site: Pen Llyn a'r Sarnau SAC.

The potential disturbance from dredging of sand from the harbour, and disposal at low water onto the coast had the potential to affect four Annex I habitats and three Annex II features. This pathway was advanced to Stage 2, Appropriate Assessment for more detailed consideration.

At Stage 2 (Appropriate Assessment), further information was collated to examine the potential for changes in the baseline conditions as a result of the project with reference to the conservation objectives for each site. As a periodic maintenance exercise, undertaken over a very short time period and using previously approved methods no additional mitigation was identified at Stage 2. Based on the dynamic nature of the estuary and adjacent coastal area resulting in tide washed shorelines with high sediment dispersal, it is considered that there would be no adverse effects on the integrity on the Pen Llyn a'r Sarnau European sites. Effects from maintenance dredge and disposal will not affect "the coherence of the sites ecological structure and function, across its whole area, which enables it to sustain the habitats, complex of habitat and/or levels of populations for which it was classified" (Tyldesley and Chapman, 2013).

A review of other plans and projects that could contribute to effects, did not identify any developments that could result in an in-combination effect.

In conclusion, based on the evidence and scientific information provided, it is considered that there would be no adverse effects on the integrity of any European designated sites from the proposed maintenance dredge or near shore disposal.

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