

Newport Effluent Pipe Replacement Scheme

Phase 2 Marine Construction Works

Habitat Regulations Assessment Report

APEM Ref: P00012364

June 2023

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Date of issue: June 2023

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Revision and Amendment Register

Version Number	Date	Section(s)	Page(s)	Summary of Changes	Approved by
1	19.06.2023	All	All	Draft report	NO

Contents

1.	Introduction	1
1.1	Overview	1
1.2	Background to the Project	1
1.3	Habitats Regulations Assessments	3
1.4	Structure and purpose of the report.....	3
2.	The Proposed Works.....	3
2.1	Summary of the Proposed Works.....	3
2.1.1	<i>Outfall installation – offshore phase</i>	6
2.1.2	<i>Outfall installation – intertidal zone</i>	6
2.1.4	<i>Laying of concrete mattresses and backfilling</i>	8
2.1.5	<i>Removal of Existing Outfall Pipe and Stone Causeway</i>	8
3.	Methodology.....	9
3.1	Legislative and policy context.....	9
3.1.1	UK (domestic) HRA legislation	9
3.1.2	Policy requirements additional to domestic legislation.....	10
3.1.3	International legal and policy obligations.....	10
3.2	The Habitats Regulations Assessment process.....	10
3.2.1	Overview.....	10
3.2.2	Assessment stages.....	10
3.2.3	In-combination assessment.....	11
3.3	Guidance on the HRA process	12
4.	Identification of European and Ramsar Sites and features potentially affected by the proposed works.....	13
4.1	European and Ramsar Site identification process	13
4.2	Potential European and Ramsar Sites (receptors).....	14
4.3	European and Ramsar Site features of interest	17
5.	Potential Effects of the Proposed Works	19
5.1	The Assessment Process.....	19

6.	Screening: Testing for LSE.....	21
6.1	LSE Conclusion.....	35
7.	Stage 2 Appropriate Assessment	36
7.1	Appropriate Assessment Conclusion	46
8.	In-combination Assessment	46
8.1	Projects considered.....	46
8.2	In-combination assessment conclusion	47
9.	Conclusions.....	47
10.	References.....	49
	Appendix I Cefas Action Levels and Sediment Contaminant Data	51

List of Figures

Figure 1: Proposed works location within the Severn Estuary.	2
Figure 2: The proposed works footprint (Image provided by Kaymac Marine & Civil Engineering Ltd).....	5
Figure 3: Location of the proposed works in relation to nearby SACs.....	15
Figure 4: Location of proposed works in relation to nearby SPA and Ramsar sites.	16

List of Tables

Table 1. Stages in the HRA process	11
Table 2. Features of interest of the European and Ramsar Sites within 15 km of the proposed development.....	17

1. Introduction

1.1 Overview

Proposed plans or projects that have the potential to affect European and Internationally designated nature conservation sites (detailed below) are required to be considered through the Habitats Regulations Assessment (HRA) process as required by The Conservation of Habitats and Species Regulations 2017 (as amended¹) (the Habitats Regulations).

This report (hereafter referred to as the HRA Report) considers the proposed construction works (hereafter referred to as 'the proposed works') required for an effluent pipe replacement scheme at Newport, South Wales, as part of the HRA process. The report provides the information required by Natural Resources Wales (NRW) to fulfil its function as a 'competent authority' under the Habitats Regulations and determine if the proposed works are likely to have a significant effect on the conservation objectives of a European Site, either alone, or in combination with other plans or projects.

1.2 Background to the Project

A pipeline, approximately 1,360 m long, is currently in place to safely discharge effluent from Eastman Chemicals in Newport, South Wales, into the Severn Estuary and it has reached the end of its operational lifecycle. The pipeline crosses the intertidal zone and discharges below mean low water spring (MLWS). To continue to safely discharge effluent into the Severn Estuary the current pipeline needs to be replaced to reduce risks associated with the structure's integrity and to reduce the likelihood of any future leaks. Therefore, Solutia UK propose to replace the current effluent pipeline and sea outfall to ensure that effluent continues to discharge safely into the estuary. The decommissioning and removal of part of the existing pipe will be undertaken during the same period as the installation of the new pipe.

Kaymac Marine & Civil Engineering Ltd. (hereafter referred to as Kaymac) have been commissioned by Solutia UK to carry out the pipeline and sea outfall replacement works, which will involve the installation of the new effluent pipe adjacent to the existing pipe.

The location of the proposed works within the Severn Estuary is indicated in Figure 1.

¹ The legal provisions that amend the 2017 Regulations are:
The Conservation of Habitats and Species and Planning (Various Amendments) (England and Wales) Regulations 2018 [Statutory Instrument 2018 No 1307]
The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 [Statutory Instrument 2019 No 579]

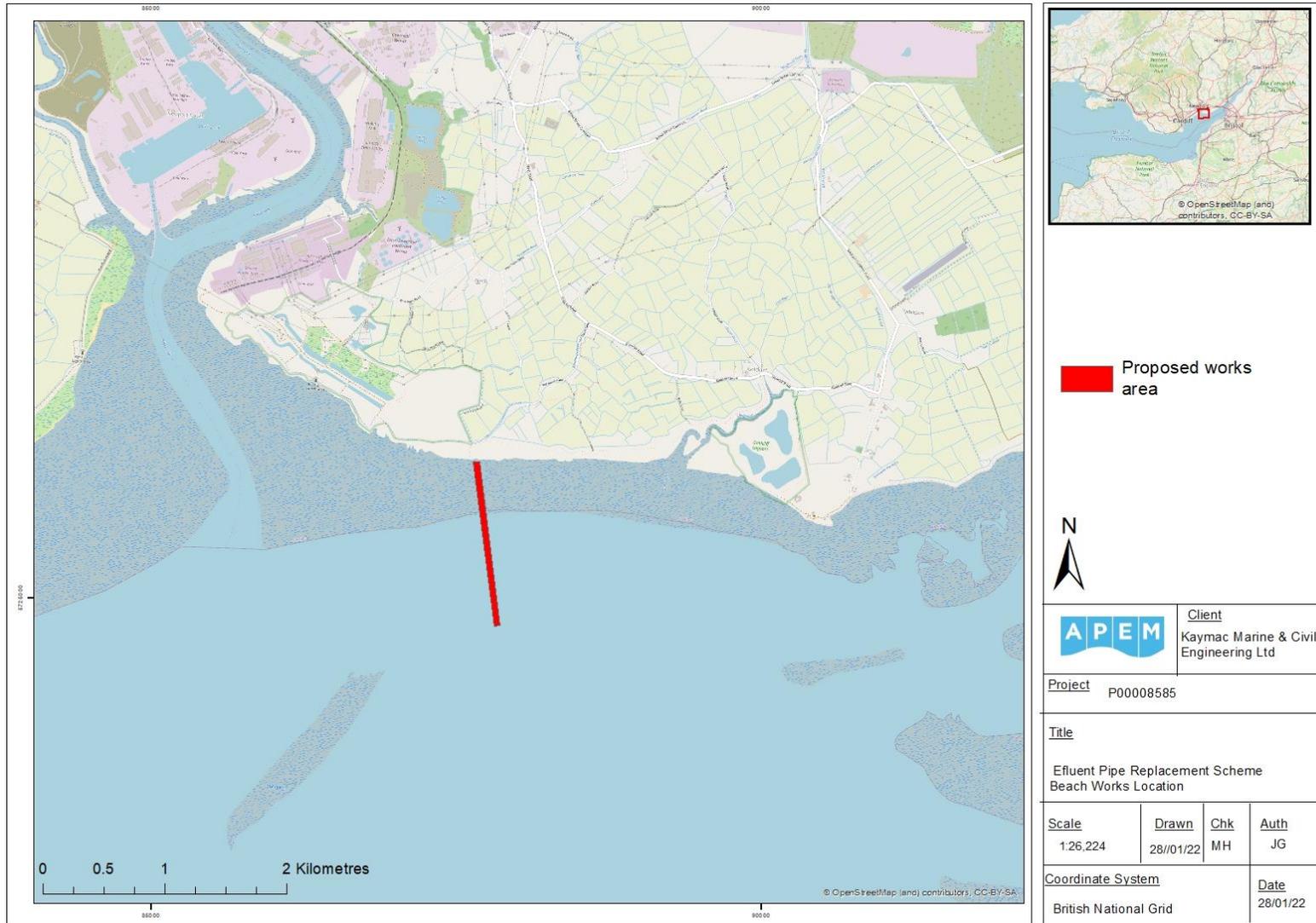


Figure 1: Proposed works location within the Severn Estuary.

1.3 Habitats Regulations Assessments

The Habitats Regulations require that an Appropriate Assessment of the implications of any development consent must be made by the relevant competent authority, in this case Natural Resources Wales, if a project (or plan) is likely to have a significant effect on the conservation objectives of a European Site (defined below), either alone, or in-combination with other plans or projects.

HRA is a progressive, staged process which determines if there is potential for Likely Significant Effect (LSE) and, where appropriate, assesses potential adverse impacts on the integrity of a European Site. Further detail on the process followed and the definition of particular terms, is provided in the methodology (Section 3).

1.4 Structure and purpose of the report

This report provides information on the construction works and the HRA Screening and Appropriate Assessment process. It then carries out the different stages in that process (where required) and presents the results and conclusion.

This report provides information to allow NRW (as the competent authority) to determine whether there will be an adverse effect on the integrity of any sites within the National Site Network in view of their conservation objectives as a result of the project.

In the context of a HRA, where the potential for LSE cannot be excluded, a competent authority must make an Appropriate Assessment of the implications of the plan or project for that site, in view of the Site's conservation objectives. The competent authority may agree to the plan or project only after having ruled out adverse effects on the integrity of the site/s within the National Site Network. Where an adverse effect on the site's integrity cannot be ruled out and where there are no alternative solutions, the plan or project can only proceed if there are imperative reasons of over-riding public interest (IROPI) and if the necessary compensatory measures can be secured.

2. The Proposed Works

2.1 Summary of the Proposed Works

A full description of the activities and methods associated with the proposed works is provided in Kaymac's method statements (2023). A summary of key aspects of relevance to this assessment is provided below. The proposed works involve the installation of the new effluent pipe adjacent to the existing pipe and outfall. The proposed works will be contained within a footprint of approximately 1,290 m by 100 m (0.129 km²) (Figure 2) and involve activities in both the intertidal and subtidal zones. The volume of excavated material for the trench will total circa 7,057 m³.

The proposed works can be defined under three main activities:

- Outfall Installation – offshore phase;
- Outfall Installation – intertidal zone;
- Removal of existing outfall pipe and stone causeway

The primary plant required for the works are:

- Backhoe dredger or excavator on barge – offshore trench excavation;
- Landing craft;
- 1 x Crane barge;
- 2 x Multicats (for manoeuvring barge above);
- 2 x Small support/crew boats;
- 2 x general support (RIB & Dory)
- 1 x 15t 360° tracked amphibious excavator with Bio Oil and digging bucket;
- 1 x 18t 360° tracked amphibious excavator with Bio Oil and digging bucket;
- Wheeled dumper;
- GPS and surveying equipment;
- Surface supplied diving equipment;
- Fuel bowser;
- Navi mats;
- Small hand tools (i.e., shovels etc.); and
- Cat and Genny

The excavation of the trench will largely be undertaken on the flood tide by an excavator mounted on the floating barge, which will be maintained in position by the vessels' spud legs. Approximately 900 m of the trench will be excavated in this way with the remainder of the trench in the upper intertidal excavated in the dry using amphibious excavators.

The works in the intertidal zone and offshore area are due to last for two months from early April 2024 to early June 2024.



Figure 2: The proposed works footprint (Image provided by Kaymac Marine & Civil Engineering Ltd).

2.1.1 Outfall installation – offshore phase

Excavation of trench

The 'Offshore Phase' relates to the section of pipe that lies beneath MLWS. The discharge point within the estuary is at chainage 1470 m and the pipe becomes visible above the seabed at chainage 567 m. The floating plant (e.g. a backhoe dredger or an excavator on a barge) will be used to excavate a trench, adjacent to the existing outfall pipe in which the new pipe will be laid. Precast concrete mattresses will be lowered from a crane barge over the new pipe for protection and to prevent future movement. The trench throughout this section will be approximately 900 m in length with a depth of approximately 1.5 m.

If the water level at low tide is higher than the existing pipe at the corresponding chainage (i.e., the pipe is fully submerged) the marine vessel will be positioned above the trench in a suitable position to enable the excavator onboard to reach and dig the trench. Onboard GPS and surveying equipment will be utilised to accurately determine the position, line, and level of the trench from the water's surface. A backhoe dredger may be used instead or in conjunction with the excavator and barge, this will be confirmed after contract award and prior to commencement on site. The trench will be excavated ensuring all sides are battered back to a suitable angle of repose to prevent collapse and to prevent any material from falling back into the trench. All excavated bed material will be side-cast adjacent to the trench.

It is estimated that the lowest 900 m of the trench, from approximately chainage 1,470 m to chainage 570 m, will be excavated on the flood tide. The trench will be excavated to a depth of approximately 1.5 m with a cross section of circa 5.4 m². As such, if circa 900 m of the trench is excavated on the flood tide, the total volume of excavated material in this area will be circa 4,860 m³.

2.1.2 Outfall installation – intertidal zone

Excavation of trench

This section is within the intertidal zone between chainages 567m and 176m. This beach area will dry out during low water periods and will be accessible by landing craft. This section can be excavated either from the floating plant during high water periods or from the beach using amphibious plant during low water periods. A combination of the two will be used to maximise the working windows. The pipe will be laid within the trench and will be covered with precast concrete mattresses for protection.

If the water level at low tide is lower than the existing pipe at the corresponding chainage (i.e., the pipe is dry), the landing craft will ground itself within the vicinity of the new pipe, with the first section of the new pipe being placed at chainage 176 m. The marine plant will position itself to maximise the working window before the tide comes back in. The plant and equipment will be checked for any leaks before any items are tracked off the landing craft and onto the beach. In a methodical manner, the trench will be excavated ensuring all sides are battered back to a suitable angle of repose to prevent collapse and to prevent any material from falling back into the trench. All excavated bed material will be side-cast adjacent to the trench. Side-casting the material will also provide a more efficient backfilling process later, by reducing the requirement to transport material to and from site. The trench excavation and the subsequent pipe installation will not be completed during one low water period, therefore, an element of

re-work of the trench will need to be carried out prior to works commencing on the following low water period.

The trench in the upper intertidal zone is expected to be excavated during an ebb tide. In this case, the excavator will be delivered to the beach by the landing craft and excavation will occur in the dry. The landing craft will deliver plant to site and land as high up the beach as possible to maximise the available working window as the tide falls.

The trench in this area will be excavated along a length of 460 m and to a depth of approximately 1.5 m with a cross section of circa 5.4 m². The total volume of excavated material in the upper intertidal area will be circa 2,484 m³. The excavated material will be side-cast and later used to backfill the trench.

2.1.3 Pipe laying and installation of outfall

The pipe sections will be transported to site by the landing craft. The pipe laying technique will depend on the state of tide and the tidal level at the time the pipe is ready to be laid. It will either be sunk into the trench with the falling tide, or the sinking valve will be opened, and the pipe allowed to fill with water to aid sinking into position. The outfall section at the terminus of the pipe will be lowered from the landing craft using the excavator and installed by a dive team.

Once a 125 m section of the trench is prepared and the line and level has been checked by the Site Manager/Engineer, the first 125 m length of pipe will be pulled into position by a marine vessel during a high tide. The weather forecast will be frequently monitored prior to transportation to ensure the pipe is only transported during calm weather. The pipe will be towed into position specifically during a rising tide to ensure that the maximum amount of time is available to position and secure the pipe above the trench prior to submerging.

The planned 'sinking route' will be marked clearly with floating buoys to the surface to ensure the pipe is placed accurately. A line of ten temporary timber piles (approximately 300 mm diameter) will be driven to a depth of approximately 3 m parallel to the trench, over 250 m at a time, at 25 m centres with the amphibious excavator. These are to assist with locating the pipe during the submerging process and will be removed when the pipe has been located within the trench.

Three temporary cylindrical pin piles (approximately 300 mm diameter, hollow steel piles) will be driven approximately 5 m into the seabed at strategic positions along the length of the proposed pipeline. These will anchor the landward end of the pipe in position while the workboat will anchor the seaward end via a winch cable. During the sinking procedure, the cable will be made taught to offer sufficient tension to maintain the position of the pipe.

The geotechnical survey undertaken in 2022 indicated soft sediment at the site. As such, both timber and steel piles will be pushed into the sediment using the amphibious excavator. There will be no requirement for percussive piling methods. Pin piles will be pushed to a depth of approximately 5 m and timber piles to a depth of approximately 3 m. The steel pin piles will be installed in the intertidal zone in the dry (when the tide is out). The timber piles will be installed during both low and high tide periods as required.

The workboat supervisor will assess the weather forecast and make the decision as to whether it is safe to begin the sinking procedure. There should be minimal wind and waves during this process. The pipeline will be positioned to follow the correct route by the supporting vessels

on site. The 'landward' end will be connected to the excavator via a winch line. The 'Seaward' end will then be attached to the winch on-board the workboat, to offer the necessary 'pulling force' required during the sinking process.

Divers will enter the water to open the inlet and outlet valves to the sinking lid on the 'seaward' end, which will allow the pipe to be sunk in accordance with the manufacturer's sinking procedure. The inlet valve will be used to flood the pipe with water, whilst the outlet valve will allow air to escape to the surface via a suitable length of hosing, when required.

On completion of the submersion process, divers will be deployed to check that the pipe is located within the trench in accordance with the contract drawings. If the pipe is out of line, then the excavator on board the floating plant will be able to adjust the position accordingly prior to placing the concrete mattresses over the top.

This process will be repeated until all the lengths of pipe have been installed.

2.1.4 Laying of concrete mattresses and backfilling

Once in the trench, the pipe sections will be maintained in position using concrete mattresses, which will run the length of the pipe. Once the pipe is in position the concrete mattresses will be placed on top of the pipe using the excavator. Once the mattresses are in position, the trench will be backfilled using the side-cast material.

Due to the required slope of the pipe, some matressing will remain above surface level for a length of 76.4 m and a width of 3 m (total area of 229.2 m²). In addition, there will also be an area of 853.8 m² (284.6 m length x 3 m width) where the backfilled sediment will not reach a depth of at least 300 mm above the matressing.

2.1.5 Removal of Existing Outfall Pipe and Stone Causeway

To mitigate benthic habitat loss, which may occur due to the installation of the new pipeline, the redundant pipeline and stone causeway will be removed to allow the habitat to return to its natural state. Therefore, on completion of the outfall replacement works, the redundant exposed section of the outfall in the intertidal zone between chainage 184m and 554m will be removed.

To negate the need to have plant tracking across the intertidal zone, all decommissioning works will be undertaken from the landing craft, materials handling barge and the stone causeway. The landing craft will beach perpendicular to the causeway with navi mats placed between the bow door and the stone causeway to allow the dumper to access the causeway without tracking across the intertidal zone. The pipe, rock and concrete mattresses will be removed by an amphibious excavator operating from the landing craft or from the causeway.

The dumper will transport the removed material to the top of the causeway, where it will be placed into a materials handling barge by a second excavator. This process will be repeated until such time as the tide comes back in, or the barge is full. It is assumed that an average of approximately 20 meters of the causeway will be removed each day between tides and that the surface of the beach underneath the causeway should be regraded and levelled to match the surrounding landscape prior to leaving every day.

The total length of pipe to be removed is 370 m. The area of associated rock armour and matressing to be removed is 370 m in length and 3.75 m in width. As such, the total area of existing pipe and rock armour to be removed is 1,387.5 m².

3. Methodology

3.1 Legislative and policy context

This section describes the legislation as it applies now that the UK has left the European Union (EU). Guidance from Defra has been provided on the application of the relevant legislation in the post-Brexit period in their policy paper published on 1st January 2021². The Habitats Regulations provide for the protection of particular habitats, plants and animals through the creation of, and specific decision-making procedures applied to, the 'national site network' (Regulation 3 'Interpretation'). This 'national site network' consists of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) that were designated both in that period when the UK was a member of the EU and since the UK left the EU.

Since those particular parts of the Habitats Regulations relating to the HRA process continue to refer to the designated sites collectively as 'European Sites', rather than as the 'national site network', that approach has been followed in this report.

3.1.1 UK (domestic) HRA legislation

The Habitats Directive (92/43/EEC) on the conservation of natural habitats and of wild fauna and flora, protects habitats and species of European nature conservation importance. Together with the Council Directive (2009/147/EC) on the conservation of wild birds (the 'Birds Directive'), the Habitats Directive established a network of internationally important sites, designated for their ecological status: Special Areas of Conservation (SACs), under the Habitats Directive to promote the protection of flora, fauna and habitats; and Special Protection Areas (SPAs), under the Birds Directive to protect rare, vulnerable and migratory birds. These sites combined to create a Europe-wide 'Natura 2000' network of designated sites, which are referred to as 'European sites'.

The above Directives were transposed into UK legislation through a series of Regulations. Terrestrial areas of the UK, and territorial waters out to 12 nautical miles (nm), are covered under The Conservation of Habitats and Species Regulations 2017, with waters beyond 12 nm, to the extent of the British Fishery Limits and UK Continental Shelf Designated Area, covered under The Conservation of Offshore Marine Habitats and Species Regulations 2017 (collectively referred to here as the Habitats Regulations). The Habitats Regulations incorporate all SPAs into the definition of 'European sites' and, consequently, the protections afforded to European sites under the Habitats Directive apply to SPAs designated under the Birds Directive. The UK left the European Union (Brexit) on Exit Day, 31st January 2020, followed by Completion Day on 31st December 2020.

² <https://www.gov.uk/government/publications/changes-to-the-habitats-regulations-2017/changes-to-the-habitats-regulations-2017>

3.1.2 *Policy requirements additional to domestic legislation*

It is UK Government policy that all competent authorities should treat candidate SACs (cSACs) and potential SPAs (pSPAs) as being within the requirements of the Habitats Regulations. In the UK this is identified in paragraph 176 of the National Planning Policy Framework (Ministry of Housing, Communities and Local Government, 2019).

Accordingly, in this report the term 'European Site' is used to refer collectively to SACs, cSACs, SPAs and pSPAs.

3.1.3 *International legal and policy obligations*

The UK is a contracting party to the Convention on wetlands of international importance especially as waterfowl habitat, Ramsar, Iran, 1971 (the 'Ramsar Convention') which seeks to protect wetlands of international importance, especially those wetlands utilised as waterfowl habitat.

It is UK Government policy that all competent authorities should treat Ramsar Sites in their decision-making processes as if they are SACs or SPAs and hence Ramsar Sites are considered within the requirements for HRA of the Habitats Regulations. In the UK this is identified in paragraph 176 of the National Planning Policy Framework (MHCLG 2019). As a consequence, in this report Ramsar Sites are referred to alongside European Sites collectively as European and Ramsar Sites. UK Government policy (ODPM Circular 06/2005) states that internationally important wetlands designated under the Convention on Wetlands 1971, called the Ramsar Convention (Ramsar sites) are afforded the same protection as SPAs and SACs for the purpose of considering development proposals that may affect them.

3.2 **The Habitats Regulations Assessment process**

3.2.1 *Overview*

The requirements of the Habitats Regulations with regard to the implications of plans or projects are set out within Regulation 63. The step-based approach implicit within this Regulation is referred to as a 'Habitats Regulations Assessment' (HRA), which is the term that has been used throughout this report.

It is a requirement of any public body, referred to as a 'competent authority' within the Habitats Regulations, to carry out a HRA when they are proposing to carry out a project, implement a plan or authorise another party to carry out a plan or project. Competent authorities are required to record the process undertaken, ensuring that there will be no adverse effects on the integrity of any European or Ramsar Site as a result of a plan or project whether alone or in combination with other plans or projects.

3.2.2 *Assessment stages*

The assessment of a plan or project goes through a number of stages, with published guidance available to aid competent authorities to fulfil their responsibilities. Those stages are summarised in Table 1.

Table 1. Stages in the HRA process

Stage	Description	Legislative Context
Purpose	Determines if the purpose of the plan or project is directly connected with, or necessary, to the management of a European or Ramsar Site. If it is, then no further assessment is necessary	Regulation 63(1)(b)
Scoping	The identification of any European or Ramsar Site that might be within scope of an HRA i.e., those sites that should be taken forward to the screening stage based on a wide consideration of spatial and ecological factors. Such a site may be located within the plan or project area but may also include sites located in neighbouring authority areas.	
Screening	Assessment of whether a plan or project, either alone or in combination with other plans or projects, is likely to have a significant effect on any qualifying feature (habitats and species) and the achievement of the conservation objectives of a European or Ramsar Site. This is also known as the 'test of likely significant effect' (ToLSE).	Regulation 63(1)(a)
Appropriate Assessment	Consideration of the effects of the proposals to determine whether or not it is possible to conclude with certainty that the development will not result in any adverse effect on the integrity of European or Ramsar Site, either alone or in combination with other plans or projects and with reference to the conservation objectives of the European or Ramsar Site. This is also known as the test of 'adverse effect on integrity' (AEoI). At this stage consent may be granted for the plan or project if it is possible to conclude with certainty that the proposal will not result in any adverse effect on the integrity of any European or Ramsar Site, either alone or in combination with other plans or projects.	Regulation 63(5)
If it cannot be concluded with certainty that the proposal will not result in any adverse effect on the integrity of any European or Ramsar Site then proceed to:		
Assessment of alternative solutions	Assess whether there is an alternative solution to the plan or project i.e. one that better respect the European or Ramsar sites. If no such alternative solution exists, the process continues to Assessment of IROPI.	Regulation 64(1)
Assessment of IROPI	Assess whether a plan or project can be justified as being needed for 'imperative reasons of overriding public interest' (IROPI).	Regulation 64(1)
Compensatory measures	Identify and secure any necessary compensatory measures to ensure that the overall coherence of the 'national site network' is protected.	Regulation 68

3.2.3 *In-combination assessment*

The Habitats Regulations, taken with Government policy, require the consideration of the potential effects of a project on European and Ramsar Sites both alone and in-combination with other plans or projects.

The identification of plans and projects to include in the in-combination assessment will be based on:

- approved plans;
- constructed projects;
- approved, but as yet unconstructed projects; and
- projects for which an application has been made, are currently under consideration and will be consented before the proposed development begin.

3.3 Guidance on the HRA process

In preparing this report, consideration has been given to the relevant guidance issued by a number of Governmental, statutory and industry bodies.

Guidance from Government bodies includes:

- Ministry of Housing, Communities and Local Government online Guidance on the use of Habitats Regulations Assessment <https://www.gov.uk/guidance/appropriate-assessment>
- Defra, NE, Welsh Government and NRW guidance on Habitat Regulations Assessments <https://www.gov.uk/guidance/habitats-regulations-assessments-protecting-a-european-site>

Guidance from the Statutory Bodies includes:

- MMO online guidance on Marine Licensing: impact assessments <https://www.gov.uk/guidance/marine-licensing-impact-assessments>
- NRW online guidance on HRA in the marine licensing process <https://naturalresources.wales/permits-and-permissions/marine-licensing/marine-licence-habitats-regulations-assessment/?lang=en>

In addition to recent guidance are a series of notable recent rulings by the European Court of Justice (ECJ), referred to here as Sweetman II or ‘People over Wind’³, and Holohan⁴. The People over Wind ruling relates to how screening for potential LSE is carried out, specifically that mitigation cannot be taken into account at that stage (but remains applicable for the determination of adverse effects on integrity). The Holohan ruling relates to the importance of species and habitats which are not a reason for the designation of the site but are relevant to the conservation objectives of the site (e.g. prey items of a designated species). Both these rulings have been taken into consideration during preparation of this HRA Report.

³ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A62017CJ0323>

⁴ <http://curia.europa.eu/juris/liste.jsf?language=en&td=ALL&num=C-461/17>

4. Identification of European and Ramsar Sites and features potentially affected by the proposed works

4.1 European and Ramsar Site identification process

For the scoping process, European and Ramsar Sites in the vicinity of the proposed works which could potentially be influenced by the works were identified. The different interest features within these sites were then considered individually.

It only requires one site interest feature to be considered to be potentially impacted by the proposed works for the European and/or Ramsar Site to be scoped into the HRA, along with each of its associated interest features. The HRA scoping process for this project used the conceptual 'source-pathway-receptor' model. The model was used to identify potential environmental effects resulting from the proposed works. This process provides an easy to follow assessment route between impact sources and potentially sensitive receptors ensuring a transparent impact assessment. The parameters of the model are defined as follows:

- source – the origin of a potential effect (noting that one source may have several pathways and receptors);
- pathway – the means by which the effect of the activity could impact a receptor; and
- receptor – the element of the receiving environment that is impacted.

Where there is no pathway, or the pathway is so long that the effect from the source has dissipated to a negligible level before reaching the receptor, there is justification for the scoping out of that particular receptor. Where the receptor (site interest feature) only occurs in the area on a seasonal basis and/or that receptor is not present in the period in which particular activities of the proposed works are a source of a potential effect, there is justification for the scoping out of that particular receptor.

Animals that are interest features of European and Ramsar Sites may be mobile and not confined to the boundary of the designated site. For example, wintering waterbirds may forage or roost on agricultural land outside of the designated site. Although that agricultural land is not part of the European or Ramsar Site, it is 'functionally linked' because it serves a function for waterfowl that are interest features of the designated site. Account has to be taken of such functionally linked land in the HRA process since, for instance, the loss of such land to development could potentially adversely affect the survival of those wintering waterbirds and lead to a reduction in the population of birds within the designated site.

Functionally linked land has been defined as follows (Chapman & Tyldesley 2016):

'the term 'functional linkage' refers to the role or 'function' that land or sea beyond the boundary of a European Site might fulfil in terms of ecologically supporting the populations for which the site was designated or classified. Such land is therefore 'linked' to the European Site in question because it provides an important role in maintaining or restoring the population of qualifying species at favourable conservation status.'

4.2 Potential European and Ramsar Sites (receptors)

An initial scoping exercise was undertaken for all European and Ramsar Sites within 15 km of the site of the proposed works. Given the nature of the works, the Zone of Influence is anticipated to be very limited, however a precautionary approach was taken and a 15 km buffer from the proposed works was included for screening. The River Wye SAC lies outside of this 15 km buffer but has been considered at the request of NRW.

The European and Ramsar Sites that fall within the scoping criteria described above are:

- The Severn Estuary SAC;
- The Severn Estuary SPA;
- The Severn Estuary Ramsar site;
- River Usk SAC; and
- River Wye SAC.

The boundaries of these sites in relation to the proposed works are indicated in Figure 3 (SACs) and Figure 4 (SPA and Ramsar site).

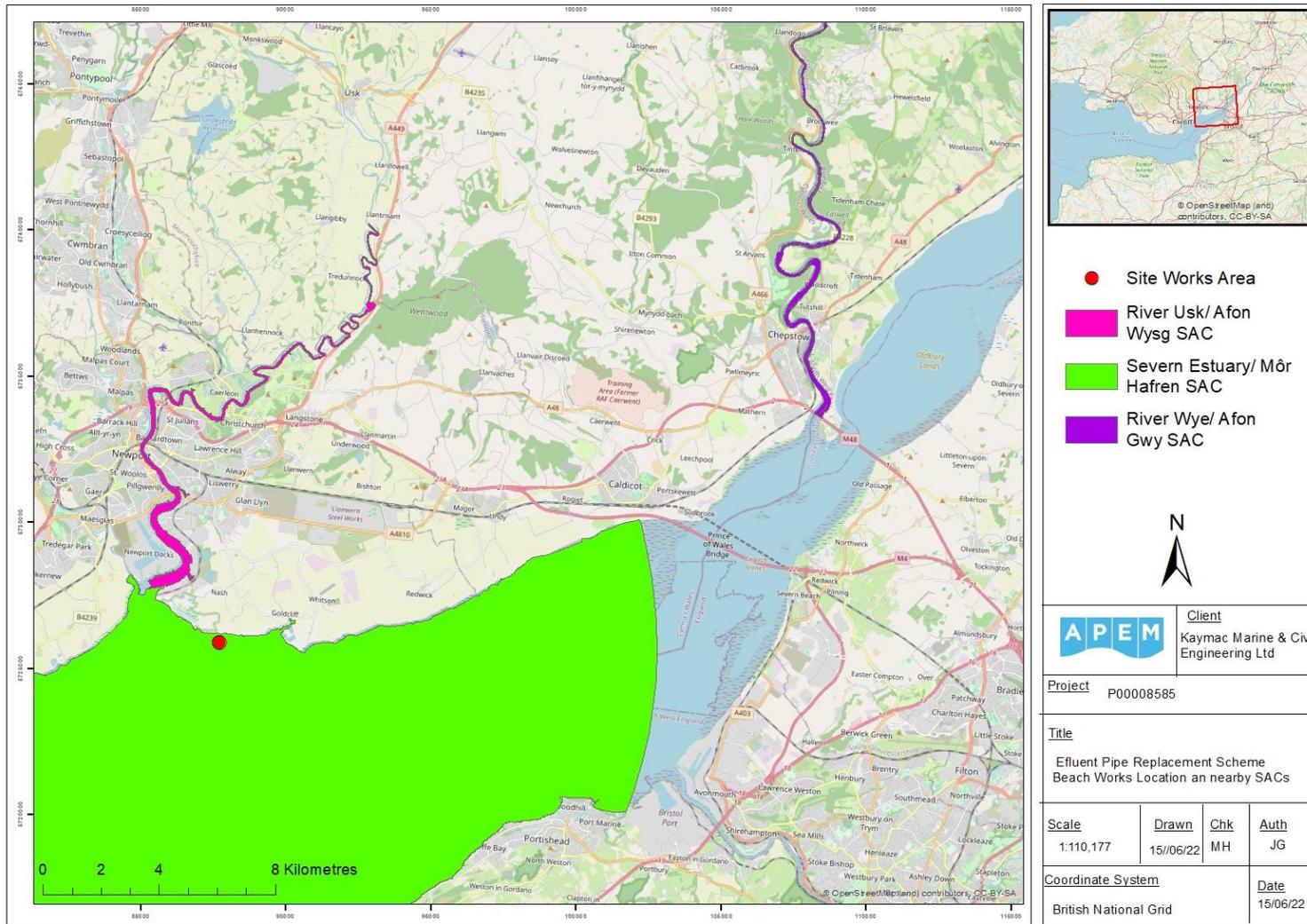


Figure 3: Location of the proposed works in relation to nearby SACs.

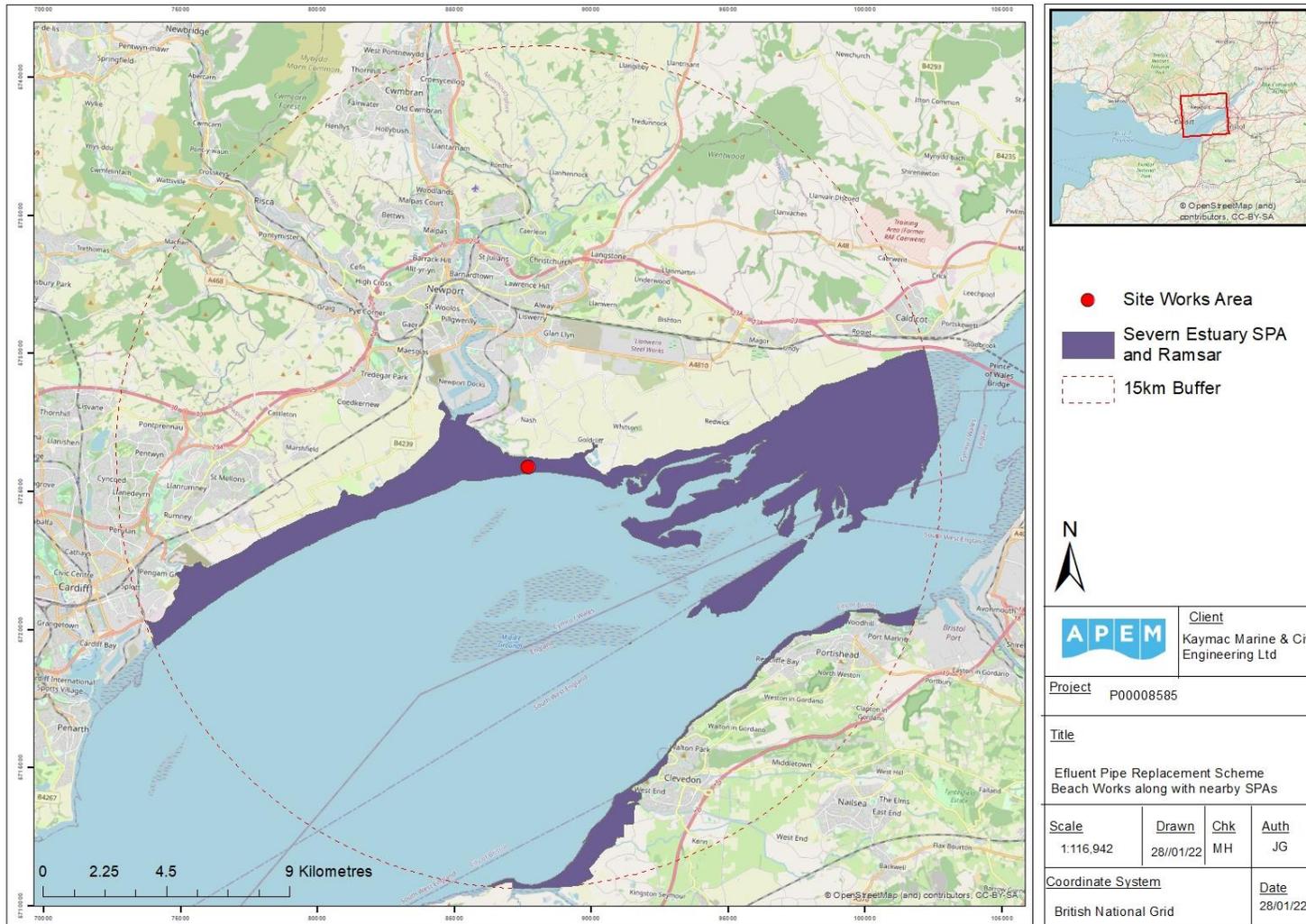


Figure 4: Location of proposed works in relation to nearby SPA and Ramsar sites.

4.3 European and Ramsar Site features of interest

The interest features scoped in from each European and Ramsar site are indicated in Table 2.

Table 2. Features of interest of the European and Ramsar Sites within 15 km of the proposed development.

Site	Interest feature
The Severn Estuary / Môr Hafren SAC UK0013030 (JNCC website)	<ul style="list-style-type: none"> • 1130 Estuaries • 1140 Mudflats and sandflats not covered by seawater at low tide • 1330 Atlantic salt meadow (<i>Glauco-Puccinellietalia maritima</i>) • 1110 Sandbanks which are slightly covered by sea water all the time • 1170 Reefs • 1095 Sea lamprey <i>Petromyzon marinus</i> • 1099 River lamprey <i>Lampetra fluviatilis</i>
The Severn Estuary Ramsar (NE and CCW 2009)	<ul style="list-style-type: none"> • Estuaries • Sea lamprey <i>Petromyzon marinus</i> • River lamprey <i>Lampetra fluviatilis</i> • Twaite shad <i>Alosa fallax</i> • Allis shad <i>Alosa alosa</i> • Atlantic salmon <i>Salmo salar</i> • Sea trout <i>Salmo trutta</i> • European eel <i>Anguilla anguilla</i> • Bewick's swan <i>Cygnus columbianus bewickii</i> • European white-fronted goose <i>Anser albifrons albifrons</i> • Dunlin <i>Calidris alpina alpina</i> • Redshank <i>Tringa tetanus</i> • Shelduck <i>Tadorna tadorna</i> • Gadwall <i>Anas strepera</i> • Waterfowl assemblage, including; wigeon <i>Anas penelope</i>, teal <i>Anas crecca</i>, pintail <i>Anas acuta</i>, pochard <i>Aythya farina</i>, tufted duck <i>Aythya fuligula</i>, grey plover <i>Pluvialis squatarola</i>, curlew <i>Numenius arquata</i>, whimbrel <i>Numenius phaeopus</i>, ringed plover <i>Charadrius hiaticula</i>, spotted redshank <i>Tringa erythropus</i>.
The Severn Estuary SPA UK9015022 (ASERA Website)	<ul style="list-style-type: none"> • Bewick's swan <i>Cygnus columbianus bewickii</i> • European white-fronted goose <i>Anser albifrons albifrons</i> • Dunlin <i>Calidris alpina alpina</i> • Redshank <i>Tringa tetanus</i> • Shelduck <i>Tadorna tadorna</i> • Gadwall <i>Anas strepera</i> • Waterfowl assemblage, including; wigeon, teal, pintail, pochard, tufted duck, ringed plover, grey plover, curlew, whimbrel and spotted redshank.
River Usk / Afon Wysg SAC	<ul style="list-style-type: none"> • 3260 Water courses of plain to montane levels with the <i>Ranunculon fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation

Site	Interest feature
UK0013007 (Natura 2000 2015)	<ul style="list-style-type: none"> • 1095 Sea lamprey <i>Petromyzon marinus</i> • 1096 Brook lamprey <i>Lampetra planeri</i> • 1099 River lamprey <i>Lampetra fluviatilis</i> • 1103 Twaite shad <i>Alosa fallax</i> • 1106 Atlantic salmon <i>Salmo salar</i> • 1163 Bullhead <i>Cottus gobio</i> • 1355 Otter <i>Lutra lutra</i>
River Wye / Afon Gwy SAC UK0012642 (JNCC website)	<ul style="list-style-type: none"> • 3260 Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation • 7140 Transition mires and quaking bogs • 1092 White-clawed (or Atlantic stream) crayfish <i>Austropotamobius pallipes</i> • 1095 Sea lamprey <i>Petromyzon marinus</i> • 1096 Brook lamprey <i>Lampetra planeri</i> • 1099 River lamprey <i>Lampetra fluviatilis</i> • 1103 Twaite shad <i>Alosa fallax</i> • 1106 Atlantic salmon <i>Salmo salar</i> • 1163 Bullhead <i>Cottus gobio</i> • 1355 Otter <i>Lutra lutra</i> • 1102 Allis shad <i>Alosa alosa</i>

5. Potential Effects of the Proposed Works

5.1 The Assessment Process

The process of testing for LSE considers the adverse effects that might arise from the proposed works and identifies whether or not there is a probability that each adverse effect can affect each European or Ramsar site and their interest features (see Table 1).

The process that is followed is to identify if the proposed works generate effects that could affect any of the interest features of the relevant European and Ramsar Sites. At this point, the pathway will be identified and what may reduce or prevent the effects reaching the relevant European and Ramsar sites. Only when there is a source, a pathway and an effect that reaches the interest feature is it judged that there is an LSE that would then require the more detailed assessment that is carried out at the Appropriate Assessment stage.

Potential adverse effects of the proposed works on European and Ramsar Sites have been identified using a combination of:

- Advice on Operations (AoO) from Natural England was considered for The Wash and North Norfolk SAC for the activity 'Coastal Infrastructure: Outfalls / Intake pipes (maintenance / construction / usage)⁵'. The Wash and North Norfolk SAC was chosen as a proxy for the Severn Estuary designated sites (for which recent AoO was not available) as it has similar interest features;
- Natural England & the Countryside Council for Wales' advice given under Regulation 33(2)(a) of the Conservation (Natural Habitats, &c.) Regulations 1994 for the Severn Estuary / Môr Hafren European Marine Site which provides AoO for the designated features was also used to determine potential adverse effects of the proposed works, however, this source is dated 2012. Therefore, as indicated above, AoO for The Wash and North Norfolk SAC was used as a proxy to provide more up-to-date evidence on the sensitivity of features to the impact pathways exerted by similar activities;
- Professional judgement based on experience of conducting numerous assessments of similar projects in the vicinity of European and Ramsar Sites; and
- Advice from Natural Resources Wales in relation to the proposed works.

In Section 6, a table is provided for the Screening Stage of the HRA which tests for LSEs indicating:

- The impact pathway being considered (derived from AoO from Natural England for Coastal Infrastructure: Outfalls / Intake pipes (maintenance / construction / usage);
- The features being assessed;
- Whether alone, or in combination, there is a LSE for each impact pathway / feature combination; and

⁵ Accessed via <https://designatedsites.naturalengland.org.uk/>

- Justification for the assessment.

Impact pathways indicated as being of Medium-High Risk which could be associated with the proposed works and that could affect European and Ramsar Site features were considered in this screening, in line with the AoO guidance. These impact pathways were as follows:

- Above water noise;
- Abrasion / disturbance of the substrate on the surface of the seabed;
- Changes in suspended solids (water clarity)
- Habitat structure changes – removal of substratum (extraction);
- Penetration and / or disturbance of the substratum below the surface of the seabed, including abrasion;
- Physical loss;
- Pollution from vessels;
- Release of contaminants from excavation;
- Smothering and siltation rate change (light);
- Smothering and siltation rate change (heavy); and
- Visual disturbance.

Low risk impact pathways would not usually be taken through to screening. However, for some impact pathways indicated as low risk for habitats and species within the SAC and Ramsar, the feature habitats are indicated to be sensitive to these pathways in the AoO. Consequently, a precautionary approach has been taken and the following low risk impact pathways were also considered in this screening:

- Underwater noise; and
- Introduction of light.

The following medium-high risk impact pathways that were not anticipated to be associated with the proposed works and / or did not have the potential to affect designated site features were not included in the screening, in line with the AoO guidance:

- Barrier to species movement;
- Physical change (to another seabed type); and
- Physical change (to another sediment type).

The following low risk impact pathways were also not included in the screening, in line with the AoO guidance:

- Collision below water with static or moving objects not naturally found in the marine environment;
- Deoxygenation;
- Genetic modification & translocation of indigenous species;
- Introduction of microbial pathogens;
- Introduction or spread of invasive non-native species (INNS);
- Litter;
- Nutrient enrichment;

- Organic enrichment;
- Radionuclide contamination;
- Salinity decrease;
- Salinity increase;
- Synthetic compound contamination (incl. pesticides, antifoulants, pharmaceuticals);
- Temperature decrease;
- Temperature increase;
- Transition elements & organo-metal (e.g TBT) contamination;
- Water flow (tidal current) change, including sediment transport considerations; and
- Wave exposure changes.

6. Screening: Testing for LSE

The table below shows the test for LSE for the qualifying features within the European sites and Ramsar site.

The Severn Estuary / Môr Hafren SAC – 0 (km) from the Proposed Works			
Impact pathway	Qualifying feature or species (include sub-features and supporting habitats)	LSE?	Justification
Abrasion / disturbance of the substrate on the surface of the seabed	<ul style="list-style-type: none"> 1130 Estuaries (73,677.25 ha within SAC) 1140 Mudflats and sandflats not covered by seawater at low tide (20,271.38 ha within SAC) 1330 Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) (656.06 ha within SAC) 	No	There is no overlap between the proposed works and the feature 'Atlantic salt meadow'. Access on or over the saltmarsh in the upper intertidal zone will not be required.
Changes in suspended solids (water clarity)			There is no overlap between the proposed works and the feature 'Reefs'. Although reefs are a designated feature located within the SAC, the closest reef is located over 2 km from the project site (Defra Magic Maps).
Habitat structure changes – removal of substratum (extraction)			'Estuaries', 'Mudflats and sandflats not covered by seawater at low tide' and 'Sandbanks which are slightly covered by sea water all the time' will be in the vicinity of the work activities and will experience some habitat loss, from the installation of the new pipe, and disturbance; however, the footprint of the works will be limited to 0.129 km ² . The trench for the new pipe is 1,290 m in length and will be dug to approximately 1.5 m deep with a cross section of circa 5.4 m ² and a total volume of sediment excavated being approximately 7,057 m ³ . All excavated bed material will be side-cast adjacent to the trench, covering an area of approximately 5,160 m ² (0.516 ha) and graded to a shallow angle while the trench is being excavated, the material will then be used to backfill the trench once the pipe is installed. The installation works will result in a small area of habitat structure change (removal of substratum), smothering and siltation rate change and physical loss; however, this will be minimal relative to the total area of these habitats within the SAC (note the areas of different habitat qualifying features are
Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion			
Physical loss			

The Severn Estuary / Môr Hafren SAC – 0 (km) from the Proposed Works			
Impact pathway	Qualifying feature or species (include sub-features and supporting habitats)	LSE?	Justification
Smothering and siltation rate changes	<ul style="list-style-type: none"> 1110 Sandbanks which are slightly covered by sea water all the time (11779.51 ha within SAC) 1170 Reefs (1474.28 ha within SAC) 		<p>provided in the 'Qualifying feature' column of this table). Intertidal habitat loss will result from the concrete support mattresses not being buried in some areas due to the required slope of the new pipe. The total area where mattresses will be above the existing bed level will be approximately 229 m². In addition, there will be an area of approximately 854 m² where the depth of sediment will be less than 300 mm. With less available sediment depth, benthic infaunal communities may not be able to recover after completion of the works. As such, the total area of habitat loss due to the installation of the new pipe is approximately 1,083 m². This represents approximately 0.0009% of the 'mudflats and sandflats not covered by seawater at low tide' habitat within the SAC. While the installation works will result in a small area of habitat loss, the decommissioning and removal of the section of the pipe currently present and associated rock armour will result in a small amount of habitat gain. The removal of the pipe and rock armour will allow an area of 1,387.5 m² to naturally return to intertidal habitat. As such, net habitat gain on completion of the works will be approximately 304.5 m².</p> <p>Smothering and siltation rate change will take place in the area of excavated bed material being side-cast along the trench, however, works will be temporary and short term with the side cast material only being stored adjacent to the trench for less than five days. As previously mentioned, this area will cover approximately 5,160 m² (0.516 ha or approximately 0.0025% of the total area of the 'Mudflats and sandflats not covered by seawater at low tide' habitat within the SAC [assuming a side-cast area of 4 m x 1,290 m]) which is minimal relative to the total area of this habitat within the SAC, which covers an area of 20,271.38 ha. The decommissioning works will not cause smothering or siltation rate change as they will be undertaken in the dry and do not involve excavation of any sediment.</p> <p>The proposed works may cause abrasion / disturbance of the substrate on the surface of the seabed (installation and decommissioning), changes in suspended solids (water clarity) (installation), penetration and / or disturbance of the substratum below the surface of the</p>

The Severn Estuary / Môr Hafren SAC – 0 (km) from the Proposed Works			
Impact pathway	Qualifying feature or species (include sub-features and supporting habitats)	LSE?	Justification
			<p>seabed and including abrasion (installation). However, the proposed work activities will be temporary, restricted to a 2-month period, and limited to the 0.129 km² footprint of the works. Any disturbance to the sediment will be limited, temporary and minimal relative to the size of the affected habitats within the SAC and the area would be expected to naturally return to its prior condition after the works are completed.</p> <p>Given the above, there is considered to be no LSE on these qualifying features of the Severn Estuary SAC.</p>
Underwater noise	<ul style="list-style-type: none"> 1095 Sea lamprey <i>Petromyzon marinus</i> 1099 River lamprey <i>Lampetra fluviatilis</i> 	No	<p>Temporary timber piles and temporary cylindrical pin piles will be used during the submerging procedure. These piles will be pushed into the sediment with an amphibious excavator. The temporary steel pin piles will be installed in the dry when the tide is out so there is no impact pathway from this activity on sea and river lamprey. The timber piles will be installed during both high and low tides as required. During installation when the tide is in, underwater noise will be limited due to the piling method. No percussive piling is planned with the timber piles being pushed into the sediment. As such, it is expected that this activity will not create levels of noise that are distinguishable from the other trench excavation activities, and it is considered highly unlikely to have any impact on sea lamprey or river lamprey.</p> <p>Underwater works will be spatially constrained and time limited, therefore, visual disturbance will be minimal and are highly unlikely to have any impact on the designated fish species.</p> <p>Consequently, it is considered that there would be no LSE on these features from these impact pathways.</p>
Visual disturbance			
Pollution from vessels		Yes	<p>With the use of vessels for the installation and decommissioning works there is the potential for release of oil and chemicals through accidental spills. On the advice of NRW in comments</p>

The Severn Estuary / Môr Hafren SAC – 0 (km) from the Proposed Works			
Impact pathway	Qualifying feature or species (include sub-features and supporting habitats)	LSE?	Justification
Release of contaminants during excavation			<p>on the first version of this HRA, this effect has been screened through to appropriate assessment due to the potential risk to the SAC's fish features.</p> <p>During excavation of the trench there is potential for contaminants to be released into the water column, which may result in ecotoxicological effects on qualifying fish features.</p> <p>As such, LSE cannot be ruled out and the potential for pollution from vessels and release of contaminants from sediment have been screened through to appropriate assessment.</p>

The Severn Estuary Ramsar – 0 (km) from the Proposed Works			
Impact pathway	Qualifying feature or species (include sub-features and supporting habitats)	LSE?	Justification
<p>Abrasion / disturbance of the substrate on the surface of the seabed</p> <p>Changes in suspended solids (water clarity)</p> <p>Habitat structure changes – removal of substratum (extraction)</p>	<ul style="list-style-type: none"> Estuaries 	No	<p>'Estuaries' will be in the vicinity of the work activities and will experience some intertidal habitat loss, from the installation of the new pipe, and disturbance; however, the footprint of the works will be limited to 0.129 km². The trench for the new pipe is 1,290 m in length and will be dug to approximately 1.5 m deep with a cross section of circa 5.4 m² and a total volume of sediment excavated being approximately 7,057 m³. All excavated bed material will be side-cast adjacent to the trench, covering an area of approximately 5,160 m² (0.516 ha) and graded to a shallow angle while the trench is being excavated, the material will then be used to backfill the trench once the pipe is installed. The installation works will result in a small area of intertidal habitat structure change (removal of substratum), smothering and siltation rate change and physical</p>

The Severn Estuary Ramsar – 0 (km) from the Proposed Works			
Impact pathway	Qualifying feature or species (include sub-features and supporting habitats)	LSE?	Justification
Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion			<p>loss; however, this will be a minimal relative to the total area of this habitat within the Ramsar site. Intertidal habitat loss will result from the concrete support mattresses not being buried in some areas due to the required slope of the new pipe. The total area where mattresses will be above the existing bed level will be approximately 229 m². In addition, there will be an area of approximately 854 m² where the depth of sediment will be less than 300 mm. With less available sediment depth, benthic infaunal communities may not be able to recover after completion of the works. As such, the total area of habitat loss due to the installation of the new pipe is approximately 1,083 m². While the installation works will result in a small area of habitat loss, the decommissioning and removal of a section of the pipe and associated rock armour will result in a small amount of habitat gain and the removal of the pipe and rock armour will allow an area of 1,387.5 m² to naturally return to intertidal habitat. As such, net habitat gain on completion of the works will be approximately 304.5 m².</p> <p>Smothering and siltation rate change will take place in the area of excavated bed material being side-cast along the trench, however, works will be temporary and short term with the side cast material only being stored adjacent to the trench for less than five days. As previously mentioned, this area will cover approximately 5,160 m² of the intertidal habitat which is minimal relative to the total area of this habitat within the Ramsar. The decommissioning works will not cause smothering or siltation rate change as they will be undertaken in the dry and do not involve excavation of any sediment.</p> <p>The proposed works may cause abrasion / disturbance of the substrate on the surface of the seabed (installation and decommissioning), changes in suspended solids (water clarity) (installation), penetration and / or disturbance of the substratum below the surface of the seabed and including abrasion (installation). However, the proposed work activities will be temporary, restricted to a 2-month period, and limited to the 0.129 km² footprint of the works. Any disturbance to the sediment will be limited, temporary and minimal relative to the size of</p>
Physical loss			
Smothering and siltation rate changes			

The Severn Estuary Ramsar – 0 (km) from the Proposed Works			
Impact pathway	Qualifying feature or species (include sub-features and supporting habitats)	LSE?	Justification
			<p>the affected habitats within the site and the area would be expected to naturally return to its prior condition after the works are completed.</p> <p>Given the above, there is considered to be no LSE on these qualifying features of the Severn Estuary Ramsar.</p>
Underwater noise	<ul style="list-style-type: none"> • Sea lamprey • River lamprey • Twaite shad • Allis shad • Atlantic Salmon • Sea trout • Eel 	No	<p>Temporary timber piles and temporary cylindrical pin piles will be used during the submerging procedure. These piles will be pushed into the sediment with an amphibious excavator. The temporary steel pin piles will be installed in the dry when the tide is out so there is no impact pathway from this activity on sea and river lamprey. The timber piles will be installed during both high and low tides as required. During installation when the tide is in, underwater noise will be limited due to the piling method. No percussive piling is planned with the timber piles being pushed into the sediment. As such, it is expected that this activity will not create levels of noise that are distinguishable from the other trench excavation activities, and it is considered highly unlikely to have any impact on designated fish features.</p> <p>Underwater works will be spatially constrained and time limited, therefore, visual disturbance will be minimal and are highly unlikely to have any impact on the designated fish species.</p> <p>Consequently, it is considered that there would be no LSE on these features from these impact pathways.</p>
Visual disturbance			
Pollution from Vessels			Yes

The Severn Estuary Ramsar – 0 (km) from the Proposed Works			
Impact pathway	Qualifying feature or species (include sub-features and supporting habitats)	LSE?	Justification
Release of contaminants during excavation			<p>on the first version of this HRA, this effect has been screened through to appropriate assessment due to the potential risk to the Ramsar’s fish features.</p> <p>During excavation of the trench there is potential for contaminants to be released into the water column, which may result in ecotoxicological effects on qualifying fish features.</p> <p>As such, LSE cannot be ruled out and the potential for pollution from vessels and release of contaminants from sediment have been screened through to appropriate assessment.</p>
Visual disturbance	<ul style="list-style-type: none"> • Bewick’s swan • European white-fronted goose • Dunlin • Redshank • Shelduck • Gadwall • Waterfowl assemblage (including; wigeon, teal, pintail, pochard, tufted duck, ringed plover, grey plover, curlew, whimbrel and spotted redshank). 	Yes	<p>Bewick’s swan, European white-fronted goose and gadwall are not birds of intertidal environments, so do not reside within or in close proximity to the proposed works. They are also not present within the months during which the proposed works are being undertaken. Therefore, there is no potential for LSE on wintering Bewick’s swans, European white-fronted geese or gadwall since these features will be absent from this area of the Ramsar site.</p>
Above water noise			<p>The Ramsar is designated for non-breeding dunlin, redshank and shelduck, which have the potential to be present within or in proximity to the proposed works during the non-breeding period (peaking during the core winter period from November through to February in the Severn estuary). The Phase 2 works are due to be undertaken between April and June 2024 so these species are unlikely to be present during this time.</p> <p>Some of the non-breeding waterfowl assemblage bird species (including; pintail, pochard and tufted duck) are not birds that utilise intertidal environments, so do not reside within or in close proximity to the proposed works. Therefore, there is no potential for LSE on these species in the non-breeding waterfowl assemblage.</p> <p>Other bird species in the non-breeding waterfowl assemblage (including; wigeon, teal, ringed plover, grey plover, spotted redshank and curlew) have the potential to be present within or in close proximity to the proposed works during the non-breeding period (mostly from October through to March). Other species (including whimbrel) are only found during migratory periods in the spring and / or autumn. The Phase 2 works are due to be undertaken between early</p>

The Severn Estuary Ramsar – 0 (km) from the Proposed Works			
Impact pathway	Qualifying feature or species (include sub-features and supporting habitats)	LSE?	Justification
			April and early June 2024 so a number of these migratory species may be present during the works. As such, LSE cannot be ruled out and waterfowl assemblage species have been screened through to Stage 2 Appropriate Assessment.

The Severn Estuary SPA – 0 (km) from the Proposed Works			
Impact pathway	Qualifying feature or species (include sub-features and supporting habitats)	LSE?	Justification
Visual disturbance	<ul style="list-style-type: none"> Bewick’s swan European white-fronted goose Dunlin Redshank Shelduck Gadwall Waterfowl assemblage (including; wigeon, teal, pintail, pochard, tufted duck, ringed plover, grey plover, curlew, whimbrel and spotted redshank). 	Yes	Bewick’s swan, European white-fronted goose and gadwall are not birds of intertidal environments, so do not reside within or in close proximity to the site proposed works. They are also not present within the months during which the proposed works are being undertaken. Therefore, there is no potential for LSE on wintering Bewick’s swans, European white-fronted geese or gadwall since these feature will be absent from this area of the SPA.
Above water noise			The Ramsar is designated for non-breeding dunlin, redshank and shelduck, which have the potential to be present within or in proximity to the proposed works during the non-breeding period (peaking during the core winter period from November through to February in the Severn estuary). The Phase 2 works are due to be undertaken between April and June 2024 so these species are unlikely to be present during this time. Some of the non-breeding waterfowl assemblage bird species (including; pintail, pochard and tufted duck) are not birds that utilise intertidal environments, so do not reside within or in close proximity to the proposed works. Therefore, there is no potential for LSE on these species in the non-breeding waterfowl assemblage.

The Severn Estuary SPA – 0 (km) from the Proposed Works			
Impact pathway	Qualifying feature or species (include sub-features and supporting habitats)	LSE?	Justification
			Other bird species in the non-breeding waterfowl assemblage (including; wigeon, teal, ringed plover, grey plover, spotted redshank and curlew) have the potential to be present within or in close proximity to the proposed works during the non-breeding period (mostly from October through to March). Other species (including whimbrel) are only found during migratory periods in the spring and / or autumn. The Phase 2 works are due to be undertaken between early April and early June 2024 so a number of these migratory species may be present during the works. As such, LSE cannot be ruled out and waterfowl assemblage species have been screened through to Stage 2 Appropriate Assessment.

River Usk / Afon Wysg SAC – 2.6 (km) from the Proposed Works			
Impact pathway	Qualifying feature or species (include sub-features and supporting habitats)	LSE?	Justification
Abrasion / disturbance of the substrate on the surface of the seabed	<ul style="list-style-type: none"> 3260 Water courses of plain to montane levels with the <i>Ranunculus fluitantis</i> and 	No	<p>There is no overlap between the work activities and the feature 'Water courses of plain to montane levels with the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation'.</p> <p>As such, there is no LSE on this qualifying feature of the River Usk / Afon Wysg SAC.</p>
Changes in suspended solids (water clarity)			

River Usk / Afon Wysg SAC – 2.6 (km) from the Proposed Works			
Impact pathway	Qualifying feature or species (include sub-features and supporting habitats)	LSE?	Justification
Habitat structure changes – removal of substratum (extraction)	<i>Callitricho-Batrachion</i> vegetation		
Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion			
Physical loss			
Smothering and siltation rate changes;			
Underwater noise	<ul style="list-style-type: none"> 1095 Sea lamprey <i>Petromyzon marinus</i> 1096 Brooke lamprey <i>Lampetra planeri</i> 1099 River lamprey <i>Lampetra fluviatilis</i> 	No	Temporary timber piles and temporary cylindrical pin piles will be used during the submerging procedure. These piles will be pushed into the sediment with an amphibious excavator. The temporary steel pin piles will be installed in the dry when the tide is out so there is no impact pathway from this activity on sea and river lamprey. The timber piles will be installed during both high and low tides as required. During installation when the tide is in, underwater noise will be limited due to the piling method. No percussive piling is planned with the timber piles being pushed into the sediment. As such, it is expected that this activity will not create levels of noise that are distinguishable from the other trench excavation activities, and it is considered highly unlikely to have any impact on designated fish features.
Visual disturbance			

River Usk / Afon Wysg SAC – 2.6 (km) from the Proposed Works			
Impact pathway	Qualifying feature or species (include sub-features and supporting habitats)	LSE?	Justification
	<ul style="list-style-type: none"> 1103 Twaite shad <i>Alosa fallax</i> 		<p>Underwater works will be spatially constrained and time limited, therefore, visual disturbance will be minimal and are highly unlikely to have any impact on the designated fish species.</p> <p>Consequently, it is considered that there would be no LSE on these features from these impact pathways.</p>
Pollution from Vessels	<ul style="list-style-type: none"> 1106 Atlantic salmon <i>Salmo salar</i> 1163 Bullhead <i>Cottus gobio</i> 1355 Otter <i>Lutra lutra</i> 	Yes	<p>With the use of vessels for the installation and decommissioning works there is the potential for release of oil and chemicals through accidental spills. On the advice of NRW in comments on the first version of this HRA, this effect has been screened through to appropriate assessment due to the potential risk to the SAC's migratory fish species, which may pass through the works area.</p> <p>During excavation of the trench there is potential for contaminants to be released into the water column, which may result in ecotoxicological effects on migratory qualifying fish features.</p> <p>As such, LSE cannot be ruled out and the potential for pollution from vessels and release of contaminants from sediment have been screened through to appropriate assessment.</p>
Release of contaminants during excavation			

River Wye / Afon Gwy SAC – 22.1 (km) from the Proposed Works			
Impact pathway	Qualifying feature or species (include sub-features and supporting habitats)	LSE?	Justification
Abrasion / disturbance of the substrate on the surface of the seabed	<ul style="list-style-type: none"> 3260 Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation 7140 Transition mires and quaking bogs 	No	<p>There is no overlap between the work activities and the features 'Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation' and Transition mires and quaking bogs.</p> <p>As such, there is no LSE on these qualifying features of the River Wye / Afon Gwy SAC.</p>
Pollution from vessels Release of contaminants during excavation	<ul style="list-style-type: none"> 1092 White-clawed (or Atlantic stream) crayfish <i>Austropotamobius pallipes</i> 1095 Sea lamprey <i>Petromyzon marinus</i> 1096 Brook lamprey <i>Lampetra planeri</i> 	Yes	<p>With the use of vessels for the installation and decommissioning works there is the potential for release of oil and chemicals through accidental spills. On the advice of NRW in comments on the first version of this HRA, this effect has been screened through to appropriate assessment due to the potential risk to the SAC's migratory fish species, which may pass through the works area.</p> <p>During excavation of the trench there is potential for contaminants to be released into the water column, which may result in ecotoxicological effects on migratory qualifying fish features.</p> <p>As such, LSE cannot be ruled out and the potential for pollution from vessels and release of contaminants from sediment have been screened through to appropriate assessment.</p>

River Wye / Afon Gwy SAC – 22.1 (km) from the Proposed Works			
Impact pathway	Qualifying feature or species (include sub-features and supporting habitats)	LSE?	Justification
	<ul style="list-style-type: none"> • 1099 River lamprey <i>Lampetra fluviatilis</i> • 1103 Twaite shad <i>Alosa fallax</i> • 1106 Atlantic salmon <i>Salmo salar</i> • 1163 Bullhead <i>Cottus gobio</i> • 1355 Otter <i>Lutra lutra</i> • 1102 Allis shad <i>Alosa alosa</i> 		

6.1 LSE Conclusion

The tests for LSE carried out above on the European and Ramsar Sites (considering their interest features) and on functionally linked land, have been based on the range of impact pathways and potential effects anticipated to arise from the proposed works in isolation. These tests have concluded that there is potential for LSE on the following sites with the potential impact also indicated:

- The Severn Estuary / Môr Hafren SAC:
 - Pollution from vessels (fish features)
 - Release of contaminants during excavation (fish features)
- The Severn Estuary Ramsar: Potential for LSE
 - Pollution from vessels (fish features)
 - Release of contaminants during excavation (fish features)
 - Visual disturbance (bird features)
 - Above water noise ((bird features)
- The Severn Estuary SPA SPA
 - Visual disturbance (bird features)
 - Above water noise ((bird features)
- River Usk / Afon Wysg SAC
 - Pollution from vessels (fish features)
 - Release of contaminants during excavation (fish features)
- River Wye / Afon Gwy SAC
 - Pollution from vessels (fish features)
 - Release of contaminants during excavation (fish features)

Based on these conclusions the proposed works will be carried forward to Appropriate Assessment (the next stage of the HRA process).

7. Stage 2 Appropriate Assessment

An appropriate assessment of the implications of any development consent must be made by the relevant competent authority if a project is likely to have a significant effect on the conservation objectives of a European Site to determine if there is an Adverse Effect on Integrity (AEoI) of the site. Information to support such an assessment is provided in this section.

Severn Estuary / Môr Hafren SAC			
Impact pathway	Qualifying feature or species for which there is potential LSE	Taking account of any mitigation measures where necessary, can you conclude no adverse effect on site integrity?	Justification
Pollution from vessels	<ul style="list-style-type: none"> Sea lamprey River lamprey 	Yes	<p>Given the nature and size of the vessels to be used for the proposed survey activities, it is unlikely that any accidental spill events would be significant. All vessels will be International Convention for the Prevention of Pollution from Ships (MARPOL) compliant, which stipulates the requirements vessel operators must implement to prevent pollution from ships. In addition, various measures will be included in the project Construction Environmental Management Plan to mitigate the risk of this potential effect including:</p> <ul style="list-style-type: none"> Any plant delivered to site will have been cleaned, properly maintained and will be fit for purpose; On arrival at site all plant will be inspected for visible signs of fuel / oil leaks before disembarkation from the landing craft; All plant will come equipped with spill kits; All plant / equipment will be appropriately banded to prevent the release of any accidental spillages; No refuelling of plant or marine vessels will be undertaken outside of Newport ABP; Only biodegradable oils will be used; and Best practice guidance will be followed (Guidance for Pollution Prevention 5 – Works and maintenance in or near water).

			<p>As such, the risk of pollution from vessels potentially affecting the sea and river lamprey features of the European Site is negligible.</p> <p>It is therefore concluded that there is no AEoI of the site.</p>
<p>Release of contaminants during excavation</p>	<ul style="list-style-type: none"> • Sea lamprey • River lamprey 	<p>Yes</p>	<p>Kaymac have collected six sediment samples from the intertidal zone along the line of the trench that will be excavated for the new pipe. These samples were analysed for the suite of contaminants listed by the Marine Management Organisation (MMO suite) that is commonly used to determine the suitability for dredged sediment to be disposed of at sea (see Appendix I for the full suite).</p> <p>Comparison of the data against Cefas Action Levels (AL) indicates some minor exceedances of AL 1 but these were generally an order of magnitude less than AL 2 thresholds (where these exist).</p> <p>Any contaminants resuspended during the excavation works are likely to be rapidly diluted and dispersed with the tide and / or currents. In addition, under normal circumstances, the organic contaminants, such as PAHs, are most likely to remain strongly bound to the sediment with only small concentrations entering the dissolved phase. Metals are more likely to enter the dissolved phase but given the very minor exceedances of AL1 for some metals and the potential for these to be quickly diluted and dispersed, it is considered that the sediment contamination at the site poses very little risk to water quality and subsequently the fish features of the SAC. Additionally, the proposed volume of excavated material is small, so the source of potential contaminants is considered to be limited.</p> <p>The low contamination concentrations along with the potential for resuspended contaminants to be quickly diluted and dispersed by tides and currents means that increased bioavailability resulting in adverse ecotoxicological effects are not expected, especially given the highly mobile nature of sea and river lamprey enabling them to avoid the area of the works if required.</p> <p>As such, it is therefore concluded that there is no AEoI of the site.</p>

Severn Estuary / Môr Hafren Ramsar			
Impact pathway	Qualifying feature or species for which there is potential LSE	Taking account of any mitigation measures where necessary, can you conclude no adverse effect on site integrity?	Justification
Pollution from vessels	<ul style="list-style-type: none"> • Sea lamprey • River lamprey • Twaite shad • Allis shad • Atlantic Salmon • Sea trout • Eel 	Yes	<p>Given the nature and size of the vessels to be used for the proposed survey activities, it is unlikely that any accidental spill events would be significant. All vessels will be MARPOL compliant. In addition, various measures will be included in the project Construction Environmental Management Plan to mitigate the risk of this potential effect including:</p> <ul style="list-style-type: none"> • Any plant delivered to site will have been cleaned, properly maintained and will be fit for purpose; • On arrival at site all plant will be inspected for visible signs of fuel / oil leaks before disembarkation from the landing craft; • All plant will come equipped with spill kits; • All plant / equipment will be appropriately banded to prevent the release of any accidental spillages; • No refuelling of plant or marine vessels will be undertaken outside of Newport ABP; • Only biodegradable oils will be used; and • Best practice guidance will be followed (Guidance for Pollution Prevention 5 – Works and maintenance in or near water). <p>As such, the risk of pollution from vessels potentially affecting the migratory fish features of the Ramsar site is negligible.</p> <p>It is therefore concluded that there is no AEoI of the site.</p>

<p>Release of contaminants from excavation</p>	<ul style="list-style-type: none"> • Sea lamprey • River lamprey • Twaite shad • Allis shad • Atlantic Salmon • Sea trout • Eel 	<p>Yes</p>	<p>Kaymac have collected six sediment samples from the intertidal zone along the line of the trench that will be excavated for the new pipe. These samples were analysed for the suite of contaminants listed by the Marine Management Organisation (MMO suite) that is commonly used to determine the suitability for dredged sediment to be disposed of at sea (see Appendix I for the full suite).</p> <p>Comparison of the data against Cefas Action Levels (AL) indicates some minor exceedances of AL 1 but were generally an order of magnitude less than AL 2 thresholds (where these exist) (the full sediment contamination data are included in Appendix I).</p> <p>Any contaminants resuspended during the excavation works are likely to be rapidly diluted and dispersed with the tide and / or currents. In addition, under normal circumstances, the organic contaminants, such as PAHs, are most likely to remain strongly bound to the sediment with only small concentrations entering the dissolved phase. Metals are more likely to enter the dissolved phase but given the very minor exceedances of AL1 for some metals and the potential for these to be quickly diluted and dispersed, it is considered that the sediment contamination at the site poses very little risk to water quality and subsequently the fish features of the Ramsar site. Additionally, the proposed volume of excavated material is small, so the source of potential contaminants is considered to be limited.</p> <p>The low contamination concentrations along with the potential for resuspended contaminants to be quickly diluted and dispersed by tides and currents means that increased bioavailability resulting in adverse ecotoxicological effects are not expected, especially given the highly mobile nature of fish enabling them to avoid the area of the works if required.</p> <p>As such, it is concluded that there is no AEoI of the site.</p>
<p>Visual disturbance</p>		<p>Yes</p>	

<p>Above water noise</p>	<ul style="list-style-type: none"> Waterfowl assemblage (including; wigeon, teal, ringed plover, grey plover, curlew, whimbrel and spotted redshank). 		<p>Given the works commence in early April 2024, the numbers of non-breeding waterfowl present within the Ramsar site will be low but there is potential for migratory species to be present. During periods of mid to low-tide, birds will be widely distributed throughout the intertidal area and any loss of foraging area caused by displacement through visual disturbance or above water noise will be trivial and the effect negligible.</p> <p>Across the high tide period there will be limited habitat available to those species which forage in the intertidal area and birds will roost in discrete locations. In order to mitigate risk to qualifying bird features to the Ramsar site, no works will be undertaken two hours either side of high tide (four hours total) and a watching brief will be undertaken by a qualified ecologist for the period of the works. If they consider works are preventing birds from roosting then works will cease.</p> <p>With the above measures in place, it is considered that there is no AEoI of the site.</p>
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The Severn Estuary SPA			
Impact pathway	Qualifying feature or species for which there is potential LSE	Taking account of any mitigation measures where necessary, can you conclude no adverse effect on site integrity?	Justification
Visual disturbance	<ul style="list-style-type: none"> Waterfowl assemblage (including; wigeon, teal, ringed plover, grey plover, curlew, whimbrel and spotted redshank). 	Yes	<p>Given the works commence in early April 2024, the numbers of non-breeding waterfowl present within the SPA will be low but there is potential for migratory species to be present. During periods of mid to low-tide, birds will be widely distributed throughout the intertidal area and any loss of foraging area caused by displacement through visual disturbance or above water noise will be trivial and the effect negligible.</p> <p>Across the high tide period there will be limited habitat available to those species which forage in the intertidal area and birds will roost in discrete locations. In order to mitigate risk to qualifying bird features to the SPA, no works will be undertaken two hours either side of high tide (four hours total) and a watching brief will be undertaken by a qualified ecologist for the period of the works. If they consider works are preventing birds from roosting then works will cease.</p> <p>With the above measures in place, it is considered that there is no AEoI of the site.</p>
Above water noise			

River Usk SAC / Afon Wysg SAC			
Impact pathway	Qualifying feature or species for which there is potential LSE	Taking account of any mitigation measures where	Justification

		necessary, can you conclude no adverse effect on site integrity?	
Pollution vessels from	<ul style="list-style-type: none"> Sea lamprey River lamprey Twaite shad Atlantic salmon 	Yes	<p>Given the nature and size of the vessels to be used for the proposed survey activities, it is unlikely that any accidental spill events would be significant. All vessels will be MARPOL compliant. In addition, various measures will be included in the project Construction Environmental Management Plan to mitigate the risk of this potential effect including:</p> <ul style="list-style-type: none"> Any plant delivered to site will have been cleaned, properly maintained and will be fit for purpose; On arrival at site all plant will be inspected for visible signs of fuel / oil leaks before disembarkation from the landing craft; All plant will come equipped with spill kits; All plant / equipment will be appropriately banded to prevent the release of any accidental spillages; No refuelling of plant or marine vessels will be undertaken outside of Newport ABP; Only biodegradable oils will be used; and Best practice guidance will be followed (Guidance for Pollution Prevention 5 – Works and maintenance in or near water). <p>As such, the risk of pollution from vessels potentially affecting the migratory fish features of the European Site is negligible.</p> <p>It is therefore concluded that there are no adverse effects on site integrity.</p>
Release of contaminants during excavation	<ul style="list-style-type: none"> Sea lamprey River lamprey Twaite shad Atlantic salmon 	Yes	<p>Kaymac have collected six sediment samples from the intertidal zone along the line of the trench that will be excavated for the new pipe. These samples were analysed for the suite of contaminants listed by the Marine Management Organisation (MMO suite) that is commonly used to determine the suitability for dredged sediment to be disposed of at sea (see Appendix I for the full suite).</p> <p>Comparison of the data against Cefas Action Levels (AL) indicates some minor exceedances of AL 1 but were generally an order of magnitude less than AL</p>

			<p>2 thresholds (where these exist) (the full sediment contamination data are included in Appendix I).</p> <p>Any contaminants resuspended during the excavation works are likely to be rapidly diluted and dispersed with the tide and / or currents. In addition, under normal circumstances, the organic contaminants, such as PAHs, are most likely to remain strongly bound to the sediment with only small concentrations entering the dissolved phase. Metals are more likely to enter the dissolved phase but given the very minor exceedances of AL1 for some metals and the potential for these to be quickly diluted and dispersed, it is considered that the sediment contamination at the site poses very little risk to water quality and subsequently the fish features of the SAC. Additionally, the proposed volume of excavated material is small, so the source of potential contaminants is considered to be limited.</p> <p>The low contamination concentrations along with the potential for resuspended contaminants to be quickly diluted and dispersed by tides and currents means that increased bioavailability resulting in adverse ecotoxicological effects are not expected, especially given the highly mobile nature of fish enabling them to avoid the area of the works if required.</p> <p>As such, it is concluded that there is no AEoI of the site.</p>
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River Wye / Afon Gwy SAC			
Impact pathway	Qualifying feature or species for which there is potential LSE	Taking account of any mitigation measures where necessary, can you conclude no adverse effect on site integrity?	Justification
Pollution from vessels	<ul style="list-style-type: none"> Sea lamprey River lamprey Twaite shad Atlantic salmon 	Yes	Given the nature and size of the vessels to be used for the proposed survey activities, it is unlikely that any accidental spill events would be significant. All vessels will be MARPOL compliant. In addition, various measures will be

	<ul style="list-style-type: none"> Allis shad 		<p>included in the project Construction Environmental Management Plan to mitigate the risk of this potential effect including:</p> <ul style="list-style-type: none"> Any plant delivered to site will have been cleaned, properly maintained and will be fit for purpose; On arrival at site all plant will be inspected for visible signs of fuel / oil leaks before disembarkation from the landing craft; All plant will come equipped with spill kits; All plant / equipment will be appropriately banded to prevent the release of any accidental spillages; No refuelling of plant or marine vessels will be undertaken outside of Newport ABP; Only biodegradable oils will be used; and Best practice guidance will be followed (Guidance for Pollution Prevention 5 – Works and maintenance in or near water). <p>In addition, the River Wye SAC is approximately 22 km upstream of the proposed works site, it is highly unlikely that any resuspended contamination from the excavation would be transported to the European site.</p> <p>As such, the risk of pollution from vessels potentially affecting the migratory fish features of the European Site is negligible.</p> <p>As such, it is concluded that there is no AEoI of the site.</p>
<p>Release of contaminants during excavation</p>	<ul style="list-style-type: none"> Sea lamprey River lamprey Twaite shad Atlantic salmon Allis shad 	<p>Yes</p>	<p>At the request of NRW, Kaymac have collected six sediment samples from the intertidal zone along the line of the trench that will be excavated for the new pipe. These samples were analysed for the suite of contaminants listed by the Marine Management Organisation (MMO suite) that is commonly used to determine the suitability for dredged sediment to be disposed of at sea (see Appendix I for the full suite).</p> <p>Comparison of the data against Cefas Action Levels (AL) indicates some minor exceedances of AL 1 but were generally an order of magnitude less than AL 2 thresholds (where these exist) (the full sediment contamination data are included in Appendix I).</p> <p>Any contaminants resuspended during the excavation works are likely to be rapidly diluted and dispersed with the tide and / or currents. In addition, under</p>

			<p>normal circumstances, the organic contaminants, such as PAHs, are most likely to remain strongly bound to the sediment with only small concentrations entering the dissolved phase. Metals are more likely to enter the dissolved phase but given the very minor exceedances of AL1 for some metals and the potential for these to be quickly diluted and dispersed, it is considered that the sediment contamination at the site poses very little risk to water quality and subsequently the fish features of the SAC. Additionally, the proposed volume of excavated material is small, so the source of potential contaminants is considered to be limited.</p> <p>The low contamination concentrations along with the potential for resuspended contaminants to be quickly diluted and dispersed by tides and currents means that increased bioavailability resulting in adverse ecotoxicological effects are not expected, especially given the highly mobile nature of fish enabling them to avoid the area of the works if required.</p> <p>In addition, the River Wye SAC is approximately 22 km upstream of the proposed works site, it is highly unlikely that any resuspended contamination from the excavation would be transported to the European site.</p> <p>As such, it is concluded that there is no AEoI of the site.</p>
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7.1 Appropriate Assessment Conclusion

The appropriate assessment carried out above has concluded, based on consideration of the potential effects of the proposed works and the implementation of mitigation measures, no Adverse Effect on Integrity (AEoI) of the European sites listed above. The in-combination assessment is provided in Section 8.

8. In-combination Assessment

8.1 Projects considered

The identification of plans and projects to include in the in-combination assessment is based on:

- Approved plans;
- Constructed projects;
- Approved but as yet unconstructed projects; and
- Projects for which an application has been made, are currently under consideration and will be consented before the proposed works begin.

To identify the projects or plans a combination of local knowledge, the Lle Geo Portal for Wales and Newport City Planning Portal was used. Three projects were identified that are within the vicinity of the proposed works and have the potential to have an in-combination effect with the proposed works. Distances to the proposed works are provided within brackets:

- Associated British Ports (ABP) marine licence application for dredge and disposal of sediment as part of the Newport maintenance dredging operations. (1.6 km)
- Construction of Plasterboard Manufacturing facility and Associated Development at Tom Lewis Way Alexandra Docks (3.3 km).
- Newport dredge disposal site (Bristol Channel) (3.75 km).
- St Julian's Viaduct Scour Protection Works (8.2 km).

DML1950 – Marine licence renewal for Newport maintenance dredging

ABP applied to renew their marine licence for undertaking maintenance dredging of the approaches to Alexandra Docks at Newport and the River Usk from the Bristol Channel. The dredge areas are approximately 1.6 km from the proposed works site. It is assumed that the maintenance dredging operations were subject to assessment at the time of application and that with appropriate mitigation measures the works alone would not have the potential to impact the European and Ramsar Sites indicated within this report. Given the nature of the proposed works and the limited effects outlined in this report, it is concluded that there is no potential for the proposed works and the maintenance dredging activities to have in-combination effects on the European and Ramsar Sites and there would be no LSE.

Construction of Plasterboard Manufacturing facility and Associated Development at Tom Lewis Way Alexandra Docks - Licence number 21/1054

A planning permission application was submitted for the construction of plasterboard manufacturing facility, associated development, creation of new access off Tom Lewis way and provision of ecological enhancement areas. There are no details provided for the timings of the proposed works, however the planning application was submitted in October 2021 and is awaiting a decision. The proposed works are approximately 3.3 km from the site. Approval has not been granted for this application yet and no start date for the works have been set.

Given the distance of the works from this project, there is no crossover for impact pathways with the proposed works.

Given that there is no overlap with the proposed works and the fact that it was concluded that the works would have no LSE on the protected European sites or Ramsar site it can be concluded that the proposed works would not act in-combination to give rise to a LSE on any European or Ramsar sites.

Newport dredge disposal site – Site reference LU140

The Newport dredge disposal site is approximately 3.75 km offshore from the proposed works site. The dredge disposal site receives dredged sediment from nearby dredging operations. The schedule for disposals is unknown, however, given the nature of the proposed works and the temporary and short-term duration of the works, it is concluded that there is no potential for the works and activities at the dredge disposal site to have in-combination effects on the European and Ramsar Sites and there would be no LSE.

8.2 In-combination assessment conclusion

The potential effects arising from identified projects in-combination with the proposed works concluded that the proposed works would not act in-combination to give rise to an LSE on any European or Ramsar sites.

We have considered the relevant qualifying features and concluded there is no LSE or adverse effects, alone or in-combination, on the integrity of the European and Ramsar sites.

9. Conclusions

The proposed works on the northern bank of the Severn Estuary have the potential to interact with European and Ramsar Sites. As part of this assessment, protected sites in the vicinity of the proposed works which could potentially be influenced by effects arising from the proposed works were identified. Interest features within these sites were then considered individually. Screening used the conceptual ‘source-pathway-receptor’ model. The model was used to identify potential environmental effects resulting from the proposed works.

Potential effects of the works were identified using the AoO from Natural England for The Wash and North Norfolk SAC for the activity Aggregate Extraction: Beach Sand Extraction. The Wash and North Norfolk SAC was used as a proxy for the Severn Estuary designated sites as it had similar interest features and no recent AoO was available for the Severn Estuary designated sites. Reference was also made to Natural England & the Countryside Council for Wales’ advice given under Regulation 33(2)(a) of the Conservation (Natural Habitats, &c.)

Regulations 1994 for the Severn Estuary / Môr Hafren European Marine Site dated from 2012. Following reference to this guidance the following impact pathways were assessed:

- Above water noise;
- Abrasion / disturbance of the substrate on the surface of the seabed;
- Changes in suspended solids (water clarity)
- Habitat structure changes – removal of substratum (extraction);
- Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion;
- Physical loss;
- Pollution from vessels;
- Release of contaminants during excavation;
- Smothering and siltation rate change (light) and (heavy);
- Underwater noise; and
- Visual disturbance.

The tests for LSE carried out on the European and Ramsar Sites concluded that there is potential for LSE on the following sites with the potential impact also indicated:

- The Severn Estuary / Môr Hafren SAC:
 - Pollution from vessels (fish features)
 - Release of contaminants during excavation (fish features)
- The Severn Estuary Ramsar: Potential for LSE
 - Pollution from vessels (fish features)
 - Release of contaminants during excavation (fish features)
 - Visual disturbance (bird features)
 - Above water noise ((bird features)
- The Severn Estuary SPA SPA
 - Visual disturbance (bird features)
 - Above water noise ((bird features)
- River Usk / Afon Wysg SAC
 - Pollution from vessels (fish features)
 - Release of contaminants during excavation (fish features)
- River Wye / Afon Gwy SAC
 - Pollution from vessels (fish features)
 - Release of contaminants during excavation (fish features)

As such the sites were taken through to full assessment for consideration of adverse effects on site integrity (AEoI).

The Appropriate Assessment considered the potential effects on site integrity and concluded no AEoI after the implementation of appropriate mitigation measures.

The in-combination assessment concluded no LSE or AEoI of any of the sites resulting from a combination of the projects considered.

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Appendix I Cefas Action Levels and Sediment Contaminant Data

Cefas Guideline Action Levels for the Disposal of Dredged Material

	Action Level 1	Action Level 2
Contaminant / Compound	mg/kg dry weight (ppm)	mg/kg dry weight (ppm)
Arsenic	20	100
Mercury	0.3	3
Cadmium	0.4	5
Chromium	40	400
Copper	40	400
Nickel	20	200
Lead	50	500
Zinc	130	800
Organotins (TBT, DBT, MBT)	0.1	1
PCBs (sum of ICES 7)	0.01	None
PCBs (sum of 25 congeners)	0.02	0.2
DDT	0.001	None
Dieldrin	0.005	None

Total Organic Carbon and Particle Size Analysis

* See report notes at the end of this appendix.

	Units	% M/M	% (at 0.5phi intervals)				
	Method No	WSLM59*	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01
	Accreditation	UKAS/MMO	MMO	MMO	MMO	MMO	MMO
		Total Organic Carbon	45mm	31.5mm	22.4mm	16mm	11.2mm
Sample Reference	Matrix	-	-5.5	-5.0	-4.5	-4.0	-3.5
WS01 SURFACE	Sediment	2.28	0.00	0.00	0.00	0.00	0.00
WS02 SURFACE	Sediment	2.29	0.00	0.00	0.00	0.00	0.00
WS03 SURFACE	Sediment	2.44	0.00	0.00	0.00	0.00	0.00
WS04 SURFACE	Sediment	2.36	0.00	0.00	0.00	0.00	0.00
TP01 SURFACE	Sediment	2.58	0.00	0.00	0.00	0.00	0.00
TP02 SURFACE	Sediment	2.43	0.00	0.00	0.00	0.00	0.00

	Units	% (at 0.5phi intervals)					
	Method No	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01
	Accreditation	MMO	MMO	MMO	MMO	MMO	MMO
		8mm	5.6mm	4mm	2.8mm	2mm	1.4mm
Sample Reference	Matrix	-3.0	-2.5	-2.0	-1.5	-1.0	-0.5
WS01 SURFACE	Sediment	0.00	0.00	0.00	0.00	0.00	0.00
WS02 SURFACE	Sediment	0.00	0.00	0.00	0.00	0.00	0.00
WS03 SURFACE	Sediment	0.00	0.00	0.00	0.00	0.00	0.00
WS04 SURFACE	Sediment	0.00	0.00	0.00	0.00	0.00	0.00
TP01 SURFACE	Sediment	0.00	0.00	0.00	0.00	0.00	0.00
TP02 SURFACE	Sediment	0.00	0.00	0.00	0.00	0.00	0.00

	Units	% (at 0.5phi intervals)					
	Method No	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01
	Accreditation	MMO	MMO	MMO	MMO	MMO	MMO
		1mm	707µm	500µm	353.6µm	250µm	176.8µm
Sample Reference	Matrix	0.0	0.5	1.0	1.5	2.0	2.5
WS01 SURFACE	Sediment	0.00	0.00	0.00	0.00	0.00	0.00
WS02 SURFACE	Sediment	0.00	0.00	0.00	0.00	0.00	0.00
WS03 SURFACE	Sediment	0.00	0.00	0.00	0.00	0.00	0.00
WS04 SURFACE	Sediment	0.00	0.00	0.00	0.00	0.00	0.43
TP01 SURFACE	Sediment	0.00	0.00	0.00	0.00	0.00	0.00
TP02 SURFACE	Sediment	0.00	0.00	0.00	0.00	0.00	0.00

	Units	% (at 0.5phi intervals)					
	Method No	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01
	Accreditation	MMO	MMO	MMO	MMO	MMO	MMO
		125µm	88.39µm	63µm	44.2µm	31.3µm	22.1µm
Sample Reference	Matrix	3.0	3.5	4.0	4.5	5.0	5.5
WS01 SURFACE	Sediment	0.00	0.00	0.07	3.27	6.51	7.59
WS02 SURFACE	Sediment	0.00	0.00	0.01	1.71	5.91	6.33
WS03 SURFACE	Sediment	0.00	0.00	0.01	1.56	6.40	6.90
WS04 SURFACE	Sediment	4.53	1.69	0.89	6.03	7.53	8.08
TP01 SURFACE	Sediment	0.00	0.00	0.10	3.33	5.50	6.25
TP02 SURFACE	Sediment	0.00	0.00	0.01	1.60	6.03	5.92

	Units	% (at 0.5phi intervals)					
	Method No	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01
	Accreditation	MMO	MMO	MMO	MMO	MMO	MMO
		15.6µm	11µm	7.8µm	5.5µm	3.9µm	2.75µm
Sample Reference	Matrix	6.0	6.5	7.0	7.5	8.0	8.5
WS01 SURFACE	Sediment	8.94	8.24	10.31	11.65	10.45	7.63
WS02 SURFACE	Sediment	8.41	9.35	11.45	12.94	11.60	8.22
WS03 SURFACE	Sediment	7.89	8.59	10.94	12.84	11.86	8.58
WS04 SURFACE	Sediment	8.66	9.59	11.25	11.67	9.64	6.34
TP01 SURFACE	Sediment	8.21	9.21	11.63	13.09	11.63	8.20
TP02 SURFACE	Sediment	7.94	8.48	10.83	13.46	12.70	8.96

	Units	% (at 0.5phi intervals)					
	Method No	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01
	Accreditation	MMO	MMO	MMO	MMO	MMO	MMO
		1.95µm	1.38µm	0.98µm	0.69µm	0.49µm	0.34µm
Sample Reference	Matrix	9.0	9.5	10.0	10.5	11.0	11.5
WS01 SURFACE	Sediment	5.03	3.73	3.18	2.86	2.62	2.36
WS02 SURFACE	Sediment	5.02	3.43	2.86	2.63	2.49	2.29
WS03 SURFACE	Sediment	5.21	3.45	2.86	2.68	2.56	2.33
WS04 SURFACE	Sediment	3.38	1.85	1.39	1.35	1.34	1.25
TP01 SURFACE	Sediment	4.91	3.22	2.65	2.47	2.36	2.16
TP02 SURFACE	Sediment	5.12	3.22	2.68	2.60	2.56	2.39

	Units	% (at 0.5phi intervals)					
	Method No	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01	*SUB_01
	Accreditation	MMO	MMO	MMO	MMO	MMO	MMO
		0.24µm	0.17µm	0.12µm	0.09µm	0.06µm	0.04µm
Sample Reference	Matrix	12.0	12.5	13.0	13.5	14.0	14.5
WS01 SURFACE	Sediment	2.00	1.51	1.09	0.67	0.26	0.03
WS02 SURFACE	Sediment	1.96	1.46	1.04	0.62	0.24	0.03
WS03 SURFACE	Sediment	1.96	1.45	1.03	0.61	0.24	0.03
WS04 SURFACE	Sediment	1.08	0.84	0.63	0.40	0.16	0.02
TP01 SURFACE	Sediment	1.83	1.38	1.00	0.61	0.24	0.03
TP02 SURFACE	Sediment	2.03	1.51	1.06	0.63	0.24	0.03

Metals

Units	Method No	Limit of Detection	Accreditation	Units		% (at 0.5phi intervals)	mg/Kg (Dry Weight)				
				UKAS/MMO	UKAS/MMO		ICPMSS*				
Method No	0.5	0.04	MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	0.5	0.01	0.5	0.5	2
Accreditation	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO
Sample Reference	Matrix	Arsenic (As)	Cadmium (Cd)	Chromium (>14.5 Cr)	Copper (Cu)	Mercury (Hg)	Nickel (Ni)	Lead (Pb)	Zinc (Zn)		
WS1 SURFACE	Sediment	17.4	0.27	0.00	34.2	31.4	0.22	30.7	60.7	170	
WS2 SURFACE	Sediment	14.6	0.29	0.00	41.0	27.4	0.23	33.8	59.4	204	
WS3 SURFACE	Sediment	14.3	0.34	0.00	38.9	25.8	0.22	32.2	57.0	194	
WS4 SURFACE	Sediment	14.1	0.28	0.00	39.0	25.2	0.21	31.6	54.1	184	
TP1 SURFACE	Sediment	15.9	0.30	0.00	37.7	31.2	0.23	31.9	61.3	188	
TP2 SURFACE	Sediment	14.2	0.28		38.2	25.8	0.21	32.1	57.8	198	
Certified Reference Material SETOC 774 (% Recovery)		105	102	103	100	100	100	98	100		
QC Blank		<0.5	<0.04	<0.5	<0.5	<0.01	<0.5	<0.5	<2		

Organotins

		mg/Kg (Dry Weight)	
		ASC/SOP/301	
		0.001	0.001
		UKAS/MMO	UKAS/MMO
Sample Reference	Matrix	Dibutyltin (DBT)	Tributyltin (TBT)
WS01 SURFACE	Sediment	<0.005	<0.005
WS02 SURFACE	Sediment	<0.005	<0.005
WS03 SURFACE	Sediment	<0.005	<0.005
WS04 SURFACE	Sediment	<0.005	<0.005
TP01 SURFACE	Sediment	<0.005	<0.005
TP02 SURFACE	Sediment	<0.005	<0.005
Certified Reference Material SETOC 774 (% Recovery)		105	63
QC Blank		<0.5	<0.001

PAHs

Units		$\mu\text{g/Kg}$ (Dry Weight)					
Method No		ASC/SOP/303/304					
Limit of Detection		1	1	1	1	1	1
Accreditation		UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO
Sample Reference	Matrix	ACENAPTH	ACENAPHY	ANTHRACN	BAA	BAP	BBF
WS01 SURFACE	Sediment	63.2	25.6	90.2	183	188	228
WS02 SURFACE	Sediment	52.1	37.0	101	254	296	354
WS03 SURFACE	Sediment	40.9	34.6	78.3	189	217	300
WS04 SURFACE	Sediment	37.5	38.7	85.7	234	282	323
TP01 SURFACE	Sediment	49.0	30.4	93.5	222	254	316
TP02 SURFACE	Sediment	43.9	34.9	78.2	201	236	291
Certified Reference Material SETOC 774 (% Recovery)		115	109	84	76	77	71
QC Blank		<1	<1	<1	<1	<1	<1

Units		$\mu\text{g/Kg}$ (Dry Weight)					
Method No		ASC/SOP/303/304					
Limit of Detection		1	1	1	1	1	1
Accreditation		UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO
Sample Reference	Matrix	BENZGHIP	BEP	BKF	C1N	C1PHEN	C2N
WS01 SURFACE	Sediment	176	210	133	257	309	276
WS02 SURFACE	Sediment	266	304	194	283	302	278
WS03 SURFACE	Sediment	232	259	145	254	263	228
WS04 SURFACE	Sediment	246	285	156	258	272	243
TP01 SURFACE	Sediment	239	276	176	286	340	286
TP02 SURFACE	Sediment	229	254	147	259	260	251
Certified Reference Material SETOC 774 (% Recovery)		83	80	90	110	64	61
QC Blank		<1	<1	<1	<1	<1	<1

	Units	$\mu\text{g/Kg}$ (Dry Weight)					
	Method No	ASC/SOP/303/304					
	Limit of Detection	1	1	1	1	1	1
	Accreditation	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO
Sample Reference	Matrix	C3N	CHRYSENE	DBENZA	FLUORANT	FLUORENE	INDPYR
WS01 SURFACE	Sediment	192	190	37.0	384	101	168
WS02 SURFACE	Sediment	178	307	53.3	481	89.0	275
WS03 SURFACE	Sediment	157	247	46.4	413	72.3	235
WS04 SURFACE	Sediment	157	257	52.7	408	77.6	261
TP01 SURFACE	Sediment	198	274	53.0	437	88.9	247
TP02 SURFACE	Sediment	174	242	49.4	373	75.3	232
Certified Reference Material SETOC 774 (% Recovery)		125	79	74	82	83	75
QC Blank		<1	<1	<1	<1	<1	<1

	Units	$\mu\text{g/Kg}$ (Dry Weight)				mg/Kg (Dry Weight)
	Method No	ASC/SOP/303/304				ASC/SOP305
	Limit of Detection	1	1	1	1	1
	Accreditation	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	MMO
Sample Reference	Matrix	NAPTH	PERYLENE	PHENANT	PYRENE	THC
WS01 SURFACE	Sediment	144	265	339	301	39.7
WS02 SURFACE	Sediment	172	137	331	381	22.6
WS03 SURFACE	Sediment	147	110	318	326	31.5
WS04 SURFACE	Sediment	153	127	289	334	108
TP01 SURFACE	Sediment	156	122	323	363	23.6
TP02 SURFACE	Sediment	154	103	271	300	84.9
Certified Reference Material SETOC 774 (% Recovery)		82	74	81	86	106
QC Blank		<1	<1	<1	<1	<1

PCBs

	Units	mg/Kg (Dry Weight)						
	Method No	ASC/SOP/302						
	Limit of Detection	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008
	Accreditation	MMO*	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO
Sample Reference	Matrix	PCB 101	PCB 105	PCB 110	PCB 118	PCB 128	PCB 138	PCB 141
WS01 SURFACE	Sediment	0.00057	0.00040	0.00093	0.00069	0.00028	0.00125	0.00022
WS02 SURFACE	Sediment	0.00135	0.00086	0.00258	0.00197	0.00071	0.00431	0.00072
WS03 SURFACE	Sediment	0.00178	0.00114	0.00300	0.00228	0.00093	0.00518	0.00088
WS04 SURFACE	Sediment	0.00140	0.00081	0.00236	0.00177	0.00080	0.00290	0.00066
TP01 SURFACE	Sediment	0.00124	0.00080	0.00239	0.00162	0.00054	0.00260	0.00057
TP02 SURFACE	Sediment	0.00169	0.00097	0.00283	0.00209	0.00081	0.00309	0.00069
Certified Reference Material SETOC 774 (% Recovery)		79	75	93	83	107	114	107
QC Blank		<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008

	Units	mg/Kg (Dry Weight)						
	Method No	ASC/SOP/302						
	Limit of Detection	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008
	Accreditation	UKAS/MMO						
Sample Reference	Matrix	PCB 149	PCB 151	PCB 153	PCB 156	PCB 158	PCB 170	PCB 18
WS01 SURFACE	Sediment	0.00088	0.00021	0.00107	0.00010	0.00020	0.00050	0.00059
WS02 SURFACE	Sediment	0.00214	0.00054	0.00367	0.00039	0.00050	0.00128	0.00171
WS03 SURFACE	Sediment	0.00261	0.00059	0.00418	0.00038	0.00054	0.00131	0.00234
WS04 SURFACE	Sediment	0.00201	0.00052	0.00335	0.00037	0.00042	0.00113	0.00153
TP01 SURFACE	Sediment	0.00194	0.00059	0.00345	0.00032	0.00038	0.00135	0.00172
TP02 SURFACE	Sediment	0.00230	0.00059	0.00380	0.00040	0.00047	0.00129	0.00185
Certified Reference Material SETOC 774 (% Recovery)		72	76	99	85	112	76	73
QC Blank		<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008

	Units	mg/Kg (Dry Weight)						
	Method No	ASC/SOP/302						
	Limit of Detection	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008
	Accreditation	UKAS/MMO						
Sample Reference	Matrix	PCB 180	PCB 183	PCB 187	PCB 194	PCB 28	PCB 31	PCB 44
WS01 SURFACE	Sediment	0.00104	0.00025	0.00063	0.00026	0.00148	0.00132	0.00094
WS02 SURFACE	Sediment	0.00311	0.00073	0.00204	0.00071	0.00396	0.00331	0.00210
WS03 SURFACE	Sediment	0.00299	0.00075	0.00186	0.00075	0.00442	0.00407	0.00284
WS04 SURFACE	Sediment	0.00274	0.00069	0.00147	0.00066	0.00360	0.00301	0.00186
TP01 SURFACE	Sediment	0.00325	0.00066	0.00156	0.00074	0.00334	0.00300	0.00207
TP02 SURFACE	Sediment	0.00294	0.00078	0.00166	0.00067	0.00412	0.00353	0.00245
Certified Reference Material SETOC 774 (% Recovery)		83	83	98	67	105	89	107
QC Blank		<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008

	Units	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)
	Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
	Limit of Detection	0.00008	0.00008	0.00008	0.00008
	Accreditation	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO
Sample Reference	Matrix	PCB 47	PCB 49	PCB 52	PCB 66
WS01 SURFACE	Sediment	0.00031	0.00072	0.00084	0.00162
WS02 SURFACE	Sediment	0.00077	0.00176	0.00209	0.00393
WS03 SURFACE	Sediment	0.00108	0.00250	0.00304	0.00481
WS04 SURFACE	Sediment	0.00073	0.00169	0.00197	0.00366
TP01 SURFACE	Sediment	0.00070	0.00181	0.00219	0.00363
TP02 SURFACE	Sediment	0.00086	0.00204	0.00247	0.00428
Certified Reference Material SETOC 774 (% Recovery)		94	102	103	99
QC Blank		<0.00008	<0.00008	<0.00008	<0.00008

Organochlorine pesticides

	Units	mg/Kg (Dry Weight)							
	Method No	ASC/SOP/302							
	Limit of Detection	0.0001							
	Accreditation	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO	UKAS/MMO
Sample Reference	Matrix	AHCH	BHCH	GHCH	DIELDRIN	HCB	PPTDE	PPDDE	PPDDT
WS01 SURFACE	Sediment	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	0.0003	0.0003	0.0005
WS02 SURFACE	Sediment	<0.0001	<0.0001	<0.0001	0.0003	0.0004	0.0007	0.0005	0.0003
WS03 SURFACE	Sediment	<0.0001	<0.0001	<0.0001	0.0002	0.0004	0.0006	0.0005	<0.0001
WS04 SURFACE	Sediment	<0.0001	<0.0001	<0.0001	0.0002	0.0003	0.0006	0.0004	<0.0001
TP01 SURFACE	Sediment	<0.0001	<0.0001	<0.0001	0.0003	0.0004	0.0005	0.0004	0.0003
TP02 SURFACE	Sediment	<0.0001	<0.0001	<0.0001	0.0002	0.0005	0.0006	0.0005	<0.0001
Certified Reference Material SETOC 774 (% Recovery)		52	64	87	107	95	90	101	69
QC Blank		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Report Notes

Method Code	Sample ID	The following information should be taken into consideration when using the data contained within this report
*SUB_01	MAR01451.001-006	Analysis was conducted by an approved subcontracted laboratory.
WSLM59*	MAR01451.001-006	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
ICPMSS*	MAR01451.001-006	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
ASC/SOP/301	MAR01451.001-006	The matrix of this sample has been found to interfere with the result for this test. The sample has therefore been diluted, but in doing so, the detection limit for this test has been elevated.
ASC/SOP/302	MAR01451.001-006	The Primary process control data associated with this Test has not wholly met the requirements of the Laboratory Quality Management System QMS with one or more target analytes falling outside acceptable limits. The remaining data gives the Laboratory confidence that the test has performed satisfactorily and that the validity of the data may not have been significantly affected. However in line with our QMS policy we have removed accreditation, where applicable, from the affected analytes (PCB101) . These circumstances should be taken into consideration when utilising the data.
ASC/SOP/303/ 304	MAR01451.001-006	Chrysene is known to coelute with Triphenylene and these peaks cannot be resolved in the PAHSED UKAS accredited method. Chrysene and Triphenylene are resolved for MMO but this is currently not UKAS accredited therefore Chrysene is reported without this accreditation.

Deviation Code	Deviation Definition	Sample ID	Deviation Details. The following information should be taken into consideration when using the data contained within this report
D1	Holding Time Exceeded	N/A	N/A
D2	Sample Contaminated through Damaged Packaging	N/A	N/A
D3	Sample Contaminated through Sampling	N/A	N/A
D4	Inappropriate Container/Packaging	N/A	N/A
D5	Damaged in Transit	N/A	N/A
D6	Insufficient Quantity of Sample	N/A	N/A
D7	Inappropriate Headspace	N/A	N/A
D8	Retained at Incorrect Temperature	N/A	N/A
D9	Lack of Date & Time of Sampling	N/A	N/A
D10	Insufficient Sample Details	N/A	N/A
D11	Sample integrity compromised or not suitable for analysis	N/A	N/A

Method	Sample and Fraction Size	Method Summary
Particle Size Analysis	Wet Sediment	Wet and dry sieving followed by laser diffraction analysis.
Total Organic Carbon (TOC)	Air dried	Carbonate removal and sulphurous acid/combustion at 1600°C/NDIR.
Metals	Air dried	Aqua-regia extraction followed by ICP analysis.
Organotins	Wet Sediment	Solvent extraction and derivatisation followed by GC-MS analysis.
Polyaromatic Hydrocarbons (PAH)	Wet Sediment	Solvent extraction and clean up followed by GC-MS analysis.
Total Hydrocarbon Content (THC)	Wet Sediment	Ultra-violet fluorescence spectroscopy
Polychlorinated Biphenyls (PCBs)	Air dried and sieved to <2mm	Solvent extraction and clean up followed by GC-MS-MS analysis.
Organochlorine Pesticides (OCPs)	Air dried and sieved to <2mm	Solvent extraction and clean up followed by GC-MS-MS analysis.

Analyte Definitions					
Analyte Abbreviation	Full Analyte name	Analyte Abbreviation	Full Analyte name	Analyte Abbreviation	Full Analyte name
ACENAPTH	Acenaphthene	C2N	C2-naphthalenes	THC	Total Hydrocarbon Content
ACENAPHY	Acenaphthylene	C3N	C3-naphthalenes	AHCH	alpha-Hexachlorocyclohexane
ANTHRACN	Anthracene	CHRYSENE	Chrysene	BHCH	beta-Hexachlorocyclohexane
BAA	Benzo[a]anthracene	DBENZA	Dibenzo[ah]anthracene	GHCH	gamma-Hexachlorocyclohexane
BAP	Benzo[a]pyrene	FLUORANT	Fluoranthene	DIELDRIN	Dieldrin
BBF	Benzo[b]fluoranthene	FLUORENE	Fluorene	HCB	Hexachlorobenzene
BEP	Benzo[e]pyrene	INDPYR	Indeno[1,2,3-cd]pyrene	PPDE	p,p'-Dichlorodiphenyldichloroethylene
BENZGHIP	Benzo[ghi]perylene	NAPTH	Naphthalene	PPDDT	p,p'-Dichlorodiphenyltrichloroethane
BKF	Benzo[k]fluoranthene	PERYLENE	Perylene	PPTDE	p,p'-Dichlorodiphenyldichloroethane
C1N	C1-naphthalenes	PHENANT	Phenanthrene		
C1PHEN	C1-phenanthrene	PYRENE	Pyrene		