Species	Legislative Protection	Evaluation[23]	Key Ecological Receptor	Rationale
Kemp's Ridley turtle (*Lepidochelys kempii*)	• Wildlife Acts • EC Habitats Directive [92/43/EEC] Annexes II and IV • Bern Convention) Appendix II	Local Importance (Higher Value)	No	Data base record rather than any direct evidence. Prefers warmer waters like those found along the northern Gulf of Mexico.
Bat species	• All bat species are listed in Annex IV[24] of EC Habitats Directive [92/43/EEC] and the lesser horseshoe bat is listed in Annex II[25] • Wildlife Acts	National Importance/ International Importance *Leisler's bat is Important internationally as the Irish population is the largest population in Europe.*	Yes	Precautionary principle. Survey evidence indicates that the development site and overall Howth Harbour site has little intrinsic ecological value to roosting or foraging bats. The survey established that while some buildings within the overall site have very limited potential as roosting habitat there is no evidence that any are currently occupied. In addition, the activity survey established that bat activity did not occur until well after sunset and the level of activity throughout the night was very low. However, the legal status and ecological sensitivity of these species and the precautionary principle merit their evaluation as Key Ecological Receptor.
Otter (*L. lutra*)	• EC Habitats Directive [92/43/EEC] Annex II and Annex IV • Berne Convention Appendix III. • Wildlife Acts	County Importance	Yes	Precautionary principle. While surveys concluded that the species is not currently found at the site, it is possible that the species may forage within the adjoining coastal waters on occasions.

[24] Species in need of strict protection.

[25] Species requiring designation of Special Areas of Conservation.

Species	Legislative Protection	Evaluation[23]	Key Ecological Receptor	Rationale
Common frog (*R. temporaria)*	• Wildlife Acts • EC Habitats Directive [92/43/EEC] Annex V[26]. • Berne Convention Appendix III.	Local Importance (Higher Value)	No	Data base record rather than any direct evidence. This species was not recorded within the site and the habitats to be impacted by the proposed development do not constitute the habitat requirements for Common frog or any species of amphibian
Badger (*M. meles*)	• Wildlife Acts • Bern Convention Appendix III	Local Importance (Higher Value)	No	Data base record rather than any direct evidence. Lack of suitable habitat within the site.
Pine Marten (*Martes martes*)	• Wildlife Acts • EC Habitats Directive [92/43/EEC] Annex V. • Berne Convention Appendix III.	Local Importance (Higher Value)	No	Data base record rather than any direct evidence. Lack of suitable habitat within the site.
Smooth Newt (*Lissotriton vulgaris*)	• Wildlife Acts • EC Habitats Directive [92/43/EEC] Annex V. • Berne Convention Appendix III.	Local Importance (Higher Value)	No	Data base record rather than any direct evidence. This species was not recorded within the site and the habitats to be impacted by the proposed development do not constitute the habitat requirements for Smooth Newt or any species of amphibian
Common Lizard (*Zootoca vivipara*)	• Wildlife Acts • EC Habitats Directive [92/43/EEC] Annex V. • Berne Convention Appendix III.	Local Importance (Higher Value)	No	Data base record rather than any direct evidence. While some potential suitable habitat does occur in close proximity to the proposed development i.e. sand shores which have good sun exposure for basking and opportunities for cover, it is largely isolated with little or no connectivity to extended areas of open suitable habitat. Additionally, these areas will be unaffected by the proposed works.
Irish stoat (*M. erminea hibernica*)	• Wildlife Acts • Bern Convention Appendix III	Local Importance (Higher Value)	No	Data base record rather than any direct evidence. Lack of suitable habitat within the site.

[26]Species whose taking from the wild can be restricted by European law.

Species	Legislative Protection	Evaluation[23]	Key Ecological Receptor	Rationale
Hedgehog (*E. europaeus*)	• Wildlife Acts • Bern Convention Appendix III	Local Importance (Higher Value)	No	Data base record rather than any direct evidence. Lack of suitable habitat within the site.
Pygmy shrew (*S. minutus*)	• Wildlife Acts • Bern Convention Appendix III	Local Importance (Higher Value)	No	Data base record rather than any direct evidence. Lack of suitable habitat within the site.
Red squirrel (*S. vulgaris*)	• Wildlife Acts • Bern Convention Appendix III	County Importance	No	Data base record rather than any direct evidence. Lack of suitable habitat within the site.
Irish hare (*Lepus timidus hibernicus*)	• Wildlife Acts • EC Habitats Directive [92/43/EEC] Annex V. • Bern Convention Appendix III	Local Importance (Higher Value)	No	Data base record rather than any direct evidence. Lack of suitable habitat within the site.

5.6.2.1 *Selection of Avifaunal Key Ecological Receptors*

All avifauna identified during desktop or field surveys will be evaluated below for their conservation importance. Those selected as key ecological receptors are:

- of at least local importance (Higher Value);
- which were recorded during the site surveys;
- which are species of Red or Amber Conservation Concern in Ireland[27];
- for which records are retained by NPWS or at the NBDC and;
- for which suitable habitat is available.

In summary, Key Ecological Receptor avifaunal species are selected on the basis of their legal status, the types of habitat within and around the site and on the basis of current or previously recorded evidence of a species' presence within the site.

The evaluation rating given to each avifaunal species is listed in **Error! Reference source not found.17** below. The rationale behind these evaluations is also provided.

[27] As per Colhoun *et al.* (2013) Birds of Conservation Concern in Ireland 2014–2019

Table 5.17 Selection of Key Avifaunal Ecological Receptors

Species	Extent	Site Evaluation	Rationale	Key Ecological Receptor
Shore and water birds	Suitable habitats within and adjacent the development area for a number of species of conservation concern	International Importance To Local Importance (Higher Value)	Conservation Status Proximity of site to habitats/occurrence	Yes
Birds of Prey	Proximity to Howth Head which is a known breeding site for Peregrine etc.	National Importance To Local Importance (Higher level)	Conservation Status	Yes
Passerines/ pigeons and game birds Red Listed and Amber	Suitable habitats within and adjacent the development area for a number of species of conservation concern	National Importance (Higher level) to Local Importance (Higher level)	Precautionary Principle Conservation Status	Yes
Passerines/ pigeons and game birds Green Listed	Observations within adjacent site	Local Importance (Higher Level)	Precautionary Principle Conservation Status	Yes

5.7 Likely significant impacts

5.7.1 Overview

The proposed project will include the dredging of the harbour and the reclamation of land to the west of the western pier. These works will result in considerable changes to the existing environment within the proposed development site. Increased activities at the harbour during the construction and to a lesser extent during the operational phase will result in an increase in ambient noise levels in the local environment. Noise during the construction phase may disturb foraging birds and mammals. Indirect impacts on coastal habitats via re-suspension of sediments and contamination of adjoining marine water during construction, etc. could impact on foraging resources for species within these waters. Disturbance or displacement impacts to marine mammals could potentially arise during the construction phase of the project via increased levels of activity within the Harbour.

The design and construction of the works will be to the standards applied in the Irish construction industry. The work will be fit for the purpose intended, and comply with any requirements of a competent authority, Irish standards, or Irish standard code of practices and will also reflect best engineering practice.

The construction phase of the project will take place over an estimated 24-month period. It is envisaged that the work will commence in Summer 2022.

The proposed development is described in detail in **Chapter 2 Description of the Proposed Development**.

The following sections assess the potential impacts that the proposed development may have on the existing flora and fauna (terrestrial and marine) at Howth, on protected international and national sites and habitats and species of conservation interest. Potential impacts may arise from the construction and operational phase of the project, both of which are included in the assessment below.

5.7.2 Designated Sites

5.7.2.1 Natura 2000 Sites

The proposed development does not traverse the boundaries of any European or Nationally designated sites important for nature conservation. There will be no direct effects on any designated site as a result of the construction and operation of the proposed development.

An Appropriate Assessment has been undertaken to identify any potential impacts of the proposed development on Natura 2000 Sites (SACs and SPAs). This assessment is required under Article 6 of the Habitats Directive (92/43/EEC). The Stage 1 (Screening) concluded that the Natura 2000 sites requiring more detailed assessment were the following:

- Baldoyle Bay SAC (000199)
- Rockabill to Dalkey Island SAC (003000)
- Lambay Island SAC (000204)
- Rogerstown Estuary SPA (004015)
- Lambay Island SPA (004069)
- Malahide Estuary SPA (004025)
- North Bull Island SPA (004006)
- Baldoyle Bay SPA (004016)
- Ireland's Eye SPA (004117)
- South Dublin Bay and River Tolka Estuary SPA (004024)

As such a Natura Impact Statement (NIS) has been prepared to identify any potential impacts to these Natura 2000 sites as a result of the proposed development.

The NIS has objectively concluded, beyond reasonable scientific doubt, and with the implementation of the prescribed mitigation measures that the proposed development (construction and operational phases of the development), will not result in any adverse impacts on the Conservation Objectives of the relevant Natura 2000 sites and the integrity of these sites will not be adversely affected.

5.7.2.2 IBA & Ramsar Sites

Circa 203 ha of the Baldoyle Bay waters are designated as an IBA (Site Code: IE112), as are 203 ha as a Ramsar site (Site No. 413). Baldoyle Bay SPA (004016) overlaps with the IBA and the Ramsar site[28] and, the species for which the IBA and Ramsar sites are selected are included as SCI species for which the SPA site is selected.

It is considered that the conclusion of the Appropriate Assessment Screening Report and NIS, pertaining to the Baldoyle Bay SPA (004016) site applies by inference, to the IBA and Ramsar sites with which it overlaps. Therefore, it is considered that the construction and operational phases of the proposal described in this report, with mitigations in place, will not result in significant impacts within nearby IBA sites and Ramsar sites.

5.7.2.3 *Sites of National Importance*

Of the 14 pNHAs listed in **Table 5.3,** 8 are encompassed within the Natura 2000 sites listed in **Error! Reference source not found.** above. These include;

- Howth Head pNHA (000202)
- Ireland's Eye pNHA (000203)

[28] http://datazone.birdlife.org/site/factsheet/cork-harbour-iba-ireland/text

- Baldoyle Bay pNHA (000199)
- North Dublin Bay pNHA (000206)
- Malahide Estuary pNHA (000205)
- Rogerstown Estuary pNHA (000208)
- Lambay Island pNHA (000204)
- South Dublin Bay pNHA (000210)

The NIS has concluded that the proposed development (construction phase and operational phase), with mitigations in place, will not result in any adverse impacts on the Conservation Objectives of the relevant Natura 2000 sites, and the integrity of these sites will not be adversely affected. Therefore, as these pNHA's support a similar range of habitats and species that could be potentially impacted due to hydrological links, it is considered that the conclusions of the NIS that pertain to the Natura 2000 sites listed in **Error! Reference source not found.** above, apply by inference, to the pNHA listed above.

The impacts on the remaining pNHA sites within the wider landscape of the proposed project will be assessed in this section. These sites are listed in **Table 5.18** below, with their features of conservation interest and their proximity to the proposal described in this report.

Table 5.18 Impact on pNHAs

Site name and code	Distance from pNHA site to development site	Features of Interest	Rationale for exclusion from assessment.
Sluice River Marsh (001763)	pNHA located approx. 5.8km to north-west	This site is of interest because it contains several very rare plant species in addition to a number of wintering bird species of the nearby Baldoyle Bay SPA[4].	No spatial overlap. Therefore, significant impacts not reasonably foreseeable.
Feltrim Hill (001208)	pNHA located approx. 8.8km to north-west	The site is of geological importance and has been previously known to contain two rare species of plant, namely Spring squill and Long-stalked Cranes-bill[5].	Designated for terrestrial habitats. No spatial overlap. Therefore, significant impacts not reasonably foreseeable.
Santry Demesne (000178)	pNHA located approx. 11.3km to west	The primary importance of the site is that it contains the legally protected species Hairy St. John's-wort. The woodland is also of general ecological interest[4].	Designated for terrestrial habitats. No spatial overlap. Therefore, significant impacts not reasonably foreseeable

Site name and code	Distance from pNHA site to development site	Features of Interest	Rationale for exclusion from assessment.
Dalkey Coastal Zone And Killiney Hill (001206)	pNHA located approx. 11.3km to south	This site represents a fine example of a coastal system with habitats ranging from the sub-littoral to coastal heath. The flora is well developed and includes some scarce species. The islands are of ornithological importance. The site also has geological importance[4].	No spatial overlap. Due to the nature, scale and location of the proposed works along with the intervening distance, any potential for significant impacts is considered negligible.
Royal Canal (002103)	pNHA located approx. 11.8km to south-west	The ecological value of the canal lies more in the diversity of species it supports along its linear habitats than the presence of rare species i.e. Opposite-leaved Pondweed. The canal crosses through agricultural land and therefore provides a refuge for species threatened by modern farming[4].	No spatial overlap. Due to the nature, scale and location of the proposed works along with the intervening distance, any potential for significant impacts is considered negligible.
Grand Canal (002104)	pNHA located approx. 11.7km to south-west	The ecological value of the canal lies more in the diversity of species it supports along its linear habitats than the presence of rare species i.e. Opposite-leaved Pondweed. The canal crosses through agricultural land and therefore provides a refuge for species threatened by modern farming[4].	No spatial overlap. Due to the nature, scale and location of the proposed works along with the intervening distance, any potential for significant impacts is considered negligible.

5.7.3 Habitats

5.7.3.1 *Construction Phase*

During construction, the principal concern relates to direct impacts on littoral habitats, habitat loss and potential impacts on coastal processes due to sediment plumes during dredging. The main potential construction phase impact to coastline habitats is the risk of dredge sediments reaching the shore.

The area of permanent marine habitat loss (primarily Infralittoral Muddy Sands (SS2)) will be approximately 4.8Ha under the footprint of the proposed reclamation area. The loss of the habitat as a result of reclamation along the outer section of the western pier, is considered to be of local significance, with small numbers of foraging birds permanently displaced and common benthic species within the habitat. The loss of the 4.8Ha of the habitat would be permanent, however taken into the broader context that the Muddy Sands habitat is common and with better quality of the habitat within the Baldoyle Bay

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SAC, the effect on the habitat from the proposed development is considered permanent and not significant.

Within the harbour, there will be a short-term loss of habitat (primarily Infralittoral Muddy Sands (SS2)). This will occur as the sediments are dredged out. The habitat is common in harbours and the benthic survey found there was lower species diversity within the harbour. However, due to the nature of the fauna present in the area, it is expected that re-colonisation of the sediment by subtidal fauna will occur rapidly once dredging has finished. This recovery is expected to occur within one to two seasons. It is considered, the impact from the project will have a short-term, slight negative effect on these communities. Recovery in the area would be expected to occur rapidly, as most of the species identified in the area are fast growing, opportunistic species, see **Section 5.7.4.1** below. It is noted that none of the flora or benthic fauna recorded within the proposed works site are rare or protected.

The construction of the proposed reclamation area base will result in the short-term loss of rocky shore species. However, it is expected that the communities, which will re-establish themselves on this new shoreline, will be similar to the communities, which will be removed. Due to the increased size of the proposed habitat available, this will result in a net gain of hard benthos shoreline in the area (see **Appendix 12 Volume 3**, Woodrow Sustainable Solutions Ltd, 2019 Habitat, Otter and Bat Survey Howth Harbour). The shelter provided by the reclamation area will allow the colonisation of more species, increasing the biodiversity of the area directly in the lee of the reclamation area.

The littoral shore within Howth Harbour has been classified as Infra littoral Fine Mud (SS.SMu.IFiMu) habitat which is a common habitat in harbours in Ireland and the UK (Connor *et al.*, 2004). During the dredging process some sediments will go into suspension and redeposit in the inner harbour. There will also be residual sediments remaining within the harbour. The Infra littoral Fine Mud habitats within the inner harbour currently contain contaminated sediments. During the construction phase and operation phase of the project the habitat will still contain contaminated sediment from redeposited sediments during dredging and residual sediments not dredged. The impact on the Infra littoral Fine Mud habitat in the inner harbour from the proposed project's residual sediments will have a neutral effect.

The Hydrodynamic and Sediment Regime Assessment report (**Appendix 4 Volume 3**) and the GQRA (**Appendix 10 Volume 3)** outlines the dredging impact in relation to the transport of suspended solids from the inner harbour to outside the harbour. The nearest sensitive receptor of concern was identified as Claremont Beach. The hydrodynamic assessment states that any deposition of sediments at Claremont beach will be fine particulates that will be resuspended under wave and tidal action and transported further on. As the particulates or suspended solids move further on they will reduce in concentration and impact. The GQRA indicates that if unmitigated, there will be concentrations of Tribyutyltin (TBT) and Benzo (g, h, i)- perylene within the suspended solids at Claremont Beach that are above the environmental quality standards. Without mitigations the Annual Average (AA) Environmental Quality Standards (EQS) for TBT will be exceeded by a factor of 6.8 for TBT, the Maximum Allowable Concentration (MAC) EQS for

TBT is calculated to be exceeded by a factor of 78. The MAC EQS for Benzo(g,h,i)-perylene will be exceeded by a factor of 11.8. The MAC EQS exceedances will only happen when the high contaminated areas are dredged in combination with a high tide on Claremont Beach. Unmitigated, the impact of these levels will have a short term slight effect on the habitat at Claremont Beach. Mitigations are required in order to reduce the impact on the habitat and are outlined in **Section 5.8.4** below.

Overall, there will be a short-term not significant negative impact on a local scale on the marine flora and fauna within the Howth Harbour. Given the small footprint of the reclamation area in comparison to the availability of similar habitat types within the wider area, the loss of habitat in the reclamation area is considered a permanent, not significant, negative impact overall.

Impacts on terrestrial habitats i.e. buildings and artificial surfaces (BL3), amenity grassland (GA2) etc. are generally restricted to direct removal of habitats and possible impacts from the spread of invasive species. Indirect impacts may occur via damage and disturbance arising from vehicular activities and storage of overburden and materials. Levels of dust during construction are predicted to be low and effectively managed by mitigation. The impact on vegetation in adjoining habitats from wind-blown dust is predicted to be imperceptible. Overall, the habitats to be directly affected are common and no Annex 1 habitats or rare or uncommon habitats will be directly affected. The proposed development is situated adjacent to the Baldoyle SAC and there is a potential impact from construction works on this habitat through construction machinery egressing onto the SAC. Mitigations are required to prevent potential egress and these are outlined in the mitigations section 5.8 below.

5.7.3.2 *Operational Phase*

No further direct habitat loss impacts other than those described in the previous section are expected during operation of the development.

With regard to the project having any potential indirect habitat alteration impacts on coastal habitats, primarily those listed as Annex I habitats under the EU Habitats Directive, see **Section 5.5.3.1** and **Table 5.14** above. During the operational phase, the principal concern to habitats relates to potential impacts on sediment transport processes. Impacts on the drivers of sediment transport, tidal currents and waves could have a consequent impact on sediment transport.

The Hydrodynamic and sediment regime assessment concludes that the changes to the tidal currents and wave action due to the proposed development will be minimal. The change will reduce slightly the current patterns in the immediate vicinity of the west pier and reduce slightly the wave size impacting on Claremont Beach. The impact of reducing the erosion very slightly on Claremont Beach will have a not significant positive effect on the beach. Embryo dunes are removed by wave action and the minor reduction in wave action from the project could slightly increase the tendency for sand to accumulate in this area and promote embryo dunes. However, given the impact is not significant, there is not expected

to be any significant change. It is unlikely also that such embryo dunes will develop into larger dunes in this area because of the frequency of wave action and the infrastructural constraints in this area. The impact of the sediment transport change during the operational phase, on coastal habitats caused by the development will be a permanent, not significant positive effect.

It is noted that the Annex 1 habitat 'Annual Vegetation of Drift Lines (1210)' occurs immediately southwest of the proposed reclamation area. Annual Vegetation of Drift Lines (1210) habitats in general are very species-poor, fragmented and tend not to occupy large areas due to their narrow, linear nature. They exist in a state of instability and may be absent in some years due to natural and/or anthropogenic causes (NPWS, 2019). As such, it is considered likely that this habitat will continue to form along the beach at this location, but perhaps in a slightly different location to its current position, post works (Woodrow, 2020). Doogue (date unknown) notes this habitat type as saltmarsh, which has developed on shingle on the west side of the west pier, see **Section 5.5.2.1** above. The difference in species abundance/composition of this habitat resulting in different habitat classifications overtime may indicate that this area is in fact unstable and subject to change due to both natural and man-made processes. The ability of the habitat to change and the consideration that the habitat will continue but perhaps in a slightly different location will mean the impact from the development will have a permanent not significant effect on the habitat.

The introduction of the reclamation area will provide additional substrata in the area for species to attach to, resulting in an increase in biodiversity, as seaweeds, epifauna and encrusting organisms will settle on this new substrate, thus creating an impact of permanent not significant positive effect.

5.7.4 Marine Benthic Flora and Fauna

5.7.4.1 *Construction Phase*

Dredging will be undertaken during the construction phase. It is proposed to dredge a total area of 14ha, within the existing harbour. The total volume of dredged material will be approximately 240,000m³.

The removal of 240,000m³ of sediment will result in the loss of species and habitat over the entire dredged area. Additionally, the deposition of the treated dredged material within the proposed reclamation area will result in the loss of habitat of approximately 4.8ha. This will result in a more pronounced impact in terms of smothering with the likelihood that few, if any, benthic invertebrates from the existing community below the deposited spoil will be able to burrow vertically through the deposited layers in time to escape.

The area within the existing harbour i.e. Stations S15-S19 were species poor, containing a low number of species and individuals. In addition, Stations S10 to S14 were also species poor. The bivalve mollusc *Abra alba* is the most common taxa within the survey area, being present at 13 sites with 384 individuals identified. Other common taxa present across the survey area include the polychaete worms *Nephtys*

hombergii (70 individuals across 12 sites), *Lanice conchilega* (51 individuals across 8 sites), *Owenia borealis* (36 individuals across 9 sites), the gastropod mollusc *Peringia ulvae* (269 individuals across 6 sites) and the bivalve molluscs *Fabulina fabula* (80 individuals across 8 sites) and *Corbula gibba* (13 individuals across 7 sites).

While species like *Peringia ulvae, Abra alba* and *Nephtys hombergii* could be completely removed from the dredged areas, these species are common in the surrounding areas. *Abra alba* was the most abundant species recorded during the benthic survey, indicating that the species is common in the local area. While large numbers of *Abra alba* may be removed or impacted by the proposed works, *Abra alba* is capable of rapidly exploiting any new disturbed substratum suitable for colonisation, either through larval recruitment, secondary settlement or post-metamorphosis juveniles or re-distribution of adults following storms[29]. *Peringia ulvae* is widely distributed and abundant in coastal sands and muds[30]. While *Nephtys hombergii* could also be completely removed from the dredged areas, it is common in the surrounding areas. *Nephtys hombergii* can move very quickly through the substratum, downwards on the ebb tide and up again on the flood tide (Clay, 1967), it is also capable of swimming short distances with an undulatory movement. The species also releases planktotrophic (planktonic-dispersing larva that derives its nourishment by feeding in the plankton) and lecithotrophic (a planktonic-dispersing larva that lives off yolk supplied via the egg) larvae. All of these biological traits will ensure that this species will recolonise the dredged area over time and the existing communities, although species poor, will be re-established.

Within the proposed reclamation area, Stations S02 to S05 were dominated by the polychaetes *Lanice conchilega, Owenia borealis, Eumida sanguine* and *Nephtys hombergii* and the bivalves *Abra alba* and *Fabulina fibula*. While any individuals occurring within the reclamation area will likely be lost, the presence of these species in the surrounding areas means that any loss off the overall biomass of benthic fauna will be imperceptible in relation to similar habitats and colonies in the surrounding environment. *Lanice conchilega* can be found in high densities in areas that are subject to periodically high concentrations of suspended matter[25], similar to those potentially generated by dredging. The larvae of this species have a long planktonic life, spending up to 60 days in the plankton which can disperse the species over a wide area[31]. These traits will enable *Lanice conchilega* to recolonise the harbour in a short period of time or any areas temporarily disturbed by the proposed works. Therefore, any loss of the species due to the construction of the reclamation area is unlikely to have a significant impact on the overall population. *Eumida sanguine* also has a planktonic larva, thus allowing for the recolonisation of the harbour by this species.

Very little scientific study has been carried out on the effect of noise and vibration on marine benthic invertebrates. Mobile species can move away from a perceived threat, leaving only the sedentary species

[29] http://www.marinespecies.org

[30] http://www.habitas.org.uk/molluscireland/species.asp?ID=21

[31] https://www.marlin.ac.uk/species/detail/1642

at risk of impact. The results of the benthic survey show that the species present are common and widespread in the wider marine environment and any impact on individuals in the immediate vicinity of the works would have no impact on the wider population.

Overall, the species to be impacted by the proposed works are common throughout the area and will largely be able to recolonise the disturbed dredge area post works and return the community to pre-dredging conditions (approx. 1 to 2 years). In addition, all of these species have the ability to re-establish themselves from surrounding populations through the colonisation of larvae.

As no Annex I habitats for which Baldoyle Bay is designated as a SAC or species of conservation concern are present in the construction site, the integrity of the SAC will not be directly impacted by the proposed development.

Overall, the impact on benthic flora and fauna is expected to have a short-term not significant negative effect within the harbour and a permanent imperceptible negative effect on the benthic flora and fauna recorded outside the harbour.

5.7.4.2 *Operational Phase*

No further impacts on benthic fauna other than those described in the previous section are expected during operation of the development.

5.7.5 Marine Physical, Chemical Aspects & Water Quality

5.7.5.1 *Construction Phase*

Sediment transport during the construction works is based around the movement of sediment during the dredging phase where heavier particles lost into the water column during dredging settle out immediately in the area of the dredging while some smaller particles go into suspension and are transported further including out of the harbour mouth on the ebb tide. The hydrodynamic and sediment regime assessment outlines the impacts and assesses the quantity of this sediment transport. The assessment indicates that the main area impacted was Claremount strand where a 0.4mm annual deposition of marine sediment from the dredging was predicted. This material will undergo removal by tide and wave action on a daily basis and the impact on biodiversity from sediment transport is a short term, not significant negative effect.

Within the harbour, the chemical composition of the sediment that will undergo suspension and then redeposition in the area of the dredging will be similar to the existing sediments within the area. Due to this similarity the impact of the dredging within the harbour is a short term not significant negative effect on physical and chemical aspects of the marine environment.

The GQRA (**Appendix 10 Volume 3 of this EIAR**) shows through presentation of the leachate analysis in the harbour sediments that contaminants going into solution during dredging phase is not a risk. The contaminants within the sediments are likely bound to the sediments.

Accidental spillages or oil or diesel from the construction vessels is unlikely to negatively impact on the water quality of the harbour because a) procedures will be implemented to minimise the potential for spillages and b) the quantities are likely to be very small, similar to quantities present in all commercial/recreational harbours.

During the construction phase of the project, a number of measures have been developed to ensure that the proposed works will not deteriorate the water quality within the surrounding marine environment. This will also safeguard the existing water quality status. These mitigation methods outlined within the Construction Environmental Management Plan (**CEMP, Appendix 8 Volume 3 of this EIAR**) will effectively prevent impacts from silt and hydrocarbons. Following the implementation of these measures, no significant impact on water quality and aquatic ecology during construction is predicted to occur.

Monitoring of water quality (i.e. suspended sediments and turbidity) will be carried out on the outside of the dredge site at selected locations in accordance with the EPA licence. Limits will be set and agreed with the relevant authority prior to the works commencing. Contingency plans will be in place for when the limits are exceeded by dredging activities. These will include adjustment of dredging methodology to ensure compliance with the limit levels.

5.7.5.2 *Operational Phase*

A large volume of contaminated sediment will be treated and stabilised which will remove them from the potentially entering into the environment. During the operational phase there will be a permanent positive not significant effect on water quality by the removal of the dredged contaminated sediments permanently from the harbour.

As outlined within he GQRA there will be leaching of minor amounts of contaminants from the stabilised sediments. The levels of leaching will be within the environmental quality standards. The impact from this leaching will be a permanent imperceptible negative effect on the water quality.

During the operational phase the principal concern relates to potential impacts on sediment transport processes. Impacts on the drivers of sediment transport, tidal currents and waves could have a consequent impact on sediment transport.

During the operational phase there will be a change in tidal currents from the new reclamation area. As outlined in the Hydrodynamic and sediment regime assessment the impact will be localised and in the order of less than 0.1m/s in the area just west of the proposed development. Impacts towards the beach areas are much less. This will have a permanent not significant effect on the marine physical environment.

As outlined in the Hydrodynamic and sediment regime assessment wave action is going to slightly reduce at Claremont Beach, west of the proposed reclamation area. This will have the effect of reducing the erosion of embryo dunes on Claremont beach. However, the impact is expected to be not significant as the reduction in wave action is considered minimal. The overall impact of wave action on biodiversity is considered a positive imperceptible permanent impact on the dunes habitats on Claremont Beach.

During the operational phase there was no sediment transport identified that would have any impact.

During the operational phase, day-to-day vessel operations have the potential to result in water quality impacts as a result of fuel or oil spill, wash down of boats, discharge of wastewater, fish waste or other sources of potential pollution to which fishing harbours may be subject. However, Howth FHC operates within the operational guidelines and protocols outlined within the "Fishery Harbour Centres Best Practice Manual". A harbour spill kit is available in the event of any accidental fuel or oil spill. Fishing vessels are not permitted to discharge any form of waste into the harbour. Dedicated waste storage areas are located on the piers. The operational guidelines to which trawlers are currently subject within the harbour will continue once the West Pier and reclamation works are complete. Surface water within the reclaimed area will be collected via gullies and discharged to the sea via a hydrocarbon interceptor/silt trap. Therefore, it is not expected that the proposed upgrade works will have any potential for significant water quality impacts during the project's operational phase. Overall, the impact on water quality is predicted to be long-term imperceptible.

5.7.6 Marine Mammals

5.7.6.1 *Construction Phase*

The most likely impact of the proposed dredging and reclamation works on marine mammals will be from sound disturbance and local habitat modification. The proposed dredging works will result in a significant short-term modification to the local biological environment. Destruction of benthic communities will be a by product of the dredging and reclamation activities through substrate removal and potential smothering of the infaunal communities through plumes and dumping of the treated dredge spoil. This will displace many species of invertebrate and fish species, which in turn may subsequently affect the food chain and impact on marine predators at a local scale. Pinnipeds and cetacean species are highly mobile, with ranges that are likely to overlap with the dredging and reclamation works.

There have been few studies on the effects of marine dredging on marine mammals (Thomsen et al. 2006; Nowacek et al. 2007). Physical injury or mortality from collisions, noise production, and increased turbidity are the main ways dredging can affect marine mammals directly, while indirect impacts include changes to their physical environment, or to their prey (Todd et al. 2014).

Hearing is the most important sense for most marine mammal, in particular cetaceans, and the ability to hear well is vital in all key aspects of their lives including finding food, navigating and social interactions.

Any reduction in hearing ability, whether by physical damage or masking by other sound, may seriously compromise the viability of individuals and, therefore, populations. Whilst at an extreme level noise can lead to cetacean mortality from barotrauma, sub-lethal effects may also have a significant impact. Sub-lethal effects could include threshold shift or complete hearing loss, which would seriously compromise the viability of individuals or entire populations. Displacement of cetaceans from important feeding, migration or reproductive sites could also lead to a change in population dynamics (DoEHLG, 2007).

Studies on the responses of marine mammals to anthropogenic noise have identified the following factors as influencing the degree of response given by animals (Anguilar et al., 2004):

- source intensity levels;
- degree of background noise;
- distance to source;
- species involved;
- behavioural state and season;
- prior degree of exposure;
- age, sex ; and
- time of day.

The peak pressure, duration and the frequency spectrum of anthropogenic sound are important factors relating to potential biological impacts. Several studies have examined the direct and indirect impacts of underwater noise on marine mammals, and in general have indicated that source levels of 180-200dB P-P re 1 µPa are sufficient to induce behavioural effects on marine mammals within a few kilometres from the sound source (Gausland, 2000).

Todd *et al.* (2014) reviewed the impacts of dredging on marine mammals and suggested a back-calculated source level of 163 dB re 1 mPa at 1 metre (bandwidth ¼ 20 Hz–100 kHz) for a backhoe dredging operation off the Shetlands of 179 dB re 1 mPa at 1 metre (bandwidth ¼ 3 Hz – 20 kHz). A second study estimated a source level of 179 dB re 1 mPa at 1 metre (bandwidth ¼ 3 Hz – 20 kHz) but used different scaling. Despite these elevated levels, they are mainly low frequency and below the peak frequency for echolocation and would attenuate quickly. There are no measurements available for long reach excavators but it's likely to be considerably less than these levels reported. As can be seen these suggested levels are below the injury threshold criteria to non-pulsed sounds for Harbour porpoise as detailed in Lucke *et al.* (2009) for example.

Auditory capabilities are frequency dependent and vary between species (Southall *et al.* 2007). **Table 5.19** below provides details the relevant auditory bandwidth as defined by Southall *et al.* (2007) and NMFS (2016), and the broadband injury threshold sound pressure levels proposed by Southall *et al.* (2007) and Lucke *et al.* (2009).

Table 5.19 Marine mammal species auditory capabilities

Marine mammals recorded in the wider area of Howth Harbour	Hearing range	Proposed injury threshold criteria to non-pulsed sounds (SPL)
Low-frequency cetaceans	7Hz to 22kHz[1]	230 dB re 1µPa[1]
Minke whale		
Humpback whale		
Mid-frequency cetaceans	150Hz to 160kHz a,b	230 dB re 1µPa a
Bottlenose dolphin		
Common dolphin		
High-frequency cetaceans	200Hz to 180kHz a	200 dB re 1µPa c
Harbour porpoise	275Hz to 160kHz b	
Pinnipeds in water	75Hz to 75kHz a	218 dB re 1µPa a
Harbour seal	50Hz to 86kHz b	
Grey seal		

Notes: Injury is defined as the level at which a single exposure is likely to cause onset of permanent hearing loss[1]. SPL = Sound Pressure Level. Sources: a Southall et al. (2007); b NMFS (2016); c Lucke et al. (2009).

Marine mammals, especially cetaceans, have well developed acoustic capabilities and are sensitive to sound at much higher frequencies than humans. They are less sensitive to the lower frequencies but there is still great uncertainty over the effects of sound pressure levels on marine mammals and thus the assessment of its impact. Received levels of dredging noise by marine mammals can exceed ambient levels to considerable distances depending on the type of dredger used (Richardson *et al.* 1995).

The NPWS have identified increased sound pressure levels above ambient do occur due to dredging, which could be detected up to 10km from shore. These levels are thought to potentially cause masking or behavioural effects but are not thought to cause injury to a marine mammal. There is no guidance on the effects of noise generated by dumping of dredge material on marine mammals (NPWS, 2014).

A Marine Mammal Risk Assessment was carried out in relation to the dredging and rock breaking operations and this is presented in **Appendix 5 Volume 3 of this EIAR**. This assessment noted the following in relation to the project;

- *The project will not cause injury or death but could lead to very local disturbance, from noise associated with the project.*
- *The dredging activities proposed during this project will occur through a long reach excavator on a barge with some increased marine traffic associated with sea-going barges. It is very unlikely any noise generated will be capable of causing permanent or temporary hearing injury to a marine mammal.*

- *While grey seals frequently and regularly occur inside Howth Harbour in small numbers there may be local disturbance to these but they are accommodated to human activities and are likely to not be affected. Outside Howth Harbour it is unlikely there will be any disturbance to cetaceans or seals.*

Impacts on cetaceans from the proposed development are likely to be acoustic in nature and due consideration should be taken of any sound pressure waves created. The hearing system of marine mammals, being highly sensitive and adapted to respond to changes in pressure in an aquatic environment, is particularly susceptible to damage. Many routine anthropogenic sounds in the sea, for example seismic surveys, pile driving or chemical explosions can also cause significant disruption of normal behaviour by marine mammal species. Mitigation for marine mammals is outlined in **Section 5.8.6** below. Once mitigations are in place there will be a short term not significant effect on the marine mammal life from the proposed project construction phase.

5.7.6.2 *Operational Phase*

It is likely that, following completion of the construction works, the waters around and within Howth Harbour will be used by species such Grey seal, based on sightings of individuals foraging within the existing harbour.

Both seals and cetaceans have been documented with mild to severe and lethal trauma after vessel collision (Moore et al. 2013). Different factors can affect the severity of the impact, such as vessel size and velocity, the angle at which collision takes place, and the anatomy of the body part that is hit (Laist et al. 2001, Vanderlaan & Taggart 2007, Moore et al. 2013).

It is likely that impacts on marine mammals during the operational phase will be similar to existing operational impacts. While boat traffic may be slightly higher, due to the increased size of the marina, the risk of injury or mortality due to collisions from increased use of the harbour is considered low as seals and cetaceans in the immediate vicinity of the site are exposed to human activity on a daily basis and would be habitualised. The vessels operating within the harbour will be slow moving and thus any animals in the area would have sufficient time to avoid any collisions and thus injury or mortality. Overall, it is considered that there will be a likely neutral impacts on marine mammals in the vicinity of the site arising from the operational phase of the development.

5.7.7 Bats

5.7.7.1 *Construction Phase*

In the event that night-time dredging takes place, increased night-time activity, human disturbance and temporary security lighting of the construction site has the potential to impact on bats feeding in the area. Given the existing use of the proposed development site as a working harbour, any bats using the area would be habituated to some level of night-time activity, human disturbance and some lighting of the

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area. It was noted that the harbour was well-lit by street lights at night time, particularly along the promenade of West Pier.

The daytime preliminary assessment determined that the buildings within the development site, while supporting some Potential Roost Features (PRF's), was low in bat roost potential given the lack of optimal foraging habitat.

The desk top study established that the geographical area encompassing the site and approximately 20km extending away from it from has a low Bat Habitat Suitability Index (BHSI) rating indicating that the geographical area, including the Howth Harbour, is not likely to be a significant resource to any population of any bat species. In other words, bats are likely to preferentially select alternative areas for foraging.

Bat activity, recorded in the vicinity of the harbour, was low and the existing buildings and structures within and in the immediate vicinity of Howth Harbour were deemed to be of low bat roost potential. It is concluded that as a result of the proposed development there will be a short term imperceptible negative effect on foraging/commuting/roosting of any bat species .

5.7.7.2 *Operational Phase*

The results of the onsite daytime preliminary assessment and Passive Automated Bat Survey indicate that that Howth Harbour does not contain any roost sites nor is it used extensively by foraging bats. It should also be noted that the majority of the bat activity survey area was well-lit by street lights at night time, particularly along the promenade of West Pier.

Increased lighting of public areas and security lighting in the area could impact on bat feeding habitat, however, due to the location of the proposed development there is already a considerable amount of public/security lighting in place. Leisler's bat was the only species of bat recorded in the vicinity of the proposed development (see **Section 5.5.3.3**) and is generally accepted to be less vulnerable to light avoidance than other species. The impact of the operation of the proposed development on bats will result in a permanent imperceptible negative effect on a local scale.

Overall, the proposal will not result in a net loss of linear foraging habitat for bats. It is concluded that as a result of the proposed development there will be a permanent imperceptible negative effect on foraging/commuting/roosting of any bat species.

5.7.8 Otter (*Lutra lutra*)

5.7.8.1 *Construction Phase*

As shown in **Section 5.5.3** above, no evidence of otter was found within or adjacent i.e. within 200m of Howth Harbour (Woodrow, 2020), however otter has been recorded in the past in the wider landscape (see **Section 5.5.2.3**).

Construction works, particularly night time works, could result in displacement of otters from foraging habitat in the immediate construction area. However, otter activity was not recorded within the Harbour or in close proximity and therefore it is likely otter, if present in the wider landscape, utilise foraging habitat outside the zone of influence of the proposed works..

Water pollution incidents during construction could result in deterioration of foraging habitat, alter prey abundance and/or result in otter fatalities. The risk of serious pollution is considered unlikely, but should it occur, would result in a moderate negative short-term impact at a local level.

It is noted that the proposed development site is located within an existing and operating harbour, and as such is subject to noise disturbance and light pollution from the site. During the construction stage, there may be short-term increases in noise disturbance. Likewise given that otters are able to adapt to increased noise and activity levels, which is evidenced by the presence of otters in the centre of Cork and Limerick City, it is considered that any otters present will habituate to the proposed development within a short period of time.

The construction phase impact of the proposed development will result in an imperceptible short term effect on the otter at a local level.

5.7.8.2 *Operational Phase*

Once construction works are complete, circumstances will revert largely to those that currently pertain and it is reasonable to predict that the current level of activity will resume with only a slight possible increase. It is considered that otters, if present, that may have been temporarily displaced owing to construction activity will utilise the habitats within and adjacent to the development site, within a short period of time.

During the operational phase of the development, there may be increase in the level of boat traffic, however this disturbance is considered to be slight, in relation to amount of activity currently at the site. It is noted that otters are largely, but not exclusively, nocturnal and can habituate to human disturbance (Chanin, 2003). The impact of the operational phase of the development on otter is considered permanent imperceptible.

5.7.9 Birds

5.7.9.1 *Habitat Loss (Construction Phase and Operational Phase)*

Shore and water birds

The loss of 4.8 hectares of coastal habitat, including intertidal sand/mudflat habitat, constitutes the loss of potential feeding areas for birds. Habitat loss and degradation are undoubtedly amongst the most important processes driving the declines of bird species. These processes are widespread due to different anthropogenic pressures across the world and affect a wide range of habitats and the species that rely on them. Coastal wetlands support large numbers of waterbirds particularly during the non-breeding season, providing them with the type and amount of resources needed to survive the winter months and/or refuel during migration (van de Kam et al. 2004).

During the winter bird period a greater abundance and species composition was noted utilising the inner harbour and proposed reclamation area. For most species, the numbers recorded and frequency of use were notably low. Dredging will deepen the harbour and as a result there will be less exposed substrate at low tide and this has the potential to displace any birds, waders in particular, that forage in this type of intertidal habitat. While there were Gulls, Brent Geese, Redshanks, Turnstones and the occasional Oystercatcher utilising intertidal mud within the harbour, numbers were low. Any alteration in habitat availability will not have an impact beyond displacement of a very small number of birds and would not be considered significant at anything more than a local level. In addition, the areas within the harbour recorded as being used by birds foraging at low tide will not be directly targeted by the dredging works, specifically the south-eastern corner of the harbour (backing the Marina).

Similarly, the loss of potential foraging habitat for waterbirds that would occur as a result of reclamation along the outer section of the western pier, was considered to be of local significance, with small numbers of foraging birds permanently displaced. Over time the proposed rock armouring would provide similar intertidal foraging habitats, both in terms of function and area. The loss of open water at high tide would be permanent, however recorded usage of this area by species of divers, grebes and auks was periodic and by small numbers and therefore any displacement effect of foraging birds would not be considered significant.

As can be seen in the above discussion, **Section 5.5.3.5** above and described in further detail in **Appendix 7 Volume 3 of this EIAR** *'Howth Harbour FHC Dredging and Reclamation Works Bird Surveys 2019 / 2020 Report'*, while the habitats to be removed may form part of the feeding range of a number of species, the area to be removed is not likely to be a critical feeding resource for these species based on similar available and higher valued habitat in the surrounding landscape. It is considered that the foraging habitat loss within the site will not significantly impact the shore and water birds that use the greater area. More favourable habitats occur in the wider area e.g. Baldoyle Bay SPA and coastal waters around Ireland's Eye SPA. It is considered that the foraging habitat loss within the site as a result of the proposed development will result in permanent not significant effects.

Passerines, Pigeons, Game Birds and Birds of Prey

The habitats that occur within the site do not have a natural value more significant than any of the habitats readily available for bird species in the general location surrounding the site, including passerines, pigeons, birds of prey and game birds.

The wider surroundings of the proposed development consist primarily of nearby estuarine and intertidal habitats, the waters of the wider Howth Harbour area, grassland and urban areas with artificial surfaces and buildings. These offer ample foraging and nesting habitat for species such as grey wagtail, linnet, pied wagtail and starling. Once the construction phase is complete, it is considered that the bird species present will continue to use the habitats within and adjacent to the site. It is considered that the habitat loss required as part of this proposal will result in permanent imperceptible impact on passerines, pigeons, birds of prey and gamebirds using the area.

5.7.9.2 *Displacement and Disturbance (Construction Phase and Operation Phase)*

This section of the assessment focuses on the disturbance and displacement effects on all birds observed during the winter and summer surveys.

Shore and water birds

There is the potential for visual disturbance to impact shore and water birds arising from workers, plant and machinery, and from noise emissions from machinery on site both during construction and the operational stages of the development.

Certain species are more sensitive to disturbance than others. The response of birds to noise disturbance is seen as birds moving away from the works to areas which are less disturbed. Moderate noise disturbance is typified as high-level noise which has occurred over long periods so that birds become habituated to it. It is considered that the construction work will present a moderate to low level of noise disturbance. This encompasses regular noise between 60-70dB, and noise between 55-72dB in some highly disturbed areas such as adjacent to roads (IECS, 2013). Noise emissions from the construction work i.e. dredging and reclamation works, are predicted to be below 65dB at the site boundary and it is considered that this will result in no significant disturbance and is within acceptable noise levels for water birds. During construction, the impact on birds is predicted to be short-term and not significant. Mitigation measures are proposed to help minimise / avoid such disturbance, see **Section 5.8.7**.

It is noted that birds in Howth harbour have habituated to moderate levels of disturbance associated with the daily activity of a busy harbour. Black guillemot has been assessed as having a low sensitivity to boat disturbance; this species is abundant in areas where regular marine activity takes place, including close to active piers and harbours, and it is unlikely to be displaced by boat activity (Jarrett et al., 2018). A study of breeding success in Black Guillemots in relation to human disturbance on islands in the Gulf of St

Laurence, Canada found that, despite the depression in success rates associated with observer interference, maximum weights attained by fledglings were considerably higher in the heavily disturbed area than in the lightly disturbed area. Those birds which succeeded in hatching their eggs in the face of daily disturbance may have been more attentive or more experienced as parents than the average successful nester in the lightly disturbed area (Cairns 1980). This would help increase the chances of first year bird's survival rates during the non-breeding season when the birds move out to the Irish Sea where they will experience increased frequency of winter storms which can affect survival and recruitment of birds to the population in the following breeding season. In general, Black Guillemots nesting in nest boxes or jetties appear to be highly tolerant of human activity and presence of boats (Greenwood, 2002).

A Black Guillemot colony (c.6 pairs) was recorded at Howth Harbour. The colony is split between the East Pier and some buildings on West Pier. The proposed development is not predicted to result in the loss of currently used nesting crevices at the East Pier location.

There will be a loss of the two Black Guillemot nesting locations on the West Pier (see **Figure 5.14** above). Once the reclamation area is complete it is expected that the location will become unsuitable for the Black Guillemot. The impact on the Black Guillemot breeding locations from the proposed project will have a permanent moderate effect on the Black Guillemot breeding within Howth Harbour. Mitigations are required to lessen this impact and given below in **Section 5.8.6**.

There is the potential for disturbance to roosting birds arising from disturbance from workers, plant and machinery and from noise emissions from machinery on site particularly within or adjacent to the harbour. The environs surrounding Howth Harbour contain numerous alternative roosting sites and as such offer alternative roosting locations for each species during the construction phase of the project. Additionally, certain species may habituate to noise and activities associated with the construction work. The disturbance to roosting birds includes the displacement of roosting Ringed Plover from the identified roosting location on the northern tip of the West pier (see **Figure 5.16** above). It is considered that during construction works this roosting location will not be accessible for birds including the ringed plover. It is considered that the birds will alternatively use the roosting locations identified on the East Pier or Claremont Beach. It is also considered that the current roosting location is inaccessible to people walking on the west pier and that after construction the new potential roosting location for the birds on the new west pier will be more accessible to people therefore increasing the potential for disturbance to the birds. It is considered that the current roosting location on the east pier is open for potential disturbance of roosting birds. All roosting locations in general are considered to be open for disturbance and the effect of this is that the birds will take off and find another roosting location nearby. As such the potential increase in disturbance for roosting birds on the west pier is similar to the potential disturbance of all roosting locations in harbours. The loss of the west pier roosting location during construction works is an impact that will have a short-term moderate effect on the wintering bird population of the area. The increased potential disturbance from people to the new potential roosting location on the west pier during the operational phase is an impact that will have a permanent moderate effect on the wintering

bird population of the area. Mitigations are required to minimise this effect and are listed below in **Section 5.8.**

The disturbance of sediments during construction also has the potential to indirectly impact on piscivorous bird foraging activity through elevated suspended solid concentrations in the water column which could lead to a reduction in visibility and/or avoidance of turbid waters by the species. Deposition of suspended solids in intertidal habitats in which wading birds rely on is a natural occurrence which occurs over a number of tidal cycles and thus any minor increase as a result of the proposed project will not result in any change to the existing infaunal communities in these habitats and thus not impact on the foraging recourses and capabilities of these species.

Prey species of both pelagic fish (Herring (*Clupea harengus*) and Mackerel *(Scomber scombrus*) etc) and demersal fish (Cod (*Gadus morhua*), Whiting (*Merlangius merlangus*), Plaice (*Pleuronectes platessa*), Sole (*Soleidae*) etc) can be found in the waters of the Irish Sea off Fingal coast (Ecoserve, 2006). Plumes of sediment generated as a result of dredging activities could cause behavioural shifts i.e. avoidance or worst-case scenario mortality in fish species in proximity to the harbour, which in turn could have a knock-on effect on piscivorous bird species.

The effects of suspended solids depends principally on a combination of concentration and duration of exposure. The higher the concentration of solids and the longer the exposure period, the higher the risk is of adverse impacts for fish. Direct mortalities from high suspended solids in nature is likely to be rare because in experiments these effects are not normally observed until concentrations of tens or hundreds of thousands of milligrams per litre of suspended solids are in question and these levels rarely occur in nature (Alabaster and Lloyd 1980, Newcombe & Jensen 1996).

As fish are mobile, they can and do avoid turbidity plumes e.g. Herring and Cod (Westerberg et al, 1996). Bottom dwelling species such as flat fish tend to be more tolerant of solids exposure than pelagic species (Moore, 1977), presumably because they are more likely to be routinely exposed to more turbid conditions close to the sediment–water interface. Species like Whiting and Plaice for example are found at depths ranging from 10-200m over soft sediments e.g. sandy and muddy ground, and as such are accustomed to shifts in sediments. Therefore, while there may be an increase in turbidity during the construction phase of the project, this is unlikely to have significant impacts on prey species i.e. fish, on which piscivorous birds rely. Additionally, the dilution provided in the marine environment is substantial and there is no evidence that limited volume of suspended sediments picked up during dredging operations affect small shoaling fish (RPS, 2019).

Table 5.20 below notes the foraging range of each piscivorous species found in the surrounding waters. While a number of the species shown in **Table 5.20** core foraging range could include the area around Howth Harbour, the maximum distance in which they could potentially forage is well beyond any potential influence in increased sediment suspended as a result of the proposed works. The impact on foraging

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birds, particularly piscivorous plunge and pursuit divers e.g. Razorbill and Common Guillemot, from dredging impact is predicted to be short-term not-significant.

Table 1 Foraging range of piscivorous species (during the breeding season) potentially impacted by the proposed development.

SCI Piscivorous Species	Foraging Range (km)[32]		
	Core / Mean	Mean Max	Max
Cormorant	5.2	25	35
Herring Gull	10.5	61.1	92
Kittiwake	24.8	60	120
Common Guillemot	37.8	84.2	135
Razorbill	23.7	48.5	95
Black-headed Gull	11.4	25.5	40
Roseate Tern	12.2	16.6	30
Common Tern	4.5	15.2	30
Artic Tern	7.1	24.2	30
Sandwich Tern	11.5	49	54
Fulmar	47	400	580
Shag	5.9	14.5	17
Lesser Blacked-backed Gull	71.9	141	181
Red-throated Diver	4.5	9	9
Gannet	92.5	229.4	590
Common Gull	25	50	50
Puffin	30.4	62.2	200
Red-breasted Merganser	The species mainly occurs in waters of less than 3·5 m depth (Cramp and Simmons, 2004). Therefore, the potential extent of suitable foraging habitat potentially impacted within the coastal water outside the harbour is imperceptible and thus no impact in predicted to occur.		
Black Guillemot	Cairns 1987 found that Black Guillemot frequently forage up to 13km from their breeding colony with an approximate maximum foraging range measured by transects being 15km. The approximate limit calculated from absence periods was 150km.		

Note while not all species listed above were recorded during the bird survey (see section 5.5.3.5), they are listed as SCI for nearby SPA's (see section 5.3.1).

Artificial lighting can affect birds in numerous ways, it can affect the quality of breeding habitat along with breeding timing, prey availability, foraging patterns and by increasing exposure to predators. The main risk to the breeding Black Guillemot and roosting winter birds is from lighting during dusk, dawn and night hours, which could increase the risk of predation from mammalian predators, particularly during high tide periods when birds are roosting. The major threat to nesting black guillemots is predatory mammals, which strongly influence their breeding distribution and success, and human disturbance is not considered to be a major threat to this species (Johnston et al., 2018). With regard to the introduction of lighting

[32] Foraging ranges are from those detailed in Thaxter et al. (2012)

during the construction stage within the harbour, mitigation measures to address this aspect of the proposal are included below.

During construction and potentially during operation, artificial illumination may spill onto the adjoining intertidal habitats. Large areas of natural and semi-natural habitats are exposed to artificial illumination on a daily basis from adjacent urban areas and roads. Estuarine and coastal wetlands are particularly exposed to such illumination because shorelines often are heavily utilized by man (Dwyer et. al., 2013). Intertidal habitats provide important feeding areas for migratory and wintering shorebirds. Anthropogenic developments along coasts can increase ambient light levels at night across these adjacent inter-tidal habitats. The introduction of artificial lighting therefore may disturb some coastal bird species whilst benefitting others.

Numerous studies have shown that light emitted from an industrial complex have had positive effects on many waterbird species by primarily improving nocturnal visibility. This allowed sight-based foraging in place of tactile foraging, implying both a preference for sight-feeding and enhanced night-time foraging opportunities under these conditions (Dwyer et. al., 2013). Santos et. al., found that areas illuminated by streetlights were used more during the night by visual foragers, and to a lesser extent by mixed foragers, than non-illuminated areas. Visual foragers increased their foraging effort in illuminated areas, and mixed foragers changed to more efficient visual foraging strategies. These behavioural shifts improved prey intake rate by an average of 83% in visual and mixed foragers and 78% across all studied wader species (Santos, et. al., 2010). Dunlin for example, an Annex I species under the Birds Directive, have been shown to benefit from the artificial illumination of intertidal habitats which allows continuation of foraging during hours of darkness in winter months (Rehfisch et al. 1993). Dwyer et al. found that localised artificial illumination affects foraging behaviour in Redshank in a manner similar to elevated natural light. Several studies on wetland birds under wholly natural light, including many wildfowl, have similarly shown that many species take advantage of moonlight to increase foraging opportunities (e.g. Robert, McNeil & Leduc 1989; Sitters 2000; Tinkler, Montgomery & Elwood 2009).

While artificial light can have a negative effect, e.g. increased risk of predation, it can also have a positive effect on wintering shorebirds by helping to improve the foraging conditions of intertidal areas for waders. Estuaries close to major urban and industrialised regions, artificial illumination should be considered as an important environmental factor driving nocturnal habitat selection, foraging behaviour and potentially the structuring of animal communities. It is noted that the majority of the Howth Harbour is well-lit by street lights at night time, particularly along the promenade of West Pier (Woodrow, 2020) and as such any birds utilising the site will be accustomed to some levels of artificial illumination. Overall, the impact from lighting is predicted to have a permanent, not significant effect on birds.

Overall, both breeding and wintering birds in Howth harbour have habituated to moderate levels of disturbance associated with the daily activity of a busy harbour. Many species are seen to mitigate the effects of continued but harmless disturbance by habituation; as they become used to disturbance they

react less strongly. Sources of existing anthropogenic disturbance within the harbour include port activities including shipping, road traffic including trucks and commercial vehicles, aircraft, energy generation, recreational vessels, and activities associated with residential, urban areas and industrial areas on the shorelines. Any disturbance impacts during the operational phase of the proposal will result in permanent not significant impacts on shore and water birds using the area.

Passerines, Pigeons, Birds of Prey and Game Birds

Disturbance impacts during the construction stage of the project will be localised and largely confined to areas within the harbour. There may be slight short term disturbance/displacement impacts to these terrestrial bird species at construction areas.

As the habitats within the development area are not of intrinsic value to the species using the site, and as there is an abundance of similar habitat in the locale, this is not considered to be a significant impact. Birds are expected to continue utilising habitats within the development area once construction is completed. It is expected that any bird species that are displaced as a result of the construction phase will use the alternative habitats readily available to these species in the area surrounding the site.

During the operational phase, the levels of activity will stabilise and birds in the surrounding landscape will be expected to habitualise to any increased noise and disturbance levels. The impact on terrestrial birds in habitats adjoining the proposed development site is therefore predicted to be permanent and imperceptible during operation.

5.7.10 Non-native Invasive Species

The potential for impacts arising from invasive species are dependent on a do nothing or a do something scenario. The do something scenario refers to the eradication of invasive species. Under a do-nothing scenario the infestation will continue to spread due to seed dispersal and via vegetative means with the potential for significant impacts on surrounding habitats.

Following best practice guidance any amber listed species found within the proposed development site e.g. Butterfly bush, will be removed through standard eradication/control methods including digging out and post construction herbicide treatment if necessary. On the basis of its invasive qualities, the ecological value and types of habitats recorded during the walkover survey and their Amber Listing by Invasive Species Ireland, these species are unlikely to have a significant ecological impact. However, if not eradicated, species like Butterfly bush are likely to further invade adjacent semi-natural habitats and disturbed ground associated with construction activities and cause long-term landscape maintenance issues with associated costs.

It is noted that the species Hottentot-fig (*Carpobrotus edulis*) was recorded near Quarry Bay Beach, within a fixed dune habitat, to the west of Howth Harbour (Woodrow, 2020). Hottentot-fig is a non-native species

listed under the Third Schedule (Part 1) of the European Communities (Birds and Natural Habitats) Regulations 2011 (Non-native species subject to restrictions under Regulations 49 and 50). However, it is noted that the species was recorded outside the proposed development site and as such no potential spread of this species is predicated as a result of the proposed development.

5.7.11 Cumulative Impacts

An assessment of relevant projects and plans was undertaken to determine the potential for significant in combination effects on biodiversity. A cumulative impact arises from incremental changes caused by other past, present or reasonably foreseeable actions together with the proposed development.

There are a number of current grants of permission for remediation and extension works to existing dwellings and buildings in the greater area. Additionally, permission has been granted for the provision of a 134m long quay wall, associated deck and hard standing area, road access, dredging to the front of the new quay wall to provide berthing depth and land reclamation of an approximate area of 0.30ha on the east side of the Middle Pier at Howth Harbour (F19A/0296). Middle pier works commenced in late 2020 and are due to be complete in March 2022. Furthermore, subject to planning approval, protective works to the East Pier are possible in the future. Works on the Middle Pier, East Pier and this proposal development will not be undertaken at the same time. The East Pier works will be subject to Appropriate Assessment and a Natura Impact Statement has been prepared which will be submitted as part of the planning application. All works will be scheduled appropriately. It is considered that significant cumulative impacts as a result of interaction between the three projects are not expected.

Within Howth itself, increased human presence at Howth Harbour and Claremont Beach during the operational phase of the proposed development could act cumulatively with other proposals which seek to provide residential properties. The increase in footfall at Howth Harbour and Claremont Beach could potentially result in habitat loss/alteration/fragmentation of habitats and the disturbance of species of nearby ecological receptors. However, it is noted that as a result of the project activity within the harbour is not expected to significantly intensify and the planning applications within Howth i.e. F19A/0405 – construction of eight, two-bedroom apartments, or Fingal county council F15A/0362 (An Bord Pleanála ref SHD/009/19) permission for 512 residential units (including parking for 439 cars) will not see a significant increase in the population density of Howth. There is no significant cumulative impact from these developments and the proposed development.

The need for the Greater Dublin Drainage project is derived from the key findings of the Greater Dublin Strategic Drainage Study (GDSDS) Final Strategy Report and its associated Strategic Environmental Assessment (SEA) which were prepared in 2005 - 2008 respectively on behalf of the seven local authorities that form the Greater Dublin Area (GDA). As part of the project the proposed Outfall Pipeline Route will cross under the estuary habitats of Baldoyle Bay SAC and Baldoyle Bay SPA from the Coast Road to approximately 600m offshore, where it exits the tunnel. It will then continue in an easterly direction where

it terminates just north of Ireland's Eye within the Rockabill to Dalkey Island SAC Ireland's Eye SAC (002193) & Ireland's Eye SPA (004117) lies approximately 700m & 200m respectively to the south of the outfall pipeline. The proposed multiport marine diffuser is located on the final section of the proposed Outfall pipeline. The proposed marine diffuser lies within the Rockabill to Dalkey Island SAC and lies approximately 700m and 200m respectively to the north east of Ireland's Eye SAC and Ireland's Eye SPA. The construction of the outfall will commence in 2022 with commissioning finishing in 2025.

Construction along the marine pipeline corridor of the GDSDS requires dredging and subsequent burial of the main pipeline which will disrupt the benthos over a short term period as well as create a source of anthropogenic noise through vessel activity and dredging operations during the period of construction. However, conclusions of the NIS which was submitted as part of the proposed project i.e. *Greater Dublin Drainage Project Natura Impact Statement*, noted that with the implementation of mitigation measures the project will not result in direct, indirect or cumulative impacts which would have the potential to adversely affect the qualifying interests/special conservation interests of the Natura 2000 sites within the study area with regard to the range, population densities or conservation status of the habitats and species for which these sites are designated (i.e. conservation objectives).

The water quality model developed for the GDSDS project included consideration of flows from numerous WWTPs in the area and predicted that the project will have an imperceptible to slight impact on the water quality of the coastal waters off Co. Dublin during its operation.

In summary, it is noted that significant water quality effects are not envisaged during either the construction or operational phases of the proposed Howth Dredge and Reclamation project and that harbour operations in terms of the number of vessels or level of activity is not expected to significantly intensify following completion of the works. Any potentially significant impacts which have been identified, namely potential disturbance/displacement of marine mammals and birds during the construction phase, due mainly to increased noise emissions, will be mitigated such that residual significant impacts are not expected. In the unlikely event that there is an overlap in timing of construction works with the Middle and East Piers, it is considered that the recommended mitigation measures in relation to adjoining habitats and fauna will be adequate to ensure no significant cumulative impacts.

The proposed project in-combination with the impacts of other projects or developments is not expected to have a significant cumulative impact on ecological receptors.

5.8 Mitigation

A detailed Construction and Environmental Management Plan (CEMP) will be developed by the appointed Contractor. This CEMP (**Appendix 8 Volume 3 of this EIAR**) will comprise of all the construction mitigation measures, which are set out in this report.

5.8.1 Project Ecologist

A suitable qualified project ecologist will be employed for the duration of the works to ensure that mitigation measures and relevant ecological planning conditions are implemented in full. The project ecologist will also have a role in reviewing and approving all work method statements. The project ecologist will have the authority to stop works should an unforeseen issue arise.

5.8.2 Habitats

To prevent incidental damage by machinery or by the deposition of spoil during the site clearance stage, any habitats earmarked for retention, particularly Annex I habitats in close proximity to site works, will be securely fenced off early in the construction phase. The fencing will be clearly visible to machine operators.

Any habitats earmarked for retention that are damaged and disturbed will be left to regenerate naturally or will be rehabilitated and landscaped, as appropriate, once construction is complete. Disturbed areas will be seeded or planted using appropriate native grass or species native to the areas where necessary.

Any landscaping will take note of the measures outlined in the All-Ireland Pollinator Plan 2015-2020.

Mitigations are required for protection of habitats during the dredging process. These are outlined below in **section 5.8.4**. Once mitigations are in place the impact from the proposed development will have a short term not significant adverse effect on habitats.

5.8.3 Marine Physical and Chemical Aspects

Mitigation in the form of turbidity monitoring as discussed below will ensure minimal impact on the physical and chemical aspects of the harbour and surrounding waters.

5.8.4 Water Quality

The employment of good construction management practices will minimise the risk of pollution of soil, storm water run-off, seawater or groundwater. The Construction Industry Research and Information Association (CIRIA) in the UK has issued a guidance note on the control and management of water pollution from construction sites, Control of Water Pollution from Construction Sites, guidance for consultants and contractors (Masters-Williams et al 2001).

Strict controls outlined in the CEMP (**Appendix 8 Volume 3**) must be put in place to prevent the dumping of construction vessel waste during the dredging operation. Also, a strict recovery plan will be put in place in the event of accidental spillage of oil/diesel from construction vessels.

During the dredging works, loss of suspended sediments have the potential to impact on water quality. Mitigations are required and are as follows;

- Environmental buckets to be fitted to the dredge excavator;
- Silt curtains to be placed around the dredge as it is working;
- Monitoring of the waters outside the harbour in line with agreed parameters and limits from the licencing authority; and
- If monitoring indicates exceedances of agreed limits, further management of the dredging methods will be undertaken to bring concentrations below the exceedance limits.

Once mitigations are in place the impact from dredging will have a short term not significant adverse effect on water quality.

A Water Quality Management Programme (WQMP) will be prepared and implemented to incorporate the mitigation measures outlined in this section.

The proposed dredging and reclamation works will be subject to the conditions and monitoring requirements of either an Industrial Emissions licence or a waste licence from the EPA. Limits on turbidity or suspended solids in the harbour during the construction phase will be agreed with the relevant authority prior to commencement of works. The water quality will be monitored during works by the following methods:

1. Fixed station in situ water quality monitoring
2. Boat-based in situ water quality monitoring
3. Visual water quality monitoring
4. Laboratory water quality monitoring

Fixed station in situ water quality monitoring

Turbidity sensors will be used to determine turbidity during the dredging operation using in-situ readings. Continuous, real-time, in situ water quality data will be collected through the use of sensors deployed on a buoy near the construction site. High-frequency data is averaged at regular intervals and uploaded via telemetry to a website.

Fixed locations for turbidity sensors will be identified and agreed with the relevant authority.

Boat-based in situ water quality monitoring

Monthly mobile manual monitoring will also take place by boat-based water quality monitoring, the frequency of which will be approved by the relevant authority. The manual monitoring will be a combination of in situ testing and/or lab testing as agreed with the relevant authority.

Visual water quality monitoring

Daily visual monitoring will also be carried out from the shore and dredging vessel by the Contractor and Resident Engineer. The visual monitoring will include:

- Visual monitoring for suspended solids within and outside of the harbour.
- Daily inspection of surface water management systems including the stockpile drainage locations and any authorised discharge locations.
- A log will be kept of all visual monitoring.

Laboratory water quality testing

Samples will be collected at agreed regular intervals and locations to test for suspended solids. The plan will be approved by the relevant authority.

Treatment of dredge material will be carried out in an enclosed and controlled material treatment facility. The facility consisting of the mixing plant, binder silos, storage areas and pumps will be fully bunded. Any loss of dredge material within the bunded area will be collected and fed through the treatment facility again for disposal within the reclaimed area.

5.8.5 Marine Mammals

A soft start or "ramp up" procedure for noise and vibration emitting operations will take place during dredging. This procedure will be used to allow any marine mammals present in the area to vacate prior to the full dredging operation commencing.

A dedicated Marine Mammal Observer will conduct a 15-minute watch for marine mammals within 200m of the dredger prior to start up. If a seal or cetacean (or otter) is sighted within 100m of the dredger, start-up must be delayed until the animal(s) is/are observed to move outside the mitigation zone or the 15 minutes has passed without the animal being sighted within the mitigation zone.

Further measures are detailed in the MMRA which is attached as **Appendix 5** of the EIAR.

5.8.6 Birds

Works will be supervised by a project ecologist/ornithologist. Bird monitoring will be undertaken prior to commencement of construction, during construction works and following completion of the construction works. Monitoring will follow a similar methodology to that employed by Woodrow (see **Appendix 7 *'Howth Harbour FHC Proposed Dredging and Reclamation Works; Bird Surveys 2019 / 2020 Report'***), using similar techniques and point count locations with a particular focus on the Harbour itself and mudflat/sandflats and waters around Claremont beach. Surveys conducted will be as follows:

- Breeding Bird Surveys / Black Guillemot Surveys – April to August
- High Tide / Low Tide Summer Surveys – May to August

- Winter Bird Surveys – October to March

This will allow for comparative analysis with the findings of the Woodrow surveys.

All vegetation removal required to accommodate the works will be done outside of the bird breeding period, March to August, inclusive.

Lighting will be provided with the minimum luminosity sufficient for safety and security purposes both during the construction phase and operational phase of the project. Lights will be focused away from the intertidal areas which support feeding birds. Lights will be as low as possible and light spillage will be minimised. Designs to luminaires to help reduce light spillage and to direct light to the intended area only, particularly along the northern boundary, is by using accessories such as hoods, cowls, louvres and shields.

It is important to maintain Dark Zones for roosting intertidal bird species in areas where lighting is not necessary. However, where lighting is required, this lighting should be placed at a minimum height using the lowest lux value permitted for health and safety.

Construction works in the reclamation area will mean the loss of the winter bird roost on the end of the east pier for the duration of the works. The wintering birds will move to alternative roosts. The short term loss of the west pier winter roost will be mitigated by reducing disturbance on the other two identified winter roosts. To reduce disturbance on the remaining two identified winter roosts, screening will be erected along the southern boundary of the reclamation area. This will reduce disturbance on the southern winter roost near Claremont Beach. Screening or fencing will be erected around the winter roost at the end of the East Pier. The screening or fencing on the East Pier will happen over the period of time that the winter roosts are used by the birds (generally autumn and winter). The type of screening or fencing best suited and the requirement to close the walkway on the top of the pier wall at this location, will be agreed with the project ecologist before construction starts. Once mitigations are in place there will be a short term not significant effect on the wintering birds from the proposed development.

During the operational phase of the proposed development a permanent winter roost area will be established on the newly constructed revetment pier. This will provide a continuation of the existing winter roost area on the West Pier. The roost area will be fenced or screened off to reduce disturbance as agreed with the project ecologist. Once mitigations are in place there will be a permanent not significant effect on the wintering birds from the proposed development.

Exclusion zones will be established during the wintering bird period. These will be focused around the Claremont Beach to the southwest of the proposed reclamation area i.e. outside the proposed development boundary. Site personnel will avoid this area during rest periods e.g. breaks, as not to introduce a potential disturbance factor to foraging birds. This will allow for the continuance of exposed mudflat habitat, particularly during low tide, to be utilised as feeding ground for wading birds. Once these

mitigations are in place the impact on the wintering birds from the proposed development will be a permanent not significant effect.

To mitigate the impact on the Black Guillemot and enhance breeding bird habitat on the site for Black Guillemot, 4 nesting tunnels / nest boxes will be incorporated into the proposed reclamation area and/or existing pier structures, at appropriate locations to encourage increased numbers of breeding pairs in the harbour. A qualified ecologist will be engaged to choose appropriate locations for nest boxes and supervise installation. Once the new nest boxes are in position a preconstruction survey will take place to ensure that the nest locations on the west pier are not in use before construction starts. Under licence and with agreement of the NPWS the black guillemot nests in the holes within structures on the west pier will be blocked. The purpose of this is to stop possible nesting that may be abandoned later due to construction works. It is expected that the Black Guillemots will find more suitable nesting locations within the new nest boxes. Once mitigations are in place the proposed development will have a short term not significant effect on the Black Guillimots.

No night time dredging works will be permitted at any stage within the approach channel in order to avoid disturbance of Black Guillemot during the breeding season or roosting Ringed Plover during the wintering period. It is noted that illumination at night can increase the risk of predation.

5.8.7 Invasive Species Control

No invasive species were identified during surveys within the proposed red line construction area. A number of invasive species have been identified in adjacent habitats where works will not take place (See Woodrow report attached as **Appendix 12**). The main risk to the project from invasive species is the introduction of species through the large importation of rock and later soils required for the construction works.

Bio -security

Bio-security measures need to be implemented at the site in order to ensure the risk from invasive species is kept negligible. The following measures are proposed:

- The construction personnel involved in works will be trained in basic relevant invasive species prevention and management. This includes species identification and decontamination methods.
- Due to the presence of invasive species in adjacent habitats, works will remain within the proposed red line and the works area fenced or demarcated in order to stop machinery entering the adjacent habitats.
- Materials brought to site will be ensured to come from a known source and be inspected upon arrival. Any invasive species seen at this point are to be stopped and the loads rejected.
- Machinery used on site is to be clean off site and brought to site clean.

- Invasive species management methodologies and plans outlining Best Available Techniques (BAT) will be sourced from current best practice/TII (The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads).

5.9 Residual Effects

The potential effects of the proposed development were considered and assessed to ensure that all effects on Key Ecological Receptors are adequately addressed and no significant residual effects are likely to remain following the implementation of mitigation measures/best practice.

It is considered that residual effects will be imperceptible to not significant.

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6 LAND AND SOILS

6.1 INTRODUCTION

This chapter of the EIAR assesses the impacts to the land and soil and considers any direct or indirect effects on these resources arising from the proposed dredging and reclamation works at Howth Harbour, Co. Dublin. See **Chapter 2** for a full description of the project. The site is an active marine site with ongoing industrial, commercial and leisure activity throughout.

6.1.1 Scope of Assessment

Land and soil are considered both in geological terms and in current, historical and planned land use. The subject matter of hydrogeology is addressed in **Chapter 7 Water** of this EIAR. This chapter includes data and descriptions of the soil and geology at the site as well as any prominent features. Data includes information from baseline surveys as well as desk top research. The geology is described at the local and regional level. All activities associated with the project are considered for dredging and land reclamation, construction and operation phase impacts.

6.1.2 Methodology

The assessment was informed by desk study, field visits and site investigation and in line with the requirements of the current EPA advice notes and guidelines on Environmental Impact Assessment. The assessment has been completed having regard to the EPA's draft Guidelines on Information to be contained in Environmental Impact Assessment Reports (2017).

6.1.3 Sources of Information

A desk study was undertaken to collate and review available information, datasets and documentation sources pertaining to the site's natural environment and involved the following:

- Examination of maps and aerial photography (including the Geohive online resource of maps and historic maps);
- Examination of the Geological Survey of Ireland (GSI) datasets pertaining to geological (bedrock, heritage) and extractive industry data;
- Examination of EPA soil and subsoil maps; and
- Review of the IGI Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements (2013).

A walkover survey of the site was undertaken in July 2020 to confirm the following:

- the commercial setting of the proposed site,
- the site characterisation as constituting made ground; and
- the conditions of the coastline around the site.

6.1.4 Assessment Criteria

The assessment is based on the EPA Glossary of Impacts, included in the 2002 Guidelines on Information to be contained in Environmental Impact Statements and the draft 2017 Guidelines on Information to be contained in Environmental Impact Assessment Reports. The assessment of the Likely Significant Impacts in the Institute of Geologists of Ireland (IGI) Guide to Geology in Environmental Impact Statements (2013) was also consulted.

6.2 EXISTING ENVIRONMENT

6.2.1 Site and Project Context

Howth Harbour is situated on the north side of Howth Peninsula, to the north of Dublin Bay (**Figure 6.1**). The proposed dredging will take place within Howth harbour. The land reclamation part of the project will take place on the western side of the west pier. See **Chapter 2 Description of Proposed Development** for a full description of the project.

Figure 6.1 Site location

6.2.2 Existing Land Use

The project will take place within the footprint of the currently active harbour. The land use within the development area is described as a Sea Port. Within the harbour itself, the west pier is zoned as general employment and has a number of private businesses such as restaurants, shops and boat repair works. The east pier is zoned as high amenity with green spaces and walking areas. The harbour is also utilised daily by a range of industrial, commercial and recreational vessels.

6.2.3 Site Topography

The Howth Harbour site is made up of the western, eastern and middle piers (**Figure 6.1**), the outermost two of which have been in place since before 1842. **Figure 6.2** below shows the existence of the eastern and western piers as mapped out between 1837 and 1842. The site is bounded to the east, north and west by the Irish Sea. The small island of Ireland's Eye is located approximately 750m north of the most northern point of the western pier. The site is bounded to the south by Harbour Road which is accessed from the west by Howth Road and Howth Railway.

Figure 6.2 Historic 6 inch map of Howth Harbour (1837 – 1842)

6.2.4 Local and Regional Geology

The bedrock immediately to the south of the site at Howth and extending west towards Dublin city are mostly sedimentary in nature, dominated by limestone and shale. The Howth peninsula itself is dominated by Cambrian greywacke, slate and quartzite, which forms to the east of a north-west diagonal fault line (**Figure 6.3**). There is an igneous intrusion to the north at Donabate and Lambay Island. (GSI).

Figure 6.3 Local and Regional Geology

6.2.5 Geological Heritage

There is one Irish Geological Heritage site located about 60 meters from the site, namely Balscaddan Bay (DF013), which extends from the south end of the eastern pier along the coast to the east. The area is described in the Fingal County Geological Report as Coastal Cliffs within a small bay area.

The area is of significant interest due to the *exposure of faulted contact between the Lower Carboniferous dark muddy limestone of the Ballysteen Formation and the Cambrian polymict melange of the Elsinore Formation*, making the site "*a good teaching locality*."

Other nearby Irish Geological Heritage sites include Claremont Strand (DF014), Hill of Howth (DF010) and Ireland's Eye (DF011), Bottle Quay (DF009) and North Bull Island (DC007).

6.2.6 Economic Geology

There are no quarries operational in the area around Howth Harbour.

6.2.7 Site Investigation

2019 Site Investigation

A site investigation was undertaken by Priority Geotechnical at the proposed development site in December 2019. The full 2019 site investigation report and laboratory analysis is presented in **Appendix 2**. **Figure 6.4**, below shows the location of boreholes drilled and sediment samples taken during the 2019 survey.

The 2019 survey found the soil in the reclamation area comprised fine to medium brown SAND with underlying fine to course grey, silty gravelly SAND. Underneath the sand strata, material described as

grey, slightly gravelly CLAY with some cobble and shell content was encountered. Bedrock encountered is predominantly described as strong grey limestone.

The samples (SP1 to SP23) taken from the dredge footprint were taken at a depth of between the surface and -2m below seabed level. The soil was found to consist of very soft to soft, black, slightly sandy slightly gravelly SILT. The black silt had an organic odour to it.

2015 Site Investigation

Previous site investigations were also undertaken within the harbour in 2015 whereby 29 marine boreholes were drilled within the proposed dredge area. It was carried out as part of the middle pier works that are currently ongoing. **Figure 6.5** shows the location of boreholes drilled during the 2015 survey. The 2015 site investigation was used to recover soil, subsoil and bedrock cores within the dredge area. Very soft or soft cohesive deposits were encountered at bed level. These are described as very soft or soft dark grey or black sandy and occasionally gravelly clay/silt comprising occasional shell fragments were encountered in the majority of boreholes. Secondary sand and gravel was variable with small gravel quantities and some fishing line material also found to be present.

Some stiff deposits described as stiff brown or black sandy gravelly clay comprising some cobbles and boulders were encountered above the bedrock within the harbour. Other deposits encountered also consisted of light brown gravel sized mudstone.

Rock core described as a medium strong to strong fine to medium grained fossiliferous limestone and occasional mudstone was encountered. Limestone was occasionally not noted as fossiliferous and was described typically as Medium strong to strong dark grey/grey fine to medium grained thinly laminated to thinly bedded limestone with some interlaminated mudstone. In some locations a greater presence or thickness of mudstone was found.

6.2.8 Sediment analysis and classification

In the 2019 site investigation, 23 samples of the sediments were taken for chemical analyses. The depths of the 23 samples in the sediment ranged from surface, -1m and -2m below seabed level. The generic quantitative risk assessment (**Appendix 10**) summarises the sediment analysis.

Generic assessment criteria for sediment quality have been developed by the Irish Marine Institute (MI) for comparison against dredge sediment quality as published in the MI Guidelines on the *"Assessment of Dredged Material for the Disposal in Irish Waters (2006)"*. The guidelines, which are designed to assess the suitability of disposing of dredged material at sea, identify a Lower Level 1 and Upper Level 2 of contamination which characterises the marine sediments into three categories or classes of potential contamination:

1. Class 1: Where contamination concentrations are less than Level 1 the sediment is considered to be uncontaminated - with no biological effects likely.

2. Class 2: Where contamination concentrations are between Level 1 and Level 2 the sediment is considered to be marginally contaminated; further sampling and analysis should be considered to delineate problem areas, if possible.

3. Class 3: Where contamination concentrations are above Level 2 the sediment is considered to be heavily contaminated and very likely to cause biological effects/toxicity to marine organisms. The MI guidelines recommend that alternative management options are considered for this level.

The 23 sediment samples were compared to the MI lower and upper levels and a summary is presented in **Table 6.1** below.

Table 6.1 Analysis results compared to MI lower and upper levels

Determinand	Units	MI Lower Level	MI Upper Level	Total Samples	Limit of detection	Count of samples exceeding MI		Soil concentrations (units/kg dry weight)	
						Lower level	Upper level	Ave	Max
Aluminium	mg/kg	n/a	n/a	23	10	n/a	n/a	27626.09	56000
Arsenic	mg/kg	20	70	23	1	21	0	34.62	51.8
Cadmium	mg/kg	0.7	4.2	23	0.1	17	0	0.87	1.3
Chromium	mg/kg	120	370	23	0.5	0	0	72.04	118
Copper	mg/kg	40	110	23	2	10	1	55.23	320
Lead	mg/kg	60	218	23	2	3	1	60.83	392
Lindane (GHCH)	µg/Kg	0.3	1	23	0.1	1	0	0.13	0.41
Mercury	mg/kg	0.2	0.7	23	0.01	1	0	0.08	0.34
Nickel	mg/kg	40	60	23	0.5	2	0	32.81	45.5
Zinc	mg/kg	160	410	23	3	11	0	177.35	377
Dibutyl Tin	mg/kg	n/a	n/a	23	0.001	n/a	n/a	0.07	0.636
Tributyl Tin	mg/kg	n/a	n/a	23	0.001	n/a	n/a	0.45	6.48
Dibutyl Tin & Tributyl Tin	mg/kg	0.1	0.5	23	0.001	7	3	0.53	7.116
HCB	µg/Kg	0.3	1	23	0.1	1	0	0.16	0.86
TEH (as THC)	g/kg	1	n/a	23	0.0001	8	0	0.86	2.94
Total Of 16 PAH's	mg/kg	4	n/a	23	0.001	2	0	2.46	12.6163
PCB (individual congeners)									
PCB28	µg/Kg	1	180	23	0.08	2	0	0.56	1.43
PCB52	µg/Kg	1	180	23	0.08	2	0	0.79	5.2
PCB101	µg/Kg	1	180	23	0.08	2	0	0.64	6.3
PCB118	µg/Kg	1	180	23	0.08	3	0	0.75	6.67
PCB138	µg/Kg	1	180	23	0.08	6	0	1.05	9.27
PCB153	µg/Kg	1	180	23	0.08	6	0	0.92	7.94
PCB180	µg/Kg	1	180	23	0.08	1	0	0.47	4.42
Total PCBs (7 Congeners)	µg/Kg	7	1260	23	0.56	4	0	5.17	41.23

The analysis results (full results are presented in **Appendix 2.2 geotechnical lab test report**) show that all samples are in class 2 except for 3 of the samples which are in class 3. The class three contaminants of concern were Dibutyltin (DBT), Tributyltin (TBT), copper and lead.

As shown in **Table 6.1** above – all the sediments are Class 2 or above when compared to the Marine Institute Guideline Limits. There were three Class 3 samples. This classification of the sediments as concentrations of potentially polluting parameters would restrict dumping at sea.

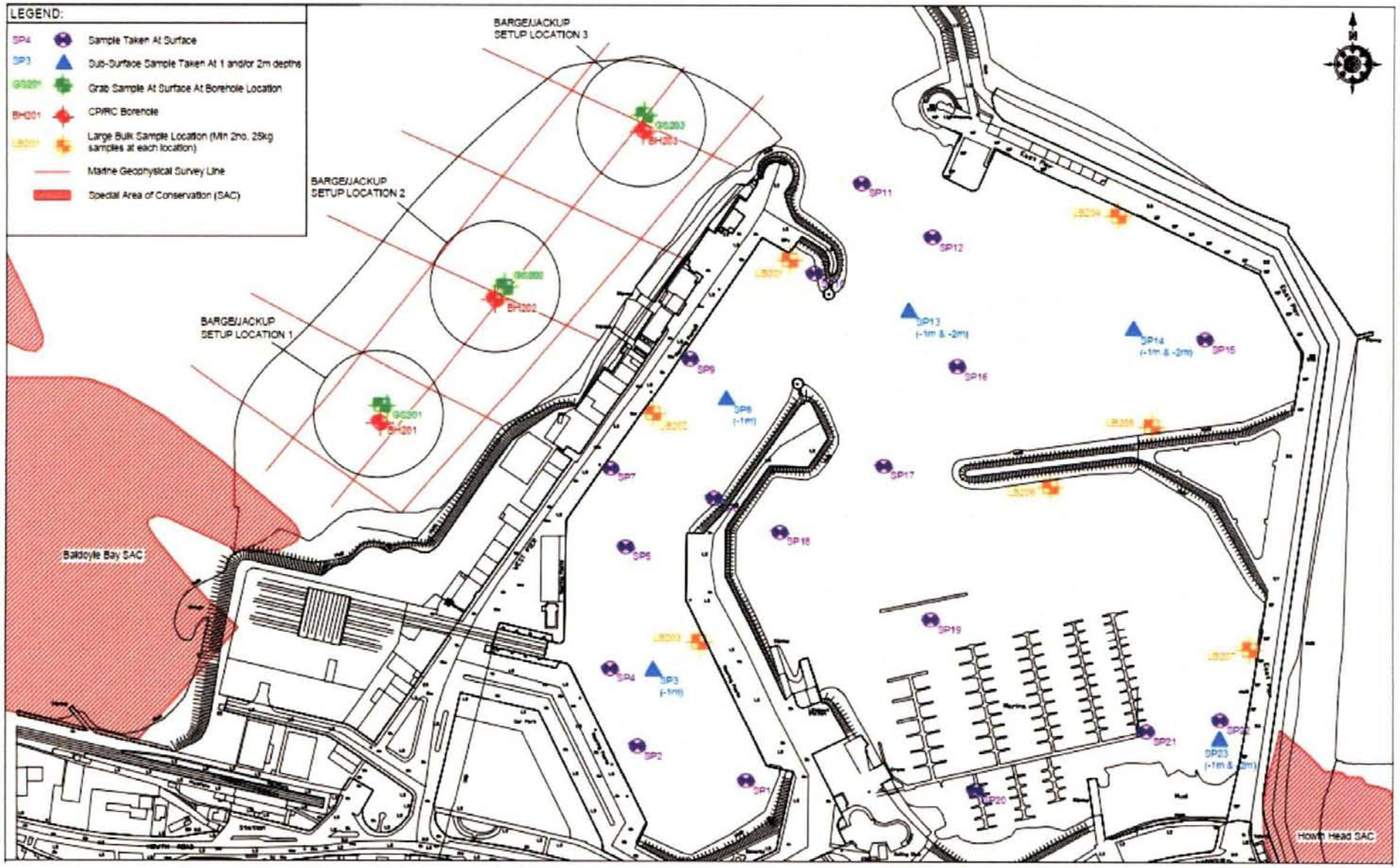

Figure 6.4 Site Investigation borehole and sample locations - 2019 site investigation

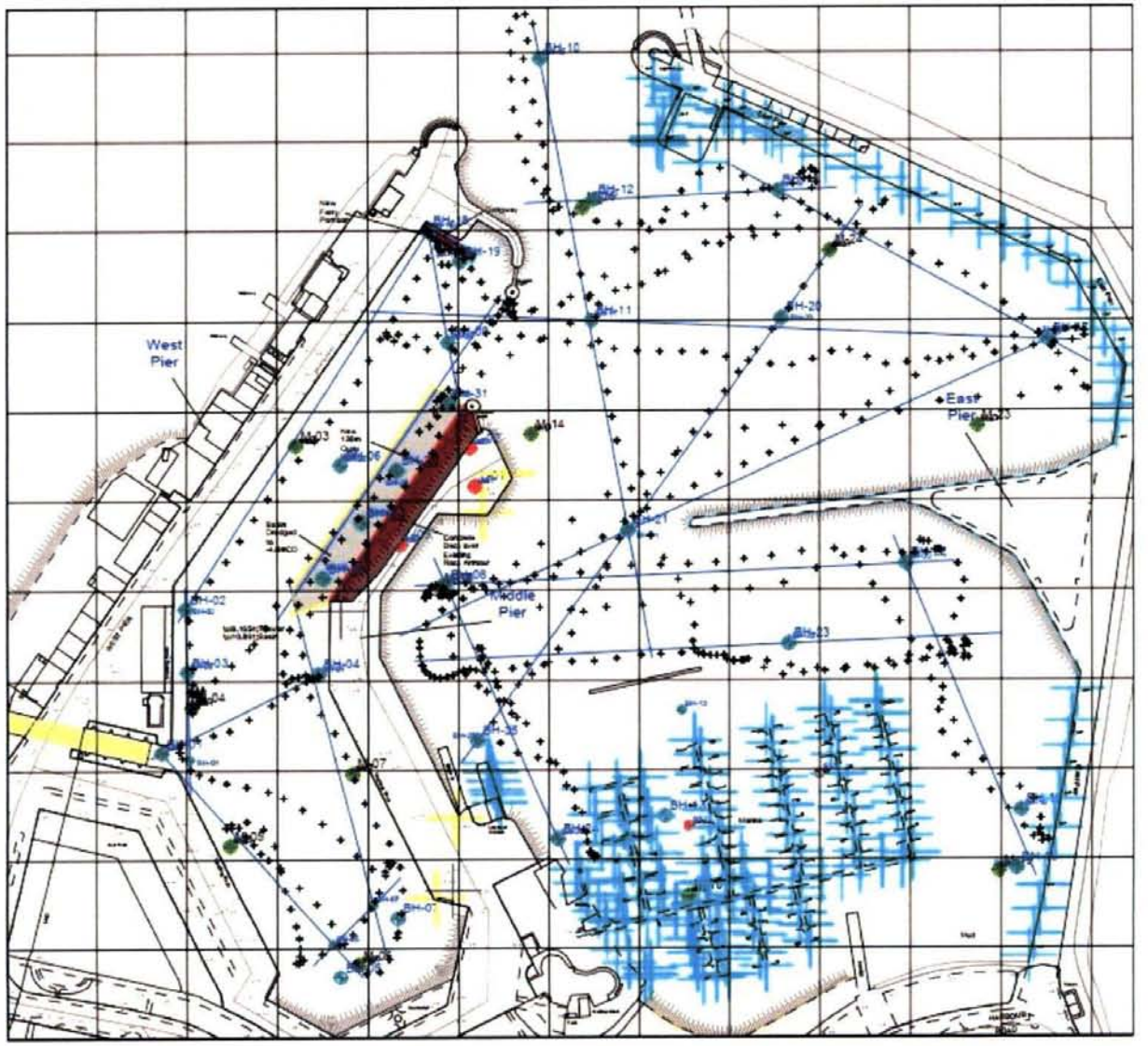

Figure 6.3 Site Investigation borehole locations 2015 site investigation

6.3 LIKELY SIGNIFICANT IMPACTS

6.3.1 Summary of the Proposed Project

The proposed development will involve the following main elements:

- Dredging the harbour;
- Reclaiming land on the west side of the west pier using stabilised dredge material;
- Coastal protection works to the perimeter of the reclaimed area;
- Landscaping on the reclaimed area;
- Provision of pavements e.g. footways, roadways and parking areas;
- Construction of slipway for access to the water;
- Provision of storage areas for harbour activities; and
- Provision of services.

The proposed works can be divided into 4 key elements as follows:

- Element 1: Construction of a perimeter embankment and rock armour revetment to the seawards edge of the reclaimed land area;
- Element 2: Dredging of the Inner Harbour;
- Element 3: Land Reclamation;
- Element 4: Finishings.

For a detailed description of the proposed project and the works refer to **Chapter 2 Project Description.**

6.3.2 Potential Impacts during Construction

6.3.2.1 Importation of Materials

The construction of the perimeter embankment at the land reclamation area will require the importation of 53,000m^3 of "Class 6A" imported granular stone fill which will be used to fill the core of the bund. The outer rock armour revetment will require the additional importation of 25,000m^3 of large rock material for use as outer-layer primary rock armour and smaller rock material for use as under-layer below the primary rock armour.

Relevant materials imported for surface finishing following reclamation of land will comprise of stone fill, concrete, paving setts and/or bituminous flexible pavement for the construction of pedestrian, road and parking paving and a slipway.

The dredge material stabilisation and solidification treatment will require the importation of 36,000 tonnes of Portland Cement and Ground Granulated Blast Furnace Slag, which will be combined with the dredged material to form a homogenous mix for use as infill in the reclamation area.

The main materials that will be required throughout construction and approximate quantities are provided in **Chapter 2 Description of the Proposed Development**. The minimum amount of materials required will be stored on-site and will be managed to minimise waste generation. All materials will be stored within the on-site construction compound.

The geological resources used during construction, as outlined above are typical construction products and will not constitute a significant geological impact. There will be a permanent not

significant effect on the soil and geological environment as a result of materials imported during the project.

6.3.2.2 Dredging

The project will require the excavation of approximately 240,000m^3 dredge spoil from the harbour. A multi-beam bathymetric survey will be undertaken to confirm the correct dredge depths are achieved. Approximately 28,370m^3 of dredge material will be bedrock. The project therefore requires some rock-breaking to be carried out, however this will not be extensive, and no blasting will be allowed. The broken rock will then be excavated from the bed by the long reach excavator with a bucket attachment. Depths of dredging to be undertaken for individual area in the harbour are shown in **Table 6.2**.

Table 6.2 Dredge depths

Location	Design dredge Depth mODM
Trawler Basin	-6.5
Harbour Approach Channel	-6.5
Marina Approach Channel	-5.5
Moorings	-5.5
Marina	-5.5
Totals	-

The hydrodynamic assessment (**Appendix 4**) shows that there will be a loss of sediments from the harbour during the dredging process. The assessment shows there will be low levels of sedimentation occurring from the loss of sediments outside the harbour during the dredging process. The assessments shows sedimentation impacting on Claremont Beach at a level of 0.4mm over one year, this sedimentation does not take into account wave or current action. Subsequent wave and tidal action will remove this sedimentation on a daily basis. The small particulate silts that make it to Claremont Beach will be mobile under wave and current action and will move further over a wider area, further reducing potential impact.

The Generic Quantitative Risk Assessment (**Appendix 10**) shows that the level of contamination from the dredged sediments to be at a short term low risk to water quality and marine life. From this it can be surmised that the impact from the sediments will have a short term imperceptible adverse effect on the soils.

There will be a loss of sediment and rock in the harbour that will be offset by the placement of this material in the land reclamation area. There will be no net loss of soils from the area.

There will be a permanent not significant effect from the material getting placed on the seabed and impacting on the soils at that location through compression.

Overall there will be a permanent not significant effect on the soil and geological environment as a result of the dredging process.

6.3.2.3 Reuse of contaminated sediments on reclamation area

Mitigation by design has been incorporated into the proposed project whereby the contaminated sediments are treated through stabilisation and solidification (S/S) in order to contain the contaminates. Once treated the S/S sediments will be a solid material of low permeability that will contain the contaminates within them. The S/S treatment will prevent any potential impact on the underlying seabed at the land reclamation area from the contaminants within the sediments. The removal of the contaminated sediments from the harbour which currently have the potential to go mobile and impact on surrounding sediments will have a positive effect on the seabed. The impact of the treatment by S/S of the sediments and their use in the land reclamation area will be a permanent not significant positive effect on the soils in the area.

6.3.2.4 Plant machinery and vessels

The proposed works will require the use of long reach excavators, barges and other vessels and machinery associated with the project. The presence of such machinery increases the risk of fuels/oils being released due to accidental spillage. Fuels/oils will be stored in the site construction compound and re-fuelling will take place on impermeable hard-standing areas where possible to ensure there is no potential for contact with underlying marine sediment. The preliminary CEMP contained in **Appendix 8** provides a detailed account of how fuels/oils and other substances will be stored and managed during construction in order to minimise the risk of spread of contaminants.

There will be a short term not significant effect on the soil and geological environment as a result of the use of machinery associated with the proposed works.

6.3.3 Potential Impacts during Operation

There is a potential impact on the imported soils placed on top of the reclamation area from leaching contaminants from the treated sediments. The treated dredge sediment samples for Howth FHC dredge were tested and exhibit very low permeability characteristics in the order of $5x10^{-11}$m/s (ref. **Appendix 2.2 Geotech Lab Report**, Volume 3 of the EIAR). The low permeability of the treated sediments is similar to the permeability of a geosynthetic clay liner ($1x10^{-10}$ - $1x10^{-12}$m/s). This permeability is enough to protect the soils above from cross contamination. There will be a permanent imperceptible negative effect on the above soils from the treated sediments below.

Refer to 6.3.2.3 above for the same operational effect on seabed sediments from the contaminated dredge material.

6.4 MITIGATION

The contractor will develop and implement a detailed construction environmental management plan (CEMP). Refer to **Appendix 8** for the preliminary CEMP prepared as part of this planning application. Standard mitigation measures are included below to ensure any potential slight impacts are minimised or avoided. The following mitigation measures are set out in the preliminary CEMP:

- Sustainable use of materials on site. Workers on-site should be briefed prior to commencing work with regard to appropriate use and disposal of waste;
- Tight control on material required to avoid waste. Incoming materials should be of a suitable quantity so as to ensure a minimum amount of waste is generated;

- Temporary storage areas for fuels and other hazardous materials required by the contractor during construction will be stored in appropriately bunded facilities to prevent the accidental spillage of hazardous liquids that could cause soil contamination.
- Detailed verification testing will be undertaken throughout the works to ensure quality control and that material is fit for purpose.

Monitoring of the project during both the construction and operational phases will take place. The monitoring will be in accordance with an EPA issued licence to undertake the proposed works. The monitoring will include sampling and testing of the treated material to show compliance with the EPA licence. The licence will not be surrendered until the EPA are satisfied there is no environmental liability with the proposed project.

6.5 RESIDUAL IMPACTS

During the construction phase, once the mitigation measures are implemented there will be a short term not significant effect on the land and soil environment from the proposed development.

During the operational phase once the mitigations are implemented the impacts on the land and soils from the proposed development range from a permanent not significant negative effect to a permanent not significant positive effect on the land and soils.

6.6 REFERENCES

Institute of Geologists of Ireland (2013) *Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements.*

Environmental Protection Agency (EPA) (2019) *EPA Maps,* Accessed 11/12/2019, *https://gis.epa.ie/EPAMaps/default*.)

Geological Survey of Ireland (GSI) (2019), Accessed 011/12/2019, https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0.

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7. WATER

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7.1 Introduction

This chapter of the EIAR describes and assesses the potential impacts of the proposed development on hydrology and hydrogeology. It identifies the potential for effects on surface water and groundwater resources associated with the proposed development. The existing environment is described, mitigation measures are proposed and the predicted residual impacts are described in the following sections.

7.1.1 Scope of Assessment

The scope of the impact assessment and methodology pertaining to hydrology and hydrogeology is as follows:

1. Establish the baseline hydrological and hydrogeological conditions relevant to the development site;
2. Identify the potential impacts of the proposed development on the receiving hydrological and hydrogeological environment;
3. Determine the significance of any identified effect;
4. Develop mitigation measures to reduce or eliminate the impacts; and
5. Identify any residual impacts after mitigation measures are implemented.

7.1.2 Methodology

The assessment methodology included desk based studies, site visits, and a qualitative assessment of the potential impacts.

Relevant guidelines have been used to inform the preparation and assessment of impacts from the proposed development on surface water and groundwater, including:

- National Roads Authority (NRA) (2009) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydro-geology for National Road Schemes and EPA Guidelines – Advice Notes on Current Practice (in the preparation of Environment Impact Statement);
- Department of Housing, Planning and Local Government (DHPLG) (2018) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment;
- EPA (2017) Guidelines on the Information to be contained in Environmental Impact Assessment Reports – Draft; and
- Institute of Geologists of Ireland (2013) Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements.

Relevant water quality standards have been consulted and used to inform the assessment where relevant, including:

- European Communities (Drinking Water) Regulations 2014 (S.I. No. 350 of 2014);
- European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9 of 2010), as amended in S.I. No. 389 of 2011, S.I. No. 149 of 2012 and S.I. No. 366 of 2016 and;
- European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272 of 2009) as amended by S.I. No. 327 of 2012, SI No. 386 of 2015 and S.I. No. 77 of 2019.

7.1.3 Sources of Information

7.1.3.1 Desk Study

A desk-based study was undertaken to establish baseline surface water features and groundwater information at the site and surrounding area. Information on geology and soils is provided in **Chapter 6 Land and Soils**. The desk study involved a review of all available information, datasets and documentation sources pertaining to the hydrology and hydrogeology of the area surrounding the application site. Publicly available information sources have been used to inform and supplement the site specific information gathered to complete this assessment as summarised in **Table 7.1** below.

Table 7.1 Outline of Public Data Sources Consulted to Inform the EIAR

Data Source	Information Relevant to the EIAR
Geological Survey of Ireland (GSI) Spatial Resources website	Aquifer classification, recharge estimates and groundwater vulnerability Groundwater well locations within 5km
Ordnance Survey of Ireland (OSI) mapping	Historic mapping to assess infilled areas.
EPA Envision Mapviewer website	Water quality data Water Framework Directive classifications Protected Areas under the Water Framework Directive
Office of Public Works (OPW) Website	Flood Risk Mapping

7.1.4 Assessment Criteria

7.1.4.1 Evaluation and impact assessment categorisation

The method of impact assessment and prediction follows the EPA (2017) Draft *Guidelines on the information to be contained in Environmental Impact Assessment Reports.*

7.1.5 Legislation context

The following section sets out the legislative context of the assessment in relation to surface and groundwater quality.

Water Framework Directive (WFD) (2000/60/EC)

The Water Framework Directive (WFD) (2000/60/EC) establishes an integrated and coordinated framework for the sustainable management of water. The WFD, transposed into national legislation in 2003, aims to:

- Prevent deterioration of status for surface and groundwaters and the protection, enhancement and restoration of all water bodies;
- Achieve good ecological status and good chemical status for surface waters and good chemical and good quantitative status for groundwaters;
- Progressively reduce pollution of priority substances and phase-out of priority hazardous substances in surface waters and prevention and limitation of input of pollutants in groundwaters;
- Reverse any significant, upward trend of pollutants in groundwaters; and
- Achieve standards and objectives set for protected areas in Community legislation.

The objective for each surface water and groundwater body is to prevent deterioration, maintain high and good status waters, restore waters to at least good status where necessary, and ensure that the requirements of associated protected areas are met.

The assessment will therefore determine the impact in accordance with the following regulations which give effect to the WFD:

- S.I No.9 of 2010 European Communities Environmental Objectives (Groundwater) Regulations 2010, as amended;
- S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Water Regulations) 2009
- S.I. No. 296 of 2009 European Communities Environmental Objectives (Pearl Mussel Regulations) 2009;
- European Communities (Quality of Salmonid Waters) Regulations, (S.I. 293 of 1988); and the
- Urban Waste Water Treatment Regulations (SI No. 254 of 2001 as amended) (UWW Regulations).

7.1.5.1 Water Framework Protected Areas

The Water Framework Directive requires a register of protected areas. These are protected for their use (such as fisheries or drinking water) or because they have important habitat and/or species that directly depend on water. The register includes areas identified by the WFD itself or other European Directives. These may include the following:

- Areas used for water abstraction - European Union (Water Policy) (Abstractions Registration) Regulations 2018 (S.I. No. 261 of 2018)
- Areas designated for the protection of economically significant aquatic species (Freshwater Fish Directive 78/659/EEC; Shellfish Directive 79/923/EEC)
- Recreational waters (Bathing Waters Directive 76/160/EEC)
- Nutrient Sensitive Areas (Nitrates Directive 91/676/EEC; Wastewater Treatment Directive 91/271/EEC)
- Areas of protected species or habitats where water quality is an important factor in their protection (Natura 2000 sites under Birds Directive 79/409/EEC and Habitats Directive 72/43/EEC)
- Surface waters (The European Communities Environmental Objectives (Surface Waters) Regulations [S.I. No 272 of 2009], and amendment regulations 2012 [S.I. 327 of 2012])

7.2 Existing Environment

7.2.1 Site and Project Context

Howth Harbour is situated on the north side of Howth Peninsula, to the north of Dublin Bay. Howth Harbour is situated in the Irish Sea. The proposed site is located within Howth harbour and to the west of the west pier.

below shows the proposed site relative to the greater Dublin Bay area.

Figure 7.1 Site location

7.2.2 Hydrology

The main hydrological feature of Howth Harbour is the Irish sea within the harbour. The piers reach north into the Irish sea forming three tidal basins within the harbour itself. There is an ebb and flow of sea water in and out of the tidal basins. The waterbody is called the Irish Sea Dublin (EPA code HA 09). In accordance with the Water Framework Directive, the water quality of the waterbody is given as a 'good status that is not at risk'.

Gray's Brook (or Boggeen Stream) is a stream entering the Harbour at the slipway south of the marina area. The river originates 1.3km to the south in Thormanby Woods. It is within the EPA water body Howth_010 and has a water quality status that is unassigned. The subcatchment is Mayne_SC_010 and is in the catchment of the Liffey and Dublin Bay (EPA code 9).

There are three storm water overflows that flow into the harbour (See **Figure 7.2**). One enters the harbour at the southern end of the trawler basin while the other two are south of the marina area.

The proposed site is situated in proximity to several Special Protection Areas (SPA) and Special Areas of Conservation (SAC), the closest of which are Howth Head SAC, Baldoyle SAC, Ireland's Eye SPA and Howth Head Coast SPA. Refer to **Chapter 5 Biodiversity** for further details.

Figure 7.2 Storm water overflows.

7.2.2.1 Existing Site Drainage

The existing site drainage on the west pier and middle pier happens in two ways. There are roadside storm water drains on both the west and middle pier. These lead to the storm water outflows shown in **Figure 7.2** above. The other drainage is surface runoff immediately back into the sea from the piers.

7.2.3 Flood Risk

A flood risk assessment (**Appendix 9**) was carried out for the project. There have been no flood reports in the site area within the Harbour.

Overtopping does occur on the East pier in certain wind and water state conditions. The impact of this overtopping is generally only a risk to people who are walking on the pier at the time. The water from the overtopping flows directly back into the Harbour. The overtopping is being addressed via a separate project to widen the east pier and so eliminate the danger. This project will happen in the future, currently planning permission has not been sought.

7.2.4 Hydrogeology

As discussed in **Chapter 6 Land and Soils**, the geology at the site is mostly sedimentary in nature, dominated by limestone and shale.

As can be seen in **Figure 7.4** below, the GSI have not classified the bedrock underlying the site as being an aquifer. This is due to the location of the site over the sea. The area to the south of the site has been classed in the Aquifer Category LI (Locally Important). The bedrock aquifer is a locally important aquifer with the bedrock moderately productive only in local zones. Groundwater at the site is expected to be brackish / saline and unsuitable for potable supply.

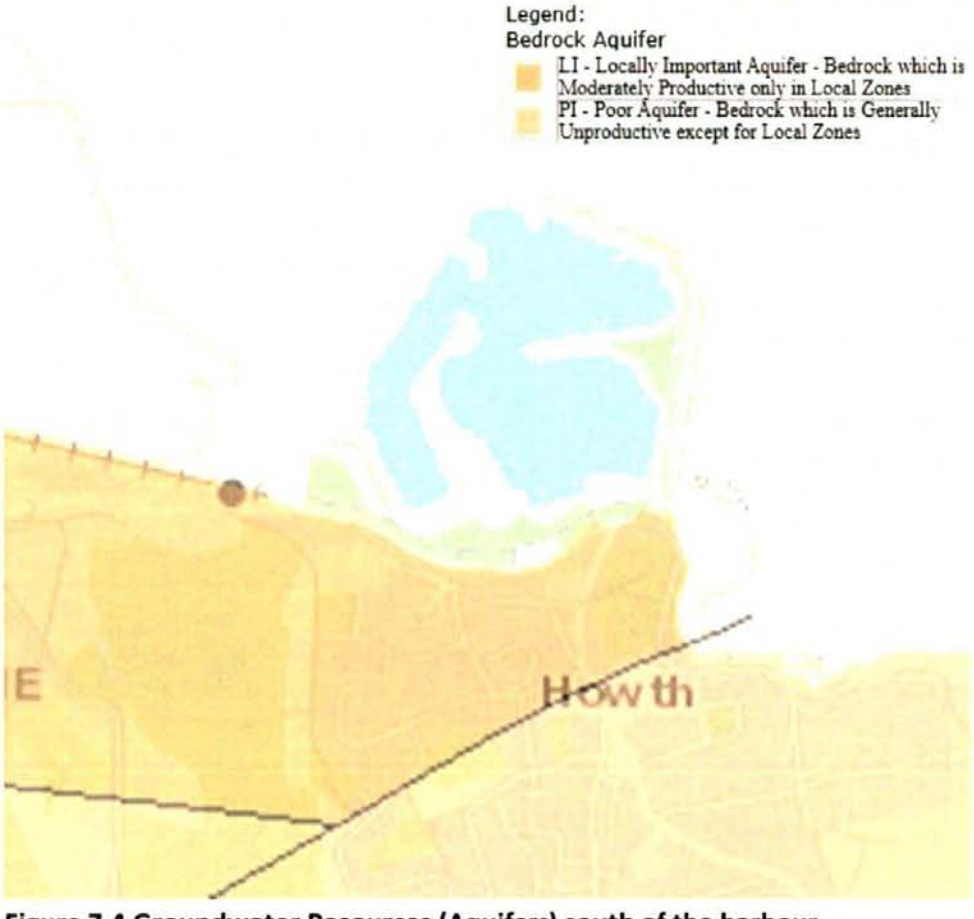

Figure 7.4 Groundwater Resources (Aquifers) south of the harbour

The groundwater vulnerability in Howth Harbour is outlined in **Figure 7.5** below. The west pier area is classed with moderate vulnerability and the east pier area is classed as extreme vulnerability.

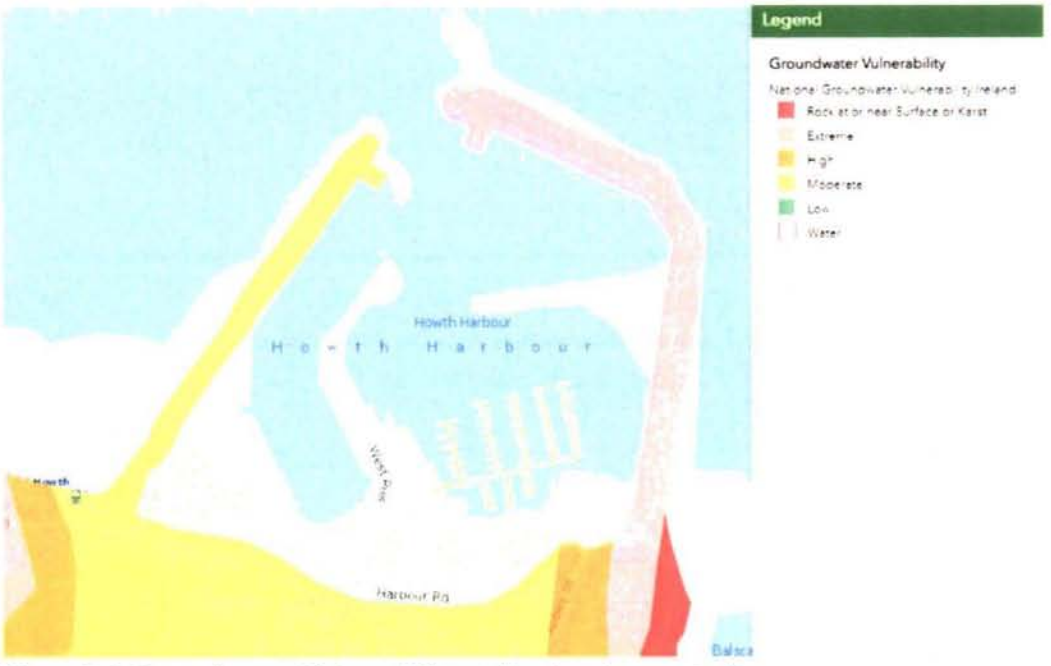

Figure 7.2 Groundwater Vulnerability at the development site

7.2.5 Water Quality

7.2.5.1 Surface Water Quality

In line with the Water Framework Directive (WFD), the EPA provides information on the water quality status of waterbodies. The WFD water quality status of the Irish Sea Dublin (HA09) is good and not at risk.

A summary of the waterbody status associated with the project is summarised in **Table 7.2.**

Table 7.2 Waterbody status for Receiving Waters[1]

Waterbody Code	Waterbody Type	Name	Status	Risk	Objective
IE_EA_070_0000	Coastal	Irish sea Dublin (HA 09)	Good	Not At Risk	n/a

The Generic Quantitative Risk Assessment undertaken for the project (**Appendix 10**) indicates that the sediments within the harbour are contaminated and not suitable for disposal at sea. Leachate analysis (**Appendix 10 GQRA Table 3**) indicates the potential for heavy metals to be present in solution in the waters around the sediments.

The GQRA assessment indicates that the majority of the contaminants are in the sediments within the inner harbour and not in solution in the waters. The risk to water quality currently is from the

[1]http://watermaps.wfdireland.ie/NsShare_Web/ReportViewer.aspx?reportName=rwb_all&layer=transitional&eu_cd=IE_SW_060_0750 [Accessed 06/09/2019]

sediments going into suspension. The waters within the harbour have a high suspended solids content at specific times of the tide. See **Plate 1** for the visual assessment of sediments in suspension during tidal flows.

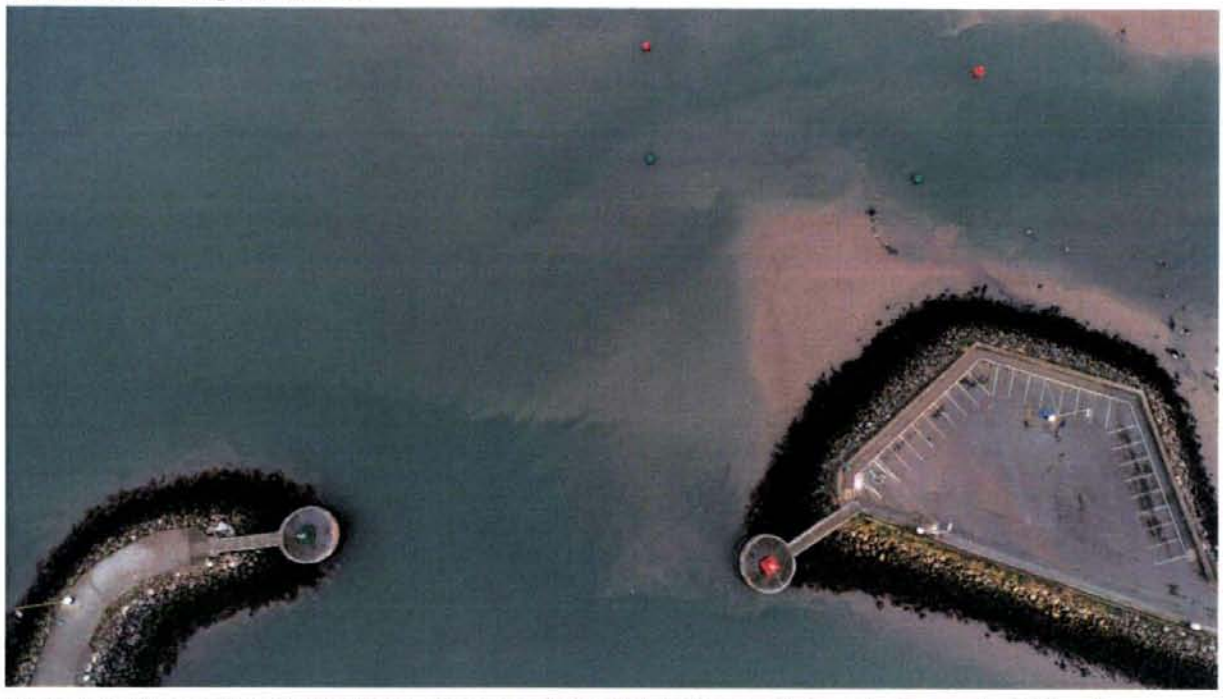

Plate 1 Sediment flow in the form of suspended solids between the west pier and middle pier.

Waters outside the harbour also contain suspended solids at certain times depending on the wave action and tidal currents. There is a natural movement of sediments along the coastline (see **Plate 2**) indicating that suspended solids increase at certain times such as high wave action and strong tidal currents.

Plate 2 Suspended solids flow outside the harbour. The source of suspended solids in this picture is from south of the harbour.

7.2.6 Do-Nothing Scenario

This section describes the current state of the hydrological and hydrogeological environment at the site and how it would be expected to evolve without the carrying out of the proposed dredge and reclamation works. Under a do-nothing scenario the following could be expected:

- The harbour would continue to silt up and would lose its functionality in time.
- The sediments would continue to go into suspension during storms and tidal currents and be carried out into the wider environment.

7.3 Likely Significant Impacts

This section addresses the potential impacts on the hydrological and hydrogeological environment from activities arising during construction and operation of the proposed development and makes a determination on the likelihood of occurrence.

7.3.1 Summary of the Proposed Development

The proposed development involves the following main elements:

- Dredging the harbour;
- Treatment of the dredge material;
- Reclaiming land on the west side of the west pier using dredge material;
- Coastal protection works to the perimeter of the reclaimed area;
- Landscaping on the reclaimed area;
- Provision of pavements e.g. footways, roadways and parking areas;
- Construction of slipway for access to the water;
- Provision of storage areas for harbour activities; and
- Provision of services.

The proposed works can be divided into 4 key elements as follows:

Element 1: Construction of a perimeter embankment and rock armour revetment to the seawards edge of the reclaimed land area;

- The perimeter construction will include a Geosynthetic Clay Liner (GCL). Once constructed sea water will be trapped inside the reclaimed land and this will have to be pumped out.

Element 2: Dredging of the Inner Harbour;

- The dredging will occur by barge and excavator. The barge when full will bring the dredged material to the middle pier compound where it will be pumped to the treatment plant for Stabilisation and Solidification (S/S).

Element 3: Land Reclamation;

- Sandy and silty material will undergo engineering stabilisation and solidification prior to placement into the reclaimed infill area. Such finer material will be pumped into a processing plant. Coarser materials (greater than say 20mm) will be filtered from the pumped material and transferred separately. A binder will be added to this dredge spoil within the processing plant until a homogenous mix is attained. The binder will consist of a combination of Portland Cement and Ground Granulated Blast Furnace Slag (GGBS) or equivalent. The processed dredge material will then be pumped as a wet mix from the processing plant to the bunded reclaimed land area where it will be deposited as backfill. Excess water (supernatant) will be collected from the surface of deposits and returned to the treatment plant for reuse to fluidise the dredge spoil as necessary to make it pumpable.

Element 4: Finishing's.

- Within the new reclamation area, surface water drainage will be constructed to collect and drain away surface water from areas with impermeable surfaces. Surface water will be collected via gullies and discharged to the sea via a hydrocarbon interceptor/silt trap. Surface water from wave overtopping will be collected in French drains along the seaside pathway and returned directly to the sea. Land drains will be used to drain surface water from soft landscaped areas.

Refer to **Chapter 2 Description of the Proposed Development** for full details.

7.3.2 Construction Phase

In considering the receiving environment and the proposed activities, the principal issues relating to the hydrological and hydrogeological environment during the construction phase is the potential impairment of surface water and/or groundwater quality associated with surface water run-off, de-watering, mobilisation of sediment and potentially existing contamination and accidental spillages / leaks of substances used at construction sites such as lubricants, fuels and oils.

7.3.2.1 Impacts on Hydrology

Surface water could potentially become polluted during the construction phase by residual contamination in the marine sediment which is mobilised during dredging works and/or accidental spillages such as hydrocarbon leaks from construction machinery or by siltation as a result of runoff during construction works. The potential impacts on surface water are outlined in **Table 7.3** below.

There is potential for runoff from stockpiles of coarse dredge sediments that will be stored on the middle pier until transported to the infilling area. The runoff will be of the same nature as the sediments in the harbour due to the fact that the sediments have come from the harbour. In order to minimise impact the run off will be controlled through mitigations outlined in the below **section 7.4** regarding the control of stockpiles.

During the dredging there is potential for sediment to become suspended solids and spread through the water column. A Hydrodynamic assessment (**Appendix 4 Volume 3**) was carried out to assess the movement of the sediments during the dredging phase. The assessment found that the coarse

material has a relatively high fall velocity, and if stirred up into the water column quickly falls to the seabed. Such material would therefore fall close to the dredging point.

The hydrodynamic assessment of impacts of suspended sediment outside the harbour is therefore based on the fine sand/ silt/ clay fraction. The fine sand/ silt/ clay sized material can stay in suspension longer than the coarser fraction and can therefore be transported by tidal currents out of the harbour. The modelling of such movement was used to estimate suspended sediment concentrations and smothering depths due to material settling on the seabed. The one-year model run output for locations along the beach and perimeter were obtained to see if there would be cumulative effects due to the ongoing nature of the dredging. As the dredging continued there would be material escaping into the water column in an ongoing manner. However, this material though fine and consequently having a low settling velocity would be dissipated further and further from the harbour and would settle out over a very large area resulting in a limit to the cumulative effect.

The hydrodynamic assessment calculated the highest concentrations of suspended solids at a sensitive receptor to be on the eastern end of Claremont Beach. The highest concentrations of suspended sediment at the east Claremont Beach location can reach 0.018kg/m^3, or 18mg/l, towards high tide. However, most of the readings are less than 3mg/l. The Generic Quantitative Risk Assessment (GQRA) (**Appendix 10 Volume 3)** looked at the risk of the dredging works on water quality. The GQRA used data from the hydrodynamic assessment and calculated the risk. The GQRA states that unmitigated, there will be an exceedance of the environmental quality standards for two parameters Tributyltin (TBT) and Benzo(g,h,i)-perylene. Without mitigations the AA EQS for TBT will be exceeded by a factor of 6.8 for TBT, the MAC EQS for TBT is calculated to be exceeded by a factor of 78. The MAC EQS for Benzo(g,h,i)-perylene will be exceeded by a factor of 11.8. The MAC EQS exceedances will only happen when the high contaminated areas are dredged in combination with a high tide on Claremont Beach. The GQRA compared the levels of exceedance to drinking water standards to address the human health concern at Claremont Beach. The levels were below the relevant drinking water standards. Unmitigated the impact of these levels will have a short term significant effect on water quality. Mitigations are required in order to reduce the impact on the water quality and are outlined in section 7.4 below.

The hydrodynamic assessment also showed that there is the potential for settlement at locations most impacted by the sediments in suspension. It calculated a 0.4mm deposition rate over one year at the eastern end of Claremont Beach. This deposition rate didn't take into account wave, current and tidal action effecting the material after settlement. On a daily basis wave and current action will remove any deposited sediment and move it further on dissipating it over a further wider area and reducing its potential impact.

The impact from suspended solids due to the dredging is assessed using the above information as a shorth term slight effect on water quality. Mitigations are outlined in the below section 7.4 to ensure that the impact is kept at a reduced level.

Table 7.3 Potential impacts on surface water during the construction phase

Activity	Potential Impacts	Potential effect
Dredging and rock removal from within the harbour area	Transport of contaminated sediment into the water column and out of the harbour.	Short term slight effect on water.
Runoff from stockpiles	Runoff from stockpiles may introduce contaminated sediment into the water column.	Short term not significant effect on water.
Release of excess water/slurry from the reclamation area infilling	Discharge of material during the infilling may impact the receiving waters.	Short term not significant effect on water.

7.3.2.2 Impacts on Hydrogeology

Potential impacts that could occur to groundwater during the construction phase are described below in **Table 7.4.**

During construction works, there is the potential for the leaching of contaminants from the stabilised material during the curing period into the underlying groundwater. As part of the construction of the revetment wall a Geosynthetic Clay Liner (GCL) barrier will be in the perimeter of the infilling area, this will retard groundwater movement. Leaching of the contaminants from the stabilised material through the floor of the infilling area is not expected as the contaminants are bound to the viscous stabilised material which will cure within a few days binding it even further. During construction there will be a short term imperceptible effect on the groundwater from the contaminants in the stabilised material.

Table 7.4 Potential impacts on groundwater during the construction phase

Activity	Potential Impacts	Potential effect
Infilling of reclamation area	Leaching of contaminates in the reclamation area into the underlying groundwater.	Likely short term imperceptible effect

7.3.3 Operational Phase

7.3.3.1 Impacts on Hydrology

Table 7.5, below, describes the potential impacts on hydrology during the operational phase.

During the operational phase of the project, the reclaimed land will contain low permeability solidified and stabilised (S/S) sediments. This is a common and accepted method of re-use for contaminated and uncontaminated dredged sediments and has been completed successfully at a number of locations in the UK and Europe. Previous assessments of contaminated dredge material in Ireland have shown that mixing the sediments with cements, clays and other materials will successfully contain the potentially polluting parameters and prevent them leaching back into the environment.

During the operational phase the majority of the contaminated sediments will have been removed from the harbour. This will reduce the potential for suspended solids and contaminants to go mobile and impact on water quality in the area. The removal of the sediment from the harbour will have a permanent not significant positive effect on water quality.

As part of this EIAR, a Generic Quantitative Risk Assessment (GQRA) (**Appendix 10 Volume 3)** was carried out on the risk associated with this stabilised material. The GQRA indicates that mixing of the material with different percentages and types of binder will greatly reduce the potential leachability of any contaminants. The connectivity of the treated material with the open waters will be reduced further by the low permeability of the engineered materials (Geosynthetic Clay Liner) contained in the perimeter engineered revetment structure. The calculations indicate that if the maximum leaching of contaminants were to occur, their dilution in the mixing zone of the internal pore space of the revetment wall would result in no concentrations of potentially polluting parameters greater than the EQS entering the sea in the short or long term. The low level of potential leaching that will occur will happen over the long term. It is expected that the leaching behaviour will reduce with time as the outer layers are washed. The quantitative risk assessment indicates the risk associated with the leaching to be a negligible long term risk to water quality. This is assessed as a permanent imperceptible negative effect on water quality from the S/S sediments in the reclamation area.

Current and wave action impact

The impacts of the change in current flow from the reclamation area are presented in the Hydrodynamic and Sediment Regime Assessment in **Appendix 4.** The results indicate that there will be a minor slowing in the current in the immediate vicinity of the perimeter of the proposed reclamation area. Away from the perimeter impacts are considered minimal. There will also be a minor reduction in wave height impacting on Claremont strand. The minor changes are considered to impact on Claremont strand by reducing very slightly the erosion potential on embryo dunes on the beach. Impacts on wave driven erosion / accretion patterns on the west of the harbour are considered to be minimal. Impacts on other areas of coastline are considered imperceptible.

The impact of the reclamation area on current and wave action will be a permanent imperceptible effect.

Stormwater Drainage System

The storm water drainage system is designed to direct the flow into the sea. The system will incorporate a triple interceptor trap before the water is discharged to the sea. The maintenance of the traps will remove solids and hydrocarbons from the stormwater. The impact on the receiving waters will have a permanent imperceptible effect on water quality.

Flood Risk Assessment

The land reclamation area is designed to take water on in storm conditions and shed it back into the sea as quickly as possible with no repercussions to flooding in the area. The proposed development will not increase flood risk outside the confines of the site.

Given the above, no significant impacts to the sites hydrological regime and the water quality of the Irish Sea are expected as a result of the operational phase of the proposed development.

Table 7.5 Potential impacts on surface water during the operational phase

Activity	Potential Impacts	Potential effect
Dredging the sediments from the harbour	Reduces the potential for suspended solids and contaminants to go mobile and impact on water quality in the area.	Permanent not significant positive effect on water quality.
Land reclamation area	Leaching of contaminants from S/S sediments into the surrounding waters.	Permanent Imperceptible negative effect on water.
Wave and current action	Minor reduction in current velocity close to the reclamation area and minor reduction in wave height impacting on Claremont Beach.	Permanent imperceptible effect on water.
Storm water drainage system	Release of suspended solids and hydrocarbons into the sea.	Permanent imperceptible effect on water quality.

7.3.3.2 Impacts on Hydrogeology

Table 7.6, below, describes the potential impacts on hydrogeology during the operational phase.

During the operational phase, there is the potential for the leaching of contaminants from the stabilised material into the underlying groundwater. As part of the construction of the revetment wall a Geosynthetic Clay Liner (GCL) barrier will be in the perimeter of the infilling area, this will retard groundwater movement. Leaching of the contaminants from the stabilised material through the floor of the infilling area is not expected as the contaminants are bound to the S/S sediments. During the operational phase there will be a permanent imperceptible effect on the groundwater from the contaminants in the stabilised material.

Table 7.6 Potential Impacts on Groundwater – Operational Phase

Activity	Potential Impacts	Potential effect
Land reclamation area	Leaching of contaminants from S/S sediments into the surrounding waters.	Permanent imperceptible impacts on groundwater quality.

7.3.4 *Risk of Major Accidents and Disasters*

Possible accidents which may occur are as follows:

- Large scale accidental spillage of chemicals resulting in contamination of surface water.

Taking cognisance of the surface water mitigation measures proposed for the construction phase of the proposed development as outlined in **Section 7.4**, below, the nature of the proposed development and given the dilution effect of the Irish Sea, the likelihood of any accidental discharge of surface water plumes are unlikely to have a significant impact on the water quality of the receiving waters. The proposed development is unlikely to pose a risk of a major accident that could impact upon hydrogeology.

7.3.5 *Cumulative Impacts*

A cumulative impact assessment was carried out specifically for water that included existing and permitted developments that are relevant to this chapter.

There are a number of current grants of permission for remediation and extension works to existing dwellings and buildings in the greater area.

Additionally, permission has been granted for the provision of a 134m long quay wall, associated deck and hard standing area, road access, dredging to the front of the new quay wall to provide berthing depth and land reclamation of an approximate area of 0.30ha on the east side of the Middle Pier at Howth Harbour (F19A/0296). These works commenced in late 2020 and should take a total of 12-15 months, including site set-up and demobilisation.

Fingal County Council granted permission (F19A/0287) for reinstatement of the existing boat shed to match the previous building complete with domed roof, on the northern end of the East Pier of Howth Fishery Harbour Centre (Protected Structure No. RPS 595).

An Bord Pleanála permission (PL06F.302039) granted for the development of a new waste water treatment plant in Clonsaugh Co. Dublin with an outfall 1 km north east of Irelands Eye. This is referred to as the Greater Dublin Drainage (GDD) Project. Irish Water have started surveys prior to construction of the GDD project and it is expected to be operational in 2026. The outfall is approximately 3km northeast of the proposed Howth harbour dredge and reclamation project.

7.3.5.1 Hydrology

It is not expected that there will be an overlap of works with the current middle pier works. Once finished, the operational middle pier will not have a cumulative impact with the proposed dredging works.

The Greater Dublin Drainage (GDD) Project is going to be constructed between 2022 and 2026. It is expected to be operational in 2026. The outfall construction (2022 – 2024) will happen at the same time as the proposed Howth FHC dredge project. The construction phase of the Howth FHC dredge will be complete before the GDD outfall becomes operational. The distance of approximately 3km between the projects is considered to be far enough apart that any sediments that do interact will be of such a small amount that there will be no significant effect on water quality. The suspended sediments created from the outfall construction would be expected to be uncontaminated creating no cumulative impact from contaminants. The cumulative impact from suspended sediments from both projects is considered to be a short term not significant effect on water quality. The operational phases of both the Howth FHC dredge and the outfall from the GDD project will not create a significant cumulative impact on water. This is due to the operational phase of the Howth FHC dredge project having a likely permanent imperceptible effect on water quality.

The current discharge at Doldrum Bay is a small domestic sewage discharge on the southern side of the Howth headland. The main risk to water quality from this discharge is coliforms. Coliforms are not a risk from the dredged sediments during the construction works. The distance from Howth harbour to Doldrum Bay would reduce any other potential cumulative impact on water quality. As such there is no significant cumulative effect on water quality.

Overall, there will not be a cumulative impact on water quality that would be considered a significant impact.

7.3.5.2 Hydrogeology

No potential cumulative impacts on hydrogeology are expected due to the proposed concurrent works.

7.4 Mitigation

7.4.1 Construction Phase

The contractor will develop and implement a detailed construction environmental management plan (CEMP). Refer to **Appendix 8 of Volume 3 in this EIAR** for the preliminary CEMP prepared as part of this planning application.

7.4.1.1 Monitoring

The proposed dredging and reclamation works will be subject to the conditions and monitoring requirements of either an Industrial Emissions licence or a waste licence from the EPA. Limits on turbidity or suspended solids in the harbour during the construction phase will be agreed with the relevant authority prior to commencement of works. The water quality will be monitored during works by the following methods:

1. Fixed station in situ water quality monitoring
2. Boat-based in situ water quality monitoring
3. Visual water quality monitoring
4. Laboratory water quality monitoring

Fixed station in situ water quality monitoring

Turbidity sensors will be used to determine turbidity during the dredging operation using in-situ readings. Continuous, real-time, in situ water quality data will be collected through the use of sensors deployed on a buoy near the construction site. High-frequency data is averaged at regular intervals and uploaded via telemetry to a website.

Fixed locations for turbidity sensors will be identified and agreed with the relevant authority.

Boat-based in situ water quality monitoring

Monthly mobile manual monitoring will also take place by boat-based water quality monitoring, the frequency of which will be approved by the relevant authority. The manual monitoring will be a combination of in situ testing and/or lab testing as agreed with the relevant authority.

Visual water quality monitoring

Daily visual monitoring will also be carried out from the shore and dredging vessel by the Contractor and Resident Engineer. The visual monitoring will include:

- Visual monitoring for suspended solids within and outside of the harbour.
- Daily inspection of surface water management systems including the stockpile drainage locations and any authorised discharge locations.
- A log will be kept of all visual monitoring.

Laboratory water quality testing

Samples will be collected at agreed regular intervals and locations to test for suspended solids. The plan will be approved by the relevant authority.

7.4.1.2 Control of Suspended Solids during Dredging

During the dredging works, loss of suspended sediments will be controlled with the use of environmental buckets. A Water Quality Management Programme (WQMP) will be prepared by the contractor and implemented to incorporate the mitigation measures outlined in this section. Mitigations are as follows;

- Environmental buckets to be fitted to the dredge excavator;
- Silt curtains to be placed around the dredge as it is working;

- Monitoring of the waters outside the harbour in line with agreed parameters and limits from the licencing authority; and
- If monitoring indicates exceedances of agreed limits further management of the dredging methods will be undertaken to bring concentrations below the exceedance limits.

Once mitigations are in place the impact from dredging will have a short term not significant negative effect on water quality.

7.4.1.3 Concrete/Cementitious materials

Concrete required for the reclamation area works will be poured *in situ*. The following measures will be implemented during the use of concrete:

- To reduce the potential for cementitious material entering the harbour, concrete pours will be supervised by the Construction Manager/suitably qualified Engineer/Environmental Manager.
- The Construction Manager/Site Engineer will ensure that the formwork for the concrete works, are completely sealed prior to concrete pour, and there is no potential for concrete to enter the adjoining waters.
- Weather and tidal conditions will be monitored, as to allow sufficient time for the concrete to cure, preventing runoff.
- In the event of a spillage on site, the Environmental Manager/Site Engineer will shut down the supply of concrete immediately, and temporarily seal off the area. Any spillage will be collected immediately, before entering marine waters, and deposited in an appropriate manner/area/removed off site to an appropriate licensed landfill.
- If dewatering is required, all contaminated water will be pumped to suitably sized settlement area/tank/bowser and treated, in order to prevent solids/contaminants escaping to the Harbour.
- pH will be monitored continuously in the Water Quality Management Plan.
- To reduce the volume of cementitious water, washout of concrete trucks will not take place on site. Concrete trucks will be washed out off site, at the batch area/source quarry.

7.4.1.4 Reclamation area sea water control

Once the perimeter embankment is created, it is expected that there will be a sea water pool trapped within the reclamation area. Dewatering of this clean seawater back to the sea will occur under appropriate discharge authorisations and will be monitored to ensure limit parameters are complied with.

7.4.1.5 Stabilised and solidified sediment mitigations

- Once stabilised dredge material is pumped into the reclamation area, excess water (supernatant) will form on the surface. Excess water (supernatant) will be collected from the surface of deposits and returned to the treatment plant for reuse to fluidise the dredge spoil as necessary to make it pumpable. In cases where there is a higher amount of excess

water then is required for reuse, then the excess water or trade effluent will be appropriately treated to remove sediment and discharged to the sewer system or storm water system or tankered off site, as appropriate and authorised under the EPA licence.

- The treatment locations will be supervised by either the Site Engineer/ Environmental Clerk of Works / Environmental Manager.
- As cement will be used in the treatment process, all high-alkaline water draining from the facilities will be neutralised in a settlement area (by dosing with CO^2), before being discharged under authorisation, after settlement, back into Howth Harbour, preferably toward the inner end of the harbour.

7.4.1.6 Fuel and Oil (Construction Phase)

A fuel management plan will be implemented, which will incorporate the following elements:

Vessels/barge/s

- It is recommended that appropriate fuel management measures are put in place and agreed with the Harbour Master prior to the works commencing, to ensure that no significant negative impacts occur to water quality.
- Potential leaks from vessels/boats will be mitigated by contractually requiring the contractors to only operate/supply vessels/boats that are in good working order, up to date in servicing etc., and free of leaks.

Refuelling of Construction Plant On-Site

- Refuelling will be carried out using 110% capacity double bunded mobile bowsers. The refuelling bowser will be operated by trained personnel. The bowser will have spill containment equipment which the operators will be fully trained in using.
- Plant nappies or absorbent mats to be place under refuelling point during all refuelling to absorb drips.
- Mobile bowsers, tanks and drums should be stored in secure, impermeable storage area, away from drains and open water.
- To reduce the potential for oil leaks, only vehicles and machinery will be allowed onto the site that are mechanically sound. An up to date service record will be required from the main contractor.
- Should there be an oil leak or spill, the leak or spill will be contained immediately using oil spill kits; the nearby dirty water drain outlet will be blocked with an oil absorbent boom until the fuel/oil spill has been cleaned up and all oil and any contaminated material removed from the area. This contaminated material will be properly disposed of in a licensed facility.
- The site Environmental representative will be immediately informed of the oil leak/spill, and will assess the cause and the management of the clean-up of the leak or spill. They will inspect nearby drains for the presence of oil, and initiate the clean-up if necessary.
- Immediate action will be facilitated by easy access to oil spill kits. An oil spill kit that includes absorbing pads and socks will be kept at the site compound and also in site vehicles and machinery.
- Correct action in the event of a leak or spill will be facilitated by training all vehicle / machinery operators in the use of the spill kits and the correct containment and cleaning up

of oil spills or leaks. This training will be provided by the Environmental Manager at site induction.

- In the event of a major oil spill, a company who provide a rapid response emergency service for major fuel spills will be immediately called for assistance, their contact details will be kept in the site office and in the spill kits kept in site vehicles and machinery.

7.4.1.7 Temporary Construction Compound

- Drainage within the temporary site compound will be directed to an oil interceptor to prevent pollution if any spillage occurs.
- Temporary toilet facilities will be managed by the Contractor during the construction phase. The sewage tank will be emptied as required by a vacuum tanker, and removed from site to a licensed facility. These staff facilities will be removed at the end of the construction phase.
- A bunded containment area will be provided within the compound for the storage of fuels, lubricants, oils etc.
- The compound will be in place for the duration of the construction phase and will be removed once commissioning is complete.
- Treatment of dredge material will be carried out in an enclosed and controlled material treatment plant. The facility consisting of the mixing plant, binder silos, storage areas and pumps will be fully bunded. Any loss of dredge material within the bunded area will be collected and fed through the treatment facility again for disposal within the reclaimed area.

7.4.1.8 Storage and Stockpiles

- Stockpiles will be located away from drainage systems and silt retaining measures (silt fence/silt curtain or other suitable materials) to reduce risk of silt run-off shall be installed along the downgradient edges of stockpiled earth materials.
- Temporary storage areas for fuels and other hazardous materials required by the contractor during construction will be stored in appropriately bunded facilities to prevent the accidental spillage of hazardous liquids that could cause soil and groundwater contamination.
- Collision with oil stores will be prevented by locating oils within a steel container in a designated area of the site compound away from vehicle movements.
- Long term storage of waste oils will not be allowed on site. These waste oils will be collected in leak-proof containers and removed from the site for disposal or re-cycling by an approved service provider.
- The scale of potential impacts on water quality will be reduced by only storing the required volume of oils for the works taking place at the time.
- Oil and fuel stored in bunded areas shall be stores an appropriate distance from any watercourse/discharge point etc, as to prevent accidental spills entering the harbour.
- Access to oil stores will be controlled by the storage of oils/fuels within a locked steel container/designated area, and cannot be accessed when there are no site personnel present.
- Collision with oil stores will be prevented by highly visible signs/posted.
- Leakages of oil from oil stores will be prevented by storing these oils in bunded tanks which have a capacity of 110% of the total volume of the stored oil. Ancillary equipment such as

hoses and pipes will be contained within the bunded storage container. Taps, nozzles, or valves will be fitted with a lock system.

- The volume of leakages will be prevented through monitoring oil storage tanks/drums for leaks and signs of damage. This will be carried out daily/regularly by the Environmental Manager.
- Long term storage of waste oils will not be allowed on site. These waste oils will be collected in leak-proof containers, and removed from the site for disposal, or re-cycling by an approved service provider.

7.4.2 Operation Phase

Surface water run-off will be collected through a network of gullies feeding into storm water drains. The drains will collect at a number of hydrocarbon/silt interceptors before out falling into the sea through headwalls in the proposed revetment. Maintenance of the interceptors will be carried out periodically during the operation of the west pier.

Monitoring

Monitoring of the water quality during both the construction and operational phases will take place. The monitoring will be in accordance with an EPA issued licence needed to undertake the proposed works. The monitoring will include sampling and testing of the waters to show compliance with the EPA licence. The licence will not be surrendered until the EPA are satisfied there is no environmental liability with the proposed project.

7.5 Residual Impacts

Construction Phase

During the construction phase water quality will be impacted by sediment suspended solids. Mitigations will be implemented to monitor and reduce these impacts. The residual impact will have a likely short term not significant adverse effect on water quality.

Operational phase

In the long term, the risk to water quality will come from the S/S sediment that will permanently remain in the reclaimed land. The GQRA has assessed this risk. Leaching will occur at a level that will meet the EQS for surface waters. The S/S sediments will be a low permeable material that will resist leaching. The residual impact of the S/S sediment will have a likely permanent imperceptible negative effect on water quality.

The removal of the contaminated sediments and containing them within the reclaimed land will have a permanent not significant positive effect on water quality.

7.6 References

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8 AIR AND CLIMATE

8.1 INTRODUCTION

Howth Fishery Harbour Centre (Howth FHC) proposes to undertake dredging at Howth Harbour, Co. Dublin. The resultant dredge spoil will be stabilised and transported to the western pier where it will be used to reclaim an area of land just west of this pier. The site is situated on the north side of Howth Peninsula, to the north of Dublin Bay (**Figure 8.1**).

This chapter comprises an assessment of the likely impacts the proposed development, as outlined in **Chapter 2 Description of the Proposed Development**, will have on Air Quality and Climate.

Figure 8.1 Site location – local and greater area

The main air quality impacts relating to the proposed development which are likely to occur relate mainly to the use of machinery associated with the dredging and reclamation works.

The impact assessment methodology, summary of the proposed development, receiving environment, likely significant impacts, and recommended mitigation measures are described in the following sections.

8.1.1 Methodology

To assess the impacts on air quality and climate from this proposal, a detailed desktop review was completed. This review aimed to assess baseline air quality and all relevant project activities to determine the likelihood and significance of any emissions arising.

The following information was reviewed as part of the desktop assessment:

- Existing EPA air quality monitoring data to characterise existing baseline air quality;
- Identification of sensitive receptors within the site and in close proximity to the area;
- Relevant assessment criteria, guidelines and best practice to assess the potential impact of the proposed development on air quality (at sensitive receptors) and climate;
- The construction methodology and its potential for dust generation.

8.1.2 Sources of Information

A review of all relevant guidance, best practice and legislation was also completed.

The following legislation and published guidance has been consulted in undertaking this assessment:

- EU EIA Directive 2014/52/EU on the assessment of the effects of certain public and private projects on the environment (2014 EIA Directive);
- Revised (draft) EPA Guidelines on the Information to be Contained in Environmental Impact Reports (EPA, August 2017);
- Revised (draft) EPA Advice Notes for Preparing Environmental Impact Assessments (EPA, September 2015);
- Transport Infrastructure Ireland (TII), (formerly the National Roads Authority (NRA)) (2011). Guidelines for the Treatment of Air Quality during the Planning and Construction of National Roads Schemes. TII, Dublin, Ireland.

8.1.3 Assessment Criteria

8.1.3.1 Climate Change and Policy Context

Ireland is a party to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement, which together provide an international legal framework for addressing climate change. The Paris Agreement is the new legally binding, global agreement addressing climate change under the UNFCCC. The Paris Agreement was adopted by 195 Parties to the UNFCCC, representing 95% of global emissions, at the twenty-first session of the Conference of the Parties to the UNFCCC in December 2015. The ratification of the Agreement by the European Union triggered its entry into force on 4 November 2016, the same date the Agreement was ratified by Ireland. This legally-binding agreement represents a global milestone in international efforts to achieve a peaking of greenhouse gas emissions as soon as possible and to achieve net zero emissions by the second half of the century. The overall aims of the agreement are to limit global warming to no more than 2°C above pre-industrial levels, and to attempt to limit warming to no more than 1.5°C above pre-industrial levels.

Each party to the agreement must commit to a Nationally Determined Contribution (NDC) that shall increase in ambition over time, with progress being tracked by a series of global stocktakes, to be held every five years, starting in 2023. Ireland's contribution to the Paris Agreement will be via the NDC tabled by the EU on behalf of its Member States. The EU as a whole has committed to reducing its greenhouse gas (GHG) emissions by at least 40% in 2030 and by 80% to 95% by 2050.

8.1.3.2 National policy

With a view towards strengthening the country's resolve towards meeting its targets, the Irish Government published the Climate Action Plan in 2019. The plan defines a roadmap for achieving a net zero carbon energy system. Included within this plan is a detailed sectoral roadmap, designed to deliver a cumulative reduction in emissions between 2021 and 2030. Within the context of this report, the plan outlines targets for the energy sector, the details for which are as follows:

- "Increase reliance on renewables from 30% to 70% adding 12GW of renewable energy capacity (with peat and coal plants closing) with some of this delivered by private contracts"
- "Put in place a coherent support scheme for micro-generation with a price for selling power to the grid"
- "Open up opportunity for community participation in renewable generation as well as community gain arrangements"
- "Streamline the consent system, the connection arrangements, and the funding supports for the new technologies on and offshore"

Additional details on the plan are available at https://www.gov.ie/en/publication/5350ae-climate-action-plan.

8.1.3.3 Clean Air for Europe (CAFE) Directive (2008/50/EC)

In May 2008, the Ambient Air Quality and Clear Air for Europe (CAFE) Directive (2008/50/EC) was published. This Directive outlines the air quality standards for Ireland and other EU member states for a wide variety of pollutants.

The standards set out in this Directive include how air quality should be monitored, assessed, and managed. This EU legislation was transposed into Irish law via the National Air Quality Standards Regulations (S.I No. 180 of 2011). This is the main Irish ambient air quality legislation currently in force.

The CAFE Directive, replaced the 1996 Air Quality Framework Directive (96/62/EC) and three of its four "daughter" Directives. The fourth Daughter Directive (2004/107/EC) covers polyaromatic hydrocarbons, arsenic, nickel, cadmium, and mercury in ambient air. This Directive was transposed into Irish legislation by the Arsenic, Cadmium, Mercury, Nickel, and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I. No. 58 of 2009). **Table 8.1**, below outlines the Limit Values for pollutants as set out in the CAFE Directive.

Table 8.1 Limit values of CAFE Directive (2008/50/EC)

Pollutant	Limit Value Objective	Averaging Period	Limit Value ug/m3	Limit Value ppb	Basis of Application of the Limit Value	Limit Value Attainment Date
SO_2	Protection of human health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year	1 Jan 2005
SO_2	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year	1 Jan 2005
SO_2	Protection of vegetation	calendar year	20	7.5	Annual mean	19 July 2001
SO_2	Protection of vegetation	1 Oct to 31 Mar	20	7.5	Winter mean	19 July 2001
NO_2	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in a calendar year	1 Jan 2010
NO_2	Protection of human health	calendar year	40	21	Annual mean	1 Jan 2010
$NO + NO_2$	Protection of ecosystems	calendar year	30	16	Annual mean	19 July 2001
PM_{10}	Protection of human health	24 hours	50		Not to be exceeded more than 35 times in a calendar year	1 Jan 2005
PM_{10}	Protection of human health	calendar year	40		Annual mean	1 Jan 2005
$PM_{2.5}$ - Stage 1	Protection of human health	calendar year	25		Annual mean	1 Jan 2015
$PM_{2.5}$ - Stage 2	Protection of human health	calendar year	20		Annual mean	1 Jan 2020
Lead	Protection of human health	calendar year	0.5		Annual mean	1 Jan 2005
Carbon Monoxide	Protection of human health	8 hours	10,000	8620	Not to be exceeded	1 Jan 2005
Benzene	Protection of human health	calendar year	5	1.5	Annual mean	1 Jan 2010

Source: EPA Air Quality monitoring https://www.epa.ie/air/quality/standards/

8.1.3.4 National Air Quality Standards (NAQS)

The National Air Quality Standards (NAQS) Regulations (S.I No. 180 of 2011) aim to protect air quality in terms of community exposure and the environment.

The NAQs Regulations set out limits for Nitrogen Dioxide (NO_2), Nitrogen Oxides (NO_x) and Particulates (as PM_{10}). These are shown below in **Table 8.2**, below.

Table 8.2 Air Quality Standards Regulations 2011 (SI No 180 of 2011)
Annual limit value for the protection of vegetation

Pollutant	Criteria	(µg/m³)
Nitrogen Dioxide (NO_2)	Hourly – 99.8% (not to be exceeded more than 18 times per year)	200
	Annual Average	40
Nitrogen Oxides (NO_x)[a]	Annual Average	30
Particulates (as PM_{10})	Daily – 90.4% (not to be exceeded more than 35 times per year)	50
	Annual Average	40

8.1.3.5 TII Air Quality Guidelines

Significance criteria were adopted from the TII air quality guidelines as presented in **Table 8.3**. These criteria provide a basis for assessing the level of impact due to the additional traffic present during the construction phase.

8.1.3.6 Dust Deposition Guidelines

Construction dust has the potential to cause local impacts through dust nuisance at the nearest residential houses and sensitive ecosystems. Construction activities such as demolition and excavation may generate dust, particularly in dry weather conditions.

There are no statutory limits for deposition of dusts and industry guidelines are typically employed to determine any impact. The TA Luft (German Government 'Technical Instructions on Air Quality') states a guideline of 350 mg/m²/day for the deposition of non-hazardous dusts. This value will be used to determine the impact of residual dust as an environmental nuisance

The National Roads Authority (NRA) has published guidance for assessing dust impacts from road construction *'Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes'* (2011). This has been used to determine the potential impacts from the proposed construction activities.

Table 8.3 below provides a list of distances at which dust can be expected to result in a nuisance from construction sites. These distances present the potential for dust impact with standard construction mitigation measures in place.

Table 8.3 Assessment Criteria for the impact of dust from construction with standard mitigation measures in place

Source		Potential distance for significant effects (distance from source)		
Scale	**Description**	**Soiling**	**PM_{10}**	**Vegetation**
Major	Large construction sites, with high use of haul roads	100m	25m	25m
Moderate	Moderate sized construction sites, with moderate use of haul roads	50m	15m	15m
Minor	Minor construction sites, with limited use of haul roads.	25m	10m	10m

Source: National Roads Authority (NRA) Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes

An assessment of the increase in AADTs (Annual Average Daily Traffic) was carried out on roads in close proximity to the proposed development as part of the traffic impact assessment presented in **Chapter 13 Traffic and Transportation** in order to determine if a detailed Air Quality Assessment was required.

The TII Guidelines state that increases in Annual Average Daily Traffic (AADT) flows during the construction phase of less than 10% are unlikely to result in significant air quality impacts. The

predicted AADTs during construction are less than 10%. Therefore, significant negative effects on air quality in proximity to sensitive receptors due to an increase in traffic movements are not envisaged.

8.1.4 Scope of Assessment

The aim of this assessment is to consider the impacts that will arise from the proposed development on air quality and climate. It will also assess the potential cumulative effect on receptors from the proposed development.

Once the construction phase of the proposed development has been completed there will be no significant emissions to the atmosphere. Therefore, while the operational phase of the project is addressed in the following sections, the assessment will focus primarily on the construction phase.

Due to the nature and temporary duration of the construction phase of the proposed development (approximately 24 months), the impact on regional and national air quality is considered to be negligible. The scope of this assessment focuses primarily on the likely significant impacts to existing local air quality.

8.2 EXISTING ENVIRONMENT

8.2.1 Site context

Howth Harbour is situated on the north side of Howth Peninsula, to the north of Dublin Bay (**Figure 8.1** above). The harbour itself comprises of three main areas; a trawler basin entered between two bull-noses to the north, swing moorings area to the east and a marked channel to the yacht club marina.

Howth Harbour operates as a Fishery Harbour Centre under the Department of Agriculture, Food and the Marine. The core fishing fleet is in the order of 50 vessels, and there is significant marine leisure activity including the Howth Yacht Club and the Howth Sailing and Boating Club. There are also a number of restaurants and shops along the West Pier. Fish processing and boat repair works are also undertaken on the harbour.

The nearest urban centre to the proposed development is Howth village. Howth village lies within the Electoral Division of Fingal, and has a population of 8,294 people (CSO, 2016). The largest nearby urban centre is Dublin City to the west, with a total population of 1,173,179.

Representative Environmental Protection Agency (EPA) ambient air quality data has been used to characterise the existing air quality and meteorological conditions in the area. Sensitive receptors include the nearest residential houses and ecologically sensitive areas.

8.2.2 The EPA Air Quality Index for Health (AQIH)

Ambient air quality in Ireland is generally high due to Ireland's location on the western side of Europe, and its exposure to prevailing winds off the Atlantic Ocean to the west of the country.

The EPA manages the National ambient air quality network.The EPA's Air Quality Index for Health (AQIH) is a number from one to ten that describes the current air quality in a region. There are six regions as follows: Dublin, Cork, Large Towns (>15,000 population), Small Towns (5,000 – 15,000 population), Rural East and Rural West.

The AQIH is calculated on an hourly basis using representative sampling from each region. Each region is ranked 1 – 10, with 1 being 'Good' and 10 being 'Very Poor' based on the worst case pollutant in that region. A ranking of 10 means the air quality is 'Very Poor' and a ranking of 1 – 3 inclusive means that the air quality is 'Good'. The AQIH is calculated every hour. The index was accessed via the EPA's website (https://gis.epa.ie/EPAMaps/) on the 2nd September 2019.

The air quality at Howth Harbour and its surrounding environs to the west (Dublin) is currently ranked as '3 - Good'. This is based on the worst case ranking available which was measured in Blanchardstown, located approximately 20km west of Howth Harbour. Refer to **Figure 8.2**, below.

The closest EPA Air Quality Monitoring Station is located at St. Anne's Park, approximately 7.3km south west of the site. The station at St. Anne's which monitors PM_{10} and $PM_{2.5}$, has a ranking of 1 – Good. **Table 8.4**, below outlines the available emission results at the time the website was accessed. Note that values are updated hourly.

Table 8.4 Emissions results available on the EPA website (http://www.epa.ie/air/quality/)

Location	Pollutant	Date	Hourly Value
St. Anne's Park	PM_{10}	12/12/19	6.01* µg/m^3
	$PM_{2.5}$	12/12/19	3.55* µg/m^3

Note* In the AQIH Particulate Matter (PM10 or PM25) is expressed as a rolling 24-hour average value.

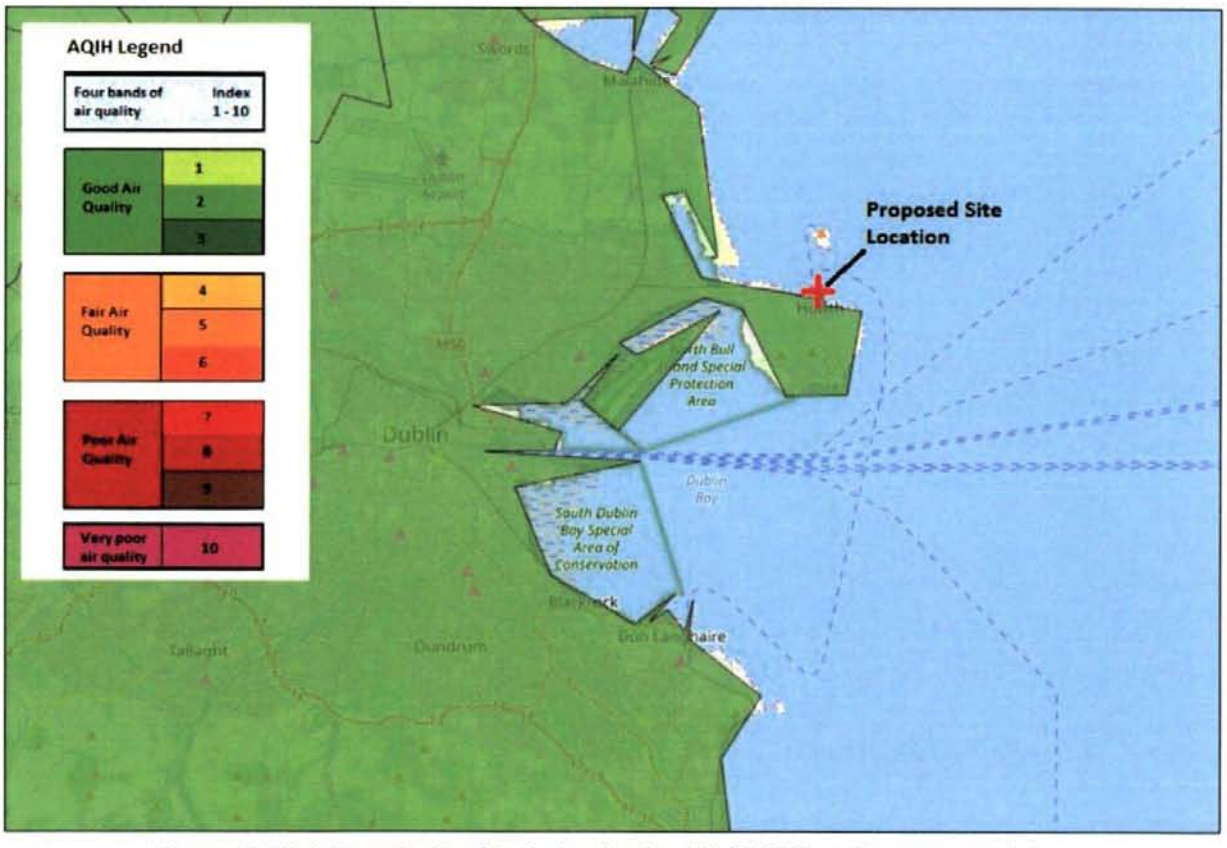

Figure 8.2 Existing Air Quality Index for Health (AQIH) at the proposed site

8.2.3 Existing Sources of Atmospheric Pollution

Local traffic (CO_2, NO_x) and shipping traffic (CO_2, NO_x) emissions along with emissions from nearby industrial facilities, and the urban centres of Howth village and Dublin City are the principal nearby potential sources of air pollution.

8.2.3.1 Licensed Air Emission Points

There are no licensed emission points located on the proposed development site. The closest facility which holds an EPA Industrial Emissions Licence (Reg No. P0097-01) is Newport Synthesis Ltd. The facility is located at Baldoyle Industrial Estate, approximately 5km west of Howth Harbour.

8.2.3.2 Traffic Emissions

Existing traffic consists of commercial and recreational vehicle movements to and from the harbour and local residential traffic along the R105.

The main pollutants of concern from traffic emissions are NO_x and PM_{10}. The R105 which borders the harbour to the south, is one of two main access roads to Howth peninsula, and therefore experiences the largest volumes of road traffic.

8.2.3.3 Rail

The Dublin – Howth railway (Dart) line terminates to the south west of the harbour.

8.2.3.4 Urban Emissions

Howth Harbour is located in a predominantly urban area, in close proximity to Ireland's largest city. A golf course lies to the south west beyond the retail area on the R105. The peninsula consists of a mix of mainly residential and recreational areas.

The impact of urban emissions on ambient air quality in the region is most likely as a result of urban activities, such as home heating and emissions from road traffic. Emissions from such sources are most likely to consist of $PM_{2.5}$, PM_{10} and CO_2.

8.2.3.5 Shipping

Fisheries

Some 50 fishing vessels use the harbour, with approximately 3 crew on each craft. BIM statistics from 2019 (BIM "The Business of Food", 2019) valued the landings of fish at Howth at €11 million. Howth FHC was 5th in terms of fishery landings at Fishery Harbour Centres in 2019.The harbour has 650m of berthing quay face available and an ice plant.

Shipyard

There is a functioning shipyard, with electric power supply and fresh water, for use to all types of vessels. Engine repairs can be undertaken locally. Electronic and radio repairs are carried out by agents for all gear. The Harbour offers a service to lift and transfer vessels to the shipyard. An average of 50 to 70 vessels use the boatyard each year.

RNLI

The RNLI operate an inshore lifeboat from a station situated within the Marina Area, just west of the Yacht Club Marina.

Marina

Howth Yacht Club marina is a private members sailing club with a 250 berth marina.

8.2.3.6 Tourism

Howth is a popular tourist destination with easy access via the DART. Tourists come to Howth to sight-see at the harbour, to walk on the piers and hill and also to take boat trips from the harbour. A passenger ferry pontoon is located on the West Pier. The local golf course is also a popular recreational attraction. Estimates from Fingal County Council are that between 700,000 and 1,000,000 people visit Howth Peninsula on an annual basis. A large proportion of whom would move through the harbour due to its location and proximity to the DART station and parking.

8.2.4 Sensitive Receptors

The proposed development is located within a densely populated area with a population of approximately 8,294 people (CSO, 2016). The nearest residential receptors are located along the R105 to the south of the proposed site.

Under the Birds Directive (79/409/EEC) and Habitats Directive (92/43/EEC), Ireland has identified 154 sites as Special Protection Areas (SPA) (NPWS, 2018a) and approximately 13,500 square kilometres of land, lakes and marine environments as Special Areas of Conservation (SAC) (NPWS, 2018b). These are known as Natura 2000 sites and the biodiversity of these sites is required to be protected.

It is well documented that certain forms of atmospheric pollution such as nitrogen and its deposition into the environment are a threat to biodiversity. Ammonia has been found to reduce biodiversity at Natura 2000 sites. There are 18 Natura 2000 sites in the vicinity of the site as identified in **Table 8.5**, below.

Table 8.5 List of Natura 2000 sites located within 15km of the proposed development

No.	Designated Site
1	• Howth Head SAC (000202)
2	• Ireland's Eye SPA (004117)
3	• Howth Head Coast SPA (004113)
4	• Rockabill to Dalkey Island SAC (003000)
5	• Baldoyle Bay SAC (000199)
6	• Ireland's Eye SAC (002193)
7	• North Dublin Bay SAC (000206)
8	• North Bull Island SPA (004006)
9	• Baldoyle Bay SPA (004016)
10	• Malahide Estuary SAC (000205)
11	• Malahide Estuary SPA (004025)
12	• South Dublin Bay and River Tolka Estuary SPA (004024)
13	• South Dublin Bay SAC (000210)

14	• Lambay Island SPA (004069)
15	• Lambay Island SAC (000204)
16	• Rogerstown Estuary SPA (004015)
17	• Rogerstown Estuary SAC (000208)
18	• Dalkey Islands SPA (004172)

The location of these sites is illustrated in **Figure 8.3**, below.

Figure 8.3 Proposed Development site in relation to surrounding Natura 2000 sites

8.3 LIKELY SIGNIFICANT IMPACTS

8.3.1 Construction Phase

The main potential impacts of the proposed development on air quality in the receiving environment during the construction stage are from fugitive dust and vehicle emissions associated with the following activities:

- Generation of airborne dust from construction activities
- Deposition of material on public roads during off-site transportation
- Transportation and unloading of materials on, off and around the site.

The movement of machinery, construction vehicles and the use of generators during the construction phase will generate exhaust fumes containing predominantly carbon dioxide (CO_2), sulphur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), and particulate matter (PM_{10}).

8.3.1.1 Dust

All construction phase works will take place within the footprint of the proposed development. The construction phase of the development is likely to be completed within a relatively short timeframe of approximately 24 months.

Using the NRA criteria listed in **Table 8.3**, the construction phase of the proposed dredging and reclamation works can be characterised as being a Minor/Moderate-sized construction site. Therefore, with the implementation of standard mitigation measures, dust is unlikely to cause an impact at sensitive receptors beyond 25m/50m of the source. There is a minimum separation of approximately 50m between the nearest dwelling and the development footprint. Therefore it is considered that dust will not have a significant impact on air quality during the construction phase. Standard mitigation measures for dust prevention and control are presented in **Section 8.4.**

The placement of the dredge material at the unloading point will be done in a controlled manner and necessary mitigation measures to prevent and control dust emissions will be in place. The dredge spoil is brought to the quayside in a barge where the material is agitated and fluidised in order to allow it to be pumped into the treatment plant. Material could similarly be transferred to bunds on land where the material can be agitated and fluidised and screened for larger sized particles. These components are conveyed to the treatment mixing plant in liquid form. Mixing is undertaken in an enclosed system which allows dust emissions to be controlled.

The Stage 4 finishing procedure works will include landscaping and installation of pathways, parking facilities, surface water drainage system, mains water supply, electricity supply, viewing areas and water access points at the reclamation area. These works will be undertaken using best practice construction strategies, with necessary mitigation measures implemented for the control of dust.

In summary, given the limited size and extent of the construction site, the scale of plant and machinery involved, the relatively short construction timeframe, the mitigation measures which will be implemented to control fugitive dust emissions from the site, as well as the distance of most sensitive receptors from the site, the fact that the sediments will be wet, it is unlikely that receptors will be affected by fugitive dust emissions during the construction phase or that the emissions will have an adverse impact on local ambient air quality. The impact of fugitive dust will be a short term not significant impact on air quality.

8.3.1.2 Exhaust Emissions

Exhaust emissions from construction and delivery vehicles are unlikely to have an adverse impact on local air quality and will not impact significantly on local, regional or national air quality standards given the scale of plant and machinery involved, the high levels of dispersion, and the limited extent and duration of the works.

The principal pollutants of concern to sensitive ecosystems are nitrogen oxides. Nitrogen oxides may have a positive or negative impact by acting as a fertiliser or a phytotoxicant. The potential impact of exposure of plants to nitrogen oxides are mainly on growth, photosynthesis and nitrogen assimilation/metabolism.

The National Roads Authority (NRA) (now TII) has developed guidelines for the assessment of the significance of impact of construction projects on sensitive ecosystems. These guidelines state that should the predicted concentrations exceed the annual NOx limit (30µg/m^3) then the sensitivity of the relevant species should be assessed by the project ecologist. The construction phase of the proposed project is not predicted to cause NOx levels in excess of this 30µg/m^3.

8.3.1.3 Climate change/CO_2 Emissions

The national policy position for Climate Change establishes a vision for Ireland of low-carbon by 2050 (80% reductions on 1990 emissions) across the electricity generation, built environment and transport sectors. The construction phase of the proposed development at Howth Harbour will not have a significant effect on National CO_2 emissions and reduction trends.

8.3.2 Operational Phase

8.3.2.1 Air Quality

Once operational, there will be no direct impact from emissions to the atmosphere from the proposed development.

8.3.3 Cumulative impacts

A cumulative impact assessment was carried out specifically for air and climate that included existing and permitted developments that are relevant to this chapter.

Permission has been granted for the provision of a 134m long quay wall, associated deck and hard standing area, road access, dredging to the front of the new quay wall to provide berthing depth and land reclamation of an approximate area of 0.30ha on the east side of the Middle Pier at Howth Harbour (F19A/0296). These works commenced in late 2020 and should take a total of 12-15 months, including site set-up and demobilisation. There will be no overlap of construction works with this project.

The boat yard works on the west pier has the potential to produce fugitive emissions that could have a cumulative impact on air quality. The boat yard will have controls in place at the yard for fugitive dust. The proposed development will have a short term not significant effect on air quality due to fugitive dust. The cumulative impact is considered to be a short term not significant effect.

Overall, the cumulative impact is considered to be a short term not significant effect on air quality.

8.4 MITIGATION

8.4.1 Construction Phase

It is recommended that best practice is adhered to during the construction phase in order to minimise fugitive dust emissions in particular.

The assessment of construction impacts contained in **Section 8.3** includes for the implementation of 'standard mitigation', as stated in the TII (formerly NRA) guidance. This shall include the following measures:

- Dampening of exposed earthwork activities and site access route during dry weather;
- Covering of stockpiles and/or dampened during dry weather;
- Control of vehicle speeds, speed restrictions and vehicle access; and
- Sweeping of hard surface roads.
- Internal and public roads will be inspected regularly for cleanliness and cleaned as necessary;
- Daily site inspections should take place to examine dust measures and their effectiveness.

In addition, the following measures will be implemented during the construction phase:

- Generators will be located away from sensitive receptors.
- Stockpiles will be located as far as possible from sensitive receptors and covered and/or dampened during dry weather.

All appropriate controls and mitigation measures are outlined in the preliminary CEMP which accompanies the planning application

Employee awareness is also an important way that dust may be controlled on any site. Staff training and the management of operations will ensure that all dust suppression methods are implemented and continuously inspected.

Construction Traffic Emissions

Construction traffic emissions can be reduced using the following measures:

- Ensure regular maintenance of plant and equipment. Carry out periodic technical inspection of vehicles to ensure they perform most efficiently;
- Implementation of the Construction Traffic Management Plan to minimise congestion; and
- All site vehicles and machinery to be switched off when not in use - no idling.

8.4.2 Operational Phase

It is not expected that any negative impacts will occur during the operational phase; therefore no mitigation measures are required.

8.5 RESIDUAL IMPACTS

The residual construction phase impact will be a short term not significant effect on air quality from fugitive dust emissions.

Once operational, there will be a neutral impact on air quality from the proposed development.

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9 LANDSCAPE /SEASCAPE AND VISUAL ASSESSMENT

9.1 INTRODUCTION

This report describes the landscape and seascape context of the proposed harbour dredging and land reclamation works at Howth Harbour and assesses the likely impacts of the scheme on the receiving environment, in terms of both landscape / seascape character and visual amenity.

Like landscape assessment, seascape assessment relates to changes in the physical environment, brought about by a proposed development, which may alter its character. This requires a detailed analysis of the individual elements and characteristics of a landscape or seascape that go together to make up the overall character of that area. By understanding the aspects that contribute to this character it is possible to make judgements in relation to its quality (integrity) and to identify key sensitivities. This, in turn, provides a measure of the ability of the landscape or seascape in question to accommodate the type and scale of change associated with the proposed development, without causing unacceptable adverse changes to its character.

Visual Impact Assessment (VIA) relates to changes in the composition of views as a result of changes to the landscape, how these are perceived and the effects on visual amenity. Such impacts are population based rather than resource based as in the case of landscape / seascape impacts.

This landscape / seascape and visual impact assessment is based on:

- Landscape Institute and the Institute of Environmental Management and Assessment publication entitled Guidelines for Landscape and Visual Impact Assessment (GLVIA-2013);
- Natural England publication 'An approach to Seascape Character Assessment' (2012);
- Environmental Protection Agency (EPA) publication 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports (Draft August 2017)

In relation to Seascape assessment, GLVIA-2013 states that it is important to take account of the particular characteristics of the marine and coastal environment, including those associated with the natural environment, cultural and social characteristics, and perceptual and aesthetic qualities. These will include:

- Coastal features;
- Views to and from the sea;
- Particular qualities of the open sea;
- The importance of dynamic changes due to weather and tides;
- Change in seascapes due to coastal processes;
- Cultural associations;
- Contributions of coastal features to orientation and navigation at sea.

9.1.1 Statement of Authority

This Landscape / Seascape and Visual Assessment report was prepared by Macro Works Ltd of Cherrywood Business Park, Loughlinstown, Dublin 18; a consultancy firm specialising in Landscape and Visual Assessment and associated maps and graphics. Relevant experience includes a vast range of infrastructural, industrial and commercial projects since 1999, including numerous offshore projects. It also includes the Landscape/Seascape and Visual Assessment report for a proposed deep-water pier at Rossaveel, County Galway as well as the proposed upgrade works for the adjacent Howth East Pier and Howth Middle Pier.

9.1.2 Description of the Proposed Development

Due to a multi-decade build-up of siltation, as well as increasing vessel sizes, it is necessary to dredge the existing basins and approach channels in Howth Harbour to provide safe access, navigation and berthing for the vessels using the harbour.

It is proposed to dredge circa 240,000m3 of material from the seabed within the harbour, and then treat and beneficially re-use this material to the west of the West Pier to create an additional circa 4.8Ha of reclaimed land. For the purposes of this chapter, this is referred to as the West Pier Reclamation Area. The aim of the overall project is to increase the depth of water in the harbour in order to provide safe access for the largest range of vessel sizes and types on the widest range of tides, within the structural parameters of the existing harbour quay structures; and, where possible to treat and re-use or dispose of dredge material in an environmentally sensitive and cost effective manner. The proposed development involves the following main elements:

- Dredging the harbour;
- Reclaiming land on the west side of the west pier using dredge material;
- Coastal protection works to the perimeter of the reclaimed area;
- Landscaping on the reclaimed area;
- Provision of pavements e.g. footways, roadways and parking areas;
- Construction of slipway for access to the water;
- Provision of storage areas for harbour activities; and
- Provision of services.

For a more detailed account of the proposed development, please refer to 'Chapter 2 Description of the Proposed Development.'

9.1.3 Definition of Study Area

The proposed development is likely to be difficult to discern beyond approximately 2km and is not likely to give rise to significant landscape / seascape or visual impacts beyond this distance. In the interests of a comprehensive appraisal, a 2km radius study area is used in this instance.

Figure 9.1 – Study area of the proposed development

9.1.4 Assessment Methodology

Production of this Landscape and Visual Impact Assessment involved;

- A desktop study to establish an appropriate study area, relevant landscape and visual designations in the Fingal Development Plan 2017-2023, as well as other sensitive visual receptors. This stage culminated in the selection of a set of 10 potential viewpoints from which to study the likely effects of the proposed development;
- Fieldwork to establish the landscape character of the receiving environment and to confirm and refine the set of viewpoints to be used for the visual assessment stage;
- Assessment of the significance of the landscape / seascape impact of the proposal as a function of landscape/seascape sensitivity weighed against the magnitude of the landscape/seascape impact;
- Assessment of the significance of the visual impact of the proposal as a function of visual receptor sensitivity weighed against the magnitude of the visual impact.

9.1.5 Assessment Criteria

9.1.5.1 Landscape/seascape Impacts

When assessing the potential impacts on the landscape/seascape resulting from a proposed development, the following criteria are considered:

- Landscape / seascape character, value and sensitivity;
- Magnitude of likely impacts; and
- Significance of landscape effects.

The sensitivity of the landscape / seascape to change is the degree to which a particular receptor (Landscape / Seascape Character Area (LCA) or feature) can accommodate changes or new features without unacceptable detrimental effects to its essential characteristics. Landscape / seascape value and sensitivity is classified using the following criteria derived from GLVIA:

Table 9.1 Landscape / Seascape Value and Sensitivity

Sensitivity	Description
Very High	Areas where the landscape / seascape character exhibits a very low capacity for change in the form of development. Examples of which are high value landscape / seascapes, protected at an international or national level (World Heritage Site/Marine Park), where the principal management objectives are likely to be protection of the existing character.
High	Areas where the landscape / seascape character exhibits a low capacity for change in the form of development. Examples of which are high value landscape / seascapes, protected at a national or regional level (National Parks), where the principal management objectives are likely to be considered conservation of the existing character.
Medium	Areas where the landscape / seascape character exhibits some capacity and scope for development. Examples of which are landscape / seascapes, which have a designation of protection at a county level or at non-designated local level where there is evidence of local value and use.
Low	Areas where the landscape / seascape character exhibits a higher capacity for change from development. Typically, this would include lower value, non-designated landscape / seascapes that may also have some elements or features of recognisable quality, where landscape / seascape management objectives relate to enhancement rather than protection.
Negligible	Areas of landscape / seascape character that include dereliction and industrial uses where there would be a reasonable capacity to embrace change or the capacity to include the development proposals. Management objectives in such areas could be focused on change, creation of landscape / seascape improvements and/or restoration to realise a higher value.

The magnitude of a predicted landscape / seascape impact is a product of the scale, extent or degree of change that is likely to be experienced as a result of the proposed development. The magnitude takes into account whether there is a direct physical impact resulting from the loss of landscape / seascape components and/or a change that extends beyond the proposal site boundary that may have an effect on the landscape / seascape character of the area.