Water Framework Directive (WFD) Detailed Compliance Assessment

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Shell Island 2026

Shell Island Maintenance Dredge
29 May 2026

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Important note

This Water Framework Directive detailed compliance assessment has been prepared for the Shell Island Maintenance Dredging.

Baseline data in the report were derived from the Environment Agency's catchment data explorer website (https://environment.data.gov.uk/catchment-planning). This is presumed accurate in preparing the report.

If any of the proposed works change then this will require the report to be re-evaluated.

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1. Introduction

1.1 Overview

This Water Framework Directive Assessment (WFD) provides an evaluation of compliance with the requirements of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (WFD Regulations) for the Shell Island Maintenance Dredging (hereafter referred to as 'the Proposed Scheme). This is being undertaken by Jacobs on behalf of Richard Workman of Shell Island.

1.2 Legislative Context

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 transpose the EU Water Framework Directive (2000/60/EC) into domestic law. The overarching aim of the WFD is to prevent deterioration and to protect, enhance, and restore the status of all surface waters (including rivers, lakes, transitional and coastal waters) and groundwater bodies.

The key objectives include:

- Preventing deterioration in the status of all water bodies.
- Achieving Good Ecological Status (GES) and Good Chemical Status or Good Ecological Potential (GEP) for Heavily Modified Water Bodies (HMWBs) and Artificial Water Bodies (AWBs).
- Reducing pollution from priority substances and phasing out priority hazardous substances.
- Promoting sustainable water use, including the protection of groundwater quantity and surface water flows.
- Supporting the achievement of objectives for protected areas.

These objectives are defined in Article 4 of the WFD and transposed into Regulation 13 of the WFD Regulations.

All proposed developments must demonstrate compliance with these objectives, including the incorporation of mitigation measures and, where necessary, justification for any reliance on WFD derogations.

The requirements of the WFD are separate from, but complementary to, those of the Conservation of Habitats and Species Regulations 2017 (as amended). Where relevant, potential effects on European sites are considered through a separate Habitats Regulations Assessment (HRA).

1.3 Purpose and Scope of this Report

1.3.1 Outline of the Scheme

Shell Island Lagoon is near the inner estuary entrance of the Afon Artro. The works involve maintenance dredging at Shell Island (Mochras), Llanbedr, Gwynedd, and disposal of the dredging arisings.

Dredging of sandy material will be undertaken over an area of approximately 0.04 km^2 within the Artro Estuary. Material will be disposed of within the red polygon shown in Figure 1**Error! Reference source not found.** (52° 49.6424N, 4° 7.8893W; 52° 49.6212N, 4° 7.9310W; 52° 49.6450N, 4° 7.9589W; 52° 49.6794N, 4° 7.9036W).

A location plan of Shell Island is shown in Figure 1.

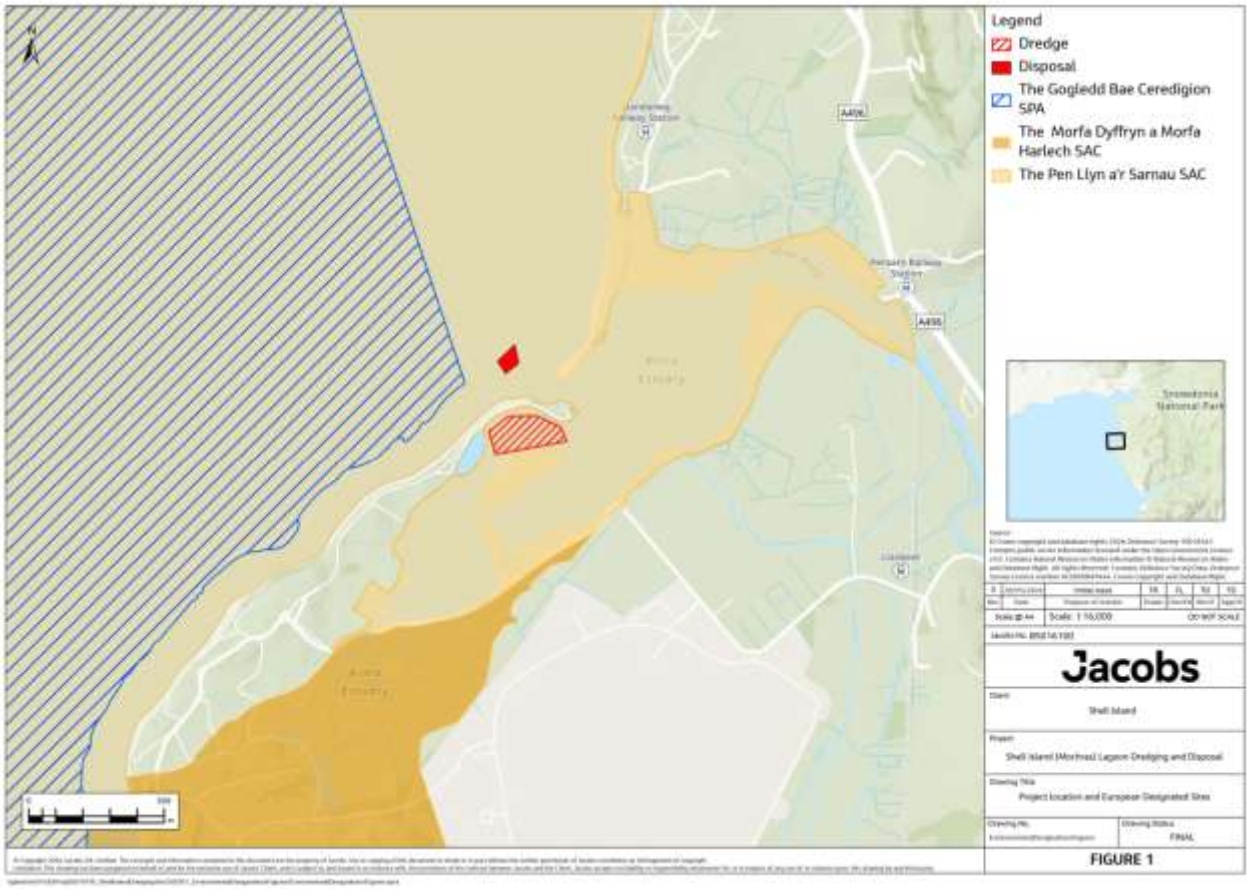

Figure 1 Proposed scheme overview

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. 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 (marine licence: DML1961) and materials will be carried along existing slipways and predetermined routes over the foreshore and deposited on Bar Newydd.

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[1]. 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).

Paragraph 6.10b of the OSPAR guidelines state that material may be exempt from sediment chemistry testing if it is composed almost exclusively of sand. Exemptions granted under 6.10b should be supported by particle size data. The materials to be dredged in 2026 required particle size analysis (PSA) only as were previously found to be predominantly sand, and this was undertaken in April 2026 for the purposes of the marine licence

[1] Halcrow (2006). Long term management plan for dredge and disposal operations at Shell Island: Llandanwg beach. Halcrow Report. 12 pp

application. The results confirmed that the sediments were predominantly sand and NRW agreed no sediment chemistry was required.

Project works are planned for November-December 2026, and will be localised and over a short period (2 weeks).

1.3.2 Scope of the Report

A WFD compliance assessment is required where a proposed scheme has the potential to affect a WFD-designated water body. This assessment evaluates whether the Proposed Scheme complies with the WFD environmental objectives outlined in Section 1.2.

The assessment will:

- Identify surface water and groundwater bodies potentially affected by the Proposed Scheme.
- Assess impacts on relevant water body quality elements including biological, physico-chemical, and hydromorphological elements for surface waters, and chemical and quantitative status for groundwater.
- Identify mitigation measures to avoid or reduce adverse effects.
- Determine whether any reliance on WFD derogations (Regulation 19) is required.

Compliance with the WFD is assessed against the following tests:

- No deterioration in the status of any surface water or groundwater body.
- No adverse effects on water bodies at High Status.
- No prevention of the achievement of Good Ecological Status, Good Ecological Potential, or Good Groundwater Status.
- No permanent compromise of the ability of other water bodies to meet their environmental objectives.
- No failure to support the reduction of pollution from priority substances or the phasing out of priority hazardous substances.

2. Methodology

2.1 Approach to Assessment

In order to assess compliance with the WFD objectives outlined in Section 1, a structured approach has been applied.

The NRW website cycle 2 rivers and water bodies[2] was used to obtain baseline data for each water body potentially affected by the Proposed Scheme. It includes their identification (ID) numbers, designation and classification details. This has been supplemented by groundwater risk and status datasets and other relevant information.

The assessment comprises:

- Baseline characterisation of relevant water bodies;
- Identification of receptors and elements potentially at risk; and
- Assessment of potential impacts and identification of mitigation measures.

Where relevant, the findings of the WFD assessment are considered alongside the Habitats Regulations Assessment to ensure a consistent understanding of potential effects on designated European sites.

2.2 Assessment Stages

The assessment follows a structured process to demonstrate compliance with the WFD Regulations:

- **Baseline Data collection:** Identification of relevant water bodies potentially influenced by the Proposed Scheme.
- **Screening:** Identification and exclusion of activities with negligible or low risk of impact.
- **Scoping:** Identification of water body receptors and quality elements requiring further assessment.
- **Impact Assessment:** Evaluation of potential impacts, identification of mitigation measures, and consideration of whether the Proposed Scheme could cause deterioration or prevent the achievement of Good Ecological Status (GES), Good Ecological Potential (GEP), or Good Groundwater Status.
- **Test of compliance:** Determination of whether the Proposed Scheme meets WFD objectives, including consideration of any requirement for derogation.

[2] https://nrw.maps.arcgis.com/apps/webappviewer/index.html?id=4ef6ea25c5984c939636714dbfce25f3

3. Baseline Data Collection

The Proposed Scheme is located within the Western Wales River Basin District, which is managed by the Western Wales River Basin Management Plan[3].

The NRW website cycle 2 rivers and water bodies[4] was used to identify and characterise water bodies within the Study Area, including their current classification status. This has been supplemented by a review of other data (where relevant) relating to groundwater risk and status.

The following water bodies have been assessed:

- Tremadog Bay (GB651009350000) – See Table 3-1 and Figure 2
- Cardigan Bay North (GB621009600000) – See Table 3-2 and Figure 2
- Artro Estuary (GGB521006407200) – See Table 3-3 and Figure 2

Table 3-1 Baseline data for Tremadog Bay.

Water body ID	GB651009350000
Water body Name	Tremadog Bay
Water body Type	Coastal
NGR	SH 530 350
Catchment Length (km)	N/A
Catchment Area (km^2)	239.42
Hydromorphology Designation	Not Designated A/HMWB
Ecological Objective	Good Ecological Status by 2027
Reasons for not achieving Good status	No failures recorded in 2019 cycle (coastal waterbody generally meets objectives)
Ecological status (2019)	Good
Biological quality elements (2019)	Good (benthic invertebrates)
Physico-chemical quality elements (2019)	High / Good (dissolved oxygen, nutrients, temperature, salinity)
Hydromorphological Supporting Elements (2019)	Supports Good (no significant morphological pressures)
Chemical status (2019)	Good
Protected Areas (2019)	Morfa Harlech a Morfa Dyffryn SAC

Table 3-2 Baseline data for Cardigan Bay North.

Water body ID	GB621009600000
Water body Name	Cardigan Bay North

[3] **Natural Resources Wales (2022)** ***Western Wales River Basin Management Plan 2021–2027: Summary*****. Available at:** https://cdn.cyfoethnaturiol.cymru/695227/western-wales-rbmp-2021_2027-summary.pdf (Accessed 29 May 2026).

[4] https://nrw.maps.arcgis.com/apps/webappviewer/index.html?id=4ef6ea25c5984c939636714dbfce25f3

Water body Type	Coastal
NGR	SH 200 550
Catchment Length (km)	N/A
Catchment Area (km^2)	712.19
Hydromorphology Designation	Not Designated A/HMWB
Ecological Objective	Good Ecological Status by 2027
Reasons for not achieving Good status	Chemical status failure due to ubiquitous persistent hazardous substances (e.g., PBDEs, mercury compounds)
Ecological status (2019)	Good
Biological quality elements (2019)	Good (phytoplankton, benthic invertebrates, macroalgae)
Physico-chemical quality elements (2019)	High / Good (nutrients, dissolved oxygen, temperature, salinity)
Hydromorphological Supporting Elements (2019)	**Supports Good** (no significant morphological pressures identified)
Chemical status (2019)	Fail
Protected Areas (2019)	Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC

Table 3-3 Baseline data for Artro Estuary.

Water body ID	GGB521006407200
Water body Name	Artro Estuary
Water body Type	Transitional Western Wales TRaC
NGR	SH 585 300
Catchment Length (km)	4.5 km *(length of the Artro river system feeding the estuary)*
Catchment Area (km^2)	0.72
Hydromorphology Designation	Not High (i.e., not designated as HMWB or AWB)
Ecological Objective	Good Ecological Status by 2027
Reasons for not achieving Good status	No failures recorded — ecological and chemical elements met Good in 2019
Ecological status (2019)	Good
Biological quality elements (2019)	Good (fish, benthic invertebrates, saltmarsh/macroalgae)
Physico-chemical quality elements (2019)	High / Good (nutrients, dissolved oxygen, pH, temperature)
Hydromorphological Supporting Elements (2019)	Supports Good (no significant morphological pressures)
Chemical status (2019)	Good
Protected Areas (2019)	Meirionnydd Oakwoods and Bat Sites SAC

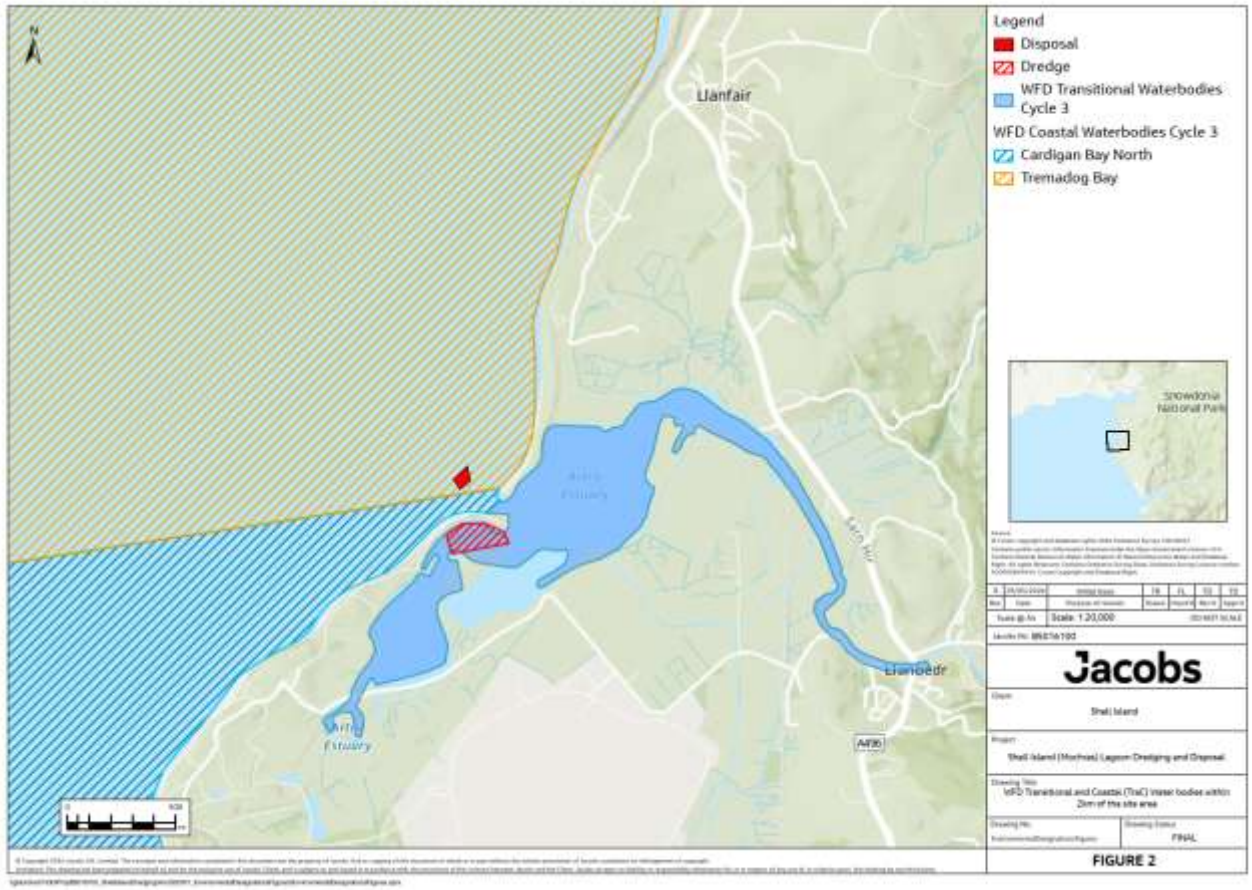

Figure 2 WFD Transitional and Coastal (TraC) Water bodies within 2km of the site area.

4. Clearing the Waters Screening

Screening requires consideration of those activities which are low risk, including the following:

- a self-service marine licence activity or an accelerated marine licence activity that meets specific conditions;
- maintaining pumps at pumping stations;
- removing blockages or obstacles like litter or debris within 10m of an existing structure to maintain flow;
- replacing or removing existing pipes, cables or services crossing over a water body – but not including any new structure or supports, or new bed or bank reinforcement;
- 'over water' replacement or repairs to, for example bridge, pier and jetty surfaces – if bank or bed disturbance is minimised;

If the activity has been carried out during 2015 to 2022 and there is already a WFD assessment, this does not need to be repeated unless:

- there have been changes to how the activity is carried out, including method, size or scale, volume, depth, location or timings
- there has been a pollution incident since the activity was last carried out.

None of the above apply.

5. Clearing the Waters Scoping

5.1 Protected Areas

The WFD Regulations 2017 require that activities are also in compliance with other relevant legislation, as considered below. For transitional waters, the Clearing the Waters for All guidance recommends that the following are looked at as part of the assessment which are discussed in more detail below and overleaf.

- Nature conservation designations
- Bathing waters
- Nutrient sensitive areas
- Shellfish waters

5.1.1 Nature Conservation Designations

The Conservation of Habitats and Species Regulations 2017 [5], as amended and the Offshore Marine Conservation (Natural Habitats & c.) (Amendment) Regulations 2010 protect sites that are internationally important for threatened habitats and species, and create a legal framework for species requiring strict protection. This network of protected areas (previously known as the 'Natura 2000 Network') comprises Special Protection Areas (SPAs) and Special Areas of Conservation (SACs).

Ramsar sites are wetlands of international importance designated under the Ramsar Convention (adopted in 1971 and came into force in 1975), providing a framework for the conservation and wise use of wetlands and their resources. In the UK, Ramsar sites are afforded the same status as SPAs and SACs.

Multi-agency Geographic Information for the Countryside (MAGIC [6]) was used to find out the nature conservation designations within 2km of the Site:

- Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC (UK0013117);
- Morfa Harlech a Morfa Dyffryn SAC (UK003004);
- Meirionnydd Oakwoods and Bat Sites SAC (UK0014789); and
- The Northern Cardigan Bay (Gogledd Bae Ceredigion) Special Protection Area (SPA), also immediately adjacent to the dredge disposal site (UK9020327).

Nature conservation designations are therefore scoped into the assessment.

5.1.2 Bathing Waters

Bathing waters are those designated under the Bathing Water Regulations England and Wales 2013[7].

MAGIC was used to find out the nature conservation designations within 2km of the Site:

- Llandanwg (NGR: SH5669028180) in Tremadog Bay;
- Harlech Bathing Water (NGR: SH5676031480) in Cardigan Bay; and
- Dyffryn (Llanendwyn) (NGR: SH5671022580) in Cardigan Bay.

[5] The Conservation of Habitats and Species Regulations 2017. (No. 1012). London: The Stationery Office.

[6] Department for Environment, Food & Rural affairs (2025). MAGIC. Accessed November 2025. https://magic.defra.gov.uk/

[7] The Bathing Water Regulations 2013. (No. 1675). London: The Stationery Office.

Bathing waters are therefore scoped into the assessment.

5.1.3 Nutrient Sensitive Areas

Nutrient sensitive areas comprise nitrate vulnerable zones and polluted waters designated under the Nitrate Pollution Prevention Regulations 2015[8] and areas designated as sensitive areas under the Urban Waste Water Treatment (England and Wales) Regulations 1994[9]. The Urban Waste Water Treatment regulations aims to protect the environment from the adverse effects of the collection, treatment and discharge of urban waste water. Sensitive areas under the UWWTD are water bodies affected by eutrophication associated with elevated nitrate concentrations and act as an indication that action is required to prevent further pollution caused by nutrients.

There are no Coastal Sensitive Areas (Eutrophic) within 2km of the Sites.

There are no Nutrient Vulnerable Zones within 2km of the Sites.

Nutrient Sensitive Areas are therefore scoped out of the assessment.

5.1.4 Shellfish Waters

The Surface Waters (Shellfish) (Classification) Regulations 1997 aims to protect or develop economically significant shellfish production. Water quality standards of the regulations require that a discharge affecting Shellfish Waters must not cause the suspended solid content of the water to exceed by more than 30% the content of waters not affected.

There are no shellfish waters within 2km of the Sites, therefore, shellfish waters are scoped out of the assessment.

5.1.5 Drinking Waters

Drinking water safeguard zones are designated areas in which the use of certain substances must be carefully managed to prevent the pollution of raw water sources that are used to provide drinking water. These zones are areas where land use is causing pollution of the raw water.

The Proposed Scheme overlaps with a drinking water protected area (Meirionnydd, GB41002G203200). Therefore, Drinking water safeguard zones are scoped into the assessment.

5.2 Scoping of Receptors

This section provides a site-specific scoping appraisal of the Scheme against biological, physico-chemical and hydromorphological quality elements for the coastal water body following the Environment Agency's 'Clearing the Waters for All' guidance.

The proposed elements of the Scheme are considered in terms of their impact on the water bodies using Water Framework Directive (WFD) Coastal Waterbodies Cycle 2 data[10] and is used as part of the assessment. Mitigation is stated where necessary.

5.2.1 Hydromorphology

This section provides a summary of the known existing hydromorphology risk issues for the Tremadog Bay, Cardigan Bay, North, and Artro estuary waterbodies (Table 5-1).

[8] Nitrate Pollution Prevention Regulations 2015. (No. 668). London: The Stationery Office.

[9] Urban Waste Water Treatment (England and Wales) Regulations 1994. (No. 2841). London: The Stationery Office.

[10] https://datamap.gov.wales/

Table 5-1 Hydromorphology scoping summary

Scoping considerations	Waterbody		
	Tremadog Bay	Cardigan Bay North	Artro Estuary
Consider if your activity could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status?	No, not at High status.	No, not at High status.	No, not at High status.
Consider if your activity could significantly impact the hydromorphology of any water body?	No. Dredging is not occurring within this water body but dredge arisings are being deposited on the backshore adjacent to Cardigan Bay.	Dredging is not occurring within this water body but dredge arisings are being deposited within the waterbody which could impact on hydromorphology through substrate quality and quantity changes.	Dredge plume could impact on hydromorphology; operation will remove sediment on seabed which could impact substrate quality and quantity.
Consider if your activity is in a water body that is heavily modified for the same use as your activity?	No. Not designated heavily modified.	No. Not designated heavily modified.	No. Not designated heavily modified.

Construction Phase: Dredging is occurring in the Artro Estuary. Removal of substrate during construction phase will lead to temporary change in morphological conditions within the dredge area.

Operation Phase: Deposition of dredge spoil will change morphological conditions because there will be more sediment. This could change the substrate quality and quantity.

For the reasons stated, hydromorphology has been scoped into the assessment.

5.2.2 Biology – Habitats

Table 5-2 presents a summary of biology (habitat) considerations and associated risk issues for the works for the Tremadog Bay, Cardigan Bay, North, and Artro estuary waterbodies.

Table 5-2 Biology (habitats) scoping summary

Scoping considerations	Water body		
	Tremadog Bay	Cardigan Bay North	Artro Estuary
Is the footprint of the activity 0.5km^2 or larger?	No – no dredging in this water body. Disposal site is 0.4 km^2.	No – no dredging or disposal in this water body.	No. The area to be dredged is about 0.03 km^2 and will be confided to the confined to Artro Estuary.
Is the footprint of the activity 1% or more of the water body's area?	No - footprint of the disposal of dredge arisings is 0.17% of the water body's area.	No, no dredging or disposal in this water body.	Yes. The total dredge footprint is about 4.16% of the water body's area.
Is the footprint of the activity within 500m of any higher sensitivity habitat?	Yes - there are Polychaete Reefs and subtidal kelp beds offshore (within 500	No, no dredging or disposal in this water body.	No – there are no higher sensitivity habitats within

Scoping considerations	Water body		
	Tremadog Bay	Cardigan Bay North	Artro Estuary
	m) of where the disposal site is.		500 m of dredging activity in the Artro estuary.
Is the footprint of the activity 1% or more of any lower sensitivity habitat?	No. There are gravel and cobbles (intertidal and subtidal coarse sediments); intertidal soft sediments; subtidal soft sediments; and rocky shore (intertidal rock) close by the disposal activity. The disposal activity is not 1% or more of any of these habitats.	No, no dredging or disposal in this water body.	No. There are gravel and cobbles (intertidal and subtidal coarse sediments); intertidal soft sediments and rocky shore (intertidal rock) at the vicinity where dredging activities will occur. The footprint of the activity is not 1% or more of these habitat types.

Construction Phase: Dredging occurring in the Artro estuary is about 4.16% of the water body's total area. There are no high sensitivity habitats in the estuary. The closest which may be impacted are the polychaete reefs and subtidal kelp in Tremadog Bay waterbody (within 500m of the disposal site). Dredging will not occur within 500 m of any lower sensitivity habitats in any 3 of the waterbodies.

Operation Phase: Disposal is within the Tremadog Bay waterbody, and is approximately 0.17% of the water body's total area. There are polychaete reefs and subtidal kelp within 500 m of the disposal site for dredge arisings. The disposal activity footprint is not more than 1% of any lower sensitivity habitat.

The 'Nature Conservation Designations' section discusses the nature conservation sites within the study area and is not repeated here.

As at least one biology (habitats) consideration indicates that a risk could be associated with the works, this receptor has been scoped into the impact assessment.

5.2.3 Biology – Fish

Activities occurring within an estuary or inshore environment could impact on expected fish behaviour such as movement, migration or spawning. Table 5-3 presents a summary of biology (fish) considerations and associated risk issues for the Proposed Scheme.

Table 5-3 Biology (fish) scoping summary

Scoping considerations	Water body		
	Tremadog Bay	Cardigan Bay North	Artro Estuary
Consider if your activity is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary?	Yes. Temporary disturbance to fish (noise/visual), temporary loss of feeding habitats, increased suspended sediments.	Yes. Temporary disturbance to fish (noise/visual), temporary loss of feeding habitats, increased suspended sediments.	Yes. Temporary disturbance to fish (noise/visual), temporary loss of feeding habitats, increased suspended sediments.
Consider if your activity could impact on normal fish	No - works will take place at low tide to further reduce the risk of impacts	No - works will take place at low tide to further reduce the risk of impacts	No - works will take place at low tide to further reduce the risk of impacts

Scoping considerations	Water body		
	Tremadog Bay	Cardigan Bay North	Artro Estuary
behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)?	to migration /movement /spawning.	to migration /movement /spawning.	to migration /movement /spawning.
Consider if your activity could cause entrainment or impingement of fish?	No the activity will not entrain or impinge any fish.	No the activity will not entrain or impinge any fish.	No the activity will not entrain or impinge any fish.

Construction Phase: The Proposed Scheme may cause a temporary disturbance to fish through use of equipment creating noise and visual disturbance. This may act as a barrier to species movement. The removal of material through dredging may create a temporary loss of feeding habitat, and disturbance may cause temporary displacement of fish to feed elsewhere. There will also be localised and temporary suspended sediment at the dredge site. Works are planned to take place at low tide to reduce the risk of impacts to fish through migration, movement, and spawning.

Operation Phase: Dredge disposal may cause a temporary disturbance to fish through use of equipment creating noise and visual disturbance. This may act as a barrier to species movement. The addition of material through disposal may smother a previous feeding habitat, and disturbance may cause temporary displacement of fish to feed elsewhere. There will also be localised and temporary suspended sediment at the disposal site.

As at least one biology (fish) consideration indicates that a risk could be associated with the works, this receptor has been scoped into the impact assessment.

5.2.4 Water Quality

Consideration should be made regarding whether phytoplankton status and harmful algae could be affected by the works, as well as identifying the potential risks of using, releasing or disturbing chemicals. Table 5-4 presents a summary of water quality considerations and associated risk issues of the works for the Tremadog Bay, Cardigan Bay, North, and Artro estuary waterbodies.

Table 5-4 Water quality scoping summary

Scoping considerations	Water body		
	Tremadog Bay	Cardigan Bay North	Artro Estuary
Consider if your activity could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)?	Yes. Effects on water quality are anticipated (disposal). Works are planned for 14 days.	No. Activity not in this water body.	Yes. Effects on water quality are anticipated (dredging). Works are planned for 14 days.
Consider if your activity is in a water body with a phytoplankton status of moderate, poor or bad?	No data are available for phytoplankton in this water body.	Phytoplankton are at high status.	Phytoplankton not assessed.
Consider if your activity is in a water body with a history of harmful algae?	No data are available for harmful algae in this water body.	No data are available for harmful algae in this water body.	No data are available for harmful algae in this water body.

Scoping considerations	Water body		
	Tremadog Bay	Cardigan Bay North	Artro Estuary
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if the chemicals are on the Environmental Quality Standards Directive (EQSD) list?	Particle Size Distribution analysis in 2026 showed sediment to be sand. In agreement with NRW and as per OSPAR guidelines, material may be exempt from sediment chemistry testing if it is composed almost exclusively of sand.	Particle Size Distribution analysis in 2026 showed sediment to be sand. In agreement with NRW and as per OSPAR guidelines, material may be exempt from sediment chemistry testing if it is composed almost exclusively of sand.	Particle Size Distribution analysis in 2026 showed sediment to be sand. In agreement with NRW and as per OSPAR guidelines, material may be exempt from sediment chemistry testing if it is composed almost exclusively of sand.
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if it disturbs sediment with contaminants above Cefas Action Level 1?	Particle Size Distribution analysis in 2026 showed sediment to be sand. In agreement with NRW and as per OSPAR guidelines, material may be exempt from sediment chemistry testing if it is composed almost exclusively of sand.	Particle Size Distribution analysis in 2026 showed sediment to be sand. In agreement with NRW and as per OSPAR guidelines, material may be exempt from sediment chemistry testing if it is composed almost exclusively of sand.	Particle Size Distribution analysis in 2026 showed sediment to be sand. In agreement with NRW and as per OSPAR guidelines, material may be exempt from sediment chemistry testing if it is composed almost exclusively of sand.
If your activity has a mixing zone (like a discharge pipeline or outfall) consider if the chemicals released are on the EQSD list?	N/A	N/A	N/A

As at least one water quality consideration indicates that a risk could be associated with the works, this receptor has been scoped into the impact assessment.

5.2.5 Protected Areas

Consideration should be made regarding whether protected areas are at risk from a proposed activity. Table 5-5 presents a summary of protected area considerations and associated risk issues of the Proposed Scheme.

Table 5-5. Protected areas scoping summary

Scoping considerations	Water body		
	Tremadog Bay	Cardigan Bay North	Artro Estuary
Consider if your activity is within 2km of any protected area?	Yes – WFD protected areas (Bathing Water) at Llandanwg.	Yes – WFD protected areas (Bathing Water) at Harlech in Cardigan Bay.	No WFD protected areas in this water body.

Scoping considerations	Water body		
	Tremadog Bay	Cardigan Bay North	Artro Estuary
	Yes activity within 2 km of European designated sites. • Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC • Morfa Harlech a Morfa Dyffryn SAC • Northern Cardigan Bay (Gogledd Bae Ceredigion) Special Protection Area (SPA) is also immediately adjacent to the dredge disposal site.	Yes activity within 2 km of European designated sites. • Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC • Morfa Harlech a Morfa Dyffryn SAC • Northern Cardigan Bay (Gogledd Bae Ceredigion) Special Protection Area (SPA) is also immediately adjacent to the dredge disposal site.	Yes activity within 2 km of European designated sites. • Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC • Morfa Harlech a Morfa Dyffryn SAC • Northern Cardigan Bay (Gogledd Bae Ceredigion) Special Protection Area (SPA) is also immediately adjacent to the dredge disposal site.

No impacts on Bathing Waters anticipated (impact scoped out) as no impact by coliform release and distribution from the Proposed Scheme.

This receptor has been scoped into the impact assessment due to the nearby proximity of European Designated sites.

5.2.6 Invasive Non-Native Species

Consideration should be made regarding whether there is a risk the activity could introduce or spread Invasive Non-Native Species (INNS). Risks of introducing or spreading INNS include materials or equipment that have come from, had use in or travelled through other water bodies, as well as activities that help spread existing INNS, either within the immediate water body or other water bodies. Table 5-6 presents a summary of INNS considerations and associated risk issues of the Proposed Scheme.

Table 5-6. Consideration of INNS

Scoping considerations	Water body		
	Tremadog Bay	Cardigan Bay North	Artro Estuary
Introduction or spread of INNS	Potential for introduction (on plant / equipment) or spread of INNS by accidental water pollution. It can be scoped out by use of good practice to prevent pollution; also land-based plant are to be used (no previous marine contamination).	No works in waterbody, however INNS may be introduced intro nearby waterbodies (Tremadog Bay/Arto estuary). It can be scoped out by use of good practice to prevent pollution; also land-based plant are to be used (no previous marine contamination).	Potential for introduction (on plant / equipment) or spread of INNS by accidental water pollution. It can be scoped out by use of good practice to prevent pollution; also land-based plant are to be used (no previous marine contamination).

For the reasons stated above, this receptor has been scoped out of the impact assessment.

5.2.7 Scoping Receptor Summary

The impacts of the Proposed Scheme on the biological, hydromorphological, water quality/physico-chemical, protected areas and INNS quality elements of the TraC water bodies are summarised in Table 5-7.

Table 5-7 TraC scoping summary

Receptor	Potential risk to receptor?	Note the risk issue(s) for impact assessment
Hydromorphology	Yes	Dredge plume could impact on hydromorphology; operation will remove sediment on seabed which could impact substrate quality and quantity. However, dredging has occurred before at this site.
Biology: Habitats	Yes	Lower sensitivity habitats within the harbour, and a mix of high and low sensitivity habitats offshore in the open coast, adjacent to the disposal site. The areas of sensitivity outside of the harbour entrance can be scoped out. Inside the harbour, the habitat is scoped in. However, dredging operations have occurred at this site before.
Biology: Fish	Yes	Potential temporary disturbance to fish (noise/visual), temporary loss of feeding habitats, increased suspended sediments, and potential smothering of habitat and spawning areas.
Water quality	Yes	Suspended sediment concentrations. Activities extend over about 14 days and effects on water quality are anticipated but likely to be temporary and localised.
Protected areas	Yes	Impact to Bathing Waters scoped out as no impact by/to coliform release and distribution. Impact to European designated sites scoped in.
Invasive non-native species	No	Potential for spread of INNS between the dredge and disposal areas but can be scoped out if using best practice measures and land based plant are to be used.

6. Impact Assessment

A detailed assessment to meet the guidance requirements in Clearing the Waters for All assessments is included in Table 6-1. This is taken from the Joint Nature Conservation Committee (JNCC) Marine Pressures Activities Database[11].

Table 6-1 Clearing the Waters for All detailed assessment

Category	Pressure	Justification Description	Risk Factor Description and Mitigation
Dredge and spoil disposal			
Extraction (and disposal) of non-living resources	Above water noise	Disposal activity using a dredging vessel creates a variety of airborne noise sources including vessel engine and mechanical sound (e.g. movement of a bucket dredge), pump sound (e.g. in rainbowing) and the opening of hatch doors [JNCC0318; JNCC0319]. However, the magnitude of pressure would depend on the scale, intensity and duration of the activity.	**Medium** Mitigation would include construction controls and implementation of best practice.
Extraction (and disposal) of non-living resources	Abrasion/disturbance of the substrate on the surface of the seabed	The deposition of dredged sediment can potentially cause disturbance and abrasion to seabed habitats. Abrasion effects will be most severe when coarser sediment (such as gravel) is disposed onto the seabed [JNCC0323; JNCC0338; JNCC0339].	**Low-Medium** Sediment is not very coarse however is sand (larger particle size than fine mud) and so some minor abrasion could occur. Deposit amount is small, and so impact will be minor.
Extraction (and disposal) of non-living resources	Barrier to species movement	The pressure refers to obstruction to species movement caused by physical barrier or prolonged exposure to noise, light, visual disturbance or changes in water quality. The scale of the impact will depend on scale of activity and the location and will need to be considered on case-by-case basis to determine relevance to given feature/site. Turbidity arising from dredging disposal operations may pose a barrier to species migration when	**Medium-high** No risk factor description. Mitigation would include construction controls and implementation of best practice.

[11] https://hub.jncc.gov.uk/assets/97447f16-9f38-49ff-a3af-56d437fd1951

Category	Pressure	Justification Description	Risk Factor Description and Mitigation
Dredge and spoil disposal			
		occurring on or in proximity of specific migratory routes [3152; 3080]. This will be particularly the case in confined waterbodies such as estuaries (which could potentially limit the dispersion of sediments and space for migratory movement is more limited).	
Extraction (and disposal) of non-living resources	Changes in suspended solids (water clarity)	Disposal of dredged material will cause increases in suspended sediment concentrations with the extent of sediment plumes dependant on the scale of the activity and type of material [3159; 3082]. Deposited material will spread laterally throughout the water creating a short-term increase in suspended solids [4915]. During an experiment in the southern North Sea which aimed to replicate the disposal of maintenance dredged material, suspended sediment concentrations in the area were found to be on average more than two times higher during the experiment [5085]. Modelling undertaken of the dispersal and deposition of capital dredge sediments from major channel deepening work (11.6 million m3) in Southampton Water at the Nab Tower Deposit Ground near the Isle of Wight was predicted to have initial concentrations of the order of 10,000 mg/l extending over 1 km from the point of disposal. However, at a distance of 3.5 km along the track of the plume peak concentrations of about 1700 mg/l were predicted to occur after about an hour from the time of disposal but reduce to near background levels within 2 hours [JNCC0320; 4891; JNCC0324]. Disposal of an estimated 182,000m3 of capital material as part of berth extension work in Southampton Water was predicted to cause maximum suspended sediment concentrations near to the point of disposal are predicted to	**Medium-high** No risk factor description. Use of best practice.

Category	Pressure	Justification Description	Risk Factor Description and Mitigation
Dredge and spoil disposal			
		reach up to around 200 mg/l during disposal, but rapidly reduce to around 25 mg/l within about 30 minutes following each disposal and within about 2.6km downstream on the ebb and less than 1km on the flood [4890]. Dredged material may also be disposed of beneficially for environmental schemes, coastal protection, or beach nourishment [4905]. These types of disposal will also result in localised increases in suspended sediments.	
Extraction (and disposal) of non-living resources	Collision ABOVE water with static or moving objects not naturally found in the marine environment (e.g., boats, machinery, and structures)	This pressure relates to vessel movement associated with dredge disposal. Marine birds are frequently attracted to or become disorientated by artificial light sources, which can result in collision and therefore injury or death [4378; 2826]. Bird collisions with vessels, have been recorded with the risk being greatest at night for lighted ships near coastal areas and when the vessel is relatively close to large breeding aggregations of seabirds (rather than further offshore) [4337]. However, there are relatively few sources of quantified information relating to seabird strikes on vessels. Nocturnal bird strikes on vessels tend to occur when bright, artificial light sources are used at times of poor visibility, typically during bad weather, often angled outwards or upwards from the vessel [4466; 4378].	**Low** Works are temporary (14 days).
Extraction (and disposal) of non-living resources	Collision BELOW water with static or moving objects not naturally found in the marine environment (e.g., boats, machinery, and structures)	This pressure relates to vessel movement associated with dredge disposal. Vessels are documented to have collided with mobile marine species (particularly marine mammals). Species can collide with the propeller or other parts of the hull. The most lethal and serious injuries are caused by large ships (e.g.	**Low** Works are temporary (14 days).

Category	Pressure	Justification Description	Risk Factor Description and Mitigation
Dredge and spoil disposal			
		80 m or longer) and vessels travelling at speeds faster than 14 knots. Most minor injuries, by contrast, involved collisions with vessels less than 45m long. Collisions are rarely reported for vessels doing less than 10 km/hour [5120; 4987].	
Extraction (and disposal) of non-living resources	Deoxygenation	Disposal of dredged sediment can change the redox conditions in the former surface layer considerably and anoxic conditions (oxygen deficiency and sulphide production) may develop shortly after disposal. [3163]. The release of organic rich sediments during disposal can result in the localised removal of oxygen from the surrounding water, substances which consume oxygen, nutrients and harmful materials, bonded to the sediments, can be released into the water relatively easily and thus reduce its oxygen content or cause an increase in the concentration of nutrients or harmful materials [3159; 3163]. Following the initial placement of dredged material at a disposal site, there is the potential for some localised reduction in dissolved oxygen concentrations in the water column. Given the dynamic nature of many disposal sites, the water column is likely to be rapidly re-oxygenated, making any changes localised and very short-lived [3163].	**Low** Deposited material is sand, creating more oxygen gaps between particles.
Extraction (and disposal) of non-living resources	Genetic modification & translocation of indigenous species	The disposal of dredged material can result in the translocation of native species previously removed as a result of dredging activity. However, native species might not survive dredging and disposal. The surfaces and ballast water of disposal vessels/vehicles could also translocate native species [4978; 3164].	**Low** Dredge and disposal site are close (see Figure 1), and therefore benthic communities will be similar.

Category	Pressure	Justification Description	Risk Factor Description and Mitigation
Dredge and spoil disposal			
Extraction (and disposal) of non-living resources	Hydrocarbon & PAH contamination. Includes those priority substances listed in Annex II of Directive 2008/105/EC.	Organic based contaminants such as polyaromatic hydrocarbons (PAHs) can be effectively 'locked into' the seabed sediments in coastal areas ports and harbours. These stable compounds do not decompose readily; subsequent re-mobilisation (e.g. by dredging disposal) can release these contaminants into the water column. The likelihood and severity of any impact depends upon the type and degree of sediment contamination and level of re-mobilisation of the sediment. The highest levels of contaminants generally occur in fine sediment in industrialised estuaries. However, the occurrence of very contaminated sediments is rare in the England [3159; 3163; 3145]. In addition, only harbour sediment that meets quality criteria expressed in the form of threshold levels for mineral oil (petroleum hydrocarbons) and polyaromatic hydrocarbons (PAHs) is permitted to be disposed offshore under current licencing regulations [JNCC0286; JNCC0324]. This pressure also relates to vessels associated with this activity and their movement. The primary chemicals of environmental concern in vessel oil and fuel are polycyclic aromatic PAHs [4985]. Deliberate discharges of oil or oil/water mixtures from ships are prohibited within the North West European Waters Special Area, established by the International Maritime Organization under MARPOL Annex I in 1999. This includes all waters around the UK and its approaches. However, accidental discharges still occur. Information on accidental discharges of oil from ships and offshore platforms is compiled annually by the Advisory Committee on Protection of the Sea (ACOPS) on behalf of the Maritime and Coastguard Agency.	**Low** Mitigation measures relating to water quality (pollution) impacts include best practice, i.e. implementing pollution prevention measures.

Category	Pressure	Justification Description	Risk Factor Description and Mitigation
Dredge and spoil disposal			
		Although the majority of incidents are minor, several incidents occur annually that lead to the actual or potential release of significant amounts of oil (typically from large shipping vessels and tankers) [3164].	
Extraction (and disposal) of non-living resources	Introduction of light	The pressure is potentially associated with navigation and operational lighting on vessels. Under the Merchant Shipping (Distress Signals and Prevention of Collisions) Regulations 1996 all vessels in the UK must display lights in all weathers between sunset and sunrise including masthead lighting, sidelights, stern lights, towing lighting, all-round light and flash light [JNCC0254]. Marine birds are frequently attracted to or become disorientated by artificial light sources, which can result in collision and potentially injury or death [4378; 2826].	**Low** Works will require minimal lighting, and will not be undertaken through the night. Works are temporary, for 14 days.
Extraction (and disposal) of non-living resources	Introduction of other substances (solid, liquid or gas)	Oil, synthetic compounds, hydrocarbons, heavy metals (such as nickel, copper arsenic) and organo-metals (such as Tributyltin) can be effectively 'locked into' seabed sediments. Subsequent dredging and disposal has the potential to release these contaminants into the water column. The highest levels of contaminants generally occur in silts dredged from industrialised estuaries including ports and harbours. The likelihood and severity of any impact depends upon the type and degree of sediment contamination and level of dredging (and disposal) activity [4899; 3145; JNCC0204; JNCC0294; JNCC0324]. However, only harbour sediment that meets quality criteria expressed in the form of threshold levels for trace metals, mineral oil (petroleum hydrocarbons), polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons	**Low** Mitigation measures relating to water quality (pollution) impacts include best practice, i.e. implementing pollution prevention measures.

Category	Pressure	Justification Description	Risk Factor Description and Mitigation
Dredge and spoil disposal			
		(PAHs) and organochlorine pesticides is permitted to be disposed offshore [JNCC0286]. Disposal activity can also result in the accidental, operational, incidental release of substances (e.g. via vessels from ballast water, antifoulants, hull contamination, waste products), much of which is restricted/regulated [3164; 3157; 3145].	
Extraction (and disposal) of non-living resources	Introduction or spread of invasive non-indigenous species (INNS)	The disposal of dredged material can result in the translocation of INNS removed as a result of dredging activity. However, such species might not survive dredging and disposal. This pressure also relates to use of vessels used in disposal. Aquatic organisms may be transferred to new locations as biofouling on vessels and gear and can be harmful and invasive in locations where they do not naturally occur [3164; 3132; 2798; 4338; 4339]. All craft have some biofouling, even if recently cleaned or anti-fouled [4978; 5177]. Marine species can be carried in ships' ballast water [3164]. There is concern that the expansion of non-indigenous species could alter local biodiversity and sometimes compete with native species, some of which are of commercial interest. In general, most vessels involved in disposal activity are UK vessels with disposal activity generally limited to inshore waters.	**Low** INNS are reportable and should be reported if found. Ensure materials do not pollute substrate or water body and minimise spread of species. All pollution to be controlled under current legislation and best practice. Any sightings of Mitten Crab need to be reported to Defra.
Extraction (and disposal) of non-living resources	Nutrient enrichment	The resuspension of sediments during dredging disposal may result in an increase in the levels of organic matter and nutrients [3145]. However, in general only small amounts of phosphorus and nitrogen are released as a result of dredge disposal [JNCC0321].	**Low** NRW confirmed no sediment chemistry sampling was required as sediment is sand, and therefore unlikely to sequester contamination like finer mud particles.

Category	Pressure	Justification Description	Risk Factor Description and Mitigation
Dredge and spoil disposal			
Extraction (and disposal) of non-living resources	Physical change (to another seabed type)	Dredge disposal at sea and the deposit of sediments on the seabed can result in changes to benthic communities; as a result of disturbance to the seabed and altering the substrate character [3157]. Extent of the impacts on the marine environment depend on the characteristics of the dredged material and the physical and biological features of the disposal site, as well as the techniques and the timing chosen for the disposal [3157].	**Low** Particle Size Distribution analysis has been undertaken to ensure sediment suitability for disposal at disposal site, therefore substrate will be the same as what the benthic communities were inhabiting previously.
Extraction (and disposal) of non-living resources	Physical change (to another sediment type)	Dredge disposal at sea and the deposit of sediments on the seabed can result in changes in sediment type [3157; JNCC0324]. Extent of the impacts on the marine environment depend on the characteristics of the dredged material and the physical and biological features of the dumping site, as well as the techniques and the timing chosen for the disposal [3157].	**Low** Particle Size Distribution analysis has been undertaken to ensure sediment suitability for disposal at disposal site.
Extraction (and disposal) of non-living resources	Radionuclide contamination	The greatest radioactive contamination occurs at the small ports along the Cumbrian coastline, to the north of the Sellafield reprocessing plant. A case study of a recent operation at Whitehaven, the most affected port, indicated that the predicted dose to crew involved in dredge and disposal of material at ~8 µSv. However, information concerning radionuclide activity in sediments from our major ports is limited. Under The London Convention (LC) dredged material containing radioactivity at/below de minimis levels can be disposed of at sea; regulators require an assessment where compliance with de minimis levels has not been established or may be exceeded. A 2006 review for dredging operations in	**Low** Mitigation measures relating to water quality (pollution) impacts include best practice, i.e. implementing pollution prevention measures.

Category	Pressure	Justification Description	Risk Factor Description and Mitigation
Dredge and spoil disposal			
		England and Wales found that in most regions radionuclide concentrations fell well within de minimis criteria [4374].	
Extraction (and disposal) of non-living resources	Smothering and siltation rate changes (Heavy)	Siltation can occur as a result of disposal activity as a result of the direct release of sediments during dredge disposal onto the seabed. Disposal of dredged material will also cause increases in suspended sediment concentrations with the extent of sediment plumes dependant on the scale of the activity and type of material [3159; 3082; JNCC0339]. Sediment in plumes can also resettle over the seabed. Disposal occurs in defined licensed areas and licensees are generally guided to dispose of material in the centre of the site in an attempt to restrict plumes. Impacts to the adjacent seabed will depend on the habitat type. Habitats on the outer fringes of the disposal site may be modified but not substantially altered by dispersing material [4915; JNCC0339]. During an experiment in the southern North Sea which aimed to replicate the disposal of maintenance dredged material, fluid mud layers were observed forming due to the settling of suspended matter [5085]. Deposition of capital dredge sediments from a berth extension works in Southampton Water at the Nab Tower Deposit Ground near the Isle of Wight was predicted to cause a maximum accumulation over a spring-neap cycle of the order of 1-2mm [4890].	**Medium** Very small area (0.03km^2) to be dredged and disposed.
Extraction (and disposal) of non-living resources	Smothering and siltation rate changes (Light)	Siltation can occur as a result of disposal activity as a result of the direct release of sediments during dredge disposal onto the seabed. Disposal of dredged material will also cause increases in suspended sediment concentrations with the extent of	**Medium** Very small area (0.03km^2) to be dredged and disposed.

Category	Pressure	Justification Description	Risk Factor Description and Mitigation
Dredge and spoil disposal			
		sediment plumes dependant on the scale of the activity and type of material [3159; 3082; JNCC0339]. Sediment in plumes can also resettle over the seabed. Disposal occurs in defined licensed areas and licensees are generally guided to dispose of material in the centre of the site in an attempt to restrict plumes. Impacts to the adjacent seabed will depend on the habitat type. Habitats on the outer fringes of the disposal site may be modified but not substantially altered by dispersing material [4915; JNCC0339]. During an experiment in the southern North Sea which aimed to replicate the disposal of maintenance dredged material, fluid mud layers were observed forming due to the settling of suspended matter [5085]. Deposition of capital dredge sediments from a berth extension works in Southampton Water at the Nab Tower Deposit Ground near the Isle of Wight was predicted to cause a maximum accumulation over a spring-neap cycle of the order of 1-2mm [4890].	
Extraction (and disposal) of non-living resources	Synthetic compound contamination (incl. pesticides, antifoulants, pharmaceuticals). Includes those priority substances listed in Annex II of Directive 2008/105/EC.	Synthetic compounds such as polychlorinated biphenyls (PCBs) can be effectively 'locked into' seabed sediments. These stable compounds do not decompose readily. Subsequent dredging and disposal has the potential to release these contaminants into the water column. The highest levels of contaminants generally occur in silts dredged from industrialised estuaries including ports and harbours. The likelihood and severity of any impact depends upon the type and degree of sediment contamination and level of dredging (and disposal) activity [4899; 3145; JNCC0204; JNCC0294;JNCC0222; JNCC0324].	**Low** Mitigation measures relating to water quality (pollution) impacts include best practice, i.e. implementing pollution prevention measures.

Category	Pressure	Justification Description	Risk Factor Description and Mitigation
Dredge and spoil disposal			
		Only harbour sediment that meets quality criteria expressed in the form of threshold levels for trace metals, mineral oil (petroleum hydrocarbons), polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs) and organochlorine pesticides is permitted to be disposed offshore [JNCC0286].	
Extraction (and disposal) of non-living resources	Transition elements & organo-metal (e.g. TBT) contamination. Includes those priority substances listed in Annex II of Directive 2008/105/EC.	Transition elements and organo-metals are used as marine anti-fouling agents on vessels. Historically the main ingredients in biocidal antifouling coatings have been copper or tributyltin (TBT). TBT has been banned on vessels under 25m in the UK since 1987. Since then biocides commonly used in the UK in antifoulants include Copper(I) oxide (cuprous oxide), Copper thiocyanate, Zinc pyrithione and ZineB (organosulfur compound). Heavy metals (such as nickel, copper arsenic) and organo-metals (such as Tributyltin) can be effectively 'locked into' seabed sediments. Subsequent dredging and disposal has the potential to release these contaminants into the water column. The highest levels of contaminants generally occur in silts dredged from industrialised estuaries including ports and harbours. The likelihood and severity of any impact depends upon the type and degree of sediment contamination and level of dredging (and disposal) activity [4899; 3145; JNCC0204; JNCC0294; JNCC0324]. However, only harbour sediment that meets quality criteria expressed in the form of threshold levels for trace metals, mineral oil (petroleum hydrocarbons), polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs) and organochlorine pesticides is permitted to be disposed offshore [JNCC0286].	**Low** Mitigation measures relating to water quality (pollution) impacts include best practice, i.e. implementing pollution prevention measures.

Category	Pressure	Justification Description	Risk Factor Description and Mitigation
Dredge and spoil disposal			
Extraction (and disposal) of non-living resources	Underwater noise changes	Disposal activity using a dredging vessel creates a variety of underwater noise sources including vessel engine and mechanical sound (e.g. movement of a bucket dredge), pump sound (e.g. in rainbowing) and the opening of hatch doors. Information specifically on underwater noise levels in disposal activity is limited. However, sea going vessels and dredging activity has been found to typically produce broadband noise at source levels of 165-180 dB re 1µPa-m (RMS) [4915; 4997; JNCC0319].	**Medium** Mitigation measures include works at low-tide to minimise disturbance.
Extraction (and disposal) of non-living resources	Visual disturbance	This pressure is associated with the use of dredging vessels during disposal. The movement of vessels and people, as well as machinery can create visual stimuli which can evoke a disturbance response in mobile species such as fish, marine mammals, seabirds and coastal birds. However, the magnitude of the pressure will depend on the nature, scale, intensity and duration of the activity, plus other factors such as species present and age, weather conditions and degree of habituation to disturbance source [2497; 2825; 3269; 2707; 4977].	**Medium** Mitigation measures include works at low-tide to minimise disturbance.

7. Conclusion and Test of Compliance

The Proposed Scheme has been assessed in accordance with the Water Framework Directive (WFD) Regulations to determine its potential to cause deterioration in water body status or prevent the achievement of environmental objectives for relevant surface water and groundwater bodies.

The assessment indicates that the Proposed Scheme will not result in deterioration of any WFD quality element during either the construction or operational phases.

Construction Phase

The main construction works (dredging) for the Proposed Scheme at Shell Island are occurring within the Artro Estuary waterbody. Sediment will be dredged from within the harbour, and disposed of at a local disposal site in Tremadog Bay waterbody. The following potential impacts have been identified:

- Above and below water noise, created through the use of equipment. This may impact fish and benthic ecology. Works are being undertaken at low tide and best practice measures will be implemented for noise.
- Barrier to species movement. Dredging and depositing of material can cause a physical barrier or can create prolonged exposure to noise, light, visual disturbance or changes in water quality. Works are temporary (14 days) and impact will be localised.
- Changes in suspended solids (water clarity). Dredging can increase suspended sediment at the dredge site. This impact will be temporary (14 days) and localised.
- Contamination within seabed sediments released. Particle Size Analysis was undertaken and confirmed the sediments to be sand. NRW agreed no sediment chemistry was required.
- Introduction of light. Works will require minimal artificial lighting, and will be temporary (14 days).
- Underwater noise can cause disturbance to fish. Works are temporary (14 days) and best practice noise measures will be followed.
- Visual disturbance can be caused through the works required as part of the Proposed Scheme. This can act as a barrier to species movement. Works are temporary (14 days) and will be undertaken at low tide to reduce the impact of fish spawning, migration, and movement.
- Temporary loss of feeding/nursery habitat. Works are only within 4.16% of total waterbody area and so displacement will be minimal. Works are temporary and effects will be localised.

Operation Phase

- Abrasion/disturbance of the substrate on the surface of the seabed.
- Changes in suspended solids (water clarity). Disposal can increase suspended sediment at the disposal site. This impact will be temporary (14 days) and localised.
- Collision above and below water with static or moving objects not naturally found in the marine environment (e.g., boats, machinery, and structures). The works are temporary in nature (14 days).
- Deoxygenation – disposal can change the redox system. Dredged material has been confirmed as larger sand grain particles through a sampling plan and PSA. This contains more oxygen than disposal of mud. No further mitigation required.

- Genetic modification & translocation of indigenous species – disposal of dredged material can mean species are relocated between the sites. The dredge and disposal site considered in this WFD are very close (see Figure 1), and so community composition is likely to be similar.
- Contamination within seabed sediments released. Particle Size Analysis was undertaken and confirmed the sediments to be sand. NRW agreed no sediment chemistry was required.
- Introduction of light. Works will require minimal artificial lighting, and will be temporary (14 days).
- Introduction or spread of invasive non-indigenous species (INNS). Disposal can introduce INNS species at the disposal site, either through the dredged material or through use of equipment. Best practice measures will be followed and INNS reported.
- Disposal of marine seidments can introduce physical change to both the seabed type and the sediment type. A sampling plan was produced and PSA undertaken which confirmed sediments at the dredge and disposal sites to be compatible.
- Smothering and siltation rate changes – disposal of marine sediments can cause smothering and heavy siltation on existing habitats and benthic communities. Works will be undertaken at low tide to reduce sediment suspension and transport.
- Underwater noise can cause disturbance to fish. Works are temporary (14 days) and best practice noise measures will be followed.
- Visual disturbance can be caused through the works required as part of the Proposed Scheme. This can act as a barrier to species movement. Works are temporary (14 days) and will be undertaken at low tide to reduce the impact of fish spawning, migration, and movement.

Impacts to Bathing Waters are scoped out as no impact by/to coliform release and distribution. The potential for spread of INNS between the dredge and disposal areas is scoped out by using best practice measures and land-based plant.

With the implementation of embedded and standard mitigation measures, and where appropriate enhancement measures, the Proposed Scheme is assessed to be compliant with the objectives of the WFD Regulations (refer to Table 6-1). The Scheme will not result in deterioration of ecological, hydromorphological, physico-chemical, or groundwater quality elements.

The Proposed Scheme is not expected to adversely affect compliance with other WFD objectives, including those relating to protected areas, priority substances, and the delivery of the River Basin Management Plan Programme of Measures.

Where relevant, potential effects on designated European sites are considered separately here relevant, potential effects on designated European sites are considered separately through a Habitats Regulations Assessment, which concludes that the Proposed Scheme will not result in adverse effects on site integrity.

In addition, the Proposed Scheme is expected to provide localised benefits, including improvements to habitat quality and connectivity.

Accordingly, the Proposed Scheme is considered to meet the requirements of Regulation 13 of the WFD Regulations.

Table 7-1 Test of Compliance

Environmental Objective	Proposed Works	Compliance with the WFD Directive
No changes affecting high status sites.	There would be no effect to the integrity as the works as part of the Proposed Scheme would not impact high status sites.	Yes
No changes that will cause failure to meet surface water Good Ecological Status or Potential or result in a deterioration of surface water Ecological Status or Potential.	The Proposed Scheme will not cause deterioration in the status of the water bodies if mitigation is put in place.	Yes
No changes which will permanently prevent or compromise the Environmental Objectives being met in other water bodies.	The Proposed Scheme will not cause a permanent exclusion or compromise achieving the WFD objectives in other bodies of water within the same River Basin District.	Yes
No changes which will prevent progressive reduction of pollution from priority substances and cease or phase out emissions, discharges and losses of priority hazardous substances.	There is no anticipated change which would prevent reduction in pollution from priority hazardous substances.	Yes
No changes that will cause failure to meet good groundwater status or result in a deterioration groundwater status.	There is no anticipated effect to the groundwater body.	Yes