Alexandra Basin Redevelopment 2

Bringing Dublin Port To 2040

Environmental Impact Assessment Report

Chapter 14 Coastal Processses

Volume 2



CALAFORT ÁTHA CLIATH
DUBLIN PORT

TETRA TECH

14 Coastal Processes

Chapter Contents

14 Coastal Processes 14-1
14.1 Introduction 14-2
14.2 Assessment Methodology 14-3
14.3 Baseline Environment 14-15
14.4 Description of Likely Significant Effects 14-22
14.5 Inter-relationships 14-34
14.6 Mitigation and Monitoring 14-35
14.7 Potential Cumulative Effects 14-39
14.8 Residual Impacts 14-45
14.9 Summary of Effects and Conclusions 14-45
14.10 Limitations of Assessment 14-47

14.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) comprises an appraisal of the existing coastal processes conditions within the ABR2 Project study area and addresses the potential effects of the ABR2 Project on coastal processes. The assessment is based on the description of works as noted in **Chapter 5 Project Description**. Where potential adverse impacts are identified, the assessment identifies mitigation measures that will be implemented to prevent, reduce or offset potential adverse effects, or enhance potential beneficial effects where possible.

It should be noted that coastal processes may be treated as receptors in themselves; however, they are also potential pathways for impacts on other receptors (as displayed in **Figure 14-1**). These receptors can be related to other disciplines, and as such, the assessment presented here is used to inform the following technical chapters:

- **Chapter 7 Biodiversity, Flora and Fauna**; and
- **Chapter 9 Water Quality and Flood Risk Assessment**.

This chapter considers both changes to suspended sediment concentrations and associated physical changes due to the presence of infrastructure, such as differences in tidal currents. Impacts are assessed based on their potential to affect coastal processes and coastal features. Consequential impacts from these changes on water and sediment quality and the impact upon other receptors (e.g. ecology, WFD waterbodies) not covered within this Chapter are discussed in the chapters listed above.

A Model Calibration & Validation Report has been prepared to support this assessment and is contained within **Appendix 14-1** of the EIAR.

14.1.1 Scope of the Assessment

The ABR2 Project consists of redevelopment works in two areas of Dublin Port, Alexandra Basin West and Berths 52/53. Capital dredging will be undertaken to achieve a standard depth of -10m CD at Alexandra Basin West to allow it to accommodate larger vessels entering the Port. Environmental sampling of sediment within Alexandra Basin West (above a depth of -10m CD) has demonstrated that the bed of the basin is contaminated with a range of heavy metals and organotins. As such, no material required to be dredged and removed from Alexandra Basin West will be disposed of at sea. This negates the requirement for sediment dispersion modelling at the Burford Bank Licensed Disposal Site, as commonly required for other projects in Dublin Port. Riverside Berths 52/53, currently under construction as permitted under the MP2 Project (PLN 304888), will close off the Berths 52/53 basin from the main navigational channel. Works to infill the basin are proposed under the ABR2 Project, using a combination of clean imported materials and remediated and stabilised material from dredged sediments originating from Alexandra Basin West.

For the purposes of this EIAR chapter, coastal processes are defined as encompassing the following elements:

- Bathymetry;
- Tidal elevations and currents;

- Waves;
- Seabed geology and substrate;
- Suspended sediments; and
- Sediment transport.

The primary objective of this EIAR chapter is to provide an assessment of the likely significant effects of the ABR2 Project during the construction and operational phases. To this end, a detailed EIA Scoping Report, further described in **Chapter 3 Consultation Scoping**, was produced by Tetra Tech in November 2025 which defined the scope of this assessment for Coastal Processes. Based on this report, elements from the list above were scoped into the assessment for the purposes of identifying potential significant impacts. This included assessment of both the suspended sediment concentrations during the construction phase (i.e. the dredging works within Alexandra Basin West), and potential changes to the local hydrodynamics.

Based on Tetra Tech's (formerly RPS') previous work in Dublin Port, the wave climate in the inner port is not anticipated to change significantly as a result of the infilling or dredging, as there is no increase in fetch length over which waves can be generated. Additionally, changes in sediment transport may be inferred from the changes to local hydrodynamics. That is to say, potential areas of erosion or deposition may be identified by analysing changes to residual currents, which are the primary force driving sediment transport within Dublin Port. Wave climate modelling and sediment transport modelling are therefore both scoped out of the assessment of the ABR2 Project.

The assessment of impact on coastal processes is supported by numerical modelling and presents the existing environmental baseline established from desk studies, site-specific surveys, numerical modelling studies, and consultation with stakeholders.

14.2 Assessment Methodology

This section describes the methodology which has been used in the assessment of coastal processes, which may impact or be impacted by the ABR2 Project. The methodology and associated impact assessment had regard to the general guidance for the undertaking of an EIA, as presented in **Chapter 1 Introduction.**

14.2.1 Guidance and Legislation

14.2.1.1 Overview

There is no specific guidance for producing a Coastal Processes EIAR Chapter in Ireland. Due to the comparative nature of the assessment, the conclusions are supported by quantitative data and analyses. This data also supports other environmental disciplines' assessments, such as water quality (e.g., identifying exceedances in suspended solid limits), flood risk, and benthic ecology (e.g., unacceptable rates of sedimentation and impacted areas). As such, the outputs of this technical assessment are also used to inform the impact assessment upon other receptors that may be impacted by changes in coastal processes. **Figure 14-1** below demonstrates how coastal processes align with the Source – Pathway – Receptor Model for other environmental disciplines. Generally, for Coastal Processes, the receptor is a morphological feature (e.g. a

beach) but may also act as a pathway, with either indirect or direct impacts on species present (such as smothering from sediment). These often include statutorily designated sites through the Water Framework Directive (Directive 2000/60/EC), the Floods Directive (Directive 2007/60/EU), the Habitat Directive (Directive 92/43/EEC) and the Birds Directive (Directive 2009/147/EC) as transposed into Irish Legislation. Although there is no specific guidance on carrying out a Coastal Processes assessment in an EIAR for Ireland, Natural Resource Wales has produced two useful guidance documents and is the closest statutory body to Ireland to produce such guidance. These documents are *GN109: Completing a coastal or physical processes assessment for small-scale projects* (Natural Resources Wales, 2024) and *GN41: Marine Physical Processes Guidance to inform Environmental Impact Assessment* (Natural Resources Wales, 2025).

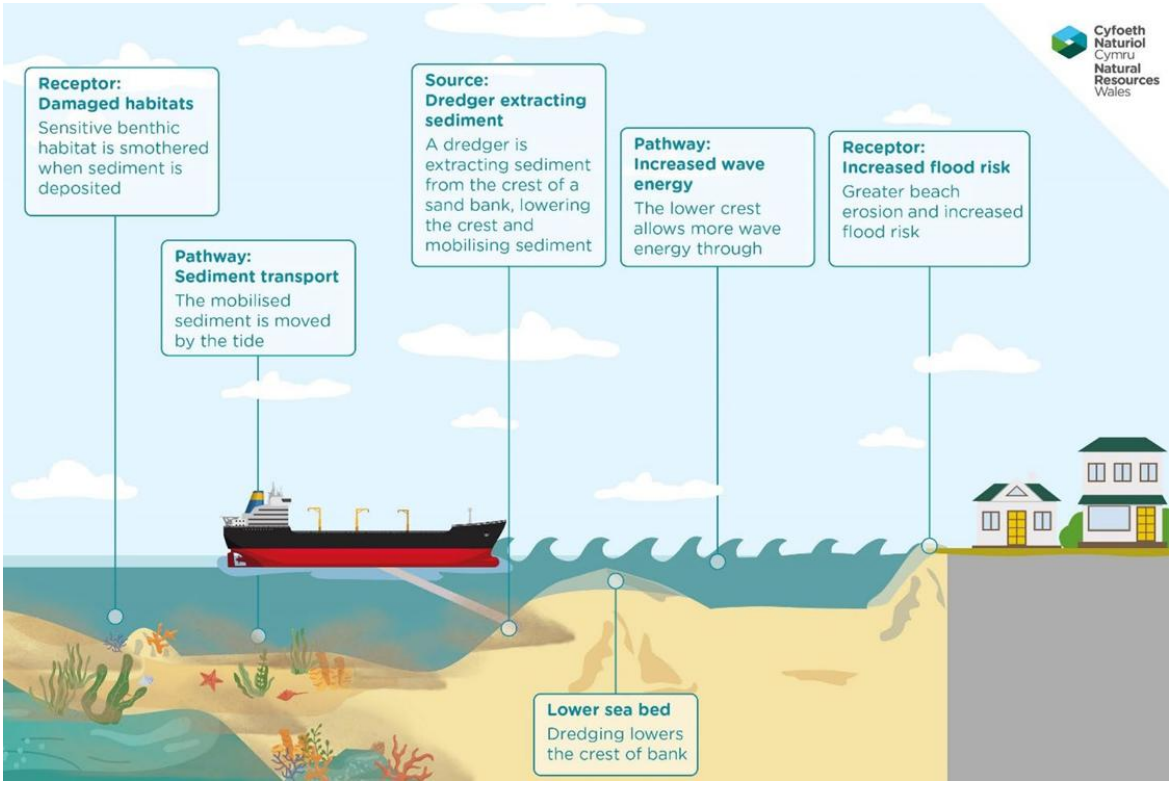


Figure 14-1: A schematic of the source-pathway-receptor concept giving two hypothetical examples of potential impacts caused by an aggregate dredging project (Source: NRW).

14.2.1.2 Policy Context

The general policy context for the ABR2 Project is set out in **Chapter 2 Project Justification**, Planning policy, which specifically relates to Coastal Processes is summarised here.

From the Government of Ireland, the National Marine Planning Framework (DHPLG, 2021) provides guidance on what matters are to be considered in the assessment. A schedule of policy compliance and the interaction between objectives and key principles behind the framework is provided in the Appendices of the accompanying Planning Report regarding the National Marine Planning Framework (NMPF) – Compliance Schedule. A summary of policies relevant to Coastal Processes and how they are addressed in the Chapter is included below in **Table 14-1**.

The NMPF has also highlighted where other planning policies should be addressed. Namely, consideration of contributions to the relevant Marine Strategy Framework Directive (MSFD) targets should be demonstrated. The MSFD is the framework through which EU Member States are required to develop strategies for achieving or maintaining Good Environmental Status in the marine environment (DHPLG, 2021). GES descriptors with relation to Coastal Processes are provided below in **Table 14-2**.

Table 14-1: Summary of NMPF provisions relevant to coastal processes

Policy	How and where considered in the EIAR
Environmental – Ocean Health Policy 1	The ABR2 Project will align with NMPF policies as noted below, and demonstrates contribution to relevant MSFD targets as identified in **Table 14-2**
Biodiversity Policy 3 **Protected Marine Sites Policy 1** **Sea-floor and Water Column Integrity Policy 3** **Climate Change Policy 1** **Ports, Harbours and Shipping Policy 5**	Adverse effects arising from increased suspended sediment concentrations and changes to hydrographic conditions are assessed in **Section 14.4**. The significance of these effects on marine/coastal features and coastal processes is considered therein. Effects on marine ecosystems, including benthic ecosystems are considered in **Chapter 7 Biodiversity, Flora and Fauna** and **Chapter 9 Water Quality and Flood Risk Assessment**
ORE Policy 3	Adverse effects arising from increased suspended sediment concentrations and changes to hydrographic conditions are assessed in **Section 14.4**. Potential cumulative effects arising from nearby or adjacent ORE sites or ORE test projects are outlined in **Section 14.7**

Table 14-2: Summary of MSFD provisions relevant to coastal processes

Summary of policy	How and where considered in the EIAR
Descriptor 6: Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.	Predicted changes to the seabed are addressed in **Section 14.4.3**. The effects on marine ecosystems, including benthic ecosystems are considered in **Chapter 7 Biodiversity, Flora and Fauna**
Descriptor 7: Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems.	Predicted changes to hydrographic conditions are assessed in **Section 14.4.3**. The effects on marine ecosystems, including benthic ecosystems are considered in **Chapter 7 Biodiversity, Flora and Fauna** and **Chapter 9 Water Quality and Flood Risk Assessment**
Descriptor 8: Concentrations of contaminants are at levels not giving rise to pollution effects.	Predicted changes to suspended sediment concentrations are assessed in **Section 14.4.2**. The effects of potential sediment contaminants on marine ecosystems, including benthic ecosystems are considered in **Chapter 7 Biodiversity, Flora and Fauna** and **Chapter 9 Water Quality and Flood Risk Assessment**

14.2.2 Study Area

The relevant study area for undertaking coastal process assessments as part of an EIA has been well defined by previous work undertaken by TT as part of the ABR, MP2, and 3FM projects. For the purpose of this assessment, TT will be utilising the same model extent, whilst the internal structure will be updated to reflect the proposed works under this development and recent bathymetric surveys. This Coastal Processes Study

Area is considered fit for purpose and captures all quantified changes associated with the ABR2 Project. The extent of the Coastal Processes Study Area is illustrated in **Figure 14-2**. This figure shows the bathymetry of the modelling undertaken for the study area; the image shown to the right presents the spatial resolution of the model, indicated by the structured mesh of the model overlain on the bathymetry. The figures presented in this chapter will illustrate the zone of influence for each change in coastal processes variable. For example, a plot would show the extent of the sediment plume from dredging at a specific tidal phase and/or the maximum concentration expected during the programme.

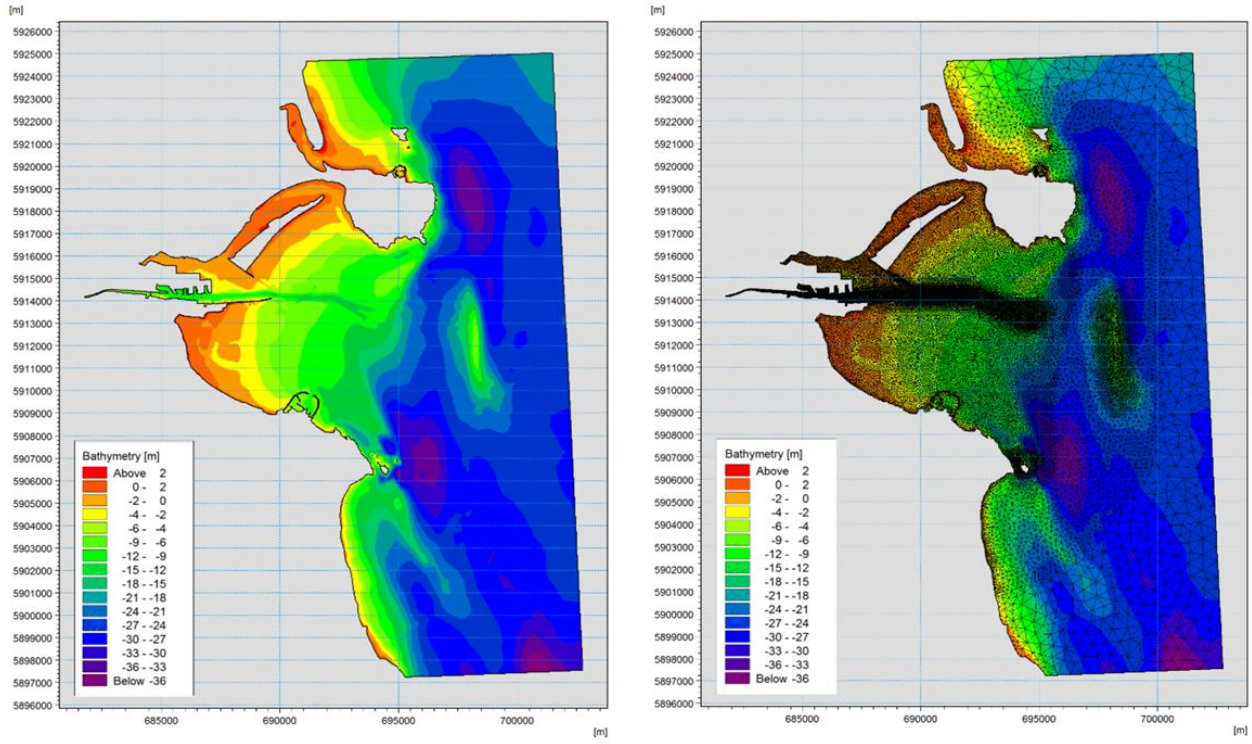


Figure 14-2: Coastal Processes Study Area (outputs indicate the bathymetry within the area of Dublin Port, an extent of the River Liffey, Dublin Bay and an area of the Irish Sea)

14.2.3 Numerical Modelling Methodology

TT used the MIKE 21 numerical modelling software package developed by DHI, to address potential coastal processes changes. This was achieved by developing a two-dimensional numerical model to represent:

- The pre-project scenario (in this case, post ABR Project and MP2 Project); and
- The post-project scenario with the ABR2 Project works in place.

These models were used in conjunction with hydrographic survey data and site-specific water quality monitoring data to assess the construction and operational impacts of the ABR2 Project in the context of the following coastal processes:

- Increased suspended sediment concentration arising from capital dredging activities; and
- Presence of infrastructure leading to changes in tidal currents.

The impact of the ABR2 Project on these coastal processes has been quantified by using difference plots throughout this chapter, i.e., post-project minus pre-project conditions. As such, the extent and magnitude of potential impacts as a result of the ABR2 Project can be clearly compared against baseline conditions. Included with the assessment, mitigation measures are proposed to reduce potential impacts if required. This enables a "with mitigation" assessment to be made of any residual impact as a result of the construction and operational phases of the ABR2 Project and/or in combination with other projects in the vicinity of Dublin Port.

14.2.3.1 Coastal Processes Modelling Software

A suite of coastal process models, based on the MIKE software developed by DHI, was used to assess the potential impact of the ABR2 Project on the coastal processes within Dublin Port and Bay. The MIKE system is a state-of-the-art, industry-standard modelling system, based on a flexible mesh approach. This software was developed for applications within oceanographic, coastal and estuarine environments. A brief synopsis of the MIKE system and modules used for this assessment is outlined below.

1. **MIKE 21 Flow Model system** - Using these flexible mesh modelling systems, it is possible to simulate the mutual interaction between currents, waves and sediment transport by dynamically coupling the relevant modules in both two and three dimensions. Hence, full feedback of the bed level changes on the waves and flow calculation can be included.
2. **The Hydrodynamic (HD) module** – Simulates water level variations and flows in response to a variety of forcing functions in lakes, estuaries and coastal regions. The HD Module is the basic computational component of the MIKE 21 Flow Model systems, providing the hydrodynamic basis for other modules like Mud Transport. It solves the two-dimensional incompressible Reynolds-averaged Navier-Stokes equations subject to the assumptions of Boussinesq and of hydrostatic pressure. Thus, the module consists of continuity, momentum, temperature, salinity and density equations.
3. **The Mud Transport (MT) module** – Simulates the erosion, transport, and deposition of cohesive sediments in water bodies. This multi-fraction, multi-layer model incorporates wave dynamics, salt-flocculation, and sediment consolidation and can be used to assess the spreading and behaviour of dispersion of sediment using the built-in dredging module, which was used to assess the construction phase effects in Alexandra Basin West.

14.2.3.2 Tidal Flow Simulations

The HD model used to assess the impact of the ABR2 Project on the coastal processes was developed from Tetra Tech's present-day Dublin Bay model. This model was created using flexible mesh technology to provide detailed information on the coastal processes around Dublin Port and Dublin Bay. The model uses mesh sizes varying from 250,000m^2 (equivalent to 500m x 500m squares) at the outer boundary of the model down to a very fine 32m^2 (equivalent to c.6m x 6m squares) within the vicinity of the ABR2 Project. The bathymetry of this model was developed using data gathered from hydrographic surveys of the Dublin Port and Tolka estuary, which have been regularly undertaken since 2017 and supplemented by data from the Irish National Seabed Survey, INFOMAR, and other local surveys collated by Tetra Tech for the Irish Wave and Water Level Modelling

Study (OPW, 2018). The extent, mesh structure and bathymetry of this model are illustrated above in **Figure 14-2**.

The tidal boundary conditions for the models were taken from Tetra Tech's Tidal and Storm Surge Forecast model. This model was developed using flexible mesh technology with the mesh size (model resolution) varying from circa 24km along the offshore Atlantic boundary to circa 200m around the Irish coastline. All open sea boundaries were applied to the model as Flather boundaries, whereby temporarily and spatially varying water level and current velocities are specified along the boundary. Flather boundaries are one of the most efficient boundary condition methods for downscaling coarse model simulations to higher resolution areas, as they avoid instabilities commonly associated with water level boundaries.

Mean river flow values for the Liffey, Dodder and Tolka, as presented in **Table 14-3**, were applied as source terms in the numerical model simulations of the tidal regime. Values are based on average flow data for April 2019, obtained by TT from ESB during previous works at Dublin Port and found to be reflective of flow conditions during 2016 and 2018.

Table 14-3: Mean discharge rates for the River Liffey, River Dodder, and River Tolka used in the models

Source	Mean Discharge Rate (m^3/s)
Liffey	7.79
Dodder	2.40
Tolka	1.80

The existing Dublin Bay model was updated to represent the baseline pre-ABR2 Project scenario. This included work completed during ABR Project Phase 1, specifically:

- Changes in bathymetry due to ongoing maintenance dredging within Dublin Port
- The completed elements of the MP2 Project layout (i.e. the riverside piles for revised Berths 52/53 Layout).

This model was further updated to produce a second version which represented Dublin Port post-implementation of the ABR2 Project. This included updated bathymetry within Alexandra Basin West following the completion of the capital dredging, as well as the closure and infilling of the existing Berths 52/53 basin. This enabled the same cell arrangement to be used for the baseline and post-construction assessment, thereby avoiding the introduction of any numerical mesh effects into the assessment. These two-dimensional models were used to undertake a quantitative appraisal of the impact of the ABR2 Project on relevant coastal processes.

14.2.3.3 Dredging Simulations

Dredging plume modelling was undertaken to quantify increases in Suspended Sediment Concentration in the waterbody. The dispersion of dredged material was assessed by coupling the relevant Hydrodynamic and Mud Transport modules described in **Section 14.2.3.1**. For this purpose, the baseline hydrodynamic model described in **Section 14.2.3.2** was utilised, enabling simulations of each dredging operation to be run over one month of tidal conditions.

Beyond baseline hydrodynamic conditions, several parameters govern the volume of sediment released into the water column and thereby directly influence suspended sediments concentrations. Principally, these parameters include:

- The sediment characteristics;
- The method of dredging;
- The rate of dredging/operating hours; and
- Applied mitigation.

Particle size analyses of samples collected throughout Alexandra Basin West found that whilst there were localised sand and gravel deposits throughout the basin at different depths, most sediment to be dredged comprised of fine silt and clay material. It was noted that the very coarse material, such as coarse sands and gravel, will settle rapidly and be removed subsequently by further dredging. The material introduced into the model simulation was therefore comprised of the remaining classifications. In the interest of undertaking a conservative assessment, 75% of the dredge material was considered as a medium silt with an average grain diameter of 0.0310mm.

To provide a worst-case scenario, all dredge material was defined as non-cohesive, meaning that sediments would remain suspended for longer and thus dispersed further within the model relative to sediment which may, in reality, flocculate together and settle to the seabed more quickly. This provides a further degree of conservatism within the model. The model simulations also accounted for resuspension of settled material should the critical shear stress be exceeded with increasing current speeds due to tidal flow conditions.

Dredging rates and locations were developed through detailed plume assessments, with this initial assessment investigating typical sediment plumes generated by a wide range of prospective rates, locations, and methodologies. Through this initial assessment, it became evident that Alexandra Basin West could be characterised by four distinct areas based on their respective typical hydrodynamic conditions and features.

As summarised in **Table 14-4** and illustrated in **Figure 14-3**, bespoke dredging rates and operating hours were developed for each of these areas. A summary allowable dredging interactions is presented in **Table 14-5**. The potential for sediment dispersion arising from dredge operations in each of these four areas was assessed using individual model simulations.

Table 14-4: Summary of dredge operation limitations for Areas 1 – 4 for the ABR2 Project

Area	Operating hours	Maximum dredge rate	Operational constraint / note
1	24 hours per day 7 days per week	83 m³/hour	Can be dredged on a continuous basis
2	07:00–23:00 7 days per week	83 m³/hour	Dredging limited to a 16-hour operational window to comply with noise assessment
3	07:00–23:00 7 days per week	125 m³/hour	Higher dredge rate due to the nature of bed materials at the entrance to the basin Cannot be dredged concurrently with any other area due to dispersive conditions at the entrance to Alexandra Basin West.
4	24 hours per day 7 days per week	83 m³/hour	Can be dredged on a continuous basis

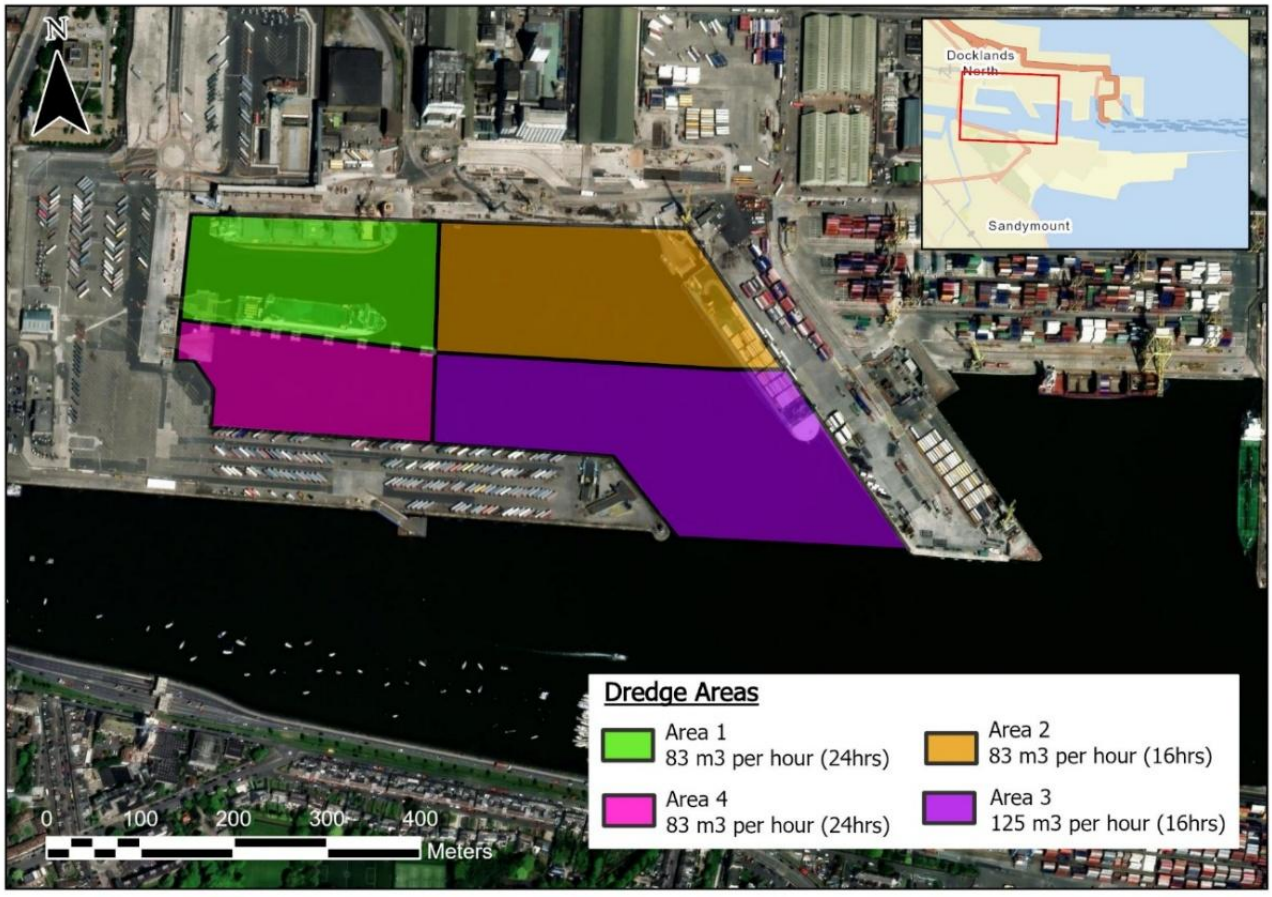


Figure 14-3: Summary of proposed dredge areas for the ABR2 dredging works, with proposed dredge rates and operating hours

Table 14-5: Allowable interaction matrix for ABR2 dredging operations

Area	1	2	3	4
1	Up to 2,000m^3 per day	Up to 4,000m^3 per day	Prohibited	Up to 4,000m^3 per day
2	Up to 4,000m^3 per day	Up to 2,000m^3 per day	Prohibited	Up to 4,000m^3 per day
3	Prohibited	Prohibited	Up to 2,000m^3 per day	Prohibited
4	Up to 4,000m^3 per day	Up to 4,000m^3 per day	Prohibited	Up to 2,000m^3 per day

As part of the initial simulations, which are presented in **Section 14.4.2**, dredging operations were represented using a backhoe dredger with good industry practices applied, which are typical when working environmentally. These good practices include utilising a dredger with an environmental bucket to reduce sediment losses and prohibiting overspill from the hopper vessel. Collectively, these measures will limit the introduction of sediment to c. 3% of the dredge rate.

SSC plume results are presented as turbidity values, which are a proxy for the total suspended solids within the water. Turbidity is a measure of the cloudiness or haziness of water caused by suspended material, such as soil particles, sediment, or small floating algae. Particles are often small and can remain in suspension for lengthy periods after mobilisation. Turbidity can be caused by natural events, such as flooding, algal growth, currents, and wind and wave action, as well as human activities such as dredging.

Turbidity is commonly reported as Nephelometric Turbidity Units (NTUs), a parameter which is readily measured on site and can be used to give a rapid estimate of the total amount of suspended solids in the water. Measuring the total suspended solids concentration requires taking water samples for filtration, weighing and drying in the laboratory.

The relationship between turbidity and suspended solids in water is site-specific and can be influenced by the type of sediment in suspension, the particle size, colour, shape and reflectivity. Therefore, sediment samples from the River Liffey at East Link Bridge have been used to establish a relationship between turbidity and suspended solids for the Dublin Port area. Sediments consisting of sandy silt and suspensions were prepared from this sample to provide turbidity in the range 0 to 150 NTU. Turbidity (NTU) and TSS (mg/l) were measured for 75 suspensions to allow construction of a calibration curve (**Figure 14-4**). This relationship can be used to derive suspended solids from turbidity readings at the monitoring stations in the inner Port area. Based on this relationship, a factor of 2.47 has been used to convert modelled TSS values to NTU. Further detail on the water quality monitoring programme is provided in **Chapter 9 Water Quality and Flood Risk Assessment**.

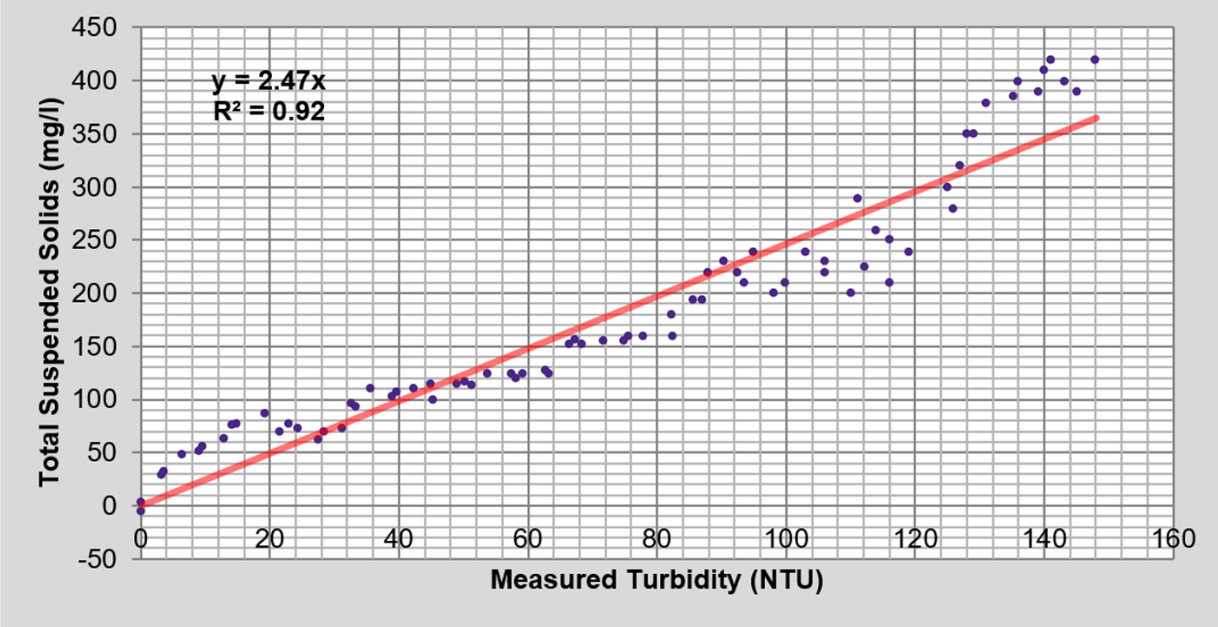


Figure 14-4: Relationship established between Turbidity and Total Suspended Solids (inner River Liffey channel)

14.2.4 Consultation

Following completion of the EIA Scoping Report, consultation was undertaken to obtain opinions regarding the ABR2 Project and its potential and scope for significant effects. No specific comments relating to Coastal Processes methodology were submitted. Dublin City Council highlighted that the applicant must comply with the Dublin City Development Plan 2022–2028 and recommended consulting the EPA and EU EIA guidance when preparing the EIAR (DCC, 2022). Several objectives within the Dublin City Council Development Plan are relevant to this assessment, but are ultimately covered in the EU Directives aforementioned. For example, relevant objectives within the plan include:

- To protect and enhance the coast shoreline and marine environment as open space and valuable natural habitats (GI35).
- To support initiatives to reduce marine pollution in Dublin Bay in partnership with other organisations and to raise awareness among Bay users and the general public and also to have regard to the Marine Strategy Framework Directive (2008/56/EU) (GI38).
- To support, encourage and facilitate coastal zone management measures for adapting to climate change, which include restoration of degraded ecosystems, increased flood resilience, water quality improvement, habitat conservation and provision of amenities for the residents and visitors of Dublin City (CA30).
- To promote and maintain the achievement of at least good status in all water bodies in the City (SI7).
- To promote the protection and improvement of the aquatic environment and water-dependent ecosystems through proactive discharge and emissions management, and through the enhancement of the physical condition of waterbodies (SI8).

- To comply with the policies and objectives of the National Marine Planning Framework as it relates to the city's coastal zone with respect to the planning and resource management of the marine area (SIO30).

The conclusions within this assessment and other assessments (e.g. water quality, biodiversity) within the EIAR, informed by modelling, demonstrate compliance with these objectives of the Dublin City Development Plan.

14.2.5 Assessment Criteria and Assessment of Significance

Determining the significance of effects is a process that involves defining the magnitude of the impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors.

The assessment on coastal processes has followed the methodology set out in the introductory chapter of this EIAR. Specific to the coastal processes assessment, the following guidance documents have also been considered:

- EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2022);
- Advice to Inform Development of Guidance on Marine, Coastal and Estuarine Physical Processes Numerical Modelling Assessments. NRW Report No. 208 (Pye *et al.*, 2017); and
- Guidance on Best Practice for Marine and Coastal Physical Processes Baseline Survey and Monitoring Requirements to inform EIA of Major Development Projects, NRW Report No. 243 (Brooks *et al.*, 2018).

14.2.5.1 Magnitude Criteria

Coastal processes may be considered receptors in themselves; however, they are also the pathway for indirect or direct impacts on other receptors, which may form part of a designated site. A full impact assessment has however, provided for the hydrodynamic regime (during operation) and suspended sediment concentration (during construction), both of which have been identified as pathways to potentially sensitive coastal processes receptors.

The impact of the ABR2 Project on the coastal processes was quantified using difference plots throughout this chapter, i.e., post-construction phase minus baseline conditions. As such, the extent and magnitude of potential impacts as a result of the ABR2 Project were identified and compared against baseline conditions.

Table 14-6 provides the definition of terms relating to the classification of the magnitude of the impacts relating to coastal process receptors. It takes into account both the scale of the change and also the duration, and reversibility.

Table 14-6: Definition of terms relating to the magnitude of the impact

Magnitude of Impact		Definition
High	Adverse	Change in coastal processes which results in the loss of a coastal feature (e.g. blockage of sediment pathway resulting in loss of spit). Persists for a long-term duration, i.e. more than five years and is irreversible.
	Beneficial	Change in coastal processes which results in the creation of a coastal feature (e.g., reduction in wave climate giving rise to dune formation). Persists for a long-term duration, i.e. more than five years and is irreversible.
Medium	Adverse	Alteration of coastal processes which effects the rate at which a coastal feature is maintained (e.g., reduction in accretion rate). Persists for a long-term duration, i.e. more than five years.
	Beneficial	Alteration of coastal processes which affects the rate at which a coastal feature is developing (e.g., reduction in erosion rate). Persists for a long-term duration, i.e. more than five years.
Low	Adverse	Some measurable change in coastal processes, but it does not affect the rate at which a coastal feature is maintained. Persists for a medium-term duration, i.e. one to five years.
	Beneficial	Some measurable change in coastal processes, but it does not affect the rate at which a coastal feature is developing. Persists for a medium-term duration, i.e. one to five years.
Negligible	Adverse	Imperceptible loss to a coastal feature, or alteration to coastal processes of short-term duration, i.e. less than one year.
	Beneficial	Imperceptible gain to a coastal feature, or alteration to coastal processes of short-term duration, i.e. less than one year.
No change		No loss or alteration of characteristics, features or elements; no observable impact in either adverse or beneficial.

14.2.5.2 Sensitivity Criteria

Table 14-7 provides the definition of terms relating to the classification of the sensitivity of coastal process receptors.

Table 14-7: Definition of terms relating to the sensitivity of the receptor

Sensitivity of the Receptor	Description
Very High	Coastal feature forms part of a wider scale system and is of very high importance and rarity, an international receptor with no potential or very limited potential for recovery.
High	Coastal feature forms part of a wider scale system and is of high importance and rarity, an international and/or national receptor with limited potential for recovery.
Medium	Coastal feature of high or medium importance and rarity, regional receptor, and potential for recovery.
Low	Coastal features of low or medium importance and rarity, local receptor and high potential for recovery (i.e. coastal feature adaptable to changes in physical processes).
Negligible	Coastal feature of very low importance and rarity, local receptor and very high potential for recovery.

14.2.5.3 Significance of Effects

The significance of effects refers to the consequences of an impact. The significance of the effect upon Coastal Processes receptors is determined by correlating the magnitude of the impact and the sensitivity of the receptor. A range of significance of effect is presented in **Table 14-8**. The final assessment of significance for each effect is based upon expert judgement of the peer-reviewed literature.

For the purposes of this assessment, any effects with a significance level of minor or less have been concluded to be not significant in EIAR terms.

Table 14-8: Matrix for determination of significant effects

		Magnitude of change				
		High	**Medium**	**Low**	**Negligible**	**No Change**
Sensitivity	**Very High**	Major	Major	Major / Moderate	Moderate	No Change
	High	Major	Major/ Moderate	Moderate	Moderate/ Minor	No Change
	Medium	Major/ Moderate	Moderate	Moderate/ Minor	Minor	No Change
	Low	Moderate	Moderate/ Minor	Minor	Minor/ Negligible	No Change
	Negligible	Negligible	Negligible	Negligible	Negligible	No Change

14.3 Baseline Environment

The following coastal processes were evaluated for the baseline scenario:

- Bathymetry;
- Hydrodynamics, i.e., tidal elevations and current speeds; and
- Sedimentology.

This assessment was undertaken using a combination of modelling techniques, site-specific data and desktop resources.

14.3.1 Designated Sites

All designated marine areas within and surrounding the area of the ABR2 Project, including qualifying features that could be affected by changes in coastal processes during the construction and operational phases, were identified in **Chapter 7 Biodiversity, Flora and Fauna** and are outlined below in **Table 14-9**. Both designated sites with marine/coastal qualifying features, or designated sites with features with the capacity to be affected by changes in coastal process, have been included.

Table 14-9: Designated Sites with marine/coastal qualifying features, or features with capacity to be affected by changes in coastal processes, as identified in Chapter 7 Biodiversity, Flora and Fauna

Designated Sites & Features of Natural Heritage Importance		
Designated Site/Feature	**Distance from Site (km) & Connectivity Pathway**	**Description / Qualifying Interests**
North Dublin Bay SAC	1.35km N Hydrologically Connected	• Mudflats and sandflats not covered by seawater at low tide [1140] • Annual vegetation of drift lines [1210] • Salicornia and other annuals colonising mud and sand [1310] • Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] • Mediterranean salt meadows (Juncetalia maritimi) [1410] • Embryonic shifting dunes [2110] • Shifting dunes along the shoreline with Ammophila arenaria (white dunes) [2120] • Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] • Humid dune slacks [2190] • Petalophyllum ralfsii (Petalwort) [1395]
Rockabill to Dalkey Island SAC	6.58km E Hydrologically Connected	• Reefs [1170] • Phocoena phocoena (Harbour Porpoise) [1351]
South Dublin Bay SAC	0.55km SE Hydrologically Connected	• Mudflats and sandflats not covered by seawater at low tide [1140] • Annual vegetation of drift lines [1210] • Salicornia and other annuals colonising mud and sand [1310] • Embryonic shifting dunes [2110]
Howth Head SAC	7.0km NE Hydrologically Connected	• Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] • European dry heaths [4030]
Lambay Island SAC	20.5km NE Hydologically Connected	• Reefs [1170] • Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] • Phocoena phocoena (Harbour Porpoise) [1351] • Halichoerus grypus (Grey Seal) [1364] • Phoca vitulina (Harbour Seal) [1365]

Designated Sites & Features of Natural Heritage Importance		
Designated Site/Feature	**Distance from Site (km) & Connectivity Pathway**	**Description / Qualifying Interests**
North Bull Island SPA	0.0km NE (Adjacent) Hydrologically Connected	• Light-bellied Brent Goose (Branta bernicla hrota) [A046] • Shelduck (Tadorna tadorna) [A048] • Teal (Anas crecca) [A052] • Pintail (Anas acuta) [A054] • Oystercatcher (Haematopus ostralegus) [A130] • Golden Plover (Pluvialis apricaria) [A140] • Grey Plover (Pluvialis squatarola) [A141] • Knot (Calidris canutus) [A143] • Sanderling (Calidris alba) [A144] • Dunlin (Calidris alpina) [A149] • Black-tailed Godwit (Limosa limosa) [A156] • Bar-tailed Godwit (Limosa lapponica) [A157] • Curlew (Numenius Arquata) [A160] • Redshank (Tringa totanus) [A162] • Turnstone (Arenaria interpres) [A169] • Black-headed Gull (Chroicocephalus ridibundus) [A179] • Shoveler (Spatula clypeata) [A857] • Wetland and Waterbirds [A999]
North-West Irish Sea SPA	2.6km E Hydrologically Connected	• Red-throated Diver (Gavia stellata) [A001] • Great Northern Diver (Gavia immer) [A003] • Fulmar (Fulmarus glacialis) [A009] • Manx Shearwater (Puffinus puffinus) [A013] • Cormorant (Phalacrocorax carbo) [A017] • Shag (Phalacrocorax aristotelis) [A018] • Common Scoter (Melanitta nigra) [A065] • Black-headed Gull (Chroicocephalus ridibundus) [A179] • Common Gull (Larus canus) [A182] • Lesser Black-backed Gull (Larus fuscus) [A183] • Herring Gull (Larus argentatus) [A184] • Great Black-backed Gull (Larus marinus) [A187] • Kittiwake (Rissa tridactyla) [A188] • Roseate Tern (Sterna dougallii) [A192] • Common Tern (Sterna hirundo) [A193] • Arctic Tern (Sterna paradisaea) [A194] • Guillemot (Uria aalge) [A199] • Razorbill (Alca torda) [A200] • Puffin (Fratercula arctica) [A204] • Little Gull (Hydrocoloeus minutus) [A862] • Little Tern (Sternula albifrons) [A885]

Designated Sites & Features of Natural Heritage Importance		
Designated Site/Feature	**Distance from Site (km) & Connectivity Pathway**	**Description / Qualifying Interests**
South Dublin Bay and River Tolka Estuary SPA	0.55km SE Hydrologically Connected	• Light-bellied Brent Goose (Branta bernicla hrota) [A046] • Oystercatcher (Haematopus ostralegus) [A130] • Ringed Plover (Charadrius hiaticula) [A137] • Grey Plover (Pluvialis squatarola) [A141] • Knot (Calidris canutus) [A143] • Sanderling (Calidris alba) [A144] • Dunlin (Calidris alpina) [A149] • Bar-tailed Godwit (Limosa lapponica) [A157] • Redshank (Tringa totanus) [A162] • Black-headed Gull (Chroicocephalus ridibundus) [A179] • Roseate Tern (Sterna dougallii) [A192] • Common Tern (Sterna etanus) [A193] • Arctic Tern (Sterna paradisaea) [A194] • Wetland and Waterbirds [A999]
North Dublin Bay pNHA	0.26km NE Hydrologically Connected	• Shared features with North Bull Island SPA and North Dublin Bay SAC.
South Dublin Bay pNHA	0.55km SE Hydrologically Connected	• Shared features with South Dublin Bay and River Tolka Estuary SPA
Dolphins, Dublin Docks pNHA	0.0km S (Adjacent) Hydrologically Connected	• Shared features with South Dublin Bay and River Tolka Estuary SPA
Grand Canal pNHA	0.82km W HydrologicallyConnected (Upstream)	• Otter (*Lutra lutra)* • Aquatic Plant Species • Calcareous Species • Smooth Newt (*Lissotriton vulgaris)* • Opposite-Leaved Pondweed *(Eryngium mathiasiae*)
Royal Canal pNHA	1.08km W Hydrologically Connected (Upstream)	• Aquatic Species • Species Rich Grassland • Calcareous Grassland
Booterstown Marsh pNHA	3.33km S Hydrologically Connected	• Brackish Saltmarsh Habitats • Migrating Waterbirds • Moorhen (*Gallinula chloropus*) • Reed Bunting (*Emberiza schoeniclus)* • Sedge Warbler *(Acrocephalus schoenobaenus)* • Teal (*Anas crecca)*

Designated Sites & Features of Natural Heritage Importance		
Designated Site/Feature	**Distance from Site (km) & Connectivity Pathway**	**Description / Qualifying Interests**
		• Snipe (*Gallinago gallinago*) • Lapwing (*Vanellus Vanellus)* • Oystercatcher (*Haematopus ostralegus*) • Redshank (*Tringa totanus)* • Dunlin (*Calidris alpina*) • Brent Geese (*Branta bernicla*)

14.3.2 Bathymetry

The water depths within the Dublin Port are maintained by an active maintenance dredging campaign. Throughout the main navigational channel and fairway, a design dredged level of -10m CD is maintained for safe navigation. Within Alexandra Basin West, previous works consented under Phase 1 achieved a maximum standard depth of -8m CD. To the north of the main navigational channel lies the Tolka Estuary. This area consists of mudflats and sandflats lying at approximately 1.5m CD. In the south of Dublin Bay, intertidal flats extend approximately 3km from shore with depths ranging from 0.4m CD to 3.0m CD. **Figure 14-2** shown in **Section 14.2.2** highlights the bathymetry used in this assessment.

14.3.3 Tidal Elevations and Currents

The Coastal Processes Study Area has an average spring tidal range of 3.4m, as recorded by the local harbour authority for Dublin (UKHO, 2025). Tidal levels are provided in **Table 14-10**.

Table 14-10: Typical tidal range for Dublin (UKHO, 2025)

Phase	Tidal Height (m Chart Datum)
Highest Astronomical Tide	4.5
Mean High Water Spring	4.1
Mean High Water Neap	3.4
Mean Low Water Neap	1.5
Mean Low Water Spring	0.7
Lowest Astronomical Tide	-0.1

Typical baseline spring tidal conditions at all tidal phases, including high water, mid-ebb, low water, and mid-flood, are illustrated in **Figure 14-5** to **Figure 14-8**. Generally, current speeds in the central navigation channel are marginally higher during mid-ebb conditions relative to mid-flood conditions owing to the contribution of flow from the Liffey, Dodder and Tolka.

Current speeds within most of Alexandra Basin West remain at <0.05m/s throughout a typical tidal cycle. However, near the entrance to the basin, current speeds may reach up to 0.22m/s during an ebb tide and 0.11m/s during a flood tide. Similar current speeds may be observed at the entrance to the existing Berths

52/53. As anticipated, decreased current speeds can be seen to the east of the existing Berths 52/53 basin entrance, owing to the riverside piles placed during the MP2 Project.

For completeness, the residual tidal currents, i.e. the average flow over one complete tidal cycle, were determined. These represent the effective driving force of sediment transport in Dublin Port. **Figure 14-9** illustrates the residual tidal flow pattern during a spring tide. As noted previously, there is a net easterly current within Dublin Port due to the influence of the River Liffey. Vector-averaged current speeds of up to 0.04 m/s are observed near the entrance of Alexandra Basin West, with speeds of up to 0.09 m/s in the broader area.

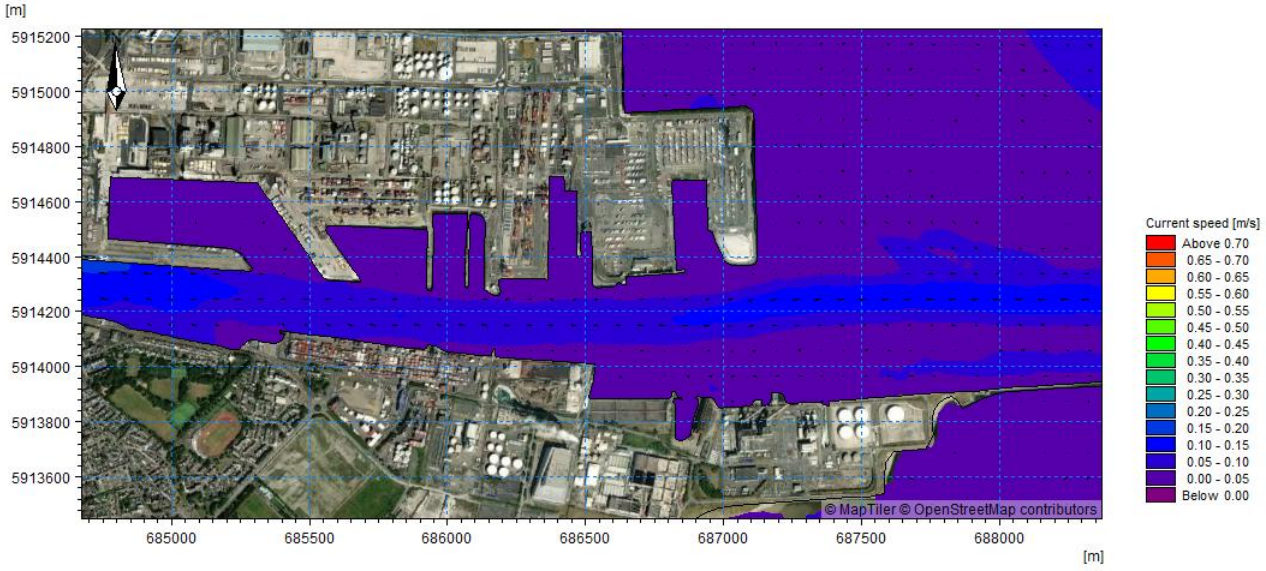


Figure 14-5: Baseline tidal flow pattern – spring tide high water

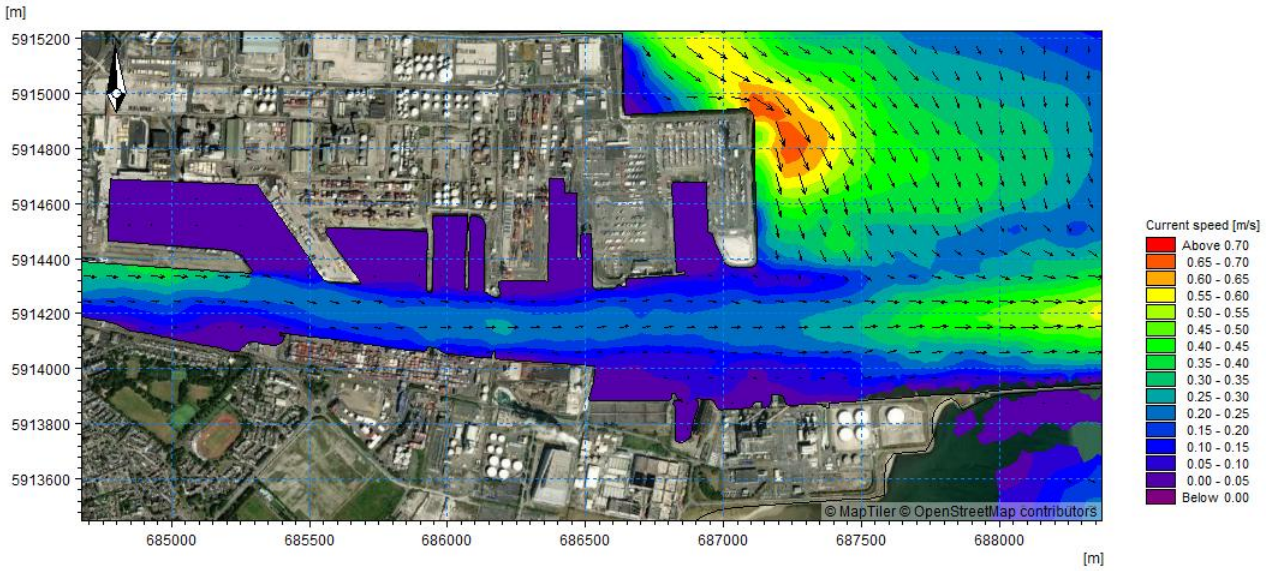


Figure 14-6: Baseline tidal flow pattern – spring tide mid-ebb

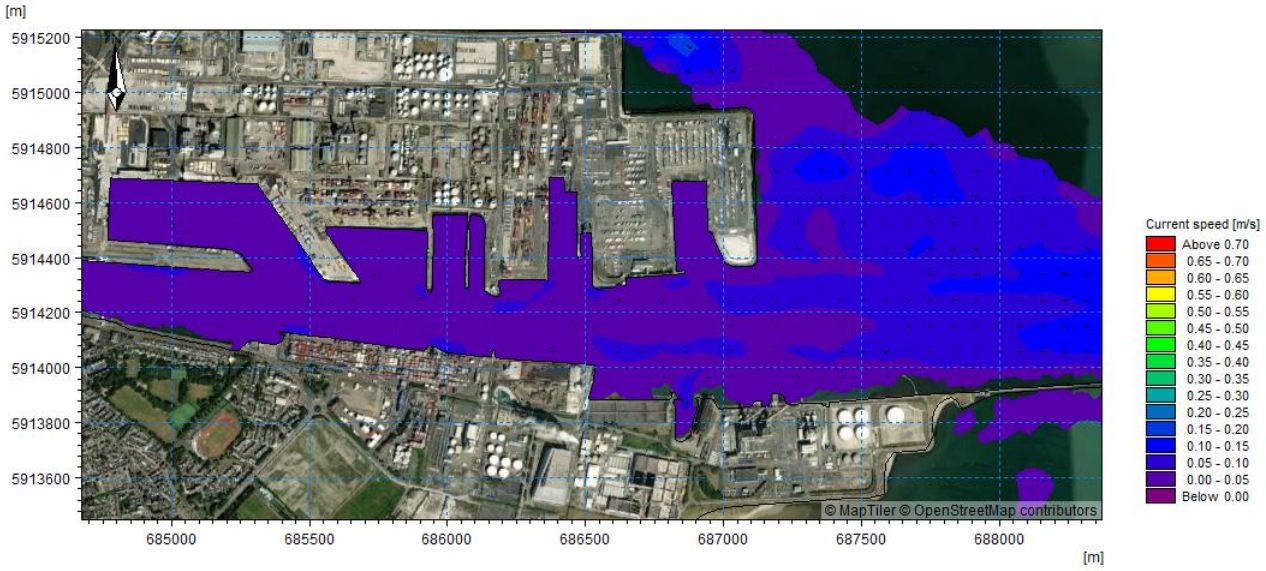


Figure 14-7: Baseline tidal flow pattern – spring tide low water

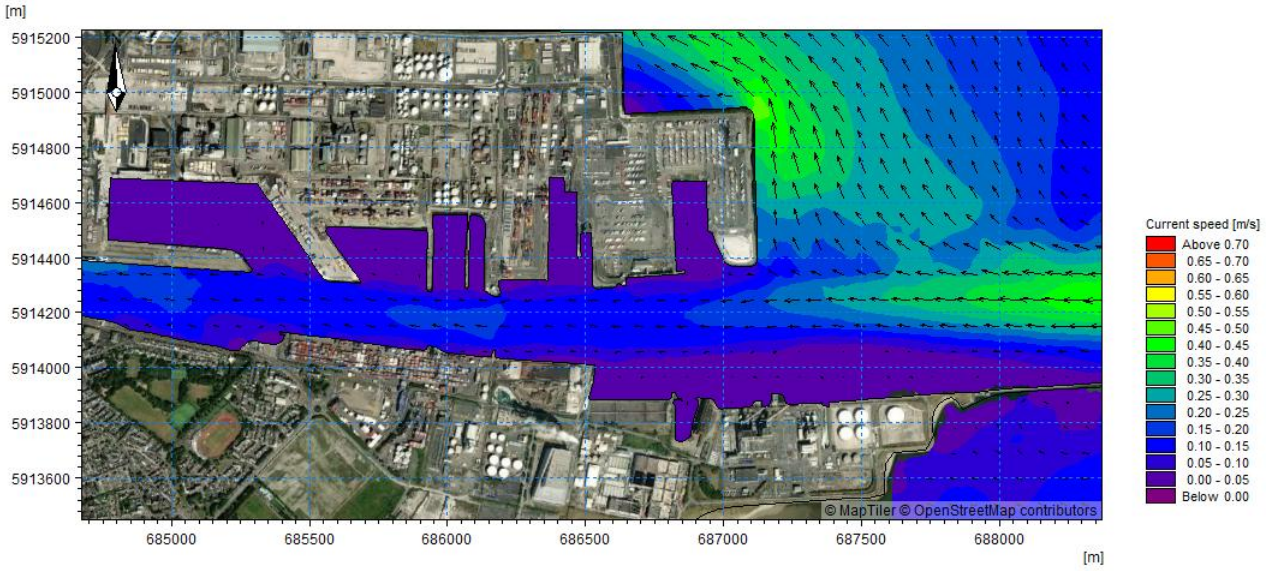


Figure 14-8: Baseline tidal flow pattern – spring tide mid-flood

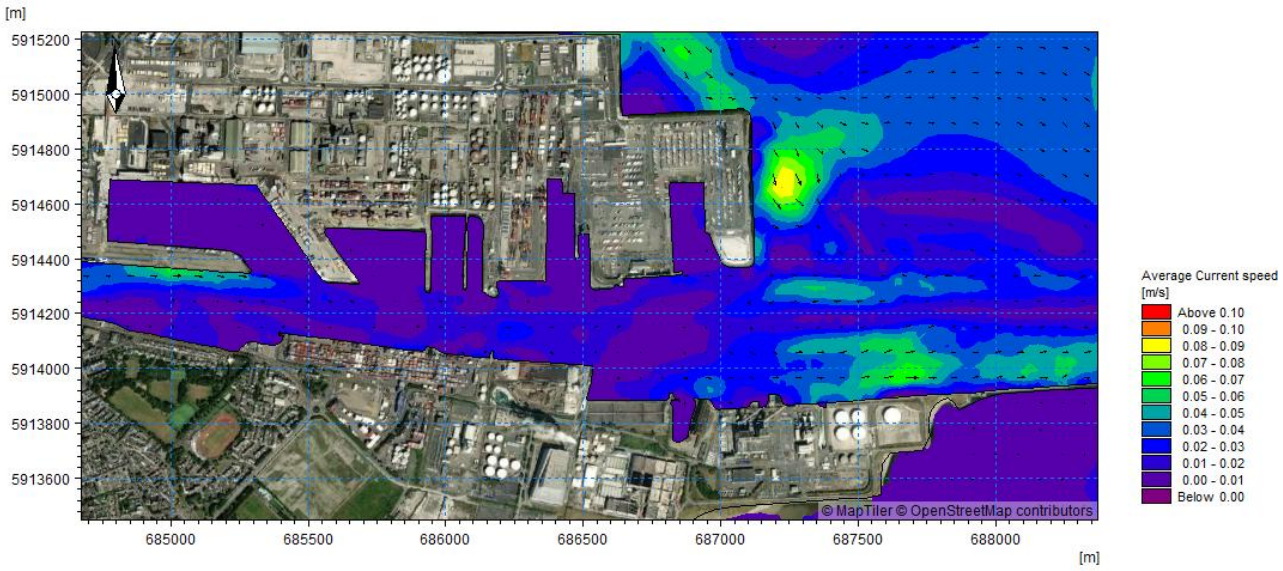


Figure 14-9: Baseline residual spring tidal flow pattern

14.3.4 Sedimentology

Seabed sediments within Dublin Port range from fine clays to gravel. In general, sediments in the outer channel are predominantly fine sands. By contrast, the sediments in the inner harbour are dominated by silts with fluvial sources likely originating in the Liffey Catchment. For this assessment, it was vital to understand the sediments present in Alexandra Basin West, as described in **Section 14.2.3.3**. A review of particle size analyses for samples collected throughout Alexandra Basin West found that whilst there were localised sand and gravel deposits throughout the basin at different depths, most sediments were comprised of fine silt and clay material.

Regarding suspended sediments, water quality monitoring during the ABR and MP2 projects has shown that background turbidity levels within the Coastal Process Study Area can be highly variable. Mean turbidity values range from 2.3 NTU to 5.9 NTU throughout Dublin Port, whilst recorded maximums at the Eastlink Monitoring Station near Alexandra Basin West have reached up to 638 NTU. Buoys deployed near Burford Bank have recorded mean values of between 7.5 NTU and 14.8 NTU, with maximums up to 548.9 NUT.

Periods of elevated turbidity often occur during the winter period, and storms are a major factor in generating elevated turbidity. Other factors that influence turbidity include, but are not limited to, prevailing discharge rates from the River Liffey, Dodder and Tolka, as well as jet wash from manoeuvring vessels in the area.

Further information on the water quality monitoring programme is provided in **Chapter 9 Water Quality and Flood Risk Assessment**.

14.4 Description of Likely Significant Effects

The ABR2 Project Description is provided in **Chapter 5 Project Description**. **Table 14-11** below outlines the project design parameters that have been used to inform the assessment of potential impacts of the construction, operational and decommissioning phases of the ABR2 Project on coastal processes. For the

purposes of the assessment presented, the maximum dredge rates during spring tides (i.e. higher current velocities) have been considered to ensure the potential for maximum impact is assessed.

Table 14-11: Parameters of the ABR2 Project included in this Coastal Processes assessment

Potential Impact	Project Phase*		Project Design Parameter	Justification
	C	O		
Increased suspended sediment concentrations	✓	×	Completion of dredging within Alexandra Basin West, with dredging of the remaining 334,000m^3 of contaminated material to a depth of -10.0m CD over an area of 194,000m^2 within the redeveloped Alexandra Basin West and its subsequent remediation. Dredge rates have been informed by the rate of treatment and the noise assessment.	Assessment of the sediment plumes dispersing out of Alexandra Basin West during dredging of fine particles and ensuring the effectiveness of the embedded mitigation to avoid any significant impact on receptors.
Presence of infrastructure may lead to changes to tidal currents	×	✓	Capital dredging works within Alexandra Basin West and the infilling of the Berths 52/53 (Terminal 5) basin of an area of 45,650m^2 and the raising of existing levels by 1.4m over an area of 95,000m^2 for delivery of the Unified Ferry Terminal under the MP2 Project.	Maximum change of velocities is investigated in the operation phase due to the change of bathymetry within Alexandra Basin West and placement of infrastructure in Berths 52/53. This will establish the final change to currents and assess potential changes to sediment transport.

14.4.1 Measures included in the Project

As described in **Section 14.2.3**, to reduce the potential for impacts on coastal processes and other receptors, standard industry measures will be implemented during dredging operations within Alexandra Basin West. This will include:

- Utilising an environmental dredge bucket;
- Prohibiting overspill from the hopper;
- Limiting dredging rates and operating hours as described in **Table 14-4**.

Collectively, these industry standard measures will limit the introduction of sediment to c. 3% as per mitigation measures applied during the ABR Project and specified for the MP2 and 3FM projects.

14.4.2 Assessment of Construction Effects

14.4.2.1 Increased Suspended Sediment Concentration as a result of Capital Dredging Activities

Magnitude of Impact

The capital dredging within Alexandra Basin West may lead to increased suspended sediment concentrations. The project design parameters include dredging the basin to a depth of -10m CD. The initial modelled scenarios based on the methodology described in **Section 14.2.3.3** used a dredging rate of 83m^3/day or 125m^3/day depending on the area that the dredger(s) is operating in (see **Figure 14-3)**. Subject to the area(s) being dredged, up to two dredge vessels may be operating concurrently, each working each day to achieve the maximum production rate of 4,000m^3/day.

The plume modelling results relating to SSCs are presented as statistical plume envelopes of the maximum dispersion and concentration values achieved while dredging occurs within each respective area of Alexandra Basin West. The purpose of the statistical plume envelopes is to convey the dispersion and fate of material which varies over a period of time in a single figure.

Each figure describes the maximum NTU value reached at each cell location in any time step during the entire course of each simulation. It is important for the observer to appreciate that, whilst the resulting figure is of use in showing the maximum values that can be reached at any point throughout the area covered and throughout the simulation, it does not represent a real situation in space or time because there is little likelihood of the maximum values recorded occurring simultaneously. Additionally, the time for which the maximum value persists in any given mesh cell will vary, and overall, the percentage frequency of occurrence will be reduced due to tidal oscillation.

A consistent colour palette and associated scale have been applied across all the figures illustrating SSC to enable results to be visually compared. It should be noted that all plotted figures utilise a nonlinear scale to cover the range of values achieved throughout the simulation, whilst also providing clarity across smaller magnitudes. The range of values which are presented is designed to convey the potential impacts above natural variation within the study area.

Figure 14-10 to **Figure 14-13** show the maximum sediment plumes arising from dredgers working in areas 1 – 4, respectively.

As anticipated, the SSC levels within the dredge areas are elevated during periods of active dredging. Increased SSCs are observed as the sediment settles through the water column, with a maximum suspended sediment level of 1356NTU (549mg/l TSS) occurring within Alexandra Basin West. This value occurs at a single cell within the centre of the statistical maximum plume for Area 2. Higher concentrations are expected within the basin (i.e. Areas 1, 2, and 4) due to its separation from the main flow of the navigation channel. The dredging simulations of Areas 1, 2, and 4 also demonstrate that suspended sediments generally remain within the confines of the basin.

The dredging undertaken at Area 3, due to its proximity to the main channel with the influence of tidal currents and river flows from the River Liffey, shows suspended sediment dispersing at a lower concentration from the basin. A maximum level of 364NTU (147mg/l TSS) occurs at the entrance to the basin, with a maximum level of 5.22NTU (2.11mg/l TSS) extending up to *c*. 1160 m from the entrance to the basin. The plume was observed to travel with the principal direction of the tidal currents (i.e. downstream during ebb tide and upstream during flood tide). It should be reiterated that the indicated levels are maximums and thus unlikely to occur simultaneously, and liable to be lower subject to continued dispersion until reaching background levels (which

vary throughout the year depending on sources upstream in the River Liffey). The modelled levels entering the main channel disperse below the trigger levels for suspended solids for port dredging operations within *c.*134m of Alexandra Basin West. Further information in regard to impacts on water quality is provided in **Chapter 9 Water Quality and Flood Risk Assessment**.

In the event that two dredgers operate simultaneously within Alexandra Basin West in Areas 1, 2 and 4, the SSCs will be greater, but critically suspended sediments will remain inside the basin. **Figure 14-14** through **Figure 14-16** illustrate the sediment plumes and concentrations arising from concurrent dredging operations within multiple areas.

The sediment dispersion modelling provided a worst-case scenario in terms of suspended sediment concentration. It was assumed that a significant portion of the material was comprised of the most easily mobilised material encountered in the area during spring tides, with the highest expected dredge rate. In reality, sediment survey information has shown sediment characteristics to vary within the basin, with areas of sand and gravel present throughout.

Whilst there will be no significant loss of sediment to the water column from the dredging of Alexandra Basin West itself, as demonstrated by the modelling outputs, dredging operations in Area 3 have the potential to generate sediment plumes that disperse. The concentration of these plumes does not exceed 5mg/l TSS (10 NTUs) *c.* 1km beyond the entrance to Alexandra Basin West, as illustrated in **Figure 14-12**. As such, the magnitude of potential impact is considered as **low adverse**.

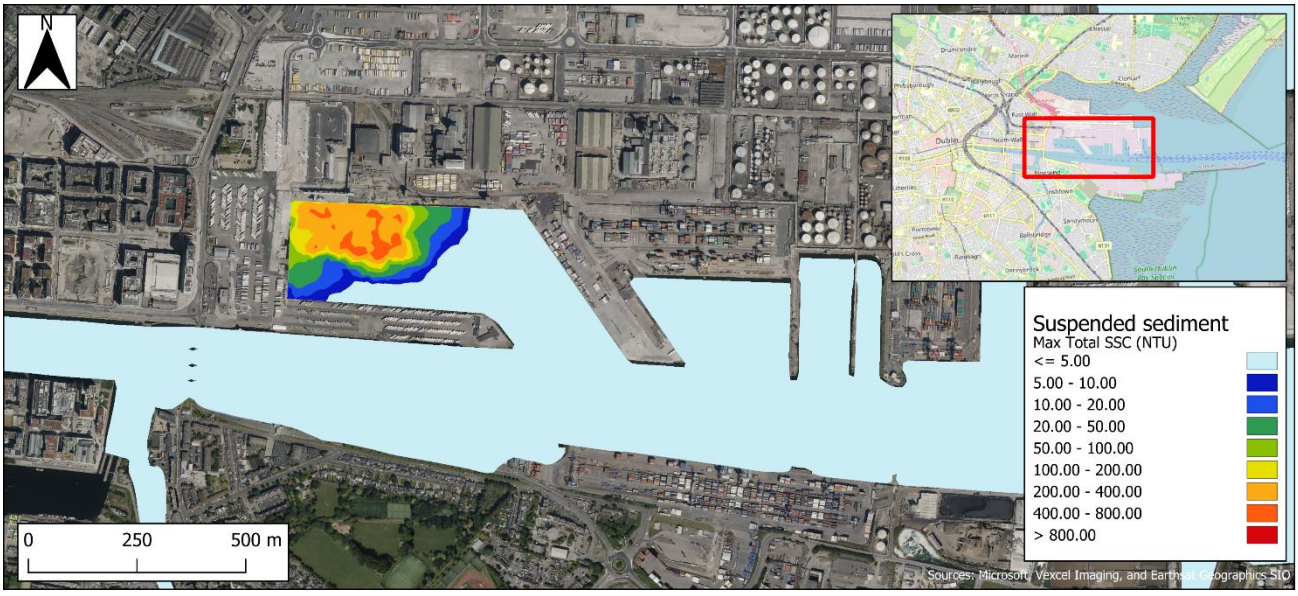


Figure 14-10: Maximum suspended sediment concentration plume with no silt curtain – Area 1

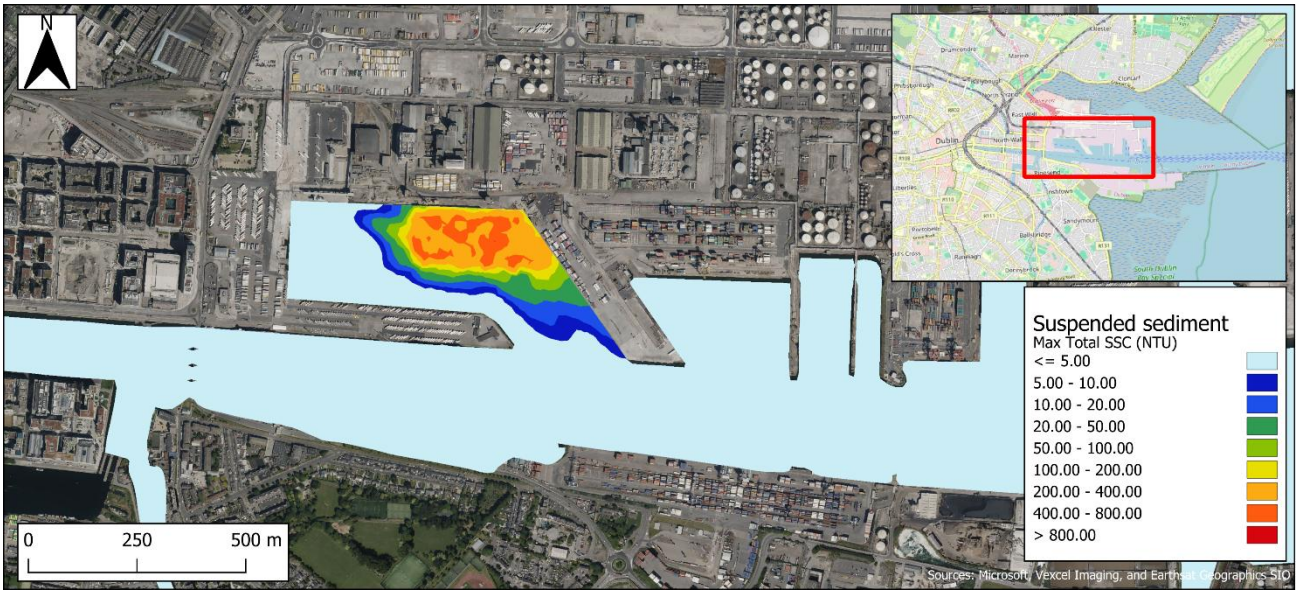


Figure 14-11: Maximum suspended sediment concentration plume with no silt curtain - Area 2

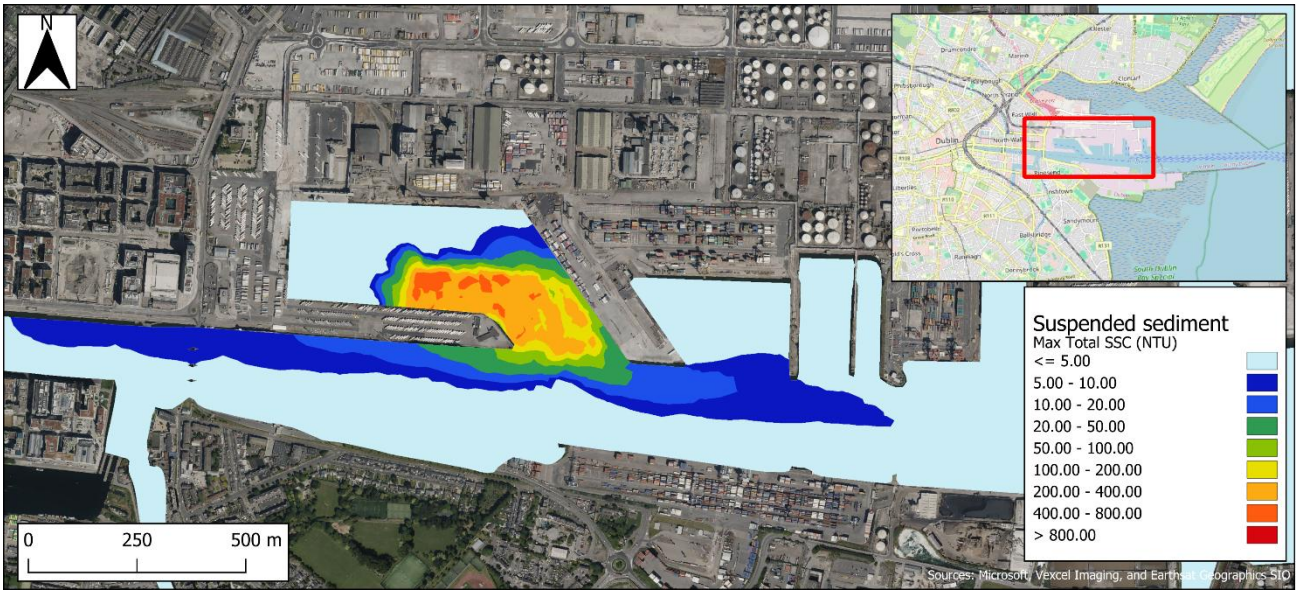


Figure 14-12: Maximum suspended sediment concentration plume with no silt curtain- Area 3

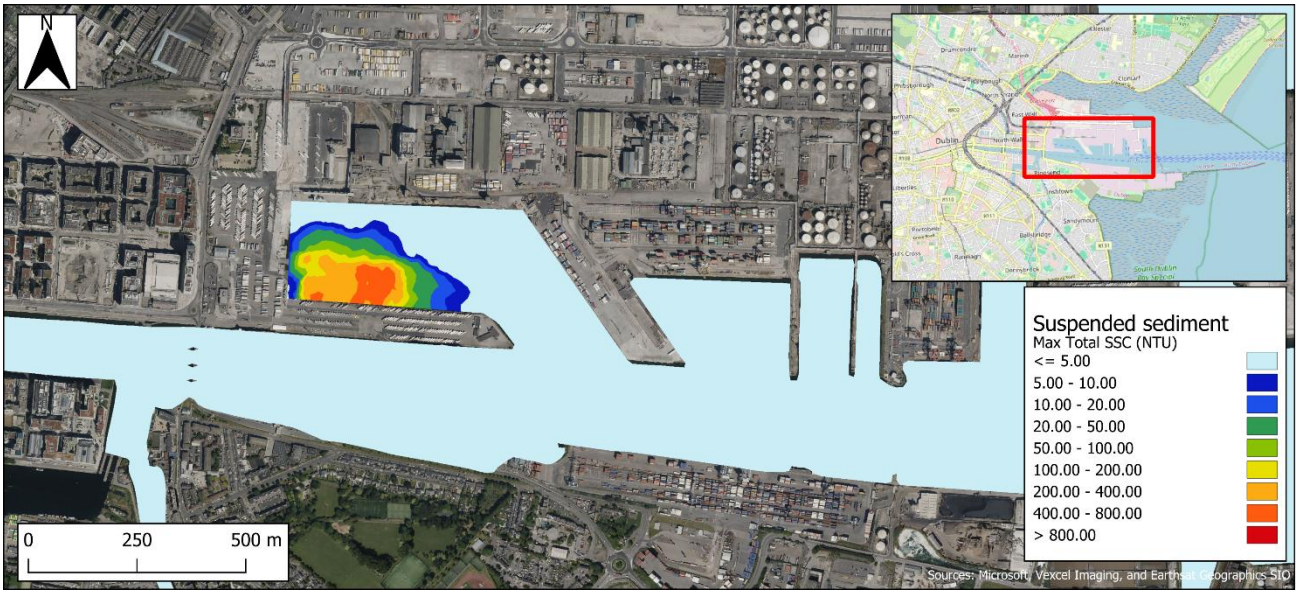


Figure 14-13: Maximum suspended sediment concentration plume with no silt curtain - Area 4

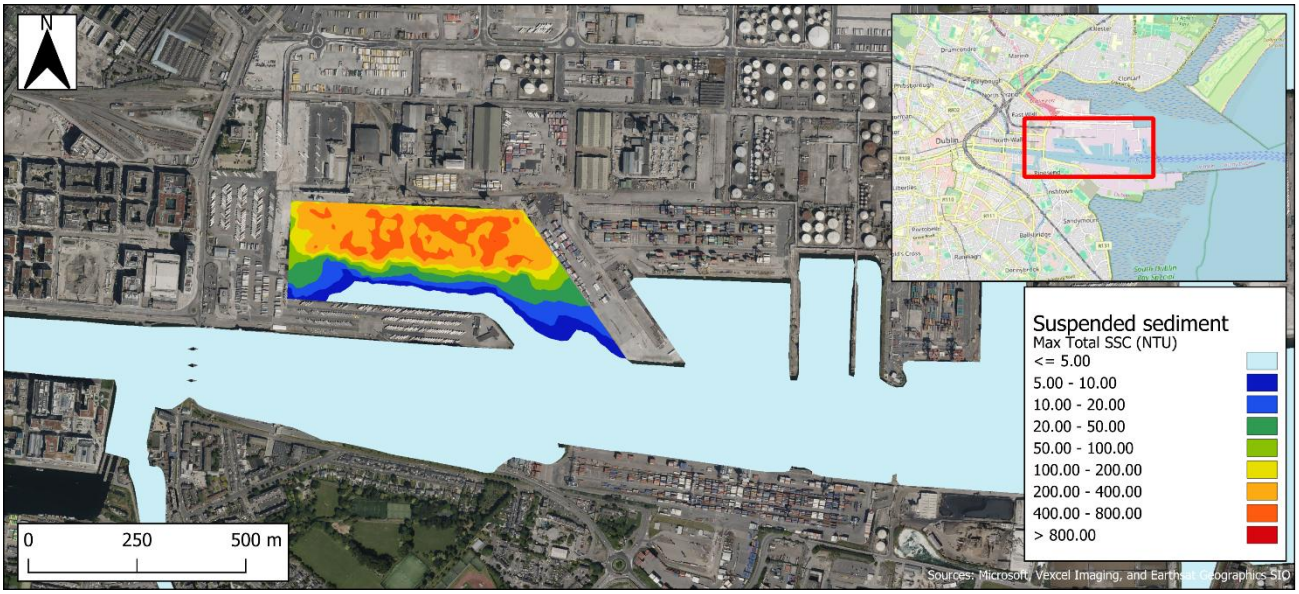


Figure 14-14: Maximum suspended sediment concentration plume with no silt curtain – Areas 1 and 2

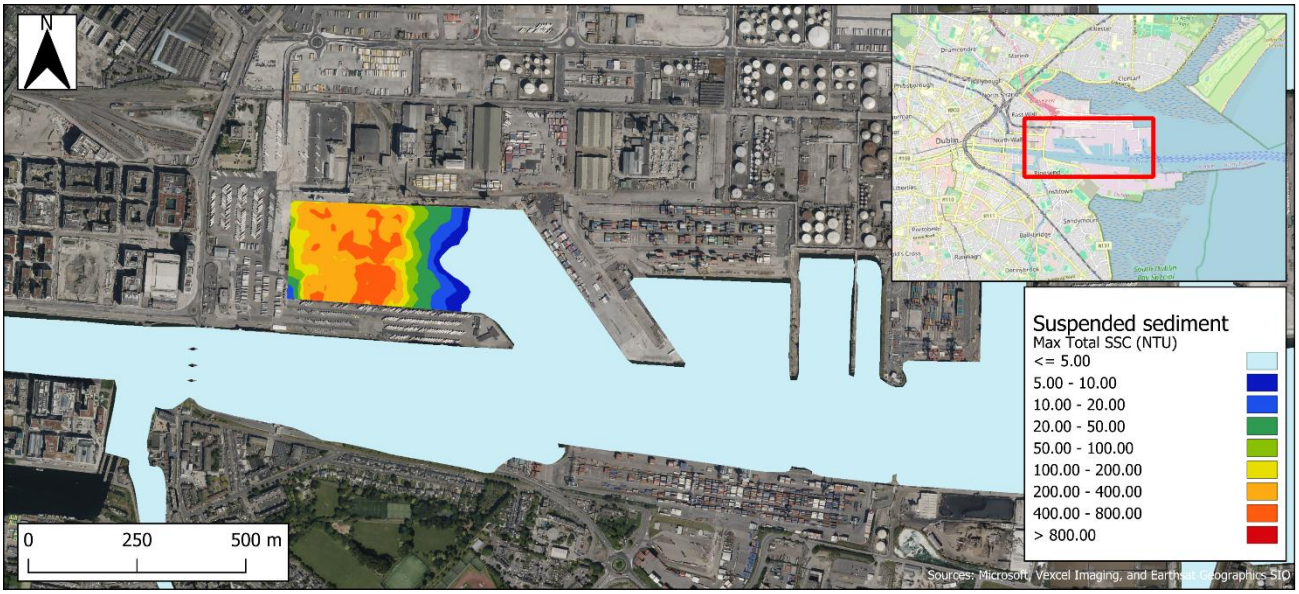


Figure 14-15: Maximum suspended sediment concentration plume with no silt curtain - Areas 1 and 4

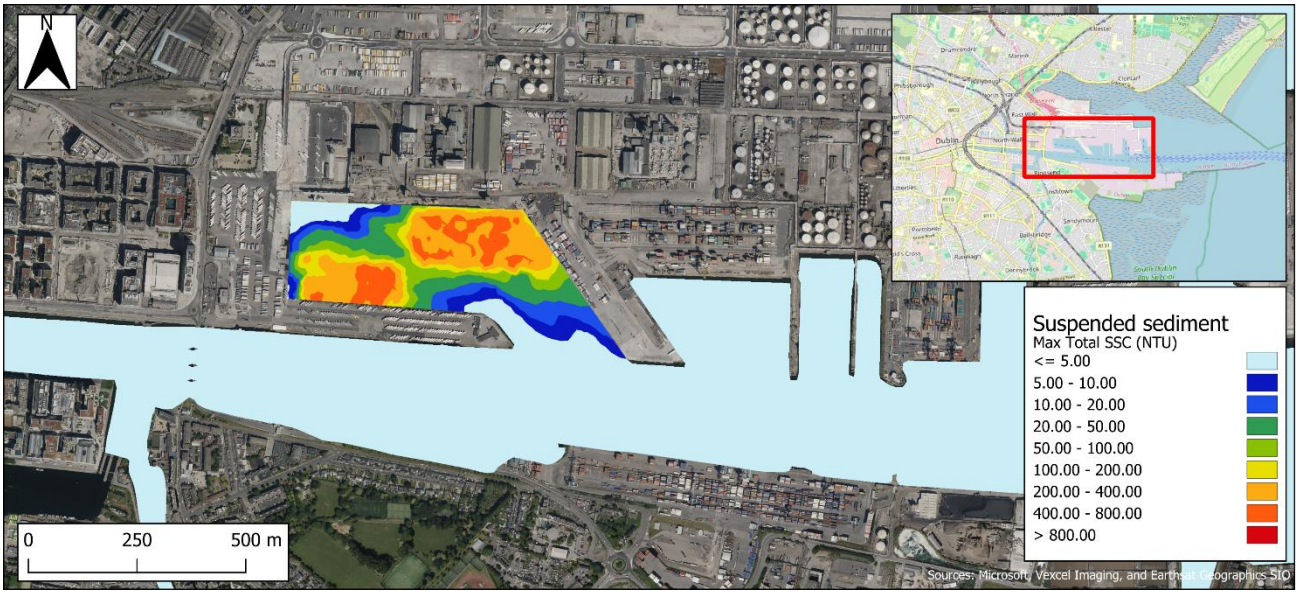


Figure 14-16: Maximum suspended sediment concentration plume with no silt curtain - Areas 2 and 4

Sensitivity of the receptor

The shoreline within Dublin Port is highly urbanised and as detailed within the baseline environment section in **Section 14.3**. The dredging works are not located within a designated site with coastal features as a qualifying feature. However, it should be noted that coastal features are present in the wider Dublin Bay area and are hydrologically connected to the dredging areas works, which is relevant for suspended sediments. Although the coastal features found in Dublin Bay are unique, these areas are extensive and would recover from the predicted magnitude of the changes in coastal processes as outlined above.

The sensitivity of the coastal feature receptors in Dublin Bay to changes in suspended sediment concentration is therefore considered to be **low**.

Significance of the Effect

During the course of the dredging operations in Alexandra Basin West, temporary increases in significant suspended sediment concentrations do not extend to the designated areas of Dublin Bay. Rather, sediment plumes remain within Dublin Port where no coastal features of importance are present (i.e., vertical key walls with berth pockets frequently dredged). The confinement of the sediment plumes is due to the location of dredging, limited dredge rates, and embedded mitigation measures within the ABR2 Project Design.

Overall, the magnitude of the impact is deemed to be **low adverse**, and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **low adverse** and of **minor significance**, which is **not significant** in EIA terms.

14.4.3 Assessment of Operational Effects

14.4.3.1 Presence of infrastructure may lead to changes in tidal currents

Magnitude of Impact

The presence of ABR2 Project infrastructure may lead to changes in tidal currents. The project design parameters, as described in **Chapter 5 Project Description**, include capital dredging of Alexandra Basin West and infilling of the Berths 52/53 basin. The following figures (Figure **14-17** to **Figure 14-21**) show the high water, mid-ebb, low water, mid-flood, and residual steps from the simulation as were presented for the baseline environment (**Figure 14-5** to **Figure 14-9**) but with the ABR2 Project infrastructure in place.

Due to the limited magnitude of the changes, difference plots are also provided in **Figure 14-22** to **Figure 14-26**. These plots show the post-construction conditions minus the baseline conditions; therefore, increases in current speeds are positive, and decreases are negative.

Within Alexandra Basin West, the results of the modelling show that the change in bathymetry has a minor and localised impact on current speeds. During a typical ebb tide, differences in current speeds within and directly outside the basin do not exceed 0.011m/s (0.02kts), whilst current speeds at the entrance to the basin are slightly accelerated by up to 0.022m/s (0.04kts). These differences are most apparent at the western edge of the entrance to the basin and constitute less than 4% of the peak ebb current flows which occur in the wider Dublin Port area.

Similarly, during the flood tide changes of up to 0.014m/s (0.03kts) can be observed, with the most apparent differences at the eastern side of the entrance to the basin. During both high water and low water tidal flow patterns are slightly altered within the basin, but these differences are minimal in magnitude and extent.

Regarding the closure and infilling of Berths 52/53 basin, the results of the hydrodynamic modelling demonstrate that tidal flows are accelerated in the immediate vicinity of the infrastructure as flows are redirected around the new structure, with a zone of reduced current speed in the lee of the structure. These differences in current speeds are generally <0.025m/s (0.05kts), which constitutes less than 4% at the peak flows that occur in the wider Dublin Port area. These changes are also limited to the immediate vicinity of the ABR2 Project infilling area. A small increase in current speed (0.045m/s) is observed around the south-eastern end of the new Berths

52/53 area. Whilst these changes will alter the hydrodynamic regime, the changes are not considered significant.

The changes to residual tidal currents, i.e. the average flow over one complete tidal cycle, are illustrated in **Figure 14-26**. A maximum decrease of 0.014m/s in the vector-averaged current speeds is observed within the south-eastern corner of Alexandra Basin West, and a maximum increase of 0.006m/s is observed around the south-eastern end of the new Riverside Berth 52 area and near the entrance to Alexandra Basin West. This corresponds to a maximum decrease of less than 15%, and a maximum increase of less than 7%, when compared to the peak baseline residual flows that occur within the wider Dublin Port area.

Areas of potential erosion or deposition may be identified by analysing the changes to the residual tidal currents. Based on the location and magnitude of the differences described above, no significant changes to the broader sediment transport system and pathways within Dublin Port are anticipated.

The hydrodynamic regime is highly variable through individual tidal cycles due to a range of factors, including but not limited to meteorological conditions. The scale of the impacts on the existing hydrodynamic regime is considered well within the natural variation.

The predicted scale impact of the ABR2 Project on hydrodynamics is therefore considered to be of local spatial extent, long-term duration, continuous and low reversibility (for the infilled area). Importantly, the magnitude is therefore considered to be **negligible**.

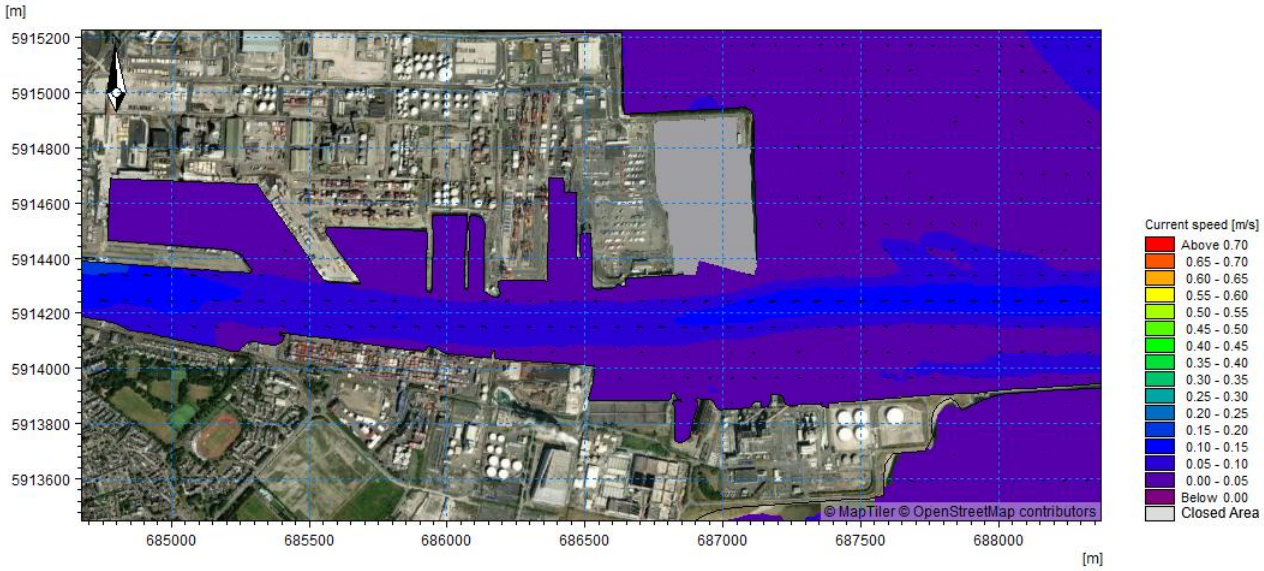


Figure 14-17: Post construction tidal flow pattern – spring tide high water

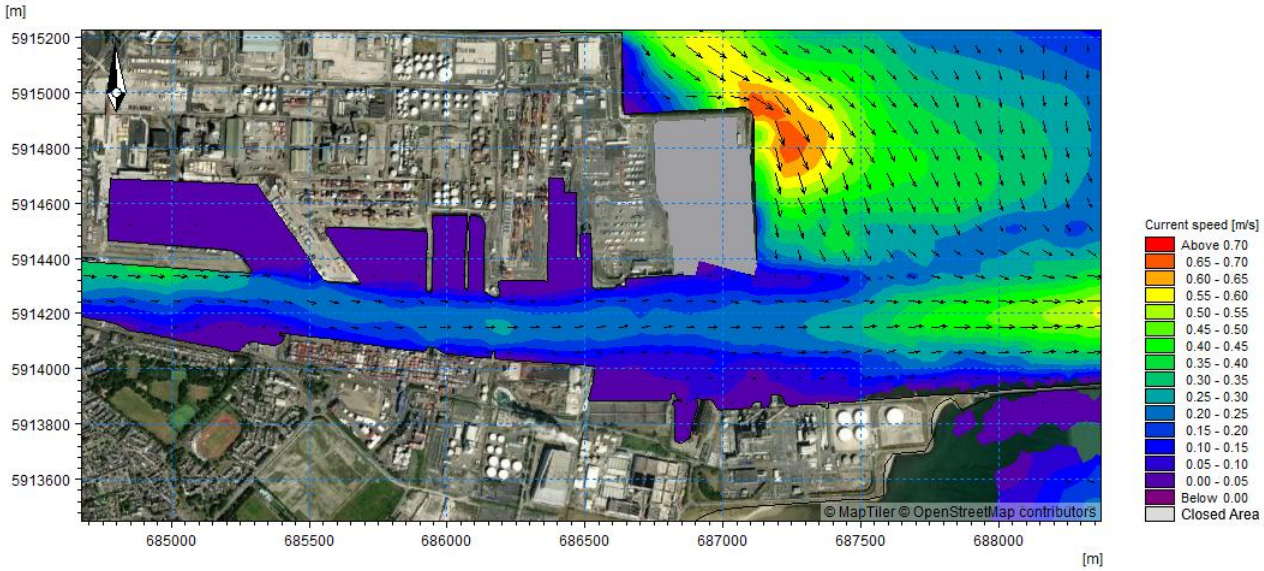


Figure 14-18: Post construction tidal flow pattern – spring tide mid-ebb

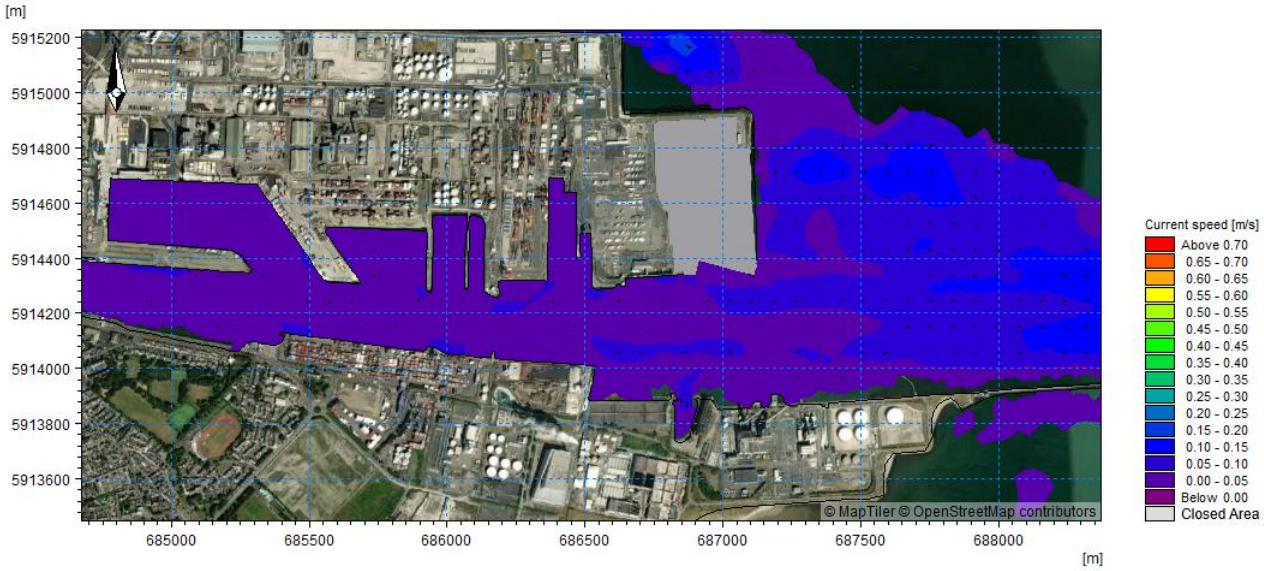


Figure 14-19: Post construction tidal flow pattern – spring tide low water

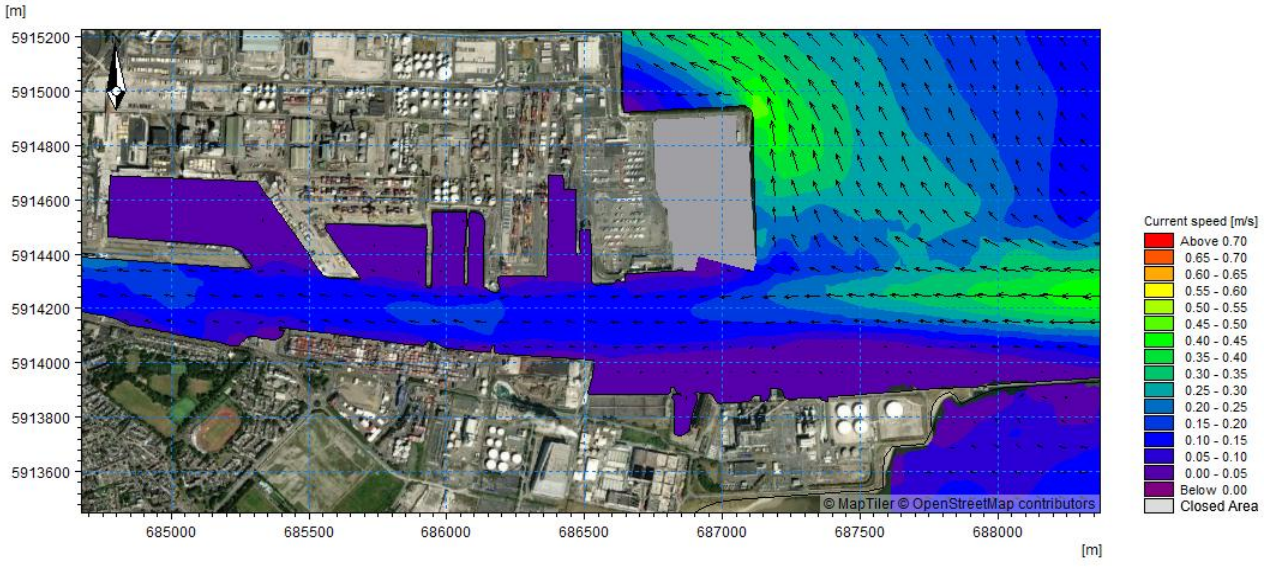


Figure 14-20: Post construction tidal flow pattern – spring tide mid-flood

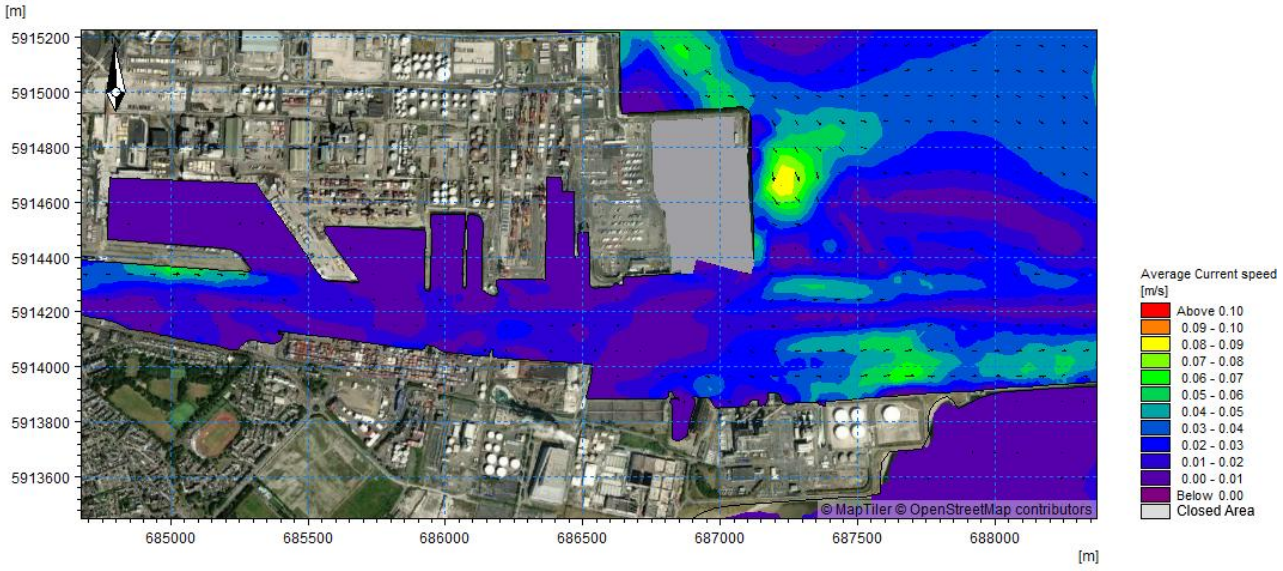


Figure 14-21: Post construction residual spring tidal flow pattern

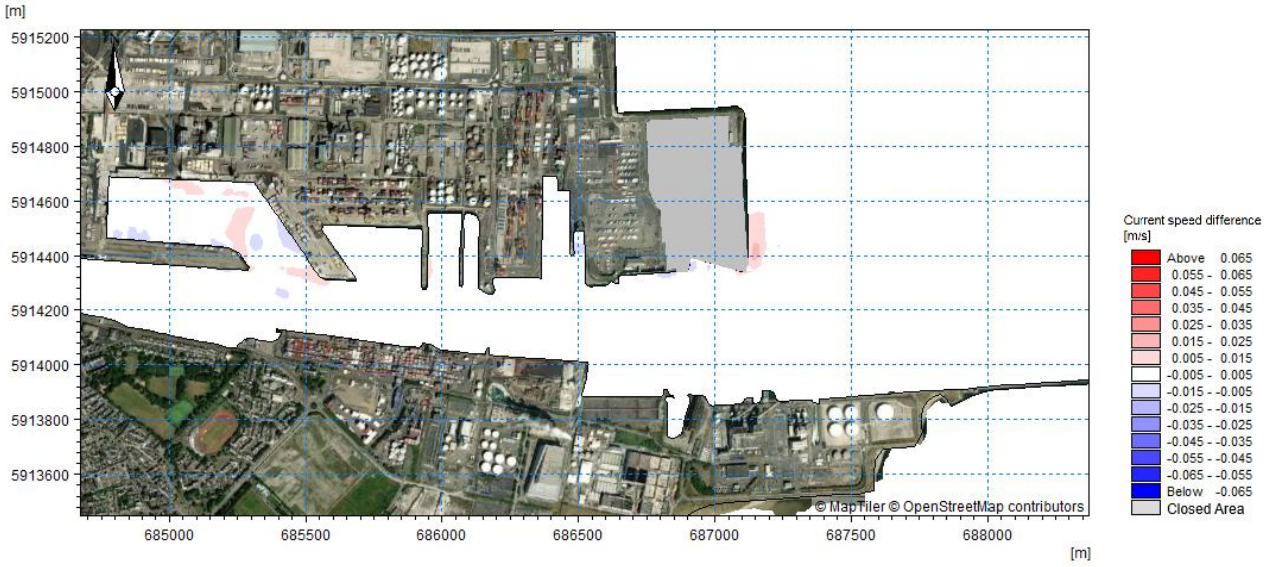


Figure 14-22: Changes to tidal flow – spring tide high water

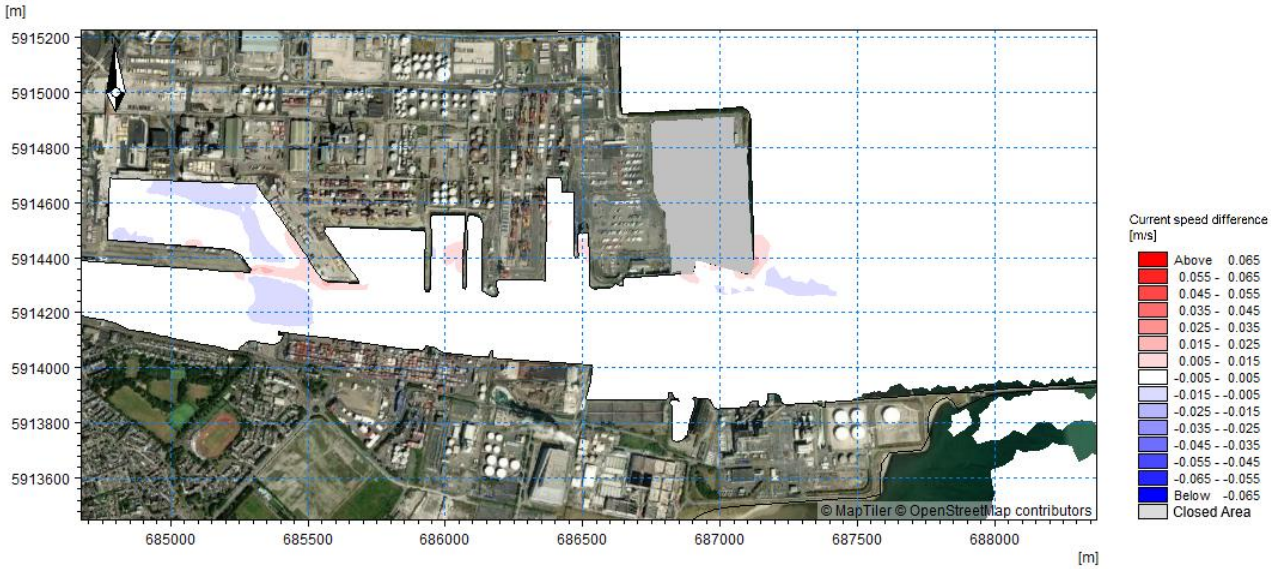


Figure 14-23: Changes to tidal flow – spring tide mid-ebb

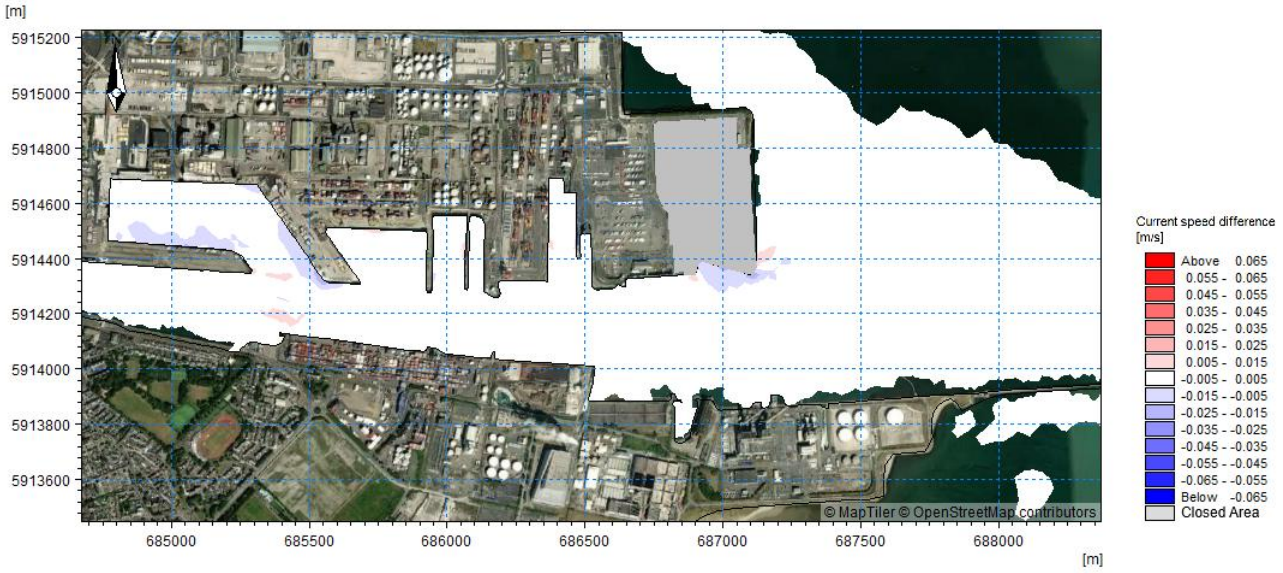


Figure 14-24: Changes to tidal flow – spring tide low water

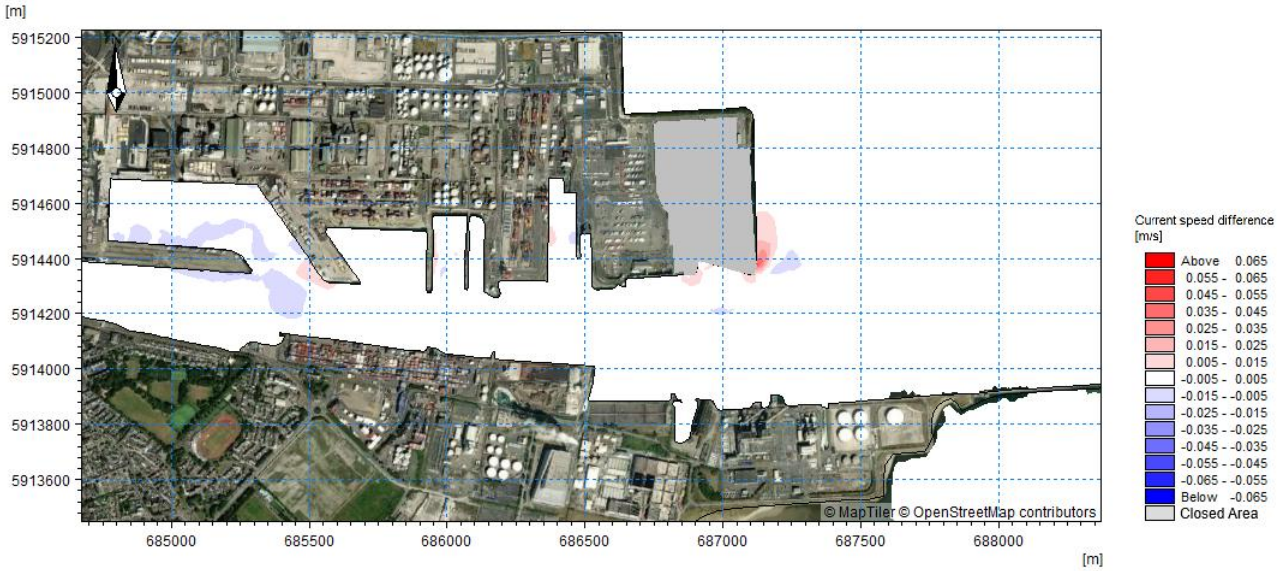


Figure 14-25: Changes to tidal flow – spring tide mid-flood

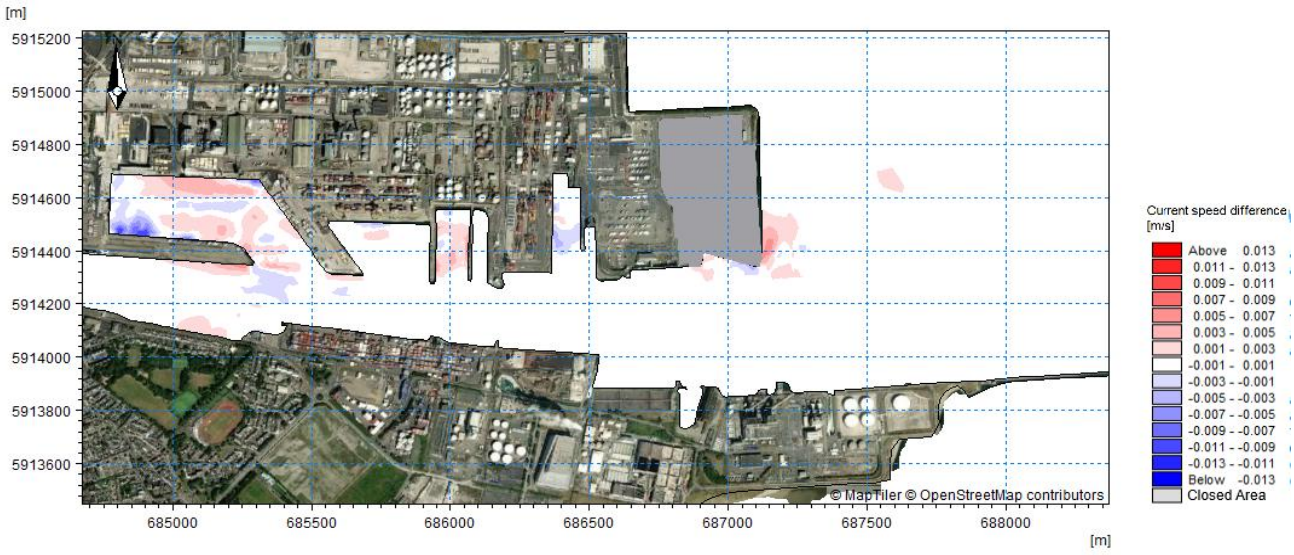


Figure 14-26: Changes to residual spring tidal flow

Sensitivity of Receptor

The shoreline within Dublin Port is highly urbanised, as detailed in **Section 14.3**. The infrastructure and dredging works are not located within a site designated for qualifying coastal features. However, it should be noted that coastal features are present in the wider Dublin Bay Study and are hydrologically connected to the dredging areas works, which is relevant for suspended sediments. Although there are not many coastal features similar to those found in Dublin Bay, these areas are extensive and would recover from the predicted magnitude of the changes in coastal processes as outlined above.

The sensitivity of the coastal feature receptors in Dublin Bay to changes in current velocities within Dublin Port is therefore considered to be **low**.

Significance of the Effect

The changes to the tidal currents are insignificant in terms of the hydrodynamic regime and will not significantly impact on the supporting hydromorphological conditions in the coastal water bodies (and therefore coastal features) within the Study Area. With minimal changes in current velocities, this also reduces the potential for any change of sediment transport resulting from the ABR2 Project. Overall, the magnitude of the impact is deemed to be **negligible,** and the sensitivity of the receptor is considered to be **low**.

The effect will, therefore, be **of minor/negligible and slight adverse significance**, which is **not significant** in EIA terms.

14.5 Inter-relationships

Effects on Coastal Processes also have the potential to have secondary effects on other receptors, which are considered in relevant topic-specific chapters. These receptors and effects are:

- Marine Biodiversity (considered in **Chapter 7 Biodiversity, Flora & Fauna**):
    - Temporary and long-term marine habitat loss/disturbance; and
    - Increased SSCs and sediment deposition.
- Water Quality (considered in **Chapter 9 Water Quality and Flood Risk Assessment**):
    - Increased SSCs and sediment deposition, which can mobilise potentially hazardous contaminants such as heavy metals into the water column.
- Flood Risk (considered in **Chapter 9 Water Quality and Flood Risk Assessment**):
    - Wider coastal processes may exacerbate coastal flooding in certain locations due to physical factors that can occur individually or in combination.
- Cultural Heritage (considered in **Chapter 17 Cultural Heritage**):
    - Increased SSCs and sediment deposition leading to indirect impacts on cultural heritage receptors, including marine archaeology; and
    - Alteration of sediment transport regime leading to indirect impacts on marine archaeology receptors.

14.6 Mitigation and Monitoring

14.6.1 Mitigation

Based on the initial assessment of sediment plumes arising from dredging activities (see **Section 14.4.2.1**), the overall effect of the proposed dredging operations to be undertaken as part of the ABR2 Project is considered to be of **low adverse and of minor significance.** This is not significant in EIA terms when good industry practices are applied (i.e., environmental bucket and no overspill from the hopper vessel). However, recognising the environmental sensitivity of the area and natural variations in suspended sediment loads, the ABR2 Project will apply additional mitigation measures to further reduce the potential for impacts arising from the dispersion of suspended sediment.

Specifically, a silt curtain will be deployed during dredge operations to further limit the dispersion of sediment. To underpin the effectiveness of this silt curtain, a dredge management protocol will also be implemented. This will entail agreeing appropriately scheduled dredging paths and windows in conjunction with Port operations through close liaison with the harbour master. This will minimise silt curtain redeployment and movement, improving the efficiency and efficacy of this mitigating measure.

The effectiveness of silt curtains is governed by a range of factors, but principally prevailing current speeds (including nearby vessel activity). Given the low-energy nature of the Alexandra Basin West environment and with dredge management protocol implemented, it has been conservatively assumed that the silt curtain would reduce sediment dispersion by 50%. This reduction is in-line with manufacturer's specifications as defined in data sheets for commonly used silt curtain products.

A bubble curtain is also included as an additional mitigation measure; however, this is treated as a failsafe/back-up mitigation and therefore not implemented within the model.

For completeness, the dredge simulations described in **Section 14.4.2** were re-run with the mitigation measures described above embedded in the modelling.

Figure 14-27 to **Figure 14-30** illustrate the sediment plumes arising from dredgers working in Areas 1 to 4 with the mitigation measures n in place.

As anticipated, the SSC levels within the dredge areas remain elevated during periods of active dredging. Increased SSCs are observed as the sediment settles through the water column, with a maximum suspended sediment level of 678 NTU (274mg/l TSS) occurring within Alexandra Basin West (compared to 1,356 NTU without mitigation measures). This value occurs at a single cell within the centre of the Area 2 statistical maximum plume. Higher concentrations are still expected within the basin (i.e. Areas 1, 2, and 4) due to its separation from the main flow of the navigation channel. However, the dredging simulations of Areas 1, 2, and 4 also demonstrate that suspended sediments generally remain within the confines of the basin.

The dredging undertaken at Area 3, due to its proximity to the main channel with the influence of tidal currents and river flows from the River Liffey, show suspended sediment dispersing at a lower concentration from the basin. A maximum level of 130 NTU (53mg/l TSS) occurs at the entrance to the basin, with a maximum level of 5.15 NTU (2.09mg/l TSS) extending up to *c.* 675m from the entrance to the basin. This is relative to a maximum

level of 5.22 NTU (2.11mg/l TSS) that extended up to c. 1160m from the entrance to the basin without mitigation measures.

In the event that two dredgers operate simultaneously within Alexandra Basin West in Areas 1, 2 and 4, the SSCs will be greater, but critically suspended sediments will remain inside the basin. **Figure 14-31** through **Figure 14-33** illustrate the sediment plumes and concentrations arising from concurrent dredging operations within multiple areas while silt curtains are deployed.

Whilst dispersed suspended sediment concentrations remain broadly analogous to those predicted without the additional mitigation measures described in this Section in place, the *extent* of the resultant sediment plumes is significantly less when mitigation measures are applied. Consequently, the magnitude of the impact from increased suspended sediment concentrations will be reduced from **low adverse** to **negligible adverse**.

The overall effect of dredging operations with mitigation measures applied is therefore considered **minor/negligible significance**, which is **not significant** in EIA terms.

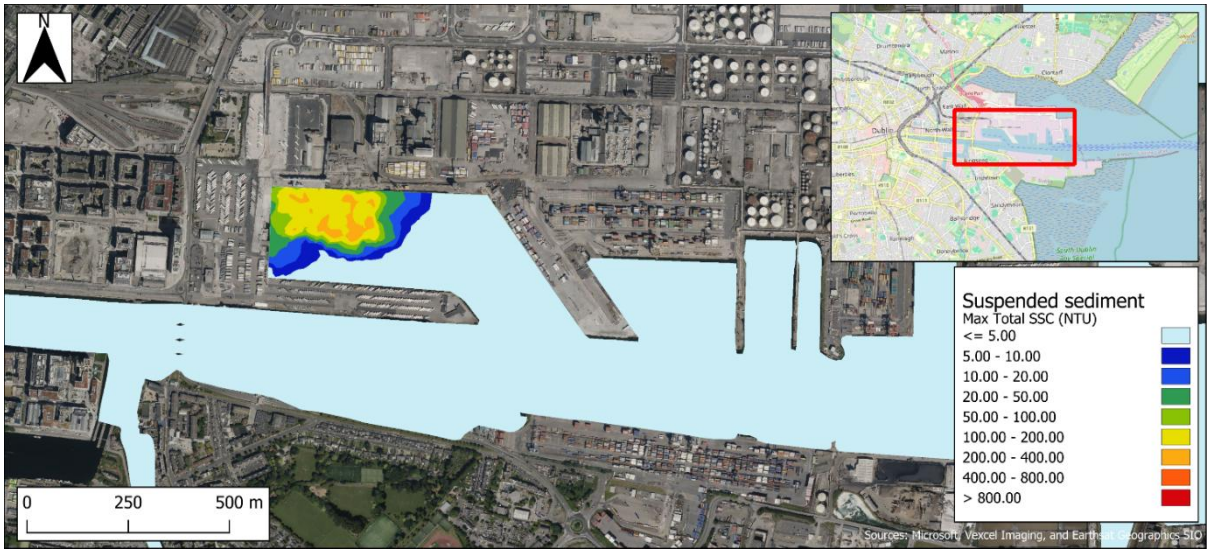


Figure 14-27: Maximum suspended sediment concentration plume with silt curtain – Area 1

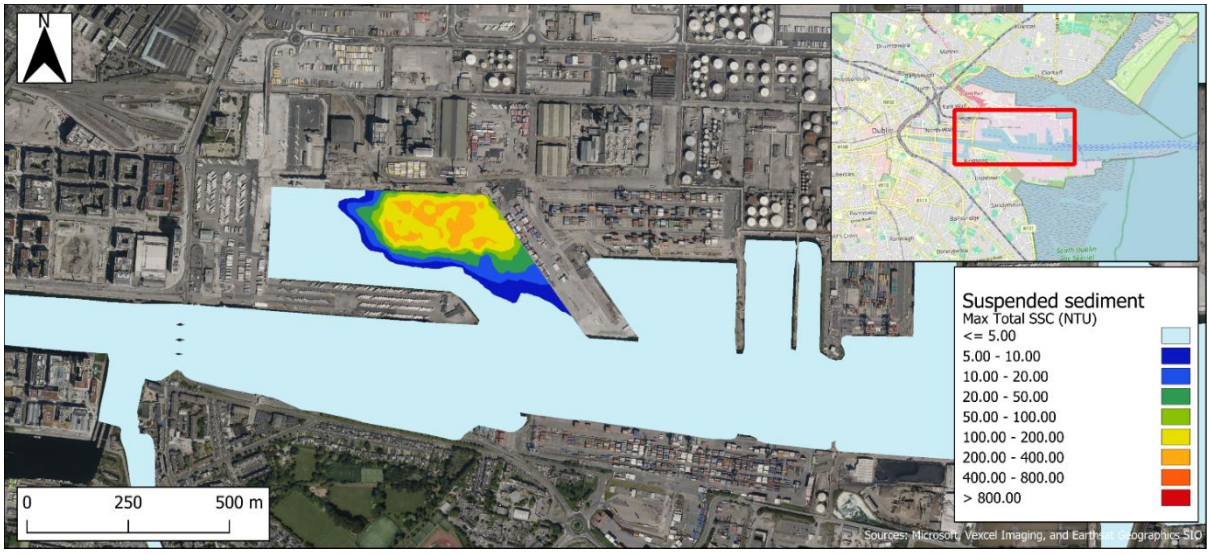


Figure 14-28: Maximum suspended sediment concentration plume with silt curtain - Area 2

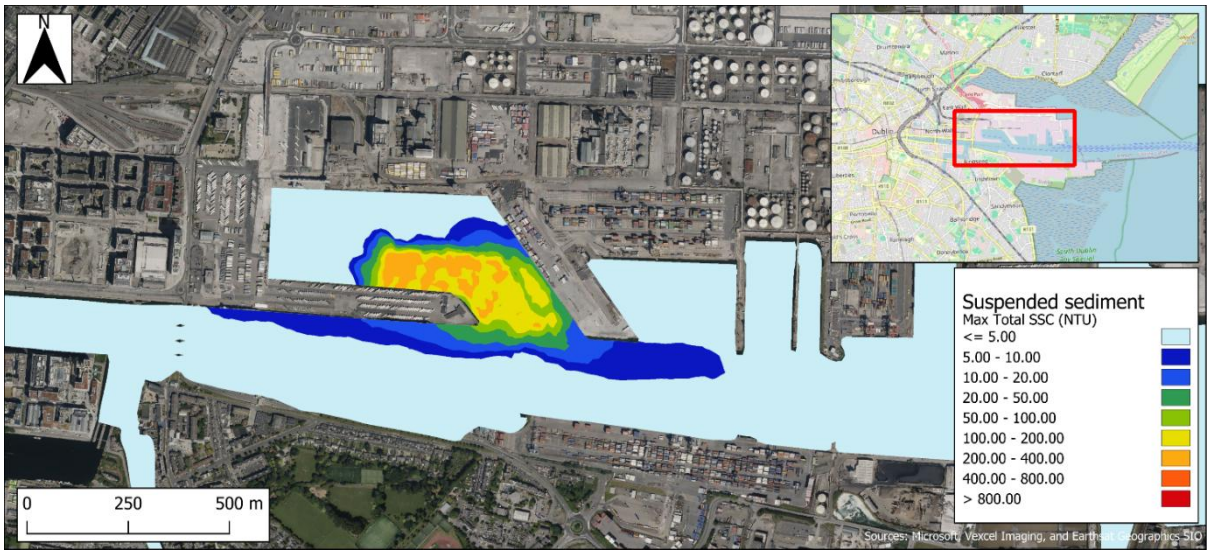


Figure 14-29: Maximum suspended sediment concentration plume with silt curtain - Area 3

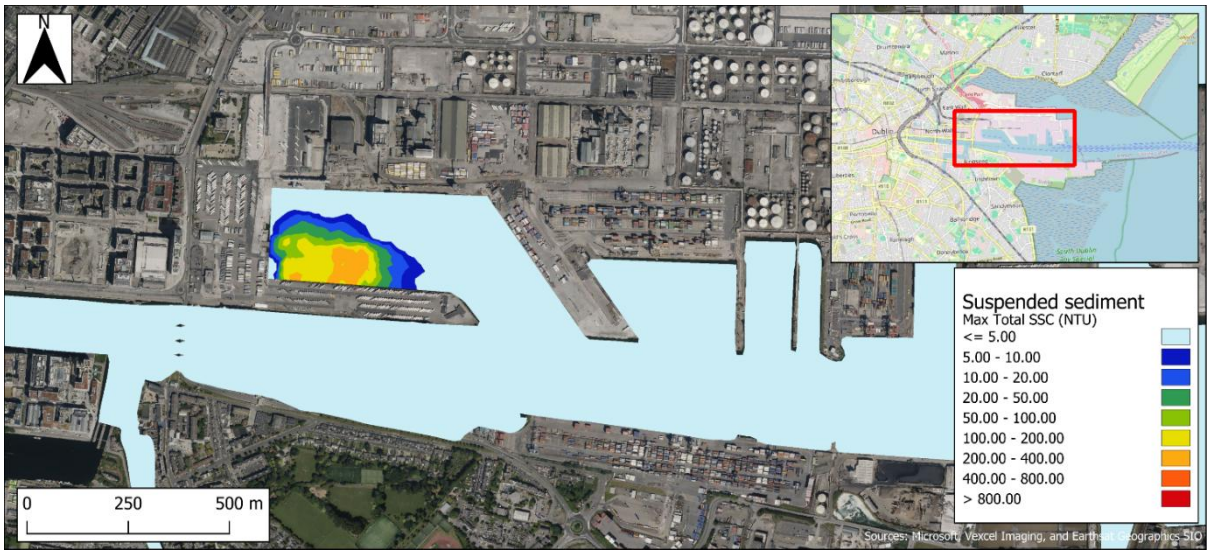


Figure 14-30: Maximum suspended sediment concentration plume with silt curtain - Area 4

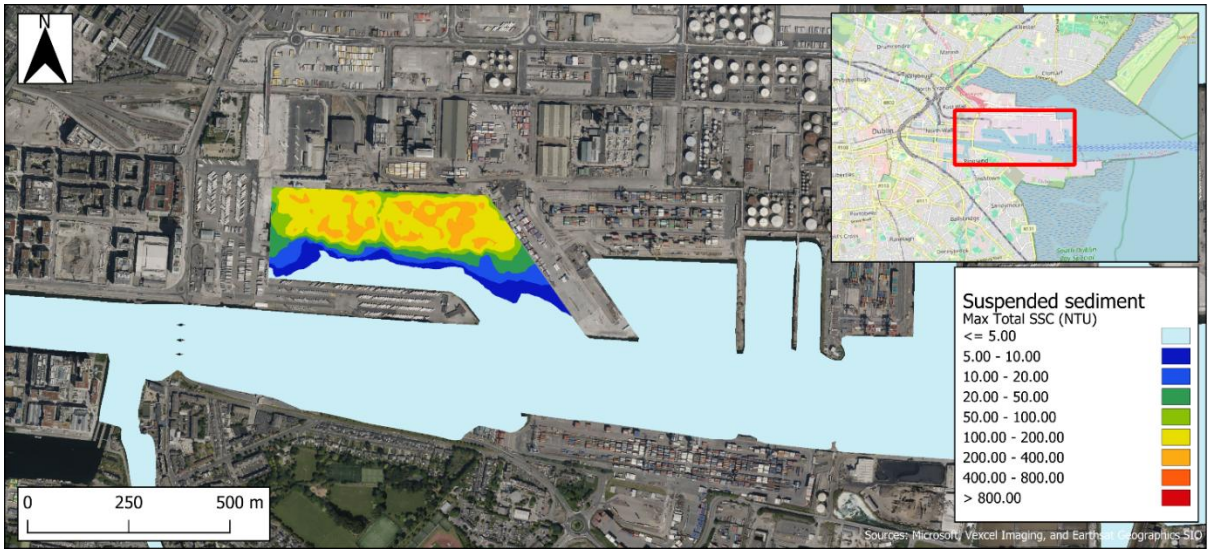


Figure 14-31: Maximum suspended sediment concentration plume with silt curtain – Area 1 and Area 2

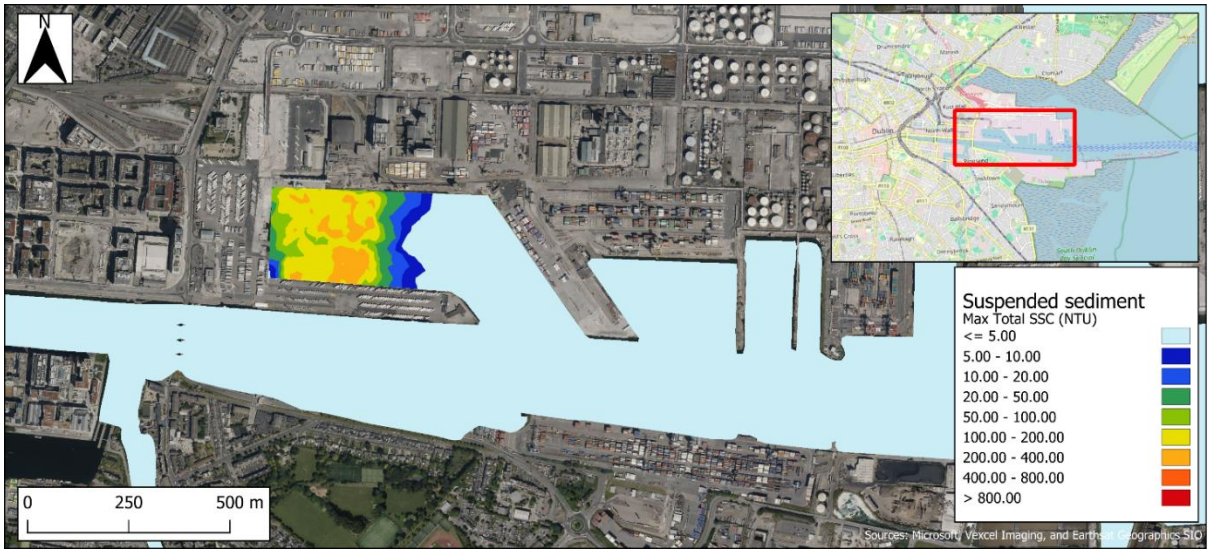


Figure 14-32: Maximum suspended sediment concentration plume with silt curtain - Area 1 and Area 4

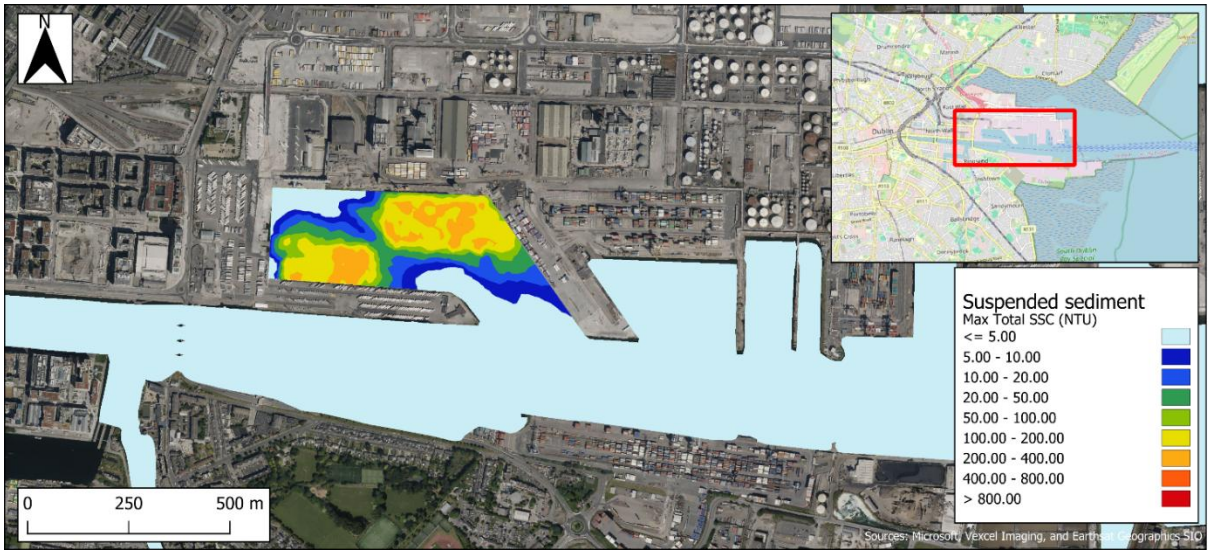


Figure 14-33: Maximum suspended sediment concentration plume with silt curtain - Area 2 and Area 4

14.6.2 Monitoring

As with the ABR Project, monitoring measures relating to the compliance monitoring of the Construction Environmental Management Plan (CEMP) and the mitigation measures therein will be undertaken throughout the duration of the ABR2 Project. Monitoring of water quality (including suspended solid levels) is outlined in **Chapter 9 Water Quality and Flood Risk Assessment**. This is to ensure measures are being implemented correctly, and to provide an evidence base to demonstrate they are working effectively. Any observations or corrective actions arising from audits and inspections will be addressed, with procedures updated in the CEMP as required.

14.7 Potential Cumulative Effects

Chapter 21 Cumulative Effects and Environmental Interactions outlines the methodology used to complete the assessment of cumulative effects, which may arise from adjacent or nearby development together with those predicted for the ABR2 Project. The long list of projects which have been considered within the assessment of cumulative effects are outlined in **Chapter 21 Cumulative Effects and Environmental Interactions**. Whilst the majority of these projects relate to terrestrial developments with no pathways to interact with the ABR2 Project in the context of coastal processes, proposals that could act in combination to potentially affect coastal processes in Dublin Port or wider Dublin Bay area have been listed in **Table 14-12**.

Each project has been considered on a case-by-case basis for screening in or out of this chapter's assessment based upon data confidence, effect-receptor pathways, and the spatial/temporal scales involved. The general approach to assessment examines the cumulative effects of the ABR2 Project alongside the following projects if they fall within the Coastal Processes Study Area shown in Figure 14-2. This is the area over which detailed numerical modelling was undertaken and encompasses a distance of approximately 15km offshore and 15km alongshore to the north and south.

This conservative distance was chosen to ensure coverage of all potential effects on the broader hydrodynamic regime and existing sediment transport pathways. However, as later established in Section 14.4, the greatest distance for potential impacts covers a reduced area of less than *c.*1km from the Red Line Boundary.

The main component of the ABR2 Project which may give rise to a cumulative effect is the potential overlap of sediment plumes during project construction with plumes arising from other projects in the area. At this stage, it is considered that there are no potential cumulative effects arising from adjacent or nearby development, together with those predicted for the ABR2 Project.

Table 14-12: List of other projects, plans and activities considered within the cumulative effects assessment

Project	Status	Distance from Red Line	Description of Project	Dates of construction / operation	Potential for Cumulative Effect with ABR2 Project
MP2 Project (PLN 304888)	Grant Perm. w Conditions	0m	15-year permission for development at Oil Berth 3 and Oil Berth 4, Eastern Oil Jetty and at Berths 50A, 50N, 50S, 51, 51A, 49, 52, 53 and associated terminal yards to provide for various elements, including new Ro-Ro jetty and consolidation of passenger terminal buildings	Q1 2020 to Q4 2032	Capital Dredging requirements for the MP2 Project lie outside the area of potential cumulative impact. Furthermore, the dredged material from the ABR2 Project is also treated rather than dumped at sea. This removes any potential for cumulative effects between the MP2 and ABR2 Project.
3FM Project (PLN 320250)	Further Consideration needed for this case	0m	A Southern Port Access Route and road network improvements, construction of a Lo-Lo container terminal, Ro-Ro freight terminal and other works	Q1 2026 to Q4 2040	Capital Dredging requirements for the proposed 3FM Project lie outside the area of potential cumulative impact. Furthermore, the dredged material from the ABR2 Project is also treated rather than dumped at sea. This removes any potential for cumulative effects between the 3FM and ABR2 Project.
Codling Wind Park (PLN 320768)	Lodged	200m	Proposed development known as Codling Wind Park	Q1 2027 to Q1 2030	Landfall of the Codling Wind Park cable is proposed for the southern side of the Port's South Estate. As Codling Wind Park and the ABR2 Project are separated by land - there is minimal potential for cumulative effects with suspended solids as demonstrated by the plume extent in Section 14.4 of this EIAR.
Dublin Harbour Capital Dredging Project (FS007164/DAS Application S0033-01)	Determined	0m	Foreshore application and Dumping at Sea Permit in respect of Capital Dredging at various locations around Dublin Port	Q1 2026 to Q1 2034	Capital dredging of the navigation channel between the entrance to Alexandra Basin West and the Western Oil Jetty has already been completed under the Dublin Harbour Capital Dredging Project. Furthermore, as the dredged material from the ABR2 Project is also treated rather than dumped at sea. This removes any potential for cumulative effects between the Dublin Harbour Capital Dredging Project and ABR2 Project.
Dublin Port Maintenance	Determined	0m	Foreshore application and Dumping at Sea Permit in respect of maintenance	Q2 2022 to Q3 2029	Dredging at Alexandra Basin West within Area 3 (closest sector to the entrance of the basin) will

Project	Status	Distance from Red Line	Description of Project	Dates of construction / operation	Potential for Cumulative Effect with ABR2 Project
Dredging Programme 2022-2029 (FS007132 / DAS Permit S0004-03)			dredging at various locations in Dublin Port for the years 2022 to 2029		be avoided during periods when maintenance dredging is taking place along the northern portion of the Liffey, upstream of the western Oil Jetty (Oil Berth 1). This minor restriction will avoid any potential cumulative impact of elevated suspended solids within the Liffey. Furthermore, as the dredged material from the ABR2 Project is also treated rather than dumped at sea. This removes any potential for cumulative effects between the Dublin Port Maintenance Dredging Programme and ABR2 Project with the adherence to the above restriction at Area 3.
EirGrid Powering Up Dublin Project – North Wall and Poolbeg (CP1216)	Planned	0m	EirGrid are installing 50km of high voltage underground cables to replace older cables across Dublin and reinforcing the grid. One planned route links Finglas substation and Poolbeg substation via North Wall, crossing the River Liffey in Dublin Port using underground tunnelling.	Q3/Q4 2026 -	The proposed installation method for the North Wall to Poolbeg underground cable to cross the River Liffey is underground tunnelling. As such, there is no potential for cumulative effects in regard to suspended solids.
LIC230016	Licensed	0m	Geophysical survey and site investigations for a proposed subsea fibre optic cable having a landfall in Dublin Port, County Dublin and to evaluate options for the route traversing Dublin Bay, across the Irish Sea to Anglesey, Wales.	Q3 2024 to Q1 2025	Area of site investigation enters into Dublin Port. As minimal sediment enters the main navigation channel during ABR2 Dredging works, there is minimal potential for cumulative effects with suspended solids as demonstrated by the plume extent in Section 14.4 of this EIAR. It is also likely the site investigation will be completed by the time (as per current LIC230016 license conditions) ABR2 commences construction.
LIC230007	Licensed	4m	Environmental survey and ground investigation works in order to inform the design of proposed Point Bridge and Tom Clarke Widening Project.	Q1 2025	Superseded by application LIC230007 below.

Project	Status	Distance from Red Line	Description of Project	Dates of construction / operation	Potential for Cumulative Effect with ABR2 Project
LIC230007MA	Applied	4m	The proposed material amendment to LIC230007 consists of an extension of the granted licence area, with a total addition of 3,775.390m^2 to the granted licence area of 36,914.81m^2 which would create a total amended licence area of 40,670.203m^2. The extension of the granted licence area would extend south into the River Dodder, spanning from one side of the river to the other. It is intended to drill 4 additional marine boreholes in the riverbed of the River Dodder.	Amendment to above, Q4 2025	The site investigation was due to be completed by December 2025 but it is unclear whether this is the case. In the case that the works are still to be completed, the Application's NIS determined that the impact to water quality from the result of sediment during in-stream works was 'minimal'. No mitigation for sediment release was proposed within the application's NIS. Combined with the slight adverse impact arising from the ABR2 Project, no significant cumulative impact is expected.
MUL230034	Licensed	186m	CWPL intends to undertake survey mobilisations at the proposed Licence Area to inform the location and detailed design of the proposed CWP OWF, export cable route, potential operations and maintenance base, potential land reclamation area at the potential onshore substation location, and additional buffer zones.	Q1 2025 to Q1 2028	Area B of the proposed site investigation by CWPL is located beside the main navigation channel in Dublin Port. This application's NIS determined: The coarse nature of the sediments across much of the Licence Area mean that any potential increase in SSC will remain within close proximity to the Proposed Activities. Given the conclusions of the NIS for MUL230034 and the results of this Coastal Processes chapter, there is no potential for significant cumulative effects.
MAC240013	Applied	0m	Proposed Activity - Replacement of high voltage underground cables	Unknown	Limited information is available for this Project which would inform this assessment, such as the method of cable installation.
MAC240014	Applied	7m	Proposed Activity - Construction of a pedestrian and cyclist bridge (Point Bridge) to the west of Tom Clarke Bridge, widening of Tom Clarke Bridge, dismantling of existing and construction of a new control room building, dismantling of existing vessel collision structures and construction of new	Unknown	Limited information is available for this Project which would inform this assessment, such as the sediment expected to be released during construction of the bridge.

Project	Status	Distance from Red Line	Description of Project	Dates of construction / operation	Potential for Cumulative Effect with ABR2 Project
			vessel collision structures to the west of the proposed Point Bridge.		
2022-MAC-006	Determined	208m	Offshore Windfarm Codling Wind	Q4 2022 to Q4 2067	Landfall of the Codling Wind Park cable is proposed for the southern side of the Port's South Estate. As Codling Wind Park and the ABR2 Project are separated by land - there is minimal potential for cumulative effects with suspended solids as demonstrated by the plume extent in Section 14.4 of this EIAR.
2022-MAC-003/004	Determined	488m	Offshore Windfarm Bray and Kish	Q4 2022 to Q4 2067	Landfall of these Projects are proposed for the southern side of the Port's South Estate. As the Offshore Windfarms at Bray and Kish and the ABR2 Project are separated by land - there is minimal potential for cumulative effects with suspended solids as demonstrated by the plume extent in Section 14.4 of this EIAR.
MAC240061	Applied	474m	Proposed Activity - Installation of an electrical transmission circuit including submarine cabling within the near-shore area, between Blackrock and Shellybanks, Dublin Bay.	Unknown	Landfall of this Project are proposed for the southern side of the Port's South Estate. As the cables and the ABR2 Project are separated by land - there is minimal potential for cumulative effects with suspended solids as demonstrated by the plume extent in Section 14.4 of this EIAR.
FS007029	Determined	489m	Site Investigation - Dublin Array at Kish and Bray Banks	Q2 2020 to Q2 2025	Landfall of these Projects are proposed for the southern side of the Port's South Estate. As the Offshore Windfarms at Bray and Kish and the ABR2 Project are separated by land - there is minimal potential for cumulative effects with suspended solids as demonstrated by the plume extent in Section 14.4 of this EIAR.
FS007045	Determined	594m	Codling Wind Park - Site Investigation Licence Application to inform the design of a possible windfarm at this site	Q4 2020 to Q4 2024	Landfall of the Codling Wind Park cable is proposed for the southern side of the Port's South Estate. As Codling Wind Park and the ABR2 Project are separated by land - there is minimal potential for cumulative effects with

Project	Status	Distance from Red Line	Description of Project	Dates of construction / operation	Potential for Cumulative Effect with ABR2 Project
					suspended solids as demonstrated by the plume extent in Section 14.4 of this EIAR.
FS007188	Determined	545m	RWE Renewables Ireland, Site Investigations for the proposed Dublin Array Offshore Wind Farm	Q3 2021 to Q3 2026	Landfall of this Project is between Bray and Dalkey. There is minimal potential for cumulative effects with suspended solids, as demonstrated by the plume extent in Section 14.4 of this EIAR.
FS007546	Determined	0m	Codling Wind Park Ltd. Site Investigations for proposed Offshore Wind Farm, off Counties Wicklow and Dublin	Q2 2023 to Q2 2030	Landfall of the Codling Wind Park cable is proposed for the southern side of the Port's South Estate. As Codling Wind Park and the ABR2 Project are separated by land - there is minimal potential for cumulative effects with suspended solids as demonstrated by the plume extent in Section 14.4 of this EIAR.

14.8 Residual Impacts

Following mitigation, the Residual Impacts of the ABR2 Project on the Coastal Processes would be of negligible adverse significance at worst, in reference to the dredging works at Alexandra Basin West and the infilling works at the basin of Berths 52/53, which is not significant in EIA terms. No cumulative effects have been identified which together could become significant.

14.9 Summary of Effects and Conclusions

Information on Coastal Processes was established from desk studies, site-specific surveys, and a comprehensive numerical modelling study. **Table 14-13** presents a summary of the potential impacts, mitigation measures and residual effects in respect to coastal processes. It also includes a summary of the potential cumulative impacts, mitigation measures and residual effects. The impacts assessed include an increased suspended sediment concentration and changes to the hydrodynamic regime (i.e., current speeds).

Table 14-13: Summary of Effects relating to Coastal Processes

Potential Effect and Receptor	Phase[1]		Measures included in the Project	Magnitude of Effects	Sensitivity of Receptor	Significance of Effect	Significant/Not Significant	Mitigation Measures	Residual Effects
	C	O							
Increased Suspended Sediment Concentration due to Capital Dredging Activities	✓		Environmental Bucket Prohibited Overspill Limited Dredge Rates & Hours	C: Low Adverse	C: Low	C: Minor significance	C: Not Significant	Silt curtain	Minor/Negligible Not Significant
Presence of infrastructure may lead to changes in tidal currents		✓	None	O: Negligible	O: Low	O: Minor/Negligible significance	O: Not Significant	None	Minor/Negligible Not Significant
Cumulative effect of Increased Suspended Sediment Concentration due to Capital Dredging Activities with other projects	✓		Environmental Bucket Prohibited Overspill Limited Dredge Rates & Hours	C: Negligible	C: Low	C: Minor/Negligible significance	C: Not Significant	Silt curtain	Minor/Negligible Not Significant

[1] C: Construction Phase; O: Operational Phase

14.10 Limitations of Assessment

Data collection campaigns undertaken by private, government, and academic institutions have been utilised for the coastal processes assessment. Site-specific surveys have also been undertaken as part of this assessment, such as the particle size analysis, recent bathymetric surveys of the navigation channel, and other data collected by Dublin Port. While coastal processes are complex and inter-related, there is a significant amount of data available. It is therefore considered that the data employed are robust and sufficient for the purposes of the impact assessment presented.

There is no specific guidance on the age (or timeframe) of data to be used to inform an assessment on coastal processes. However, Tetra Tech considers the age of the site-specific survey data to be valid to describe the current baseline environment for the purposes of EIA. All tidal regimes are governed by the gravitational interaction between the Earth, the Moon, the Sun and other planetary bodies. These interactions are considered constant. Current data collected by Acoustic Doppler Current Profiler (ADCP) therefore, remains representative of tidal conditions within the Coastal Processes Study Area indefinitely, assuming there are no significant changes to the bathymetry beyond natural variation.

Furthermore, it is important to note that the coastal processes assessment is effectively a comparative assessment. Therefore, any small changes to tide, wave, or sediment conditions over the near future would be common to both pre- and post-construction scenarios and in effect cancel one another out.

Whilst every effort was made to account for all relevant effects and processes that typically govern sediment dispersion as part of the dredge plume simulations presented in this chapter, it should be noted that other stochastic and/or ephemeral processes have the potential to influence sediment dispersion, including but not limited to:

- Propeller wash from manoeuvring vessels.
- High suspended sediment loadings entering the Port from other sources, i.e., the River Liffey, Tolka or Dodder.
- Run-off from hard-standing areas.
- Prevailing wind and wave conditions.
- Effective and correct application of embedded mitigation measures.