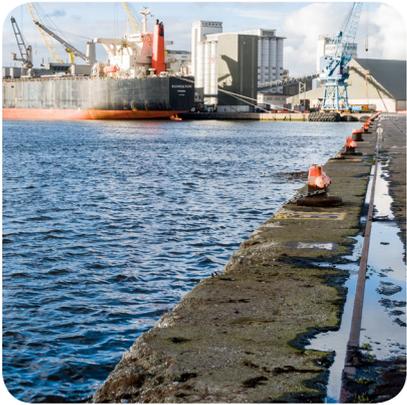
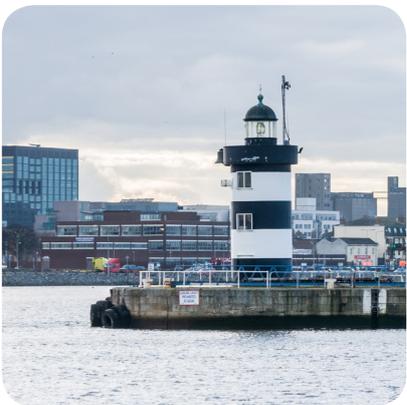




Alexandra Basin Redevelopment Project

Draft High Level Construction Environmental
Management Plan (CEMP)



Dublin Port Company
Alexandra Basin Redevelopment Project

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1 INTRODUCTION

1.1 Objectives of the Construction Environmental Management Plan (CEMP)

This document comprises a Draft High Level Construction Environmental Management Plan (CEMP) for the Alexandra Basin Redevelopment (ABR) Project.

The Final CEMP can only be produced after planning permission is granted in order to be able to address any conditions imposed by An Bord Pleanála (ABP) and prior to entering into contract with suitably experienced Contractors to undertake the works.

Dublin Port Company (DPC) is the developer of the ABR Project. DPC seeks to achieve the highest possible standards of environmental management during both the construction and operation of the proposed port infrastructure redevelopment.

The CEMP comprises two main parts

Summary of Mitigation Measures (Chapter 2)

The objective of this part of the CEMP is to capture all mitigation measures put forward within the Environmental Impact Statement (EIS) together with any conditions imposed by ABP. Mitigation measures put forward within the Natura Impact Statement (NIS) are already captured by the EIS.

This element of the CEMP will form part of the specification of the Contract Documents for the construction stage to enable suitably qualified Contractors to price the works required to implement the mitigation measures.

Management of Environmental Impact (Chapter 3)

The objective of this part of the CEMP is to develop a suite of Construction Phase Management Plans which will be prepared in association with the preferred Contractor(s). These Management Plans will be agreed with DPC and the relevant competent authorities in advance of the final Contract being signed.

1.2 Project Description

DPC produced a Masterplan in 2012 covering the period 2012 to 2040. In this Masterplan, DPC set out their proposals for major developments within the Port and Entrance Channel over the next thirty years.

DPC now wishes to advance a number of projects highlighted in the Masterplan document, mainly:

1. Works at Alexandra Basin West including construction of new quays and jetties, remediation of contamination on the bed of the basin, capital dredging to deepen the basin and to achieve the specified depths of -10m Chart Datum (CD) at the new berths.
2. Infilling of the Basin at Berths 52 & 53 and construction of a new river berth with a double tiered Ro-Ro ramp.
3. Deepening of the fairway and approach to Dublin Port to increase the ruling depth from -7.8m CD to -10.0m CD.

This is the most significant infrastructural development planned by DPC in the past 100 years and will involve a major capital investment on behalf of the Port. It reinforces the Port's commitment to providing a Port of National Significance (Tier 1) as required under National Ports Policy 2013 to the City of Dublin and Ireland as a whole. Ireland is an Island and the importance of being able to import and export goods in and out of the country is a basic requirement and vital to our livelihoods and economy as a whole. This is reflected in national policy.

1.3 Planning Process

The ABR project has been categorised by ABP as a project to be determined for planning consent by the Board under the Planning and Development (Strategic Infrastructure) Act 2006. DPC applied to ABP for planning permission on 6th March 2014 (Planning Reference number 29N.PA0034). The EIS and NIS were submitted as supporting documentation to the Planning Application.

Should ABP approve the ABR Project, a Foreshore License Application will be made to the Department of Environment, Community and Local Government. A Dumping at Sea Permit Application will also be made to Environmental Protection Agency.

Further consents will be sought associated with the treatment of contaminated material including an Industrial Emissions Licence from the EPA.

Any additional mitigation measures which may arise from these further approval processes will be incorporated into the Final CEMP.

2 SUMMARY OF MITIGATION MEASURES

2.1 Summary of Mitigation Measures arising from the Environmental Impact Statement

Chapters 5.0 to 13.0 of the EIS assess the likely significant impacts arising from the proposed development. The following table (Table 2.1) summarises the potential impacts identified and the mitigation measures required, where necessary.

Table 2-1 Summary of Impacts and Mitigation Measures

Chapter (EIS Page Ref)	Environmental Impact Appraisal	Mitigation Summary
Flora and Fauna (Chapter 5)		
Timing of Dredging Works (page 5-19)	Overarching consideration to minimize the environmental impact on the marine environment notably smolt migration, tern feeding and recovery of benthic ecology.	The dredging works will be undertaken over a 6 year period during the winter months only (October to March)
Birds		
Black Guillemots (Page 5-18)	Disturbance of bird species which breed in cavities within the existing quays and jetties	In order to avoid disturbance to nesting birds, any existing nest holes in piers to be demolished, will be blocked or otherwise made inaccessible in the month of September (before the birds generally occupy the nest holes), preceding the development works. Prior to this, temporary artificial nest boxes will be provided for the birds in immediately adjacent parts of the port, for the duration of construction works. In addition, concrete nest boxes will be incorporated into the new quays and jetties, at appropriate locations selected at the detailed design stage, to encourage the birds to return to these areas in subsequent breeding seasons. Further details of the black guillemot mitigation measures are provided in Appendix 1 of this Draft High Level CEMP.
Brent Geese (Page 5-18)	No adverse impacts on bird species foraging on the spilt agricultural products in Alexandra Basin West as a result of the works being carried out on a phased basis so that shipping will continue to be unloaded here, albeit in different locations.	The work programme will be implemented on a phased basis

Chapter (EIS Page Ref)	Environmental Impact Appraisal	Mitigation Summary
Marine Mammals		
<p>Harbour porpoise and seals (Page 5-36 & 5-37)</p>	<p>Potential effects of demolition works, piling, dredging and disposal of dredge spoil</p>	<p>The following precautionary measures will be undertaken to minimise the risk of direct injury to marine mammals in the area of operations in line with National Parks & Wildlife Service Guidelines (2013):</p> <p>A trained and experienced Marine Mammal Observer (MMO) will be put in place during piling, dredging, dumping, and demolition operations. The MMO will scan the surrounding area to ensure no marine mammals are in a pre-determined exclusion zone in the 30-minute period prior to operations. It is suggested that this exclusion zone is 500m for demolition and dredging activities, and 1,000m for piling activities considering the potential risks outlined.</p> <p>Noise-producing activities shall only commence in daylight hours where effective visual monitoring, as performed and determined by the MMO, has been achieved. Where effective visual monitoring is not possible, the sound-producing activities shall be postponed until effective visual monitoring is possible. Visual mitigation for marine mammals (in particular harbour porpoise) will only be effective during daylight hours and if the sea state is 2-3 (Beaufort scale) or less. In the absence of year-round data on marine mammal use within Dublin Bay, there is no justification for limiting works to any particular season.</p> <p>For piling activities, where the output peak sound pressure level (in water) exceeds 170 dB re: 1µPa @ 1m, a ramp-up procedure will be employed following the pre-start monitoring. Underwater acoustic energy output shall commence from a lower energy start-up and thereafter be allowed to gradually build up to the necessary maximum output over a period of 20-40 minutes.</p> <p>Once operations have begun, operations will cease temporarily if a cetacean or seal is observed swimming in the immediate (<50m) area of piling and dredging and work can be resumed once</p>

Chapter (EIS Page Ref)	Environmental Impact Appraisal	Mitigation Summary
		<p>the animal(s) have moved away.</p> <p>Dumping of material at sea will not take place if a cetacean or seal is within 50m of the vessel.</p> <p>Any approach by marine mammals into the immediate (<50 m) works area will be reported to the National Parks and Wildlife Service.</p> <p>If there is a break in piling activity for a period greater than 30 minutes then all pre-activity monitoring measures and ramp-up (where this is possible) will recommence as for start-up.</p> <p>Once normal operations commence (including appropriate ramp-up procedures), there is no requirement to halt or discontinue the activity at night-time, nor if weather or visibility conditions deteriorate, nor if marine mammals occur within a radial distance of the sound source that is 500m for dredging and demolition works, and 1000m for piling activities.</p> <p>The MMO will keep a record of the monitoring using a 'MMO form location and effort (coastal works)' available from the National Parks & Wildlife Service (NPWS) and submit to the NPWS on completion of the works.</p> <p>In order to further verify the zone of responsiveness associated with the proposed programme of piling activities associated with the Alexandra Basin Redevelopment, one of the following methods will be used:</p> <ul style="list-style-type: none"> - Modelling of sound propagation calibrated using field measurements; or - Deployment of hydrophones in combination with passive acoustic monitoring.

Chapter (EIS Page Ref)	Environmental Impact Appraisal	Mitigation Summary
Terrestrial Ecology		
<p>Bats (Page 5-56)</p>	<p>The impact of the works will not result in any loss of typical bat associated habitats such as woodland, fresh water courses and hedgerows.</p> <p>The impact of the proposed works is negligible</p>	<p>The following precautionary measures will be undertaken:</p> <p>Removal of building – Alexandra Quay West</p> <ul style="list-style-type: none"> - The roof of the building will be removed and left open for 3-4 nights prior to demolition of the building. This will change the internal temperature of the building and encourage any residing bats to move off. <p>Relocation of lighthouse</p> <ul style="list-style-type: none"> - An internal inspection for bats will be undertaken of the lighthouse, prior to movement to a new location, to ensure that there are no bats within. <p>Bats are mobile species and can roost in buildings occasionally. It is important that vigilance for individual bats within the buildings is practiced. These works will be undertaken outside the months of mid-April to mid-September to reduce the likelihood of encountering bats.</p> <p>If a bat is found, the bat will be removed under license by a bat specialist.</p>
Benthic Ecology and Fisheries		
<p>Benthic Habitat & Fisheries (page 5-107 and 5-108)</p>	<p>The proposed development at the Alexandra Basin West will result in a gain of about 3.1ha of new subtidal habitat associated with the reduction in size of the North Wall Quay Extension and the removal the spoil deposit in the North West corner of the basin. Removal of faunal communities through dredging would be considered locally severe, but minor. Recovery in the area would be expected rapidly (<1 year).</p> <p>The proposed development at Berth 52/53 will result in the loss of about 4.5 ha of subtidal benthic habitat as a result of the infilling of the basin.</p>	<p>The proposed six year dredging campaign will divide the shipping channel into six separate areas and dredging will be confined to one of the areas each winter period. This is the preferred approach from a benthic and fisheries perspective.</p> <p>A non-dredging window will apply to the inner section of the navigation from below the East Link Toll Bridge as far as the end of the north bank port area at the Alexandra Road Extension. The window will run from March to May unless otherwise advised by Inland Fisheries Ireland in order to protect out-migrating smolts.</p>

Chapter (EIS Page Ref)	Environmental Impact Appraisal	Mitigation Summary
	<p>Although the infilling of the basin will result in the permanent removal of this habitat, the impact of this is considered minor due to the nature of the faunal community present in the area.</p> <p>The faunal species removed through dredging are expected to rapidly re-colonise the seabed commencing immediately following cessation of dredging, resulting in a rapid recovery to the pre-dredge community within about 12 months to 2 years.</p> <p>The proposed extension to the existing shipping channel will result in the temporary disturbance to the benthic community covering less than 0.25% of the area of the cSAC. This impact would be considered minor.</p> <p>No reef habitats were identified in or adjacent to the area to be dredged. The proposed capital dredging scheme will therefore have no impact on this qualifying interest of the Rockabill to Dalkey Island candidate Special Area of Conservation.</p> <p>The quality of the feeding in the dredged area for adult and juvenile fish will be significantly reduced following the dredging due to entrainment of surface mobile epifauna by the dredger.</p> <p>Faunal smothering caused by increase sedimentation due to dredging. In general, where the sediment material is the same in nature as the bed material on which it's being deposited, the lower the impact is on the resident benthic fauna.</p> <p>Immediately, post dredging fish and invertebrate predators will move into the dredged areas and scavenge on dead or damaged invertebrates and fish, the area affected providing a temporary local source of food.</p>	<p>In addition, the inner narrowest portion of the channel upstream and opposite Alexandra Basin West, will not be dredged in October in order to reduce the potential risk to river lamprey migration. These non-dredge windows will be agreed in consultation with IFI.</p> <p>There will be no overflow from the dredger when it is dredging the riverside face and associated berths along the North wall Quay Extension This will help to minimise the potential release of contaminants to the water column during dredging. Also, in this area, the dredging will be timed to coincide with tidal movements that will minimise the degree of plume dispersal.</p> <p>It has been shown that the drag-head will tend to entrain more fish and mobile epibenthic crustaceans when it is lifted from the sediment surface while the pumps are still running. This occurs when the dredger comes to the end of a dredged line and turns to dredge back up along an adjacent line. In order to avoid the associated risk of increased entrainment during this turning processes. To remove this risk, the pumps will be switched off while the drag-head is withdrawn from the seabed during the turning process and not engaged again until it is replaced onto the seabed to dredge the next line.</p> <p>To facilitate more rapid recovery of the benthic communities, the depth of the over burden on the faunal communities will be minimised spreading over the whole disposal site as evenly as is practicable per calendar month in a systematic directional sequence to allow the greatest opportunity for deep burrowing invertebrates to move vertically through the newly deposited layers of spoil.</p> <p>No piling will take place along the Liffey channel during the three months of the year when smolts are likely to run in their highest numbers (i.e. March to May inclusive). This recognises the smaller size of smolts compared to returning adults and lamprey. It also takes account</p>

Chapter (EIS Page Ref)	Environmental Impact Appraisal	Mitigation Summary
	<p>As soon as the dredging ceases the affected areas will begin the process of re-colonisation. The dredged area will rapidly re-colonise in terms of species number and density over 1-2 seasons, with near full biomass recovery estimated at 2-3 years.</p> <p>In the first season post dredging small, rapidly growing invertebrates often colonise recently dredged areas of fine sediment. These worms form a very important food resource for juvenile flatfish and therefore the expected dip in the quality of food resources for the nursery aspect of the dredged channel may only last for a single season.</p> <p>Taken in the context of Dublin Bay as a whole, the temporary reduction in quality of feeding along the dredged channel will only constitute a minor adverse impact.</p> <p>Piles driven in water give rise to noise levels normally well above ambient levels. In general the effects include:</p> <ul style="list-style-type: none"> - a range of non-auditory tissue damage up to mortality, - auditory tissue damage, which results in a permanent or temporary reduction in the hearing ability, behavioural affects, e.g. startle or avoidance responses. 	<p>of the fact that smolts have a swim bladder which likely makes them more susceptible than lamprey to pressure trauma due to piling noise.</p> <p>The use of vibratory pile drivers has been shown to be associated with lower peak sound levels and SEL than impact piling and is generally believed to be less likely to cause noise-associated trauma in fish. If vibratory piling can be used on the project, then this will be considered as a methodological mitigation measure, even if piles still require a few strikes with an impact rig to drive them to refusal.</p> <p>The sequencing of piling operations will also be considered in reducing possible piling-related trauma. So, for example, if the large circular piles which potentially generate the greatest levels of noise are spread out in terms of when they are driven, or deliberately driven at a slower rate (i.e. fewer strikes per day) then these time intervals will help any potentially traumatised fish resident in the area to recover and or be exposed to a lower cumulative sound energy level per day.</p>

Chapter (EIS Page Ref)	Environmental Impact Appraisal	Mitigation Summary
Landscape and Visual (Chapter 6)		
Construction Phase	<p>Potential construction stage impacts are as follows:-</p> <ul style="list-style-type: none"> • Obstruction of views; • Change in landscape character; • Machinery for site preparation/enabling works, dredging and demolition operations; and • Site access and vehicular and plant movements. <p>Potential landscape impacts are slight negative due to the low landscape resource change that will result.</p> <p>No significant visual impacts are predicted during the construction stage.</p>	No mitigation required.
Operational Phase	<p>The predicted significance of landscape impact is slight negative.</p> <p>Landscape related planning designations are assessed there will be no significant impacts.</p> <p>The predicted significance of visual impact for nearby residential properties at will be slight/moderate negative.</p>	No mitigation required.

Chapter (EIS Page Ref)	Environmental Impact Appraisal	Mitigation Summary
Air and Climate (Chapter 7)		
Noise and Vibration		
Construction Phase, Noise (page 7-32 and 7-33)	<p>The assessment of the worst-case predicted construction noise levels (Section 7.13) using the ABC Method (BS5228:2009) and the NRA Guidelines (2004) indicates that worst-case construction noise levels will be within the required threshold limits included in these guidance documents.</p>	<p>British Standard BS5228:2009 – Noise and vibration control on construction and open sites: Part 1 - Noise outlines a range of measures that can be used to reduce the impact of construction phase noise on the nearest noise sensitive receptors. These measures will be applied by the contractor where appropriate during the construction phase of the proposed development.</p> <p>Examples of some of the best practice measures included in BS5228:2009 are listed below:</p>

Chapter (EIS Page Ref)	Environmental Impact Appraisal	Mitigation Summary
		<ul style="list-style-type: none"> • ensuring that mechanical plant and equipment used for the purpose of the works are fitted with effective exhaust silencers and are maintained in good working order; • careful selection of quiet plant and machinery to undertake the required work where available; • all major compressors will be 'sound reduced' models fitted with properly lined and sealed acoustic covers which should be kept closed whenever the machines are in use; • any ancillary pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers; • machines in intermittent use will be shut down in the intervening periods between work; • Ancillary plant such as generators, compressors and pumps will be placed behind existing physical barriers, and the direction of noise emissions from plant including exhausts or engines will be placed away from sensitive locations, in order to cause minimum noise disturbance. Where possible, in potentially sensitive areas, acoustic barriers or enclosures will be utilised around noisy plant and equipment. • Handling of all materials will take place in a manner which minimises noise emissions; • Audible warning systems will be switched to the minimum setting required by the Health & Safety Authority; <p>A complaints procedure will continue to be operated by the Contractor throughout the construction phase and all efforts should be made to address any noise issues at the nearest noise sensitive properties.</p> <p>Where construction activity takes place for the redevelopment in the vicinity of residential properties, the activities will</p>

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		operate between the hours of 08:00 and 18:00 on Monday to Fridays, between 08:00 and 13:00 on Saturdays and there will be no activity on Sundays or Bank Holidays.
Operational Phase, Noise from Night-time Port Activities (page 7-33)	Potential for increased noise impacts from increasing cruise liner activity in the Port due to the redevelopment.	A Noise Management Plan of Port activities will be implemented to ensure that foghorns are only blown when there is a navigational necessity to do so and that noise sources from cruise ships at berth are minimised during the night-time period.
Air Quality and Climate		
Construction Phase, Construction Dust (page 7-58 and 7-59)	No adverse impacts on sensitive receptors in the area around Dublin Port are expected.	A dust minimisation plan will be prepared based upon the industry guidelines in the Building Research Establishment document entitled 'Control of Dust from Construction and Demolition Activities'. This will include measures such as: <ul style="list-style-type: none"> • Site roads shall be regularly cleaned and maintained as appropriate. Hard surface roads shall be swept to remove mud and aggregate materials from their surface while any un-surfaced roads shall be restricted to essential site traffic only; • Any site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions (also applies to vehicles delivering material with dust potential); • All vehicles exiting the site shall make use of a wheel wash facility prior to entering onto public roads, to ensure mud and other wastes are not tracked onto public roads. Wheel washes will be self-contained systems that do not require discharge of the wastewater to water bodies; • Public roads outside the site shall be regularly inspected for cleanliness, and cleaned as necessary; • Material handling systems and site stockpiling of materials shall be designed and laid out to minimise

Chapter (EIS Page Ref)	Environmental Impact Appraisal	Mitigation Summary
		<p>exposure to wind;</p> <ul style="list-style-type: none"> • Water misting or sprays shall be used as required if particularly dusty activities are necessary during dry or windy periods; • All vehicles which present a risk of spillage of materials, while either delivering or removing materials, will be loaded in such a way as to prevent spillage on to the public road; • The contractor will be required to ensure that all vehicles are suitably maintained to ensure that emissions of engine generated pollutants is kept to a minimum; and • The construction Contractor will be required to monitor monthly dust deposition levels each month for the duration of construction for comparison with the guideline of 350mg/m²/day (for non-hazardous dusts). This monitoring should be carried out at a minimum of four locations at sensitive receptors around the proposed works. Where dust levels are measured to be above this guideline the mitigation measures in the area must be reviewed as part of the dust minimisation plan. <p>An outline Dust Minimisation Plan is included as Appendix 2 of this Draft High Level CEMP.</p>
<p>Construction Phase, Odour (page 7-59 and 7-60)</p>	<p>Negligible impact is predicted from odour generation during the construction phase, including dredging operations.</p>	<p>An Odour Management Plan (OMP) to mitigate the potential for odours from dredging operations will be implemented. The OMP will follow the guidance presented in the Environment Agency of England and Wales “Odour Management Guidance” (H4 Guidance, 2011). The odour monitoring and investigation aspects of the OMP will follow the EPA “Odour Impact Assessment Guidance for EPA Licensed Sites” (Guidance Note AG5, 2010).</p> <p>An outline Odour Management Plan is provided in Appendix 2 of this Draft High Level CEMP.</p>

Chapter (EIS Page Ref)	Environmental Impact Appraisal	Mitigation Summary
<p>Construction Phase, Greenhouse Gases</p> <p>(page 7-60 and 7-61)</p>	<p>The total estimated greenhouse gas emissions associated with the proposed construction phase is calculated at 253,863 tonnes of Carbon Dioxide.</p>	<p>An Energy Management System will be implemented for the duration of the works.</p> <p>Materials with a reduced environmental impact will be incorporated into the construction design, where appropriate.</p> <p>Mitigation measures to minimise Carbon Dioxide emissions from transport will include:</p> <ul style="list-style-type: none"> • Implementation of a Traffic Management Plan • Implementation of an Efficient Material Handling Plan • Restrictions on idling vehicular engines • Regular maintenance of plant and equipment
Material Assets (Chapter 8)		
Transportation		
<p>Construction Phase, Construction Traffic</p> <p>(page 8-39 and 7-60)</p>	<p>The impact of construction traffic was found to have no significant impact upon the surrounding highway network.</p>	<p>Construction Traffic will comply with the Dublin City Council HGV Management Strategy</p> <p>A Traffic Management Plan will be implemented as part of the post consent CEMP to reflect any conditions imposed by ABP.</p>
<p>Operational Phase</p> <p>(page 6-43)</p>	<p>The ABR Project will result in the closure of two existing accesses to the port. This will result in a significant reduction in the volume of traffic along the frontage of Dublin Port from East Wall Road to North Wall Quay.</p>	<p>The following two accesses will be closed to port related traffic</p> <ul style="list-style-type: none"> • Terminal 3 Access on East Wall Road • Alexandra Road Access on East Wall Road
Services		
<p>Electricity Supply and Infrastructure</p> <p>(page 8-44 and 8-45)</p>	<p>ESB / ESB Networks / Eirgrid have been consulted on an ongoing basis with respect to the ABR project.</p> <p>There are underground cables along the North Wall Quay Extension and in other parts of Alexandra Basin West. A 220kv cable which crosses the River Liffey will be replaced by ESB.</p>	<p>No works will be carried out in the vicinity of the existing 38kV or higher voltage underground cables without prior consultation with ESB Networks.</p> <p>The CEMP will ensure that safeguards are put in place to avoid disruption to power station operations and to ensure there will be no impact on the physical integrity or operation of either the intake or outfall pipes.</p>

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	<p>There are cooling water intakes and outfalls servicing three power stations, including the Poolbeg Electricity Generating Station.</p> <p>The computational modelling studies have shown that no impact is expected on any cooling water intake and outfall servicing the three power stations.</p>	<p>These measures will include:</p> <ul style="list-style-type: none"> Establishment of monitoring buoys and the setting of water quality trigger levels which safeguard the power station operations and which can initiate the temporary cessation of elements of the works which may be causing elevated levels of water quality parameters such as turbidity during dredging.
Coastal Processes (Chapter 9)		
<p>Capital Dredging Scheme (page 9-51 to 9-53)</p>	<p>An extensive programme of model simulations, supported by fieldwork and literature review, has been undertaken to evaluate how the proposed ABR Project would impact the coastal processes and the stability of the approach channel as well as to investigate the disposal of dredged spoil at the existing licensed offshore spoil site within Dublin Bay.</p> <p>The results of the model simulations show that:</p> <ul style="list-style-type: none"> There will be no significant change to the tidal flow regime of Dublin Bay; There will be no significant change to the wave climate within Dublin Bay; There will be no perceptible change in the tidal velocity within the deepened, realigned navigation channel or in its power to cause scouring of the sea bed; The new navigation channel will require maintenance dredging of a similar magnitude to that required with the existing channel; There will be no significant change to the sediment transport regime within Dublin Bay, 	<p>Restricting the navigation channel dredging operations to the winter months (October to March) provides the key mitigation to ensure that the dredging operations will have no significant impact on the qualifying interests of Natura 2000 sites.</p> <p>Additional mitigation measures associated with the proposed dredging works are presented under Chapter 5 Flora and Fauna.</p>

Chapter (EIS Page Ref)	Environmental Impact Appraisal	Mitigation Summary
	<p>including the Tolka Estuary;</p> <ul style="list-style-type: none"> • The proposed offshore disposal site to the west of the Burford Bank is dispersive for the silt fractions within the dredged spoil material. The sand fractions within the dredged spoil will remain on the disposal site under normal tidal conditions. However under storm conditions the sand will gradually be assimilated into the overall sediment regime of Dublin Bay. • The existing disposal site at the Burford Bank is the preferred disposal option as the fine sand material from the navigation channel will not be lost to the overall sediment supply to Dublin Bay; • Model simulations of the dispersion, fate and deposition of sediment plumes arising from the dredging and disposal operations have been used to inform the environmental assessment of the water environment (Chapters 5 and 10). • The dispersion, fate and deposition of sediment plumes arising from the dredging and disposal operations not expected to impact on other users of the waters within the River Liffey channel or Dublin Bay. 	
Water (Chapter 10)		
Receiving Water Environment		
<p>Construction phase (page 10-15 and 10-16)</p>	<p>Mitigation measures are required to safeguard the receiving waters from potential temporary impacts on water quality during the construction phase of the ABR Project.</p>	<p>The following mitigation measures will be implemented (to take account of any conditions imposed by ABP and following consultation with the necessary statutory bodies) to safeguard the receiving waters including:</p> <ul style="list-style-type: none"> • Waste Management Plan • Contamination Strategy • Water Quality Management Plan

Chapter (EIS Page Ref)	Environmental Impact Appraisal	Mitigation Summary
		<ul style="list-style-type: none"> • Establishment of lines of communication, reporting and actions <p>The mitigation measures will include the requirements for best practice and adherence to relevant Irish guidelines, or international guidelines where these are not available:</p> <ul style="list-style-type: none"> • Good practice guidelines on the control of water pollution from construction sites developed by the Construction Industry Research and Information Association (CIRIA, 2001); • Pollution prevention guidelines in relation to a variety of activities developed by the Environment Agency (EA), the Scottish Environmental Agency (SEPA) and the Northern Ireland Environment Agency (NIEA); • Environment Agency Pollution Prevention Guidelines (PPG6); • Fisheries Guidelines for Local Authority Works. Department of Communications, Marine & Natural Resources, Dublin, (Anonymous, 1998); • Guidelines on protection of fisheries habitats during construction projects (Eastern Regional Fisheries Board, 2006); • International Convention for the Prevention of Pollution From Ships, 1973, as modified by the Protocol of 1978 (MARPOL) for domestic waste discharges to the environment; • International Marine Organisation guidelines; and • Control of Substances Hazardous to Health (COSHH) Handling of Hazardous Materials. <p>Continual engagement with a range of interested parties/stakeholders including Dublin City Council, EPA, National Parks & Wildlife Service, Inland Fisheries Ireland, Dublin Port tenants and local community groups will be undertaken.</p> <p>A Construction Environmental Monitoring Programme will also be prepared to</p>

Chapter (EIS Page Ref)	Environmental Impact Appraisal	Mitigation Summary
		<p>provide additional safeguards to the receiving environment during the construction phase of the works. The monitoring programme will form part of the specification of the Contract Documents for the construction stage.</p> <p>The design of the Construction Environmental Monitoring Programme will include the following elements related to the receiving waters:</p> <ul style="list-style-type: none"> • An assessment using 3-D hydrodynamic computational modelling and water quality modelling to design the placement of a number of water quality monitoring buoys and telemetry based warning systems. • The establishment of water quality trigger levels and corresponding actions (including the necessity to temporarily cease construction operations) to safeguard sensitive conservation sites (SPA and SAC) and the operations of other users of the receiving waters (e.g. Power Stations)
<p>Operational phase (page 10-16 and 10-17)</p>	<p>The new port facilities, when complete, will be subject to the Port's existing Environmental Management Plan.</p> <p>Dublin Port is accredited to ISO 14001 to ensure that all employees undertake their work with due consideration for the environment and that guidance is given to tenants to promote the principles of sustainability.</p> <p>Dublin Port has been designated an 'Ecoport' at European level, in relation to its environmental management system.</p>	<p>The new port facilities, when complete, will be subject to the Port's existing Environmental Management Plan.</p> <p>In particularly, the following shall be adhered to with respect to vessels at berth or travelling through Dublin Bay:</p> <ul style="list-style-type: none"> • No waste will be disposed of at sea; • Ballast water will be treated in accordance with MARPOL standards; • Ballast tanks will be separate from hydrocarbon storage areas and no potentially contaminated streams will be diverted to the ballast tanks; • De-ballasting will be undertaken offshore in accordance with IMO guidelines; • Hazardous wastes will be stored in sealed, labelled drums in locked chemical cabinets;

Chapter (EIS Page Ref)	Environmental Impact Appraisal	Mitigation Summary
	<p>Dublin Port Company also maintains and operates an emergency management plan and has the emergency management structures and arrangements in place which are compatible with the requirements of the 2006 Framework for Major Emergency Management</p>	<ul style="list-style-type: none"> • Vessels will be equipped with oil-water separation systems in accordance with MARPOL requirements; • Spills on deck will be contained and controlled using absorbing materials; • Vessels without sewage treatment systems will have suitable holding tanks and will bring waste onshore for treatment by licensed contractors; • All chemicals used on-board will be handled in compliance with COSHH instructions on handling hazardous materials; • Chemicals will be stored appropriately in suitably bunded areas and with material safety data sheets; and • All waste discharges will be monitored and recorded as per vessel procedures.
Flood Risk Assessment (FRA)		
<p>Flood Risk (page 10-26)</p>	<p>An assessment of the flood risk to the proposed development has determined that the predominant source of flood risk emanates from coastal flooding.</p> <p>The assessment concluded that the proposed port redevelopment complies with the requirements of the Planning System and Flood Risk Management Planning Guidelines (2009).</p> <p>Model simulations have been undertaken to determine any change to the flood risk associated with neighbouring areas of Clontarf, South Quays and North Quays, particularly as a result of the proposed capital dredging scheme.</p> <p>The results of the model simulations have shown that the proposed works are not expected to increase</p>	<p>The level of the quays at Alexandra Basin West and Berth 52/53 have been designed to future proof the port facilities against predicted water level increases expected by the year 2100 as a result of climate change.</p>

Chapter (EIS Page Ref)	Environmental Impact Appraisal	Mitigation Summary
	<p>the flood risk to any of these areas.</p> <p>The proposed works will change the site at Alexandra Basin West, from Flood Zone A and B to Flood Zone C (Low Risk).</p> <p>The new level of this area will future proof it for coastal flooding due to predicted climate change.</p>	
Geology and Soils (Chapter 11)		
<p>Construction phase</p> <p>(pages 10-14, 11-11 to 11-16)</p>	<p>The sediments within Alexandra Basin West were found to be unsuitable for disposal at sea.</p>	<p>Contaminated sediments within Alexandra Basin West will not be disposed of at sea.</p> <p>Dredging operations have been designed to minimise the disturbance and escape of material at the seabed and during removal through the water column. A floating pontoon with an excavator mounted clamshell bucket adapted for environmental dredging will be used. A silt curtain will also be placed around the dredger to contain the marine sediments. This method of dredging will serve to minimize the spread of suspended contaminated sediments beyond the dredge foot print.</p> <p>The dredged material recovered from Alexandra Basin West will be transported by barge to a treatment facility adjacent to Berth 52/53. It will be stabilised and modified to improve the engineering properties of the material to allow its re-use as fill material. In order to minimise the stockpiling of dredged material, the rate of dredging will be determined by the rate of treatment of the dredged material</p> <p>Best practice industry techniques will be used to treat the contaminated material yielded from the dredging of Alexandra Basin West. Ex-situ Stabilisation/Solidification (S/S) is proposed for the treatment of the contaminated material.</p> <p>Ex-situ Stabilisation/Solidification (S/S) is a remediation technology that reduces the mobility of contaminants. Immobilisation is achieved by reaction of contaminants with reagents to promote sorption, precipitation or incorporation into crystal lattices, and/or by physically</p>

Chapter (EIS Page Ref)	Environmental Impact Appraisal	Mitigation Summary
<p>Construction phase (Cont'd)</p> <p>(pages 11-16, 11-20 to 11-23)</p>	<p>The sediments within the Navigation Channel where found to be suitable for disposal at sea.</p> <p>There is however an area immediately adjacent to Alexander Basin West where low levels of</p>	<p>encapsulating the contaminants.</p> <p>The method produces a high strength monolith-like product that physically reduces the mobility and chemically binds contaminants to the produced matrix. The treated mass can then be recovered/recycled to serve as infill material or for beneficial use.</p> <p>The treatment and recovery of the dredging spoil on site will take place in accordance with the conditions of an Industrial Emissions Licence to be obtained from the EPA. Following treatment the material will be placed in the Berth 52/53 basin and Graving Dock #2 as a recovery activity, replacing the need to use virgin materials that would otherwise be required for the development.</p> <p>A dumping at sea permit will be sought from the EPA.</p> <p>The disposal of dredge spoil at sea will be undertaken in accordance with the conditions of the dumping at sea permit.</p> <p>Sediments immediately adjacent to Alexandra Basin West where low levels of contamination have been found will be disposed of at sea only at slack tide and immediately covered by sand or gravel, if required by the EPA.</p> <p>The mitigation measures specified for Chapter 10 (Water) also apply to Chapter</p>

Chapter (EIS Page Ref)	Environmental Impact Appraisal	Mitigation Summary
	<p>contamination have been identified.</p> <p>It is proposed to dispose of the dredged at the licensed sea disposal site located to the west of the Burford Bank at the entrance to Dublin Bay, subject to the granting of a Dumping at Sea Permit by the EPA.</p> <p>Mitigation measures are required to safeguard the receiving waters from potential temporary impacts on water quality during the construction phase of the ABR project.</p>	11 (Geology and Soils)
Operational phase	The new port facilities, when complete, will be subject to the Port's existing Environmental Management Plan.	The mitigation measures specified for Chapter 10 (Water) also apply to Chapter 11 (Geology and Soils)

Chapter	Potential Impact	Mitigation
Cultural Heritage (Chapter 12)		
Underwater Archaeology of the navigation channel		
<p>Underwater Archaeology of the navigation channel</p> <p>(pages 12-48 to 12-50)</p>	<p>Dublin Bay may be regarded as retaining the very high archaeological potential for shipwreck discovery. It may also retain indications of palaeo surfaces and inundated shorelines.</p> <p>A comprehensive marine geophysical survey was undertaken to assess the archaeological risk and to highlight particular areas of archaeological potential in advance of development works, so that the archaeological risk can be managed.</p> <p>The combination of side-scan sonar, magnetometry and sub-bottom or seismic survey was completed to provide a robust suite of devices to detect anomalies on the seabed and within its sedimentary levels.</p> <p>All anomalies detected by the geophysical surveys were diver truthed under licence from DAHG.</p>	<p>Archaeological monitoring of all dredging activities conducted within the Approach Channel will be carried out, with the provision to resolve fully any material of archaeological significance observed at that point.</p> <p>An archaeologist experienced in maritime archaeology will be retained for the duration of the relevant works.</p> <p>Archaeological Licences will be required to conduct the on-site archaeological works. These will include detailed method statements which outline the rationale for the works, and the means by which the works will be resolved. The following licence types will be required: Excavation, to cover monitoring and investigations works; Detection, to cover the use of metal-detectors; and Dive Survey, to cover the possibility of having to conduct underwater inspections.</p> <p>Archaeological monitoring will be carried out by suitably qualified and experienced maritime archaeological personnel licensed by the Department of Arts, Heritage and the Gaeltacht. Archaeological monitoring is conducted during all terrestrial, inter-tidal/foreshore and seabed disturbances associated with the development.</p> <p>The monitoring will be undertaken in a safe working environment that will facilitate archaeological observation and the retrieval of objects that may be observed and that require consideration during the course of the works.</p> <p>The monitoring will include a finds retrieval strategy that is in compliance with the requirements of the National Museum of Ireland.</p>

Chapter	Potential Impact	Mitigation
		<p>In the event of archaeologically significant features or material being uncovered during the construction phase, machine work will cease in the immediate area to allow the archaeologist/s to inspect any such material.</p> <p>Once the presence of archaeologically significant material is established, full archaeological recording of such material will be recommended. If it is not possible for the construction works to avoid the material, full excavation will be recommended. The extent and duration of excavation will be a matter for discussion between the client and the licensing authorities.</p> <p>A suitable archaeological team will be on standby to deal with any such rescue excavation. This will be complimented in the event of a full excavation.</p> <p>An archaeological dive team will be retained on standby for the duration of any in-water disturbance works on the basis of a twenty-four or forty-eight hour call-out response schedule, to deal with any archaeologically significant/potential material that is identified in the course of the seabed disturbance activities.</p> <p>Facilities will be provided to facilitate the temporary storage of artefacts that may be recorded during the course of the site work.</p> <p>Buoying/fencing of any such areas of discovery will be necessary if discovered and during excavation.</p> <p>Machinery traffic during construction will be restricted to avoid any identified archaeological site/s and their environs.</p> <p>Spoil will not be dumped on any of the selected sites or their environs.</p> <p>It is a condition of archaeological licensing that a detailed project report is lodged with the DAHG within 12 months of completion of site works. The report should be to publication standard and</p>

Chapter	Potential Impact	Mitigation
		<p>should include a full account, suitably illustrated, of all archaeological features, finds and stratigraphy, along with a discussion and specialist reports. Artefacts recovered during the works need to meet the requirements of the National Museum of Ireland.</p> <p>PLEASE NOTE: the above recommendations are subject to the approval of the National Monuments Section at the Department of Arts, Heritage and the Gaeltacht.</p>
Industrial Archaeological Heritage		
<p>Industrial Archaeological Heritage</p> <p>(pages 12-63 to 12-65)</p>	<p>A conservation strategy has been developed in light of the cultural heritage significance of the North Wall Quay Extension.</p> <p>The conservation strategy includes retaining an exemplar of Bindon Blood Stoney's foundation works for public view as part of the Port's cultural heritage assets.</p> <p>The historic Graving Dock #1 will also be reinstated as part of the ABR Project.</p>	<p>A heritage architect or Engineer experienced in industrial and maritime architectural heritage will be retained for the duration of the relevant works, to advise specifically in relation to works associated with North Wall Quay Extension and the Graving Docks.</p> <p>The conservation strategy developed for the ABR Project will be implemented in full.</p>
Human Beings (Chapter 13)		
<p>Construction Phase</p> <p>(page 13-17)</p>	<p>Potential impacts on human beings in relation to construction traffic, noise and dust have been addressed and mitigation measures have been developed in their respective chapters.</p> <p>An estimated 375 workers will be employed during construction for varying lengths of time on different aspects of the project.</p>	<p>Safe working practices, in accordance with current legislation, will be enforced during the construction period to protect construction workers, port operators and visitors to the construction sites.</p> <p>The construction sites will be suitably fenced and access to the sites shall be limited to authorised personnel.</p> <p>Dublin Port Company will encourage Contractors to utilise local construction workers where it is practical to do so.</p>

Chapter	Potential Impact	Mitigation
Operational Phase	<p>Dublin Port Company employs more than 145 people directly, but a further 4,000 people are employed in what is Ireland's largest industrial estate. The ABR Project will help to secure existing employment at the Dublin Port Estate and provide opportunities for further employment associated with the continued growth in trade.</p> <p>The new berth configuration proposed in Alexandra Basin involves the extension of Berth 29 on Alexandra Quay West westwards in front of the entrance to Graving Dock #2. As a result, the port will lose the utility of this graving dock. This will result in the loss of circa 26 jobs.</p>	No mitigation proposed

2.2 Elaboration of Mitigation Measures with respect to Marine Mammals

Further detail of the Mitigation Measures put forward with respect to Marine Mammals was submitted to ABP on 18 August 2014 in response to a Request for Further Information sought by ABP. This information is summarised below:

A real-time passive acoustic monitoring (PAM) system will be installed at the approaches to Dublin Port to provide information on the presence of marine mammals during these periods when visual mitigation is not possible. This technique is to compliment and not replace visual techniques.

The PAM system is established by deploying a LIDO system (www.listentothedeep.com) which can acquire high and low frequency data and stream these data ashore through the internet. This system is provided by LAB UPC at the University of Barcelona and has been used throughout the world as an ocean basin wide acoustic monitoring tool. Additionally it allows for real time monitoring. Hardware and technical support is provided by UPC. PAM will allow monitoring of harbour porpoises and other odontocetes (bottlenose dolphins) within a range of 250 – 800m and will also detect mid and low frequency seal vocalisations. A two hydrophone system will be used to achieve monitoring of the minimum 1000m exclusion zone for piling.

PAM will be used to provide additional assurance that any disturbance is temporary and will not lead to significant impacts on marine mammals in the long term nor adversely affect the integrity of any designated site having regard to the conservation objectives of each site. This additional mitigation method will allow for ongoing assessment of disturbance as well the monitoring of the effectiveness of mitigation measures.

In order to validate the effectiveness of mitigation measures for harbour porpoises a static acoustic monitoring programme (SAM) will be established using CPODS. CPODs are self-contained click detectors which log the echolocation clicks of dolphins and porpoises. They can be deployed on a mooring for 4-6 months before recovery and downloading of data. These data can be analysed as detection positive minutes (DPM) to generate an acoustic index of activity. This technique provides large datasets to enable changes in activity to be identified at high resolutions. CPODs are spatially constrained having detection distances of around 250m for harbour porpoise and 800m for bottlenose dolphins (O'Brien *et al.* (2013). O'Brien *et al.* (2013) recommended a minimum of four units should be deployed in small inshore study areas to ensure that statistically robust data can be collected. The number of PODs required should reflect the parameters or factors to be tested (e.g. fine scale diel or larger scales such as seasonal trends). Using an even number design for replication purposes can allow for parameters such as inshore and offshore trends to be explored in larger areas. The more units that can be deployed in an area, the more an informed evaluation of a site and successful monitoring indices will be generated. Hence four stations will be established for SAM.

The four stations will be monitored including two at the dumping site on Burford Bank and two within Dublin Bay. These stations will be monitored pre-construction, during construction and for a minimum of two years post-construction in line with best international practice.

Monthly monitoring of seal haul out sites will be also carried out at Bull Island and adjacent areas pre-construction, during construction and for a minimum of two years post-construction in line with best international practice.

2.3 Conditions on Planning as specified by An Bord Pleanála

Should ABP grant Planning Permission for the ABR Project, all planning conditions set by ABP will be detailed in this Section and form an integral part of the Final CEMP.

Mitigation measures imposed by ABP will take precedent over mitigation measures within the EIS, where there is potential conflict.

3 MANAGEMENT OF ENVIRONMENTAL IMPACTS

3.1 Roles and Responsibilities

DPC intends to appoint a Contractor(s) to undertake the works. The Contract between DPC and the Contractor will allocate responsibility for compliance with the terms of the CEMP during the construction phase of the Project.

DPC will establish a liaison group including, but not limited to, representatives of DPC, the Contractor, Dublin City Council and representatives of the port users. The group will meet at least quarterly with an agenda and minutes taken of the meetings.

DPC will appoint a suitably qualified person, or persons, to the role of Environmental Clerk of Works (EnCoW) to monitor the construction works. The EnCoW will provide reports to the competent authorities at a frequency agreed by all parties and submit copies to members of the liaison group. The EnCoW will work closely with the Contractors site supervisors to monitor activities and ensure that all relevant environmental legislation is complied with and that the requirements of the CEMP are implemented. The EnCoW will have the authority to review method statements, oversee works and instruct action, as appropriate, including the authority to require the temporary cessation of works, where necessary.

3.2 Hours of Working

Where construction activity takes place for the redevelopment in the vicinity of residential properties, the activities will operate between the hours of 08:00 and 18:00 on Monday to Fridays, between 08:00 and 13:00 on Saturdays and there will be no activity on Sundays or Bank Holidays.

Where additional or alternative working hours are required, these will be agreed in advance with Dublin City Council.

3.3 Outline Environmental Management Plans

A suite of Construction Phase Management Plans will be prepared in association with the preferred Contractor(s). These Management Plans will reflect any conditions imposed by ABP and will be agreed with DPC and the relevant competent authorities in advance of the final Contract being signed.

These will include

- Traffic Management Plan
- Site Waste Management Plan

- Noise Management Plan
- Dust & Odour Management Plan
- Contamination Strategy
- Marine Mammal Observation Plan
- Marine Archaeology Management Plan
- Industrial Heritage Conservation Plan
- Water Quality Management Plan
- Dredging Management Plan

3.3.1 Traffic Management Plan

A Traffic Management Plan (TMP) will be agreed with Dublin City Council, National Roads Authority and the National Transport Authority, as appropriate.

The TMP will comply with the Dublin City Council HGV Management Strategy.

The TMP will include provisions for routing, wheel washing and covering of loads using the Dublin Port Tunnel. Appropriate parking facilities for site operatives and visitors will be maintained within the site and all parking areas will be clearly signed and monitored.

The TMP will recognise DPC's commitment to encourage transportation of materials by sea where this is both economically viable and more environmentally sustainable than transport by land.

3.3.2 Site Waste Management Plan

A Site Waste Management Plan will be agreed with Dublin City Council.

The Plan will be based on the waste disposal stipulations made in Chapter 4 of the EIS, page 4-29.

Contractors working on site during the works will be responsible for the collection, control and disposal of all wastes generated by the works. An indication of the types of waste likely to be generated by the works and the most appropriate method of disposal are presented in the table below (EIS, Table 4.5)

Typical Wastes Generated by the Construction Works and recommended disposal / treatment options

Activity	Waste Generated	Disposal/Treatment Recommendations
Demolition Waste	Construction materials, concrete, steel, clay pipes	Collected onsite for disposal by licensed waste contractor.
General Construction Waste	Waste oils	Collected by waste recycling contractor.
	Other waste	Collected in skips for disposal by licensed waste contractor.
General Office/Messing	Paper, packaging, canteen etc.	Collected in covered skips/large bins for disposal by a licensed waste contractor.
Temporary Site Toilets	Sewage	Emptied under contract for disposal at an appropriate facility.

3.3.3 Noise Management Plan

A Noise Management Plan will be agreed with Dublin City Council.

The following mitigation measures, presented in the EIS (Chapter 7), will be included in compliance with British Standard BS5228:2009 – Noise and vibration control on construction and open sites: Part 1 – Noise.

- Ensuring that mechanical plant and equipment used for the purpose of the works are fitted with effective exhaust silencers and are maintained in good working order;
- Careful selection of quiet plant and machinery to undertake the required work where available;
- All major compressors will be 'sound reduced' models fitted with properly lined and sealed acoustic covers which should be kept closed whenever the machines are in use;
- Any ancillary pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers;
- Machines in intermittent use will be shut down in the intervening periods between work;

- Ancillary plant such as generators, compressors and pumps will be placed behind existing physical barriers, and the direction of noise emissions from plant including exhausts or engines will be placed away from sensitive locations, in order to cause minimum noise disturbance. Where possible, in potentially sensitive areas, acoustic barriers or enclosures will be utilised around noisy plant and equipment.
- Handling of all materials will take place in a manner which minimises noise emissions;
- Audible warning systems will be switched to the minimum setting required by the Health & Safety Authority.

A complaints procedure will continue to be operated by the Contractor throughout the construction phase and all efforts will be made to address any noise issues at the nearest noise sensitive properties.

3.3.4 Dust & Odour Management Plan

A Dust and Odour Management Plan will be agreed with Dublin City Council.

The Dust & Odour Management Plan will be based on mitigation measures presented in the EIS (Chapter 7).

Dust Minimisation Plan

The dust minimisation plan will be prepared based upon the industry guidelines in the Building Research Establishment document entitled 'Control of Dust from Construction and Demolition Activities'. This will include measures such as:

- Site roads shall be regularly cleaned and maintained as appropriate. Hard surface roads shall be swept to remove mud and aggregate materials from their surface while any un-surfaced roads shall be restricted to essential site traffic only;
- Any site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions (also applies to vehicles delivering material with dust potential);
- All vehicles exiting the site shall make use of a wheel wash facility prior to entering onto public roads, to ensure mud and other wastes are not tracked onto public roads. Wheel washes will be self-contained systems that do not require discharge of the wastewater to water bodies;
- Public roads outside the site shall be regularly inspected for cleanliness, and cleaned as necessary;

- Material handling systems and site stockpiling of materials shall be designed and laid out to minimise exposure to wind;
- Water misting or sprays shall be used as required if particularly dusty activities are necessary during dry or windy periods;
- All vehicles which present a risk of spillage of materials, while either delivering or removing materials, will be loaded in such a way as to prevent spillage on to the public road;
- The contractor will be required to ensure that all vehicles are suitably maintained to ensure that emissions of engine generated pollutants is kept to a minimum; and
- The construction Contractor will be required to monitor monthly dust deposition levels each month for the duration of construction for comparison with the guideline of 350mg/m²/day (for non-hazardous dusts). This monitoring should be carried out at a minimum of four locations at sensitive receptors around the proposed works. Where dust levels are measured to be above this guideline the mitigation measures in the area must be reviewed as part of the dust minimisation plan.

An outline Dust Minimisation Plan is provided in Appendix 2 of this Draft High Level CEMP.

Odour Management Plan

An Odour Management Plan (OMP) to mitigate the potential for odours from dredging operations will be implemented. The OMP will follow the guidance presented in the Environment Agency of England and Wales “Odour Management Guidance” (H4 Guidance, 2011). The odour monitoring and investigation aspects of the OMP will follow the EPA “Odour Impact Assessment Guidance for EPA Licensed Sites” (Guidance Note AG5, 2010).

An outline Odour Management Plan is provided in Appendix 2 of this High Level CEMP.

3.3.5 Contamination Strategy

A Contamination Strategy will be agreed with the EPA and Dublin City Council. The Strategy will be based on the mitigation measures presented in the EIS (Chapter 11).

Alexandra Basin West

Contaminated sediments within Alexandra Basin West will not be disposed of at sea.

Dredging operations have been designed to minimise the disturbance and escape of material at the seabed and during removal through the water column. A floating pontoon with an excavator mounted

clamshell bucket adapted for environmental dredging will be used. A silt curtain will also be placed around the dredger to contain the marine sediments. This method of dredging will serve to minimize the spread of suspended contaminated sediments beyond the dredge foot print.

The dredged material recovered from Alexandra Basin West will be transported by barge to a treatment facility adjacent to Berth 52/53. It will be stabilised and modified to improve the engineering properties of the material to allow its re-use as fill material. In order to minimise the stockpiling of dredged material, the rate of dredging will be determined by the rate of treatment of the dredged material.

Best practice industry techniques will be used to treat the contaminated material yielded from the dredging of Alexandra Basin West. Ex-situ Stabilisation/Solidification (S/S) is proposed for the treatment of the contaminated material.

Ex-situ Stabilisation/Solidification (S/S) is a remediation technology that reduces the mobility of contaminants. Immobilisation is achieved by reaction of contaminants with reagents to promote sorption, precipitation or incorporation into crystal lattices, and/or by physically encapsulating the contaminants.

The method produces a high strength monolith-like product that physically reduces the mobility and chemically binds contaminants to the produced matrix. The treated mass can then be recovered/recycled to serve as infill material or for beneficial use.

The treatment and recovery of the dredging spoil on site will take place in accordance with the conditions of an Industrial Emissions Licence to be obtained from the EPA. Following treatment the material will be placed in the Berth 52/53 basin and Graving Dock #2 as a recovery activity, replacing the need to use virgin materials that would otherwise be required for the development.

Navigation Channel

A dumping at sea permit will be sought from the EPA for dredged material from the navigational channel. The disposal of dredge spoil at sea will be undertaken in accordance with the conditions of the dumping at sea permit.

Sediments immediately adjacent to Alexandra Basin West where low levels of contamination have been found will be disposed of at sea only at slack tide and immediately covered by sand or gravel, if required by the EPA.

3.3.6 Marine Mammal Observation Plan

A Marine Mammal Observation Plan will be agreed with National Parks & Wildlife Service.

The Plan will be based on the mitigation measures presented in the EIS (Chapter 5) and the further detail of the Mitigation Measures put forward with respect to Marine Mammals as submitted to ABP on 18 August 2014 in response to a Request for Further Information sought by ABP.

The following precautionary measures will be undertaken to minimise the risk of direct injury to marine mammals in the area of operations in line with National Parks & Wildlife Service Guidelines (2013):

- A trained and experienced Marine Mammal Observer (MMO) will be put in place during piling, dredging, dumping, and demolition operations. The MMO will scan the surrounding area to ensure no marine mammals are in a pre-determined exclusion zone in the 30-minute period prior to operations. It is suggested that this exclusion zone is 500m for demolition and dredging activities, and 1,000m for piling activities considering the potential risks outlined in the EIS.
- Noise-producing activities shall only commence in daylight hours where effective visual monitoring, as performed and determined by the MMO, has been achieved. Where effective visual monitoring is not possible, the sound-producing activities shall be postponed until effective visual monitoring is possible. Visual mitigation for marine mammals (in particular harbour porpoise) will only be effective during daylight hours and if the sea state is 2-3 (Beaufort scale) or less. In the absence of year-round data on marine mammal use within Dublin Bay, there is no justification for limiting works to any particular season.
- For piling activities, where the output peak sound pressure level (in water) exceeds 170 dB re: 1µPa @ 1m, a ramp-up procedure will be employed following the pre-start monitoring. Underwater acoustic energy output shall commence from a lower energy start-up and thereafter be allowed to gradually build up to the necessary maximum output over a period of 20-40 minutes.
- Once operations have begun, operations will cease temporarily if a cetacean or seal is observed swimming in the immediate (<50m) area of piling and dredging and work can be resumed once the animal(s) have moved away.
- Dumping of material at sea will not take place if a cetacean or seal is within 50m of the vessel.
- Any approach by marine mammals into the immediate (<50 m) works area will be reported to the National Parks and Wildlife Service.
- If there is a break in piling activity for a period greater than 30 minutes then all pre-activity monitoring measures and ramp-up (where this is possible) will recommence as for start-up.
- Once normal operations commence (including appropriate ramp-up procedures), there is no requirement to halt or discontinue the activity at night-time, nor if weather or visibility conditions

deteriorate, nor if marine mammals occur within a radial distance of the sound source that is 500m for dredging and demolition works, and 1000m for piling activities.

- The MMO will keep a record of the monitoring using a 'MMO form location and effort (coastal works)' available from the National Parks & Wildlife Service (NPWS) and submit to the NPWS on completion of the works.

In order to reliably quantify the zone of responsiveness associated with the proposed programme of piling activities associated with the Alexandra Basin Redevelopment, one of the following methods will be used:

- Modelling of sound propagation calibrated using field measurements; or
- Deployment of hydrophones in combination with passive acoustic monitoring.

A real-time passive acoustic monitoring (PAM) system will be installed at the approaches to Dublin Port to provide information on the presence of marine mammals during these periods when visual mitigation is not possible. This technique is to compliment and not replace visual techniques.

The PAM system will be established by deploying a LIDO system (www.listentothedeep.com) which can acquire high and low frequency data and stream these data ashore through the internet. This system is provided by LAB UPC at the University of Barcelona and has been used throughout the world as an ocean basin wide acoustic monitoring tool. Additionally it allows for real time monitoring. Hardware and technical support is provided by UPC. PAM will allow monitoring of harbour porpoises and other odontocetes (bottlenose dolphins) within a range of 250 – 800m and will also detect mid and low frequency seal vocalisations. A two hydrophone system will be installed to achieve monitoring of the minimum 1000m exclusion zone for piling.

PAM will be used to provide additional assurance that any disturbance is temporary and will not lead to significant impacts on marine mammals in the long term nor adversely affect the integrity of any designated site having regard to the conservation objectives of each site. This additional mitigation method will allow for ongoing assessment of disturbance as well the monitoring of the effectiveness of mitigation measures.

In order to validate the effectiveness of mitigation measures for harbour porpoises a static acoustic monitoring programme (SAM) will be established using CPODS. CPODs are self-contained click detectors which log the echolocation clicks of dolphins and porpoises. They can be deployed on a mooring for 4-6 months before recovery and downloading of data. These data can be analysed as detection positive minutes (DPM) to generate an acoustic index of activity. This technique provides large datasets to enable changes in activity to be identified at high resolutions. CPODs are spatially constrained having detection distances of around 250m for harbour porpoise and 800m for bottlenose

dolphins (O'Brien *et al.* (2013). O'Brien *et al.* (2013) recommended a minimum of four units should be deployed in small inshore study areas to ensure that statistically robust data can be collected. The number of PODs required should reflect the parameters or factors to be tested (e.g. fine scale diel or larger scales such as seasonal trends). Using an even number design for replication purposes can allow for parameters such as inshore and offshore trends to be explored in larger areas. The more units that can be deployed in an area, the more an informed evaluation of a site and successful monitoring indices will be generated. Hence four stations will be established for SAM.

The four stations will be monitored including two at the dumping site on Burford Bank and two within Dublin Bay. These stations will be monitored pre-construction, during construction and for a minimum of two years post-construction in line with best international practice.

Monthly monitoring of seal haul out sites will be also carried out at Bull Island and adjacent areas pre-construction, during construction and for a minimum of two years post-construction in line with best international practice.

3.3.7 Marine Archaeology Management Plan

A Marine Archaeology Management Plan will be agreed with the National Monuments Section at the Department of Arts, Heritage and the Gaeltacht.

The Plan will be based on the mitigation measures presented in the EIS (Chapter 12).

Archaeological monitoring of all dredging activities conducted within the Approach Channel will be carried out, with the provision to resolve fully any material of archaeological significance observed at that point.

An archaeologist experienced in maritime archaeology will be retained for the duration of the relevant works.

Archaeological Licences will be required to conduct the on-site archaeological works. These will include detailed method statements which outline the rationale for the works, and the means by which the works will be resolved. The following licence types will be required: Excavation, to cover monitoring and investigations works; Detection, to cover the use of metal-detectors; and Dive Survey, to cover the possibility of having to conduct underwater inspections.

Archaeological monitoring will be carried out by suitably qualified and experienced maritime archaeological personnel licensed by the Department of Arts, Heritage and the Gaeltacht. Archaeological monitoring is conducted during all terrestrial, inter-tidal/foreshore and seabed disturbances associated with the development.

The monitoring will be undertaken in a safe working environment that will facilitate archaeological observation and the retrieval of objects that may be observed and that require consideration during the course of the works.

The monitoring will include a finds retrieval strategy that is in compliance with the requirements of the National Museum of Ireland.

In the event of archaeologically significant features or material being uncovered during the construction phase, machine work will cease in the immediate area to allow the archaeologist/s to inspect any such material.

Once the presence of archaeologically significant material is established, full archaeological recording of such material will be recommended. If it is not possible for the construction works to avoid the material, full excavation will be recommended. The extent and duration of excavation will be a matter for discussion between the client and the licensing authorities.

A suitable archaeological team will be on standby to deal with any such rescue excavation. This will be complimented in the event of a full excavation.

An archaeological dive team will be retained on standby for the duration of any in-water disturbance works on the basis of a twenty-four or forty-eight hour call-out response schedule, to deal with any archaeologically significant/potential material that is identified in the course of the seabed disturbance activities.

Facilities will be provided to facilitate the temporary storage of artefacts that may be recorded during the course of the site work.

Buoying/fencing of any such areas of discovery will be necessary if discovered and during excavation.

Machinery traffic during construction will be restricted to avoid any identified archaeological site/s and their environs.

Spoil will not be dumped on any of the selected sites or their environs.

It is a condition of archaeological licensing that a detailed project report is lodged with the DAHG within 12 months of completion of site works. The report should be to publication standard and should include a full account, suitably illustrated, of all archaeological features, finds and stratigraphy, along with a discussion and specialist reports. Artefacts recovered during the works need to meet the requirements of the National Museum of Ireland.

3.3.8 Industrial Heritage Conservation Plan

An Industrial Heritage Conservation Plan will be agreed with the Department of Arts, Heritage and the Gaeltacht and Dublin City Council.

A conservation strategy has been developed in light of the cultural heritage significance of the North Wall Quay Extension (issued to ABP in support of the Planning Application).

The conservation strategy includes retaining an exemplar of Bindon Blood Stoney's foundation works for public view as part of the Port's cultural heritage assets.

The historic Graving Dock #1 will also be reinstated as part of the ABR Project.

The conservation strategy will be fully implemented.

A heritage architect or Engineer experienced in industrial and maritime architectural heritage will be retained for the duration of the relevant works, to advise specifically in relation to works associated with North Wall Quay Extension and the Graving Docks.

3.3.9 Water Quality Management Plan

A water quality management plan will be agreed with competent authorities including Dublin City Council, EPA, Inland Fisheries Ireland, National Parks & Wildlife Service and users of the receiving waters including Power Station operators and representatives of the local community.

The Plan will be based on the mitigation measures presented in the EIS (Chapter 10).

The mitigation measures will include the requirements for best practice and adherence to relevant Irish guidelines, or international guidelines where these are not available:

- Good practice guidelines on the control of water pollution from construction sites developed by the Construction Industry Research and Information Association (CIRIA, 2001);
- Pollution prevention guidelines in relation to a variety of activities developed by the Environment Agency (EA), the Scottish Environmental Agency (SEPA) and the Northern Ireland Environment Agency (NIEA);
- Environment Agency Pollution Prevention Guidelines (PPG6);
- Fisheries Guidelines for Local Authority Works. Department of Communications, Marine & Natural Resources, Dublin, (Anonymous, 1998);

- Guidelines on protection of fisheries habitats during construction projects (Eastern Regional Fisheries Board, 2006);
- International Convention for the Prevention of Pollution From Ships, 1973, as modified by the Protocol of 1978 (MARPOL) for domestic waste discharges to the environment;
- International Marine Organisation guidelines; and
- Control of Substances Hazardous to Health (COSHH) Handling of Hazardous Materials.

A Construction Environmental Monitoring Programme will also be prepared to provide additional safeguards to the receiving environment during the construction phase of the works. The monitoring programme will form part of the specification of the Contract Documents for the construction stage.

The design of the Construction Environmental Monitoring Programme will include the following elements related to the receiving waters:

- An assessment using 3-D hydrodynamic computational modelling and water quality modelling to design the placement of a number of water quality monitoring buoys and telemetry based warning systems.
- The establishment of water quality trigger levels and corresponding actions (including the necessity to temporarily cease construction operations) to safeguard sensitive conservation sites (SPA and SAC) and the operations of other users of the receiving waters (e.g. Power Stations).

3.3.10 Dredging Management Plan

A Dredging Risk Assessment has been completed of the proposed dredging works that will occur in the Alexandra Basin West and the Navigation Channel based on the environmental assessments and mitigation measures described in the EIS.

The full Risk Assessment report is presented in Appendix 3 of this Draft High Level CEMP.

The Risk Assessment has identified an additional contingency measure which will be incorporated into the CEMP as outlined below (presented in Table 4.7, Appendix 3 of this Draft High Level CEMP).

A contingency bubble curtain will be installed across the entrance to Alexandra Basin West. This bubble curtain will be utilised in the event of a breach of the silt curtain around the dredger. If a breach occurs, dredging activities will immediately cease, and the silt curtain will be repaired/replaced prior to restarting

dredging. The bubble curtain will be activated by switching on a compressor, which will force compressed air through a submerged perforated hose allowing a series of “bubble plumes”. The rising bubbles cause a vertical current of air and water flowing towards the surface, generating an air curtain. This bubble curtain will prevent the movement of any contaminated sediment from entering the Navigation channel whilst allowing port traffic to pass.

The Risk Assessment and mitigation measures therein, comprise the core elements of a Dredging Management Plan which will be agreed with competent authorities including Dublin City Council, EPA, Inland Fisheries Ireland, National Parks & Wildlife Service and users of the receiving waters including Power Station operators.

4 SITE SAFETY

Safety will be of prime importance during the construction works. The works will be subject to the Safety, Health and Welfare at Work Act 2005 and the Safety, Health and Welfare at Work (Construction) Regulations, 2013 (EIS, Chapter 4). All aspects of design construction will be reviewed with regard to health and safety and a risk assessment will be carried out.

A project supervisor (design phase) will be appointed to produce a pre-tender Health and Safety Plan for the project. The principal contractor will be responsible for the control and co-ordination of health and safety during the works and will be appointed as the project supervisor (construction stage).

All individuals working on the Project will be required to undertake induction procedures. Such will be designed to make individuals aware of all the issues associated with the Project and will include, but not be limited to;

- The terms of the CEMP;
- Working Hours;
- Access arrangements;
- Health, Safety and environmental policy and procedures;
- Code of Conduct within the site and surrounding environs;
- Statutory obligations of individuals on site;
- Traffic Management;
- Site parking;
- Public Access;
- Lighting requirements;
- Complaints and disciplinary procedures;
- Protection of the water environment;
- Protection of wildlife and habitats;
- Dust and air quality;
- Noise and vibration; and
- Emergency procedures.

Visitors will not be allowed onto the site unless they have received formal induction or are accompanied by an authorised person who has completed the induction. All visitors will be required to sign a visitor's book.

APPENDIX 1

MITIGATION MEASURES FOR BLACK GUILLEMOTS

Mitigation Measures for Black Guillemots

Background

The only likely negative impact on birds, of the proposed ABR Project, is the loss during the construction period of nest sites for a number of pairs of Black Guillemots. These are small seabirds that nest in cavities in a variety of coastal locations. Dublin Port has been fully surveyed in both of the last two breeding seasons and the total size of the Black Guillemot colony here was estimated at 82 (2013) and 62 birds (2014). This included a maximum of 8 nesting pairs in the Alexandra Basin (West) and 2 pairs in the area of Berths 52/53. The nest sites are mainly in the older quay walls, that tend to have more suitable cavities and drainage pipes, or beneath jetties and other open structures.

Black Guillemots are relatively common and widespread around the coasts of Ireland. Natural nest sites are generally in crevices at the base of rocky cliffs but they also commonly nest in harbour walls and even in artificial nest boxes (Mitchell et al. 2004). The birds, their nests and eggs are protected under the Wildlife Acts 1976 to 2000. They are not listed as Special Conservation Interests for any of the Special Protection Areas in the Dublin area.

Likely impacts

The older quay walls in the Alexandra Basin will be replaced as part of the redevelopment project. This will involve the loss, during construction, of approximately 10 nest sites within cavities in these walls in the combined areas of Alexandra Basin (West) and Berths 52/53. Mitigation measures will be introduced to provide alternative nest sites in neighbouring areas of the port, in advance of the redevelopment.

Mitigation measures

Black Guillemots generally come ashore and occupy the nest holes in October, some five months prior to egg-laying (Greenwood 1987, 1991). Young birds have generally left the nests by late August (Ferguson-Lees et al. 2011). In order to avoid disturbance to nesting birds, any existing nest holes in piers or structures to be demolished, will be blocked or otherwise made inaccessible in the month of September preceding the development works.

Prior to this, at least 10 artificial nest boxes will be erected in the area of the Oil Jetty on the north side of Dublin Port. These berths do not currently provide any suitable nest sites and are not currently proposed for redevelopment. The Oil Jetty is midway between the Alexandra Basin (West) and Berths 52/53. In addition, 10 concrete nest boxes will be incorporated into the new quays and jetties, at appropriate locations selected at the detailed design stage, to encourage the birds to return to these areas in subsequent breeding seasons.

Artificial nest boxes in similar types of harbour structures have been successfully used by Black Guillemots for nesting in Bangor Marina in Northern Ireland over the period 1985 to 2013, allowing the population at this site to increase from 7 to 38 pairs (Greenwood 2014).

Monitoring

The Black Guillemot breeding population in Dublin Port will continue to be monitored before, during and after the Alexandra Basin Redevelopment scheme. The artificial nest boxes, provided as part of the scheme, will be monitored for a period of three breeding seasons after construction, to ensure that the boxes are being used by Black Guillemots. The breeding success (average number of fledged young per pair) in the artificial nest boxes, will be calculated and compared with normal breeding parameters for this species. It is expected that the total population size of this species in Dublin Port will be maintained or increased during and after the construction period.

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Ferguson-Lees, J., Castell, R. and Leech, D. 2011. A Field Guide to Monitoring Nests. British Trust for Ornithology. Thetford.

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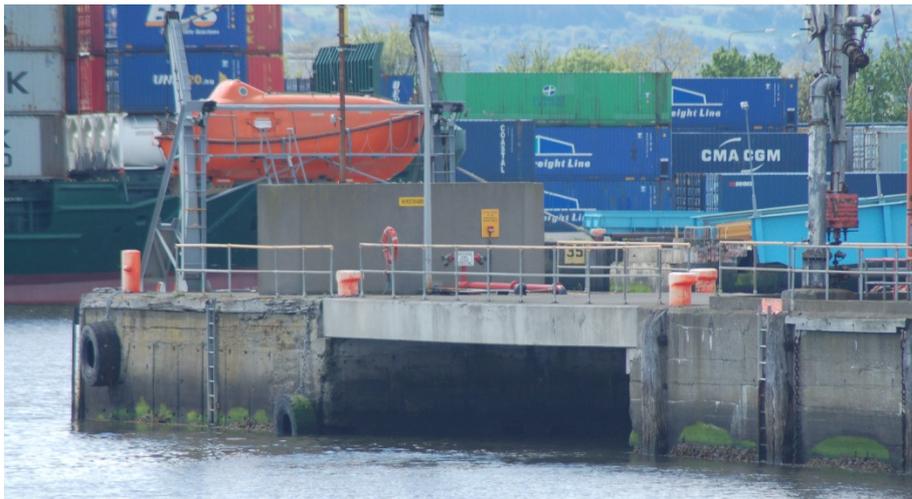
Appendix 1: Photographs



Black Guillemot in drainage hole



Typical Black Guillemot nest box



Suitable location for artificial nest boxes for Black Guillemots in Oil Jetty at Dublin Port

APPENDIX 2

DUST & ODOUR MANAGEMENT PLANS

Dust Minimisation Plan

The outline dust minimisation plan is based upon the industry guidelines in the Building Research Establishment document entitled '*Control of Dust from Construction and Demolition Activities*' (2003).

In order to ensure that any dust nuisance is minimised, a series of mitigation measures are prescribed below:

- The moisture content of the dragged material in the waste treatment area will be maintained at levels greater than 30% at all times to prevent the generation of dust from this operation.
 - Site traffic will be restricted to 20km/hr to minimise dust re-suspension.
 - Site roads shall be regularly cleaned and maintained as appropriate. Hard surface roads shall be swept to remove mud and aggregate materials from their surface while any un-surfaced roads shall be restricted to essential site traffic only.
 - Any site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions (also applies to vehicles delivering material with dust potential).
 - All vehicles exiting the site shall make use of a wheel wash facility prior to entering onto public roads, to ensure mud and other wastes are not tracked onto public roads. Wheel washes should be self-contained systems that do not require discharge of the wastewater to water bodies.
 - Public roads outside the site shall be regularly inspected for cleanliness, and cleaned as necessary.
 - Material handling systems and site stockpiling of materials shall be designed and laid out to minimise exposure to wind.
 - All material handling will be carried out to minimise drop heights from plant to plant or from plant to stockpile.
 - Water misting or sprays shall be used as required if particularly dusty activities are necessary during dry or windy periods.
-

- All vehicles which present a risk of spillage of materials, while either delivering or removing materials, will be loaded in such a way as to prevent spillage on to the public road.
- The contractor will be required to ensure that all vehicles are suitably maintained to ensure that emissions of engine generated pollutants is kept to a minimum.

The level of mitigation (water misting, use of bowsers, etc.) will be dictated by the results of the monitoring strategy and the levels of rainfall experienced in a given period. This will prevent the excessive use of water for dust suppression on site when not required to minimise secondary drainage impacts.

An apart of any broader audit of the works under the CEMP, the application of the above measures will be assessed and recorded. Where required, corrective actions will be identified and presented to the Contractor to fully implement the above measures to minimise dust.

The Contractor is required to monitor monthly dust deposition levels each month for the duration of construction. Baseline monitoring in advance of any works will also be carried for a minimum of three months to determine background levels from other sources (e.g. road transport).

The monitoring procedure employed will be the German Standard Method VDI 2119 (*Measurement of Dustfall, Determination of Dustfall using Bergerhoff Instrument (Standard Method) German Institute*). The dust deposition rate will be measured by positioning a series of Bergerhoff Dust Deposit Gauges at strategic locations at key receptor points which will be tested on a monthly basis. The selection of sampling point locations will be completed after consideration of the requirements of VDI 2119 with respect to the location of the samplers relative to buildings and other obstructions, height above ground and sample collection and analysis procedures. The locations will be proposed to Dublin City Council for approval and will be based on the potential risk to sensitive receptors in the area.

The results of the monitoring will be compared against the guideline of $350\text{mg}/\text{m}^2/\text{day}$. This is the standard German TA Luft guideline which is widely applied in Ireland to determine dust nuisance.

This guideline will be used as a trigger to determine dust nuisance. Where any monthly dust level exceeds the trigger value the contractor will carry out an investigation to determine the potential cause. Recent operations within the site, possible external sources and met data will be identified to determine the cause of any exceedence. Where the works are identified as the source the contractor will be obliged to increase mitigation, modify the proposed works or provide alternative means of dust minimisation measures. All exceedences of the trigger value and subsequent investigations will be recorded and available for review by Dublin City Council.

Odour Management Plan

This outline Odour Management Plan (OMP) has been prepared in accordance with the following guidance documents:

- Odour Management Plans for Waste Handling Facilities (Environment Agency, 2011)
- *Odour Management Guidance*" (Environment Agency, 2011).
- *Odour Impact Assessment Guidance for EPA Licensed Sites*" (EPA Guidance Note AG5, 2010).

The OMP has been designed to:-

- Employ appropriate methods, including monitoring and contingencies, to control and minimise odour pollution;
- Prevent unacceptable odour pollution at all times; and
- Reduce the risk of odour releasing incidents or accidents by anticipating them and planning accordingly.

Odour Risk

The risk of odour from the proposed work has been assessed based on the standard source-pathway-receptor model. Each area is outlined in the following section to provide an assessment of overall risk.

Source

The potential sources of odour during the constructions works relate to the dredging operation where decayed organic material has the potential to release sulphurous compounds (such as hydrogen sulphide) or where solvent contamination is uncovered.

Hydrogen sulphide (H₂S) is partially water soluble so some H₂S released during dredging will dissolve in the water to form sulphuric acid at very trace concentrations which will rapidly dilute and disperse in the water column. Previous dredging operations in the same area and at similar depths has released no hydrogen sulphide to the atmosphere.

Very low levels of organic solvents are recorded in the material to be dredged in the basin and channel equating to less than 0.02% of the total material. Any solvent vapour released during dredging will be low volume and will quickly condense into the liquid phase and either dissolve in the water (such as water soluble solvents such as alcohols) or form a residue on the water surface where not water soluble (such as aromatics).

Pathway

In the event that any odours become airborne the odours will dilute and disperse in the air. The direction of dispersion and extent of dilution is largely dictated by the wind speed and direction. Higher winds will lead to greater dilution than lower winds and calm days (such as temperature inversion) will restrict dilution/dispersion and increase odour risk. Wind direction in the Dublin area is predominately westerly-south westerly (circa 60% of the year) which will direct odours away from residential areas to the south. Northerly and north easterly winds in the direction of the residential areas to the south are very infrequent (circa 10%) as are calms (2.2% of the time).

Receptor

The nearest sensitive residential receptors to the proposed dredging operation are the residential dwellings on York Road, Pigeon House Road, Ringsend Park and Pembroke Cottages approximately 100 metres to the south of the dredging area.

Further north there are a number of residential areas along Clontarf Road which lie over 1.5km to the north of the proposed dredging operations.

The nearest commercial receptors to the proposed development include the various operations along Alexandra Road to the north and east of the site. In addition the O2 Theatre and the Gibson Hotel are the closest operations to the west of the site. To the south of the site there are a number of office developments on York Road and Thorncastle Road.

Ecological receptors can be affected by deposition of air pollutants such as nitrogen oxides and sulphur dioxide. The nearest sensitive ecological sites to the proposed development are the Grand Canal pNHA (Site Code 2104), the Royal Canal pNHA (Site Code 2103) and South Dublin Bay and River Tolka Estuary SPA (Site Code 4024). Ecological receptors would be less sensitive to odours than human receptors.

Monitoring and Audit

This plan includes for the periodic odour audit of the facility by a suitably qualified expert to identify all sources on site together with nature and scale of the odour release and associated construction details. This will be to both validate the sources listed above coupled with the identification of any new sources.

The periodic odour monitoring and investigation aspects of the OMP will follow the procedures presented in the EPA "*Odour Impact Assessment Guidance for EPA Licensed Sites*" (Guidance Note AG5, 2010). The number and frequency of audits will be dictated by the frequency of complaints (if any) coupled with any direction provided by Dublin City Council.

The results of the monitoring events and audits will be communicated to the construction manager to advise of any changes to the working practices or abatement measures to mitigate odour risk.

Complaint Investigation

As part of the plan, a dedicated recording system will be put in place to allow for the management of odour complaints. One of the most important factors associated with odour complaint recording includes the use of an easily contactable phone number for complainants to discuss their complaints. A free phone number is preferable. During normal working hours, an experienced person who is familiar with the processes should answer the phone. Only during out of hours should an answer phone be used. The answer phone should clearly state the information required of the complainant. The complainant should always be contacted back if a message is recorded. The relevant information to be recorded includes:

- Date and time of complaint
- Name of complainant
- Location of complainant
- Duration of odour
- Where and when odour was detected
- How strong the odour was/is (Intensity on a scale of 0 to 5 where 0 is not perceptible, 1 is very weak, 2 is weak, 3 is distinct, 4 is strong and 5 is very strong)?
- What did the odour smell like - A number of random descriptors should be proposed by the facility representative or offered by the resident (saying that the odour smells bad is not sufficient).
- Details of the responses made to the complainant.
- Details of the existing met conditions, in particular wind speed. Up to date met data is available on: <http://www.met.ie/latest/reports.asp>

Where possible the location of the complainant should be visited immediately to verify the nature of the odour. Where the source is confirmed to relate to the works, the construction manager should be contacted immediately to cease or modify the operation causing the odour until suitable mitigation measures are devised.

APPENDIX 3

DREDGING RISK ASSESSMENT



Alexandra Basin Redevelopment

An Bord Pleanála RFI

Item 13.3 - Risk Assessment

Document Control Sheet

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Project Title:	Alexandra Basin Redevelopment Project
Document Title:	Item 13.3 – Risk Assessment
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EXECUTIVE SUMMARY

This Risk Assessment report has been prepared in response to a Further Information Request from An Bord Pleanála in relation to the ABR Project.

The scope of the Risk Assessment report is limited to the proposed dredging works that will occur in the Alexandra Basin West and the Navigation Channel.

The risk assessment considers the risk of incidents occurring that could result in liabilities materialising e.g. the event of an accident, spillage or containment breach. The risk assessment has been prepared following the Environmental Liability Risk Assessment (ELRA) methodology outlined in EPA document ‘Guidance on assessing and costing environmental liabilities’ (EPA, 2014).

The ELRA procedure is based on the standard risk assessment principles presented in Irish Standards I.S. ISO 31000:2009 Risk Management – Principles and Guidelines; and IS. EN 31010:2010 Risk Management – Risk Assessment Techniques.

Risk identification was undertaken following a review of the information provided in the EIS. The risk identification process involved the identification of plausible incidents from dredging & disposal operations only that pose a potential hazard to the environment. Following this risk identification, a risk analysis was carried out which involved determining the likelihood and consequences for identified risk event. A risk evaluation was then carried out, which involved developing a risk matrix to allow risks to be easily displayed and risk treatment which includes mitigation measures to control and reduce the risks.

The risk assessment was carried out pre-mitigation and with-mitigation to display the reduction in risk with the proposed mitigation measures/control measures in place as outlined in the EIS. Where mitigation measures/control measures have been proposed, a set of revised risk scores have been applied.

The risk assessment has demonstrated that the proposed mitigation measures/control measures proposed will be effective in reducing the likelihood and consequence of the risk occurring.

1. INTRODUCTION

This Risk Assessment report has been prepared in response to a Further Information Request from An Bord Pleanála, herein referred to as ABP (Reference: 29N.PA0034) dated the 7th of July 2014 in relation to the ABR Project.

This Assessment has been prepared to address specific queries raised by ABP under Item 13.3 of the RFI (see below) and supplements the environmental assessments provided to ABP in the initial application and the EIS and NIS.

13.3 *Provide a timescale for dredging works in the Basin, a risk assessment and an emergency plan in the event of an accident, spillage or containment breach.*

The scope of the Risk Assessment report is limited to the proposed dredging works that will occur in the Alexandra Basin West and the Navigation Channel.

As confirmed in Section 10.3 of Volume 1 of the EIS, Dublin Port Company (DPC) has an existing Emergency Management Plan (EMP) in place. The EMP is designed to provide guidelines to the DPC for responding to an emergency within their area of jurisdiction. As such the EMP is designed to cater for both marine and land based emergencies and the plan outlines the DPC structures and arrangements for responding to emergencies that may occur within Dublin port. As the structures and arrangements are well defined, this EMP will be adhered to during the construction phase of the ABR Project and as such it will cover the dredging works in the event of an accident, spillage or containment.

2. PROJECT DESCRIPTION

2.1 SITE DESCRIPTION

The proposed development is located within Dublin Port Estate, Dublin, the largest Port in Ireland located on the East Coast of Ireland and within the navigation channel and fairway from Dublin Port into Dublin Bay and is described in Chapter 4 of Volume 1 of the Environmental Impact Statement (EIS).

Dublin Port Estate comprises an area of circa 260 hectares spanning both the North and South banks of the River Liffey.

2.2 PROPOSED DEVELOPMENT

The proposed ABR Project comprises works to be undertaken in three areas as follows:

- Alexandra Basin West
- Berths 52 / 53
- The navigation channel and fairway from Dublin Port into Dublin Bay

The extent of the proposed development works are outlined in Figure 2.1 below.

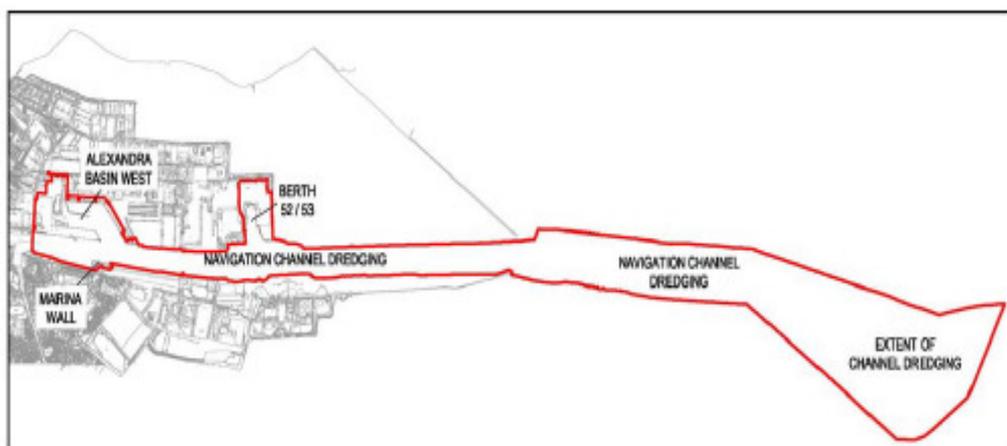


Figure 2.1 – Site Location Plan (taken from Figure 4.1A of the EIS)

The location of the Alexandra Basin West and Berths 52 / 53 in Dublin Port are shown in Figure 2.2.

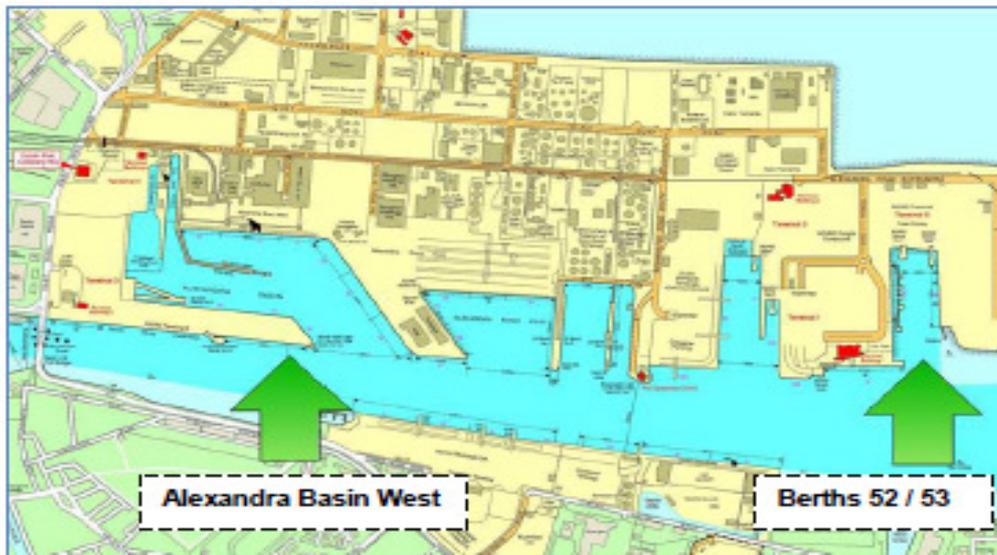


Figure 2.2 –Location of Alexandra Basin West and Berths 52 / 53 (taken from Figure 3.2 of the EIS)

The existing land-use within Alexandra Basin West is solely Port related. Similarly, the existing land-use at Berths 52 / 53, also known as Terminal 5, is solely Port related. Berths 52 / 53 are located in a basin at the eastern end of the Port, on the northern side of the River Liffey. The navigation channel is controlled by Dublin Port Company which is the competent authority with responsibility for the safe passage of all shipping entering and leaving the Port. No other commercial activities are permitted within the navigation channel for safety reasons. Maintenance dredging of the navigation channel takes place on a regular basis to maintain a depth of -7.8m Chart Datum (CD).

A project programme is included in Appendix 4 of Volume 2 of the EIS. This project programme outlines the proposed works and associated timescale that will be undertaken during the construction works of the Alexandra Basin Redevelopment, including dredging works.

From the project programme, it can be seen that there are 2 distinct dredging phases within the project; the Main Channel dredging and the Alexandra Basin dredging. It is envisaged that the Main Channel Dredging will be limited to the winter months only and will be carried out within a 6 month period to negate any potential impact on salmonid migration and summer bird feeding in the vicinity of the dredging operations. It is proposed that the dredging will commence following advance works with the first dredging operations due to commence in October 2015 and finish in March 2016. It is estimated that the main channel dredging will be completed six years. As such there will be 6 phases of dredging with the final phase proposed from October 2020 to March 2021.

The dredging of the Alexandra Basin West is not seasonally dependent. However the rate of dredging within Alexandra Basin West will be determined by the rate of treatment of the dredged material and as such it is envisaged that these works will be completed within 18 months, commencing in October 2017 and will be completed by end of March 2019.

A capital dredging scheme is an integral part of the development. Its purpose is to deepen Alexandra Basin West and the navigation channel and fairway from Dublin Port into Dublin Bay from its current depth of -7.8m CD to a depth of -10m CD. The proposed development is located within the confines of Dublin Port Company's land and the navigation channel approaching Dublin Port.

The scope of this Risk Assessment report is limited to the proposed dredging works that will occur in the Alexandra Basin West and the Navigation Channel. The dredging works are outlined in Section 3 below.

3. PROPOSED DREDGING ACTIVITY & DISPOSAL OF DREDGE MATERIAL

3.1 ACTIVITIES INVOLVED

The following dredging will be undertaken as part of the proposed works

- Dredging of Alexandra Basin West to -10.0m CD
- Dredging of the Liffey Channel to -10.0m CD, from the East Link Bridge to the Dublin Bay Buoy over a 6 year period.

This equates to approximately 6,370,000m³ of dredging. The alignment of the dredge channel is shown in Figure 3.1 below.

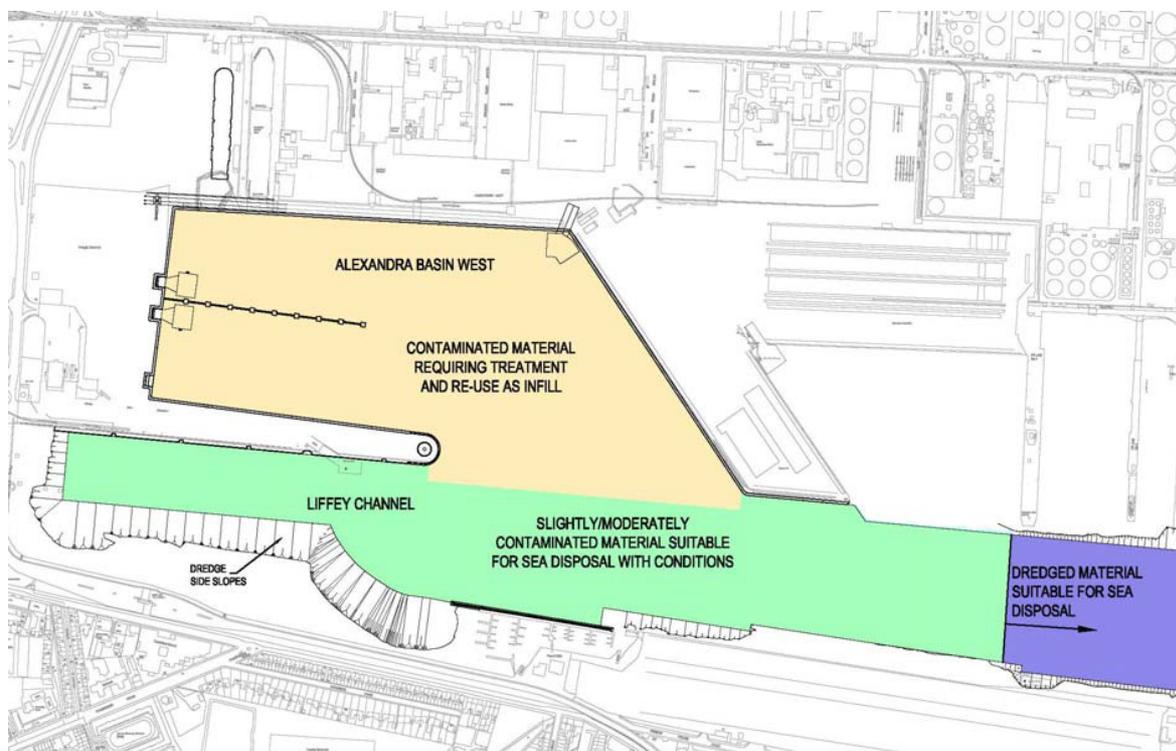


Figure 3.1 – Dredge Material Locations (taken from Figure 11.6 of the EIS)

Alexandra Basin West is contaminated particularly with heavy metals as a result of past cargo handling and ship repair activities.

As outlined in Section 11.2.4 of Chapter 11, Volume 1 of the EIS, a suite of sampling and environmental testing has been undertaken to quantify and identify the nature of the contamination within the bed materials of Alexandra Basin West and the Liffey Channel. The results shows that the bed materials within the Alexandra Basin West are contaminated with heavy metals such as Arsenic, Copper, Chromium, Cadmium, Nickel, Lead, Mercury and Zinc at depths exceeding 2m. Lower levels

of contamination were recorded in the channel sediments adjacent to the basin. The volume of material to be dredged is outlined in Table 3.1 below (taken from Table 11.3 in Chapter 11, Volume 1 of the EIS).

Table 3.1 – Dredge Volumes (taken from Table 11.3 of the EIS)

Source Location	Material Status	Approx. Volume (m ³)
Alexandra Basin West	Heavily Contaminated	470,000
Navigation Channel	Slight/Moderately Contaminated	500,000
Navigation Channel	Uncontaminated	5,400,000
Total Volume	-	6,370,000

As such, there are 3 distinct dredging and disposal operations that will be carried out as part of the proposed development, and each are discussed in more detail below.

- Dredging & Disposal of Uncontaminated material from the outer Navigation channel (between North Bull Wall/Great South Wall and the Dublin Bay Buoy);
- Dredging & Disposal of Slight/Moderately contaminated material from the Liffey Channel (adjacent to the North Wall Quay Extension and the entrance to Alexandra Basin West);
- Dredging of Heavily contaminated material from Alexandra Basin West and treatment of material at facility at Berth 52/53.

3.1.1 Dredging & Disposal of Uncontaminated material

The marine sediments from the outer channel, comprising mainly fine sands, between the North Bull Wall / Great South Wall and the Dublin Bay Buoy will be dredged using a Trailer Suction Hopper Dredger, or equivalent. The dredged material will be loaded into barges and transported directly to the licensed sea disposal site, Burford Bank in outer Dublin Bay. This disposal option is preferred because it keeps the dredge material within the natural Dublin Bay sediment cell.

Inside the North Bull Wall / Great South Wall, the bed material changes to silts, sands and gravel. This section of the channel will be dredged to the required design depths by an excavator which will operate from a floating pontoon. The dredged material will be loaded into barges and transported directly to the licensed sea disposal site.

It is envisaged that the dredging of uncontaminated material will be carried out during winter months only, within a 6 month period (October to March) to negate any potential impact on salmonid migration and summer bird feeding, notably terns, in the vicinity of the dredging operations. The dredging in the outer channel will commence at the channel mouth and continue westwards into the port, and will take place over a period of six winter seasons.

The channel will be dredged to the required depth along one side, maintaining an open shipping lane at all times. Once completed, the opposite side of the channel will be dredged to depth, with the shipping lane changed to the newly dredged section.

A Dumping at Sea (DaS) Permit will be required from the EPA, which will enable Dublin Port Company (DPC) to carry out the disposal of dredged material at the licensed disposal site, Burford Bank. The DaS Permit application will be subject to approval from the EPA.

3.1.2 Dredging & Disposal of slight/moderately contaminated material

The dredging in the Liffey Channel will be undertaken using a floating pontoon with an excavator mounted clamshell bucket adapted for environmental dredging. This will minimise the disturbance and escape of material at the seabed and during removal through the water column.

The sediment quality of the material to be dredged within the navigation channel has been tested for contamination and is suitable for disposal at sea, however, some of the material to be dredged from the channel outside Alexandra Basin West has shown slight/moderate levels of contamination.

Dredging of slight/moderately contaminated silty material adjacent to the North Wall Quay Extension and the entrance to Alexandra Basin West will be undertaken in conjunction with the dredging of gravels from the main channel. The slight/moderately contaminated silts deposited at the licensed sea disposal site, Burford Bank in outer Dublin Bay will be overlaid (capped) with the dredged gravels from the main channel. This will be carried out only at slack tide.

As outlined in Section 3.1.1, a DaS permit will be required from the EPA for the disposal of dredged material at the licensed disposal site. The DaS Permit application will be subject to approval from the EPA.

3.1.3 Dredging of Heavily contaminated material

As part of this scheme, Alexandra Basin West will be dredged to -10.0m CD. In order to achieve this, approximately 470,000m³ of material must be removed from the basin. Dredging of contaminated material within Alexandra Basin West will be undertaken to the design dredge level for the scheme.

The dredging will be undertaken using a floating pontoon with an excavator mounted clamshell bucket adapted for environmental dredging. This will minimise the disturbance and escape of material at the seabed and during removal through the water column. In addition, a silt curtain will be utilised around the dredger whilst the dredging of contaminated material is ongoing.

It is envisaged that the dredging of the contaminated sediments within Alexandra Basin West will not be seasonally dependent, as the silt curtain will serve to prevent the spread of suspended contaminated sediments beyond the dredge foot print.

A programme of sediment quality sampling and analysis has shown that the sediments within Alexandra Basin West are contaminated and not suitable for disposal at sea. As such, the dredged material recovered from the Alexandra Basin West will be loaded onto barges to be transported to a

treatment facility adjacent to Berth 52/53. No overtopping of barges will be permitted and spill plates will be utilised to prevent spillage during offloading operations.

The contaminated dredged material will be left on the barge overnight to allow for settlement. This method is proposed to remove as much free water from the dredged material as possible. Liquid arising from the solid material settling will be pumped out to an appropriately licensed mobile water treatment plant on site. The dredged material will be off loaded by excavators to the treatment facility. The dredge material will be stabilised and modified to improve the engineering properties of the material, to allow its re-use as fill material for reclamation works identified within the Port. A detailed description of the treatment process is outlined in Section 11.2.4 of Chapter 11, Volume 1 of the EIS.

In order to minimise the stockpiling of dredged material, the rate of dredging will be determined by the rate of treatment of the dredged material. The treatment and recovery of the dredging spoil on site will take place in accordance with the conditions of an Industrial Emissions Licence to be obtained from the EPA.

4 RISK ASSESSMENT

4.1 INTRODUCTION & SCOPE

This risk assessment has been prepared in response to an RFI from ABP and the scope of the risk assessment is limited to the proposed dredging works that will occur in the Alexandra Basin West and the Navigation Channel. It supplements existing assessments and mitigation measures carried out in the EIS in Chapters 4, 5, 9, 10 and 11.

The risk assessment considers the risk of incidents occurring that could result in liabilities materialising e.g. the event of an accident, spillage or containment breach. The risk assessment has been prepared following the Environmental Liability Risk Assessment (ELRA) methodology outlined in EPA document ‘Guidance on assessing and costing environmental liabilities’ (EPA, 2014).

The ELRA approach is a standard risk assessment that involves the assessment of the likelihood of occurrence of an event in combination with the consequences of that event. The ELRA procedure is based on the standard risk assessment principles presented in the following Irish Standards;

- I.S. ISO 31000:2009 Risk Management – Principles and Guidelines; and
- IS. EN 31010:2010 Risk Management – Risk Assessment Techniques.

Following the EPA Guidance, the procedure is as follows:

- Risk Assessment including the following stages:
 - risk identification, i.e. the systematic identification of plausible risks, the sensitivity of the receiving environment (receptor) and the potential pathway for the activity to impact on the environment.
 - risk analysis consists of determining the likelihood and consequences for identified risk events.
 - risk evaluation is the ranking and presentation of risks to allow for prioritisation of the risk treatment programme.
 - risk treatment is a process to mitigate risks, e.g. by removing the risk or minimising the likelihood or consequences

4.2 RISK IDENTIFICATION

Risk identification was undertaken following a review of the information provided in the EIS and in consultation with the RPS Project Team. The risk identification process involved:

- The identification of plausible incidents from dredging & disposal operations only that pose a potential hazard to the environment.
-

Based on a review of the dredging and disposal operations, the risks presented in Table 4.1 have been identified. The list includes all plausible risks that are considered possible to be associated with the dredging and disposal activities.

Table 4.1 – Risk Register

Id	Process	Plausible Risk Identified	Environmental Effect
1	Dredging	Ship Collision with the dredge vessel within the navigation channel	Release of diesel fuel resulting in marine pollution
2		Collision of dredge vessel with fixed object within the navigation channel	Release of diesel fuel resulting in marine pollution
3		Major spill from the dredge vessel during dredging activities	Release of diesel fuel, hydraulic fluid etc. resulting in marine pollution
4		Breach in containment of the silt curtain around the dredger in Alexandra Basin West during dredging of heavily contaminated material	Spread of suspended contaminated sediment beyond the dredge foot print resulting in marine pollution
5	Loading	Overtopping of barge with recovered heavily contaminated dredged material from Alexandra Basin West	Release of recovered heavily contaminated dredged material resulting in marine pollution
6		Rupture or failure of the barge with recovered heavily contaminated dredged material from Alexandra Basin West	Barge failure with the release of sediment plume resulting in marine pollution
7		Uncontrolled or poorly controlled release of heavily contaminated dredged material during loading operations	Release of sediment plume resulting in marine pollution
8	Transport	Breach in containment of the spill plates around the barge transporting heavily contaminated dredged material to Berth 52/53	Spillage of sediment into the water column resulting in marine pollution
9		Rupture or failure of the barge while transporting heavily contaminated dredged material to Berth 52/53	Barge failure with the release of sediment plume resulting in marine pollution
10		Ship collision with the barge within the Liffey Channel	Release of diesel fuel resulting in marine pollution
11		Collision of the barge with fixed object within the Liffey Channel	Release of diesel fuel resulting in marine pollution
12	Unloading	Breach in containment of the spill plates around the barges	Spillage of sediment into the water column resulting in marine pollution
13	Dumping	Dumping Dredged spoil from the Navigation Channel at the incorrect	Potential for impact on marine flora and fauna of a higher ecological value

		location	than the approved dump site location
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4.3 RISK ANALYSIS

The risks identified in Table 4.1 above were assessed against the Risk Classification Tables (RCT) in Tables 4.2 and 4.3. The risk classification tables were designed to reflect the levels of risk appropriate to the dredging activities.

Ratings, taken from the risk classification table, were applied to the consequence and likelihood of occurrence of each hazard. A risk score was calculated for each risk using the ratings.

Table 4.2 – Risk Classification Table (Likelihood)

	Likelihood	
Rating	Category	Description
1	Very Low	Very low chance of hazard occurring
2	Low	Low chance of hazard occurring
3	Medium	Medium chance of hazard occurring
4	High	High Chance of hazard occurring
5	Very High	Greater than chance of hazard occurring

Table 4.3 – Risk Classification Table (Consequence)

	Consequence	
Rating	Category	Description
1	Trivial	No damage or negligible change to the environment
2	Minor	Minor impact/localised or nuisance
3	Moderate	Moderate damage to environment
4	Major	Severe damage to local environment
5	Massive	Massive damage to a large area, irreversible in medium term

4.4 RISK REGISTER

The hazards identified associated with the dumping and dredging activities are outlined in Table 4.4. A description of each heading in the table is outlined below:

- Risk ID – Provides a unique identifier for each hazard.
- Process – Notes the activity to which the hazard relates.
- Potential Risk – Identifies the potential failure mode, which could result in the hazard occurring.
- Environmental Effect – The effect on the potential hazard on the environment, in this case Marine Flora & Fauna including migratory birds, benthic communities etc.
- Consequence Rating – Rates the environmental impact due to the hazard event occurring given the current controls. The consequence rating is ranked against the Risk Classification Table (RCT) as provided in Table 4.3.
- Basis of Consequence – Identifies the basis for the selected consequence rating.
- Likelihood Rating – Rates the likelihood of the potential hazard occurring given the current controls. The occurrence rating is ranked against the Risk Classification Table (RCT) as provided in Table 4.2.
- Basis of Likelihood – Identifies the basis for the selected occurrence rating and notes the current controls in place for the hazard.
- Risk Score – Provides a risk score to allow the ranking of each hazard. The risk score is based on the product of the severity rating and the occurrence rating for the hazard.

Table 4.4 – Risk Analysis for Dredging Operations (pre-mitigation)

Risk Id	Process	Potential Risk	Environmental Effect	Consequence Rating	Basis of Consequence	Likelihood Rating	Basis of Likelihood	Risk Score (Consequence x Likelihood)
1	Dredging	Ship Collision with the dredge vessel within the navigation channel	Release of diesel fuel from one or both vessels resulting in marine pollution	4	Spillage could cause fish kill, impact to birds and other marine life, impact on water quality. Six Natura 2000 sites and two Ramsar sites lie within 5km of the development. The volumes involved may warrant the activation of Tier 3 response under the DPC Emergency Management Plan.	2	Low chance of collision occurring, however operations occurring in busy port	8
2		Collision of dredge vessel with fixed object within the navigation channel	Release of diesel fuel resulting in marine pollution	3	Spillage could cause fish kill, impact to birds and other marine life, impact on water quality. Six Natura 2000 sites and two Ramsar sites lie within 5km of the development.	2	Low chance of occurrence with sufficient force for loss of vessel or inventory.	6

Risk Id	Process	Potential Risk	Environmental Effect	Consequence Rating	Basis of Consequence	Likelihood Rating	Basis of Likelihood	Risk Score (Consequence x Likelihood)
					The volumes involved may warrant the activation of a Tier 3 response under the DPC Emergency Management Plan.			
3		Major spill from the dredge vessel during dredging activities	Release of diesel fuel, hydraulic fluid etc resulting in marine pollution as a result of mechanical failure or refuelling	4	Spillage could cause fish kill, impact to birds and other marine life, impact on water quality. Six Natura 2000 sites and two Ramsar sites lie within 5km of the development. The volumes involved may warrant the activation of a Tier 3 response under the DPC EMP	2	Low level releases are possible during operations due to mechanical failure or refuelling spillage. High levels of loss or inventory loss are unlikely.	8
4		Breach in containment of the silt curtain around the dredger in Alexandra Basin West	Spread of suspended contaminated sediment beyond the dredge foot print resulting	3	Suspended sediment loss containing heavy metals could have an impact on the marine environment, as the sediment plume may disperse over a large	2	Low chance of occurrence, the choice of silt curtain will be determined by the site specific environmental conditions e.g. nature or material to be dredged,	6

Risk Id	Process	Potential Risk	Environmental Effect	Consequence Rating	Basis of Consequence	Likelihood Rating	Basis of Likelihood	Risk Score (Consequence x Likelihood)
		during dredging of heavily contaminated material	in marine pollution		<p>area.</p> <p>Six Natura 2000 sites and two Ramsar sites lie within 5km of the development.</p> <p><u>Birds</u></p> <p>Wintering Brent Geese, while they swim on the surface of the water, do not feed while on the water and will not be exposed to contaminated sediments during dredging.</p> <p>Turbidity in the water of the Dublin Port shipping channel has the potential to increase. Fish-eating birds, such as Black Guillemots, or morants or terns, can be sensitive to increasing turbidity as they use their eyes to chase and capture their prey under water. Black Guillemots</p>		type of dredger, etc.	

Risk Id	Process	Potential Risk	Environmental Effect	Consequence Rating	Basis of Consequence	Likelihood Rating	Basis of Likelihood	Risk Score (Consequence x Likelihood)
					<p>are rarely seen foraging in the water areas of the Basin as it is unlikely that their preferred fish prey occurs here in sufficient density. As such unlikely to be affected.</p> <p>The breeding tern colonies will not be affected as they are located some 2km away.</p>			
5	Loading	Overtopping of barge with recovered heavily contaminated dredged material from Alexandra Basin West	Release of recovered heavily contaminated dredged material resulting in marine pollution	3	<p>Six Natura 2000 sites and two Ramsar sites lie within 5km of the development.</p> <p>In the EIS, the spill rate from the barges was taken to be 108kg ms-1, this equates to the disposal of circa 0.177million m³ per month</p> <p>Model simulations in the EIS (Chapter 9)</p>	2	<p>Low chance of occurrence as there will be restriction on the maximum load of dredged material that can be carried on the barge.</p> <p>No over-spill will be allowed on the barges.</p>	6

Risk Id	Process	Potential Risk	Environmental Effect	Consequence Rating	Basis of Consequence	Likelihood Rating	Basis of Likelihood	Risk Score (Consequence x Likelihood)
					evaluated that there will be no significant impacts affecting the intertidal habitats (wetlands) which support the wintering waders and water birds for which this site is designated.			
6		Rupture or failure of the barge with recovered heavily contaminated dredged material from Alexandra Basin West	Barge failure with the release of sediment plume resulting in marine pollution	3	<p>The dredged material recovered from the Alexandra Basin West will be loaded onto barges to be transported to a treatment facility adjacent to Berth 52/53. The failure or rupture of the barge will result in a sediment plume, but this will be contained within the Alexandra Basin West.</p> <p>Six Natura 2000 sites and two Ramsar sites lie within 5km of the development.</p>	2	Low chance of occurrence of the total loss of recovered dredged material from the barge	6

Risk Id	Process	Potential Risk	Environmental Effect	Consequence Rating	Basis of Consequence	Likelihood Rating	Basis of Likelihood	Risk Score (Consequence x Likelihood)
7		Uncontrolled or poorly controlled release of heavily contaminated dredged material during loading operations	Release of sediment plume resulting in marine pollution	3	<p>The dredging will be undertaken using a floating pontoon with an excavator mounted clamshell bucket adapted for environmental dredging. This will minimise the disturbance and escape of material at the seabed and during removal through the water column.</p> <p>Six Natura 2000 sites and two Ramsar sites lie within 5km of the development.</p>	2	<p>Medium chance of occurrence, however the use of mounted clamshell bucket will minimise the release of recovered heavily contaminated dredged material. The grab size of the clamshell bucket will be between 0.75 -3 m³.</p> <p>Any uncontrolled release will result in localised sediment plume.</p>	6
8	Transport	Breach in containment of the spill plates around the barge transporting heavily contaminated dredged material to Berth 52/53	Spillage of sediment into the water column resulting in marine pollution	3	<p>The breach in containment of the spill plates around the barge may result in a spillage of sediment into the water column.</p> <p>Six Natura 2000 sites and two Ramsar sites lie within 5km of the</p>	2	<p>Low chance of occurrence as the silt curtains will be maintained.</p> <p>The times in which the curtains are temporarily opened will be minimised to control the containment of</p>	6

Risk Id	Process	Potential Risk	Environmental Effect	Consequence Rating	Basis of Consequence	Likelihood Rating	Basis of Likelihood	Risk Score (Consequence x Likelihood)
					development.		suspended solids.	
9		Rupture or failure of the barge while transporting heavily contaminated dredged material to Berth 52/53	Barge failure with the release of sediment plume resulting in marine pollution	3	<p>The dredged material recovered from the Alexandra Basin West will be loaded onto barges to be transported to a treatment facility adjacent to Berth 52/53. The failure or rupture of the barge will result in a sediment plume, but this will be contained within the Alexandra Basin West.</p> <p>Six Natura 2000 sites and two Ramsar sites lie within 5km of the development.</p>	2	Low chance of occurrence of the total loss of recovered dredged material from the barge	6
10		Ship collision with the barge within the Liffey Channel	Release of diesel fuel resulting in marine pollution	4	<p>Spillage could cause fish kill, impact to birds and other marine life, impact on water quality.</p> <p>The volumes involved may warrant the activation of a Tier 1 to Tier 3 response under</p>	2	Low chance of collision occurring, however operations occurring in busy port	8

Risk Id	Process	Potential Risk	Environmental Effect	Consequence Rating	Basis of Consequence	Likelihood Rating	Basis of Likelihood	Risk Score (Consequence x Likelihood)
					the DPC Emergency Management Plan. Six Natura 2000 sites and two Ramsar sites lie within 5km of the development.			
11		Collision of the barge with fixed object within the Liffey Channel	Release of diesel fuel resulting in marine pollution	3	Spillage could cause fish kill, impact to birds and other marine life, impact on water quality. Six Natura 2000 sites and two Ramsar sites lie within 5km of the development. The volumes involved may warrant the activation of a Tier 3 response under the DPC Emergency Management Plan.	2	Low chance of occurrence with sufficient force for loss of vessel or inventory.	6
12	Unloading	Breach in containment of the spill plates around the	Spillage of sediment into the water column	3	Spillage could cause fish kill, impact to birds and other marine life, impact on water quality	2	Low chance of occurrence of the breach in containment and	6

Risk Id	Process	Potential Risk	Environmental Effect	Consequence Rating	Basis of Consequence	Likelihood Rating	Basis of Likelihood	Risk Score (Consequence x Likelihood)
		barges	resulting in marine pollution		<p>within the Alexandra Basin and impact on wider area.</p> <p>Six Natura 2000 sites and two Ramsar sites lie within 5km of the development.</p>		rupture of barge	
13	Dumping	Dumping Dredged spoil from the Navigation Channel at the incorrect location	Potential for impact on marine flora and fauna of a higher ecological value than the approved dump site location	3	<p>The main impact associated with dredge spoil disposal is smothering of the benthos following deposition of large volumes of inert sediment on the seabed.</p> <p>The sandy sediments to be collected from the outer areas of Dublin Bay are similar in nature to the sediments identified in large parts of the dump site, as such the recovery of benthic communities present at the site will proceed more rapidly than if there were large</p>	2	<p>The proposed dump site (subject to DaS permit from the EPA) has been mapped and documented for many years. The disposal site has been used for dredge spoil disposal for several decades, with the benthos and demersal fish species subject to periodic smothering, and the dump site is not a known hotspot" for harbour porpoise foraging.</p> <p>The impacts associated with the deposition of 5.9 million m³ of mixed sediment over a 6 year period will be temporary</p>	6

Risk Id	Process	Potential Risk	Environmental Effect	Consequence Rating	Basis of Consequence	Likelihood Rating	Basis of Likelihood	Risk Score (Consequence x Likelihood)
					<p>differences in composition between the spoil and the sediment already at the site.</p> <p>Dublin Port Company will provide all dredging companies with detailed drawings, grid co-ordinates and admiralty charts indicating the exact location of the dump site.</p> <p>Six Natura 2000 sites and two Ramsar sites lie within 5km of the development.</p> <p>A deposition rate of approximately 177,000m³ of sediment (from the main shipping channel) per calendar month at the disposal site will be disposed.</p>		<p>negative in nature, principally affecting the direct footprint of the disposal site, and that substantial recovery can be expected to occur within 12 months of the cessation of disposal.</p> <p>The disposal of dredged material in the approved disposal site will take place entirely in the winter months (Oct - March), over a period 6 years.</p>	

4.5 RISK EVALUATION

Based on the risk analysis carried out in Table 4.4, the risks have been prioritised to identify the risks with the highest profile and allow for prioritisation of risk treatment. The prioritised risks are presented in Table 4.5.

The prioritisation in Table 4.5 indicates that all risks with a consequence rating of 4 relate to a ship collision with the dredge or barge vessel resulting in a release of diesel fuel. The likelihood of such events occurring are however considered “low”. The risks with a consequence rating of 3 relate mainly to dispersal of silt plume or oil as a result of an incident. The likelihood of such events occurring however are considered “low” or “Moderate”.

Table 4.5 – Risk Evaluation Table (by Rank) pre-mitigation

Id	Process	Plausible Risk Identified	Consequence Rating	Likelihood Rating	Risk Score
1	Dredging	Ship Collision with the dredge vessel within the navigation channel	4	2	8
3	Dredging	Major spill from the dredge vessel during dredging activities	4	2	8
10	Transport	Ship collision with the barge within the Liffey Channel	4	2	8
2	Dredging	Collision of dredge vessel with fixed object within the navigation channel	3	2	6
4	Dredging	Breach in containment of the silt curtain around the dredger in Alexandra Basin West during dredging of heavily contaminated material	3	2	6
5	Loading	Overtopping of barge with recovered heavily contaminated dredged material from Alexandra Basin West	3	2	6
6	Loading	Rupture or failure of the barge with recovered heavily contaminated dredged material from Alexandra Basin West	3	2	6
7	Loading	Uncontrolled or poorly controlled release of heavily contaminated dredged material during loading operations	3	2	6
8	Transport	Breach in containment of the spill plates around the barge transporting heavily	3	2	6

		contaminated dredged material to Berth 52/53			
9	Transport	Rupture of failure of the barge while transporting heavily contaminated dredged material to Berth 52/53	3	2	6
11	Transport	Collision of the barge with fixed object within the Liffey Channel	3	2	6
12	Unloading	Breach in containment of the spill plates around the barges	3	2	6
13	Dumping	Dumping Dredged spoil from the Navigation Channel at the incorrect location	3	2	6

In addition to the risk evaluation table in **Table 4.5**, a risk matrix has been developed to allow the risks to be easily displayed. The consequence and likelihood ratings are used in the matrix with the level of consequence forming the x-axis and the likelihood forming the y-axis. This matrix provides a visual tool for regular risk reviews since the success of mitigation can be easily identified. The risk matrix is displayed in **Table 4.6**.

The risks have been colour coded in the matrix to provide a broad indication of the critical nature of each risk. The colour code is as follows:

- Red- There are hazards with high-level of risks and requiring priority attention. These hazards have the potential to be catastrophic and should be addresses as a priority.
- Amber – There are hazards with medium to high-level of risk requiring action, but are not as critical as a red coloured risk.
- Green – These are the lowest-level risks and indicate a need for continuing awareness and monitoring on a regular basis. Whilst they are currently low or minor risks, some have the potential to increase to medium or even high-level risks and must therefore be regularly monitored and if cost effective mitigation can be carried out to reduce the risk even further this should be pursued.

The Risk Matrix indicates that there are no risks in the red zone requiring priority treatment.

There are 3 risks in the amber zone requiring treatment through mitigation or management action. These risks are associated with a ship collision with the dredge vessel within the navigation channel during dredging activities, major spill from the dredge vessel during dredging activities or ship collision with the barge within the Liffey Channel during transportation of dredged material which have the potential to result in marine pollution.

The majority of identified risks are located in the green zone indicating the need for continuing awareness and monitoring on a regular basis. However, assessment of the green zone risks has indicated that a number of these risks can be reduced through the implementation of mitigation measures. These risk treatment measures should be adopted where considered cost-effective to further reduce the risks.

Table 4.6 – Risk Matrix (Pre-Mitigation)

Likelihood	V. High	5					
	High	4					
	Medium	3					
	Low	2			2, 4, 5, 6, 7, 8, 9, 11, 12, 13	1, 3, 10	
	V. Low	1					
			Trivial	Minor	Moderate	Major	Massive
			1	2	3	4	5
			Consequence				

4.6 RISK TREATMENT

During the Risk Assessment, each risk identified has been examined in relation to the mitigation measures which have been recommended and proposed in the EIS. As such an updated Risk Analysis was carried out on the Risk Register, which has taken into account the mitigation measures/control measures that will be in place and as such an updated risk score is presented in **Table 4.7**.

Following the completion of the Risk Analysis (with-mitigation), a risk matrix was developed. This risk matrix was developed to allow the with-mitigation risks to be easily displayed. The consequence and likelihood ratings are used in the matrix with the level of consequence forming the x-axis and the likelihood forming the y-axis. The risk matrix is displayed in **Table 4.8**.

Table 4.7 – Risk Analysis for Dredging Operations (With-mitigation)

Risk Id	Process	Potential Risk	Environmental Effect	Risk Score (with-mitigation)	Mitigation and controls	Consequence	Likelihood	Residual Risk Score
1	Dredging	Ship Collision with the dredge vessel within the navigation channel	Release of diesel fuel resulting in marine pollution	8	Dublin Port is a highly regulated and monitored port with use of ICT to monitor vessel movements Marine notices, Radio Navigation warnings, monitoring and control of operations by the Dublin Port Harbour Master. Emergency response plans (SOPEP, DPC Emergency Plan, Dublin Bay OSCP) Onsite oil spill containment and response unit in the port.	4	1	4
2		Collision of dredge vessel with fixed object within the navigation channel	Release of diesel fuel resulting in marine pollution	8	Marine notices, Radio Navigation warnings, monitoring and control of operations by the Dublin Port Harbour Master.	3	1	3
3		Major fuel spill from the dredge vessel during dredging	Release of diesel fuel resulting in marine pollution	9	Emergency response plans (SOPEP, DPC Emergency Plan, Dublin Bay OSCP) Onsite oil spill containment and response unit in	3	1	3

Risk Id	Process	Potential Risk	Environmental Effect	Risk Score (with-mitigation)	Mitigation and controls	Consequence	Likelihood	Residual Risk Score
		activities			the port.			
4		Breach in containment of the silt curtain around the dredger in Alexandra Basin West during dredging of heavily contaminated material	Spread of suspended contaminated sediment beyond the dredge foot print resulting in marine pollution	6	<p>The silt curtains will be maintained. The times during which the curtains are temporarily opened will be minimised to control the containment of suspended solids.</p> <p>A contingency bubble curtain will be installed across the entrance to Alexandra Basin West. This bubble curtain will be utilised in the event of a breach of the silt curtain around the dredger. If a breach occurs, dredging activities will immediately cease, and the silt curtain will be repaired/replaced prior to restarting dredging. The bubble curtain will be activated by switching on a compressor, which will force compressed air through a submerged perforated hose allowing a series of “bubble plumes”. The rising bubbles cause a vertical current of air and water flowing towards the surface, generating an air curtain. This bubble curtain will prevent the movement of any contaminated sediment from entering the Navigation channel whilst allowing port traffic to pass.</p> <p>Silt curtains will be monitored as part of the site management. A furling system will allow for ease of installation and removal, allowing the silt curtains to be easily removed.</p>	3	1	3

Risk Id	Process	Potential Risk	Environmental Effect	Risk Score (with-mitigation)	Mitigation and controls	Consequence	Likelihood	Residual Risk Score
					The effectiveness of the silt curtains will be monitored by field turbidity measurements within and outside the curtain area. In addition, the curtain screen and anchoring will be inspected through a diver survey. The frequency of inspection will be dependent on the environment. Calmer environments can have inspections every several weeks. In the chance of extreme weather, the dredging will cease and the curtains will be removed in advance to avoid risk of damage.			
5	Loading	Overtopping of barge with recovered heavily contaminated dredged material from Alexandra Basin West	Release of recovered heavily contaminated dredged material resulting in marine pollution	6	Barge load limits will be adhered to and the appropriate level will be clearly marked on the materials barge hull.	3	1	3
6		Rupture or failure of the barge with recovered heavily contaminated dredged material from Alexandra	Barge failure with the release of sediment plume resulting in marine pollution	6	Dublin Port Company is provided with certification of inspection and sea worthiness for all vessels. All vessels are subject to Irish Load Line certification and MSO inspection as appropriate.	3	1	3

Risk Id	Process	Potential Risk	Environmental Effect	Risk Score (with-mitigation)	Mitigation and controls	Consequence	Likelihood	Residual Risk Score
		Basin West						
7		Uncontrolled or poorly controlled release of heavily contaminated dredged material during loading operations	Release of sediment plume resulting in marine pollution	9	A silt curtain will be utilised around the dredger whilst the dredging of contaminated material is on-going. Loading operations will be monitored by Site manager.	3	1	3
8	Transport	Breach in containment of the spill plates around the barge transporting heavily contaminated dredged material to Berth 52/53	Spillage of sediment into the water column resulting in marine pollution	6	Spill plates will be designed to prevent any “drippings” from falling between the material barge and dock where the unloading equipment is stationed. All equipment will be inspected prior to commencement of activity.	3	1	3
9		Rupture of failure of the barge while	Barge failure with the release of sediment	6	All equipment will be inspected prior to	3	1	3

Risk Id	Process	Potential Risk	Environmental Effect	Risk Score (with-mitigation)	Mitigation and controls	Consequence	Likelihood	Residual Risk Score
		transporting heavily contaminated dredged material to Berth 52/53	plume resulting in marine pollution		commencement of activity. Activity to be monitored by site management.			
10		Ship collision with the barge within the Liffey Channel	Release of diesel fuel resulting in marine pollution	8	<p>Marine notices, Radio Navigation warnings, monitoring and control of operations by the Dublin Port Harbour Master.</p> <p>Emergency response plans (SOPEP, DPC Emergency Plan, Dublin Bay OSCP)</p> <p>Onsite oil spill containment and response unit in the port.</p>	4	1	4
11		Collision of the barge with fixed object within the Liffey Channel	Release of diesel fuel resulting in marine pollution	8	Marine notices, Radio Navigation warnings, monitoring and control of operations by the Dublin Port Harbour Master.	3	1	3
12	Unloading	Breach in containment of the spill plates around the	Spillage of sediment into the water column resulting in marine	6	<p>Spill plates surrounding the barges will be checked and maintained.</p> <p>If breach in containment is noted in the spill plates, the unloading will cease and the spill</p>	3	1	3

Risk Id	Process	Potential Risk	Environmental Effect	Risk Score (with-mitigation)	Mitigation and controls	Consequence	Likelihood	Residual Risk Score
		barges	pollution		<p>plates will be repaired/replaced prior to restarting the unloading from the barges.</p> <p>All equipment will be inspected prior to commencement of activity.</p>			
13	Dumping	Dumping Dredged spoil from the Navigation Channel at the incorrect location	Potential for impact on marine flora and fauna of a higher ecological value than the approved dump site location	6	<p>The fine sediment elements of the dredged material are predicted to disperse in a plume on each tide.</p> <p>Turbidity at the approved disposal site will be elevated as dumping at this location is ongoing; however, suspended solids levels will return to background levels within a period of days, following the completion of dumping in March each year.</p> <p>Each vessel will be fitted with a tracking device which will record the vessels position and time to ensure the dredged spoil is dumped at the correct licensed location.</p> <p>Restricting the navigation channel dredging operations to the winter months (October to March) provides suitable mitigation to ensure that the dredging operations will have no significant impact on the qualifying interests of Natura 2000 sites.</p>	3	1	3

Risk Id	Process	Potential Risk	Environmental Effect	Risk Score (with-mitigation)	Mitigation and controls	Consequence	Likelihood	Residual Risk Score
					<p>To minimise the risk of direct injury to marine mammals in the areas of operation, the following will be put in place:</p> <p>A trained & experienced Marine Mammal Observer (MMO) will be put in place during dredging & dumping activities. The MMO will scan the surrounding area to ensure no marine mammals are in a pre-determined exclusion zone (500m for dredging activities) in the 30-minute period prior to operations.</p> <p>Operations will be conducted in accordance with NPWS (2014) Guidance¹ and will include seals.</p> <p>Once operations have begun operations, operations should cease temporarily if a cetacean or seal is observed swimming in the immediate (<50m) area of dredging and work can be resumed once the animal(s) have moved away.</p> <p>Dumping of material at sea should not take place if a cetacean or seal is within 50m of the vessel.</p> <p>Any approach by marine mammals into the immediate (<50 m) works area will be reported to</p>			

¹ (NPWS, 2014) "Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters" Department of Arts, Heritage and and the Gaeltacht, Ely Place Dublin.

Risk Id	Process	Potential Risk	Environmental Effect	Risk Score (with-mitigation)	Mitigation and controls	Consequence	Likelihood	Residual Risk Score
					the NPWS.			

The Risk Matrix indicates that there are no risks in the red zone.

Pre-mitigation there were 3 risks identified in the amber zone. These risks are associated with a ship collision with the dredge vessel within the navigation channel during dredging activities, major spill from the dredge vessel during dredging activities or ship collision with the barge within the Liffey Channel during transportation of dredged material which has the potential to result in marine pollution. Through the implementation of the mitigation measures/control measures that were specified in the EIS, it is evident that the likelihood of these risks can be reduced. As such, following the implementation of the proposed mitigation measures/control measures outlined in the EIS, there will no risks in the amber zone.

Pre-mitigation the remaining risks identified were in the green zone, however the likelihood of occurrence was Low. With-mitigation, the likelihood of these risks occurring has reduced and the risk of occurrence is very low.

With-mitigation, all risks will be located in the green zone, indicating the need for continuing awareness and monitoring on a regular basis.

Table 4.8 – Risk Matrix (With-Mitigation)

Likelihood	V. High	5					
	High	4					
	Medium	3					
	Low	2					
	V. Low	1			2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13	1, 10	
			Trivial	Minor	Moderate	Major	Massive
			1	2	3	4	5
			Consequence				

5 CONCLUSION

This Risk Assessment report has been prepared in response to a Further Information Request from An Bord Pleanála in relation to the Redevelopment of Alexandra Basin West and Berths 52 and 53 together with associated works in Dublin Port, Alexandra Road, Dublin 1.

The scope of the Risk Assessment report is limited to the proposed dredging works that will occur in the Alexandra Basin West and the Navigation Channel.

The risk assessment considers the risk of incidents occurring that could result in liabilities materialising e.g. the event of an accident, spillage or containment breach. The risk assessment has been prepared following the Environmental Liability Risk Assessment (ELRA) methodology outlined in EPA document 'Guidance on assessing and costing environmental liabilities' (EPA, 2014).

The risk assessment included the identification of risks, risk analysis which involved determining the likelihood and consequences for identified risk events, risk evaluation which involved developing a risk matrix to allow risks to be easily displayed and risk treatment which includes mitigation measures to control and reduce the risks.

The risk assessment was carried out pre-mitigation and with-mitigation to display the reduction in risk with the proposed mitigation measures/control measures in place as outlined in the EIS. Where mitigation measures/control measures have been proposed, a set of revised risk scores have been applied. The risk assessment has demonstrated that the proposed mitigation measures/control measures proposed will be effective in reducing the likelihood and consequence of the risk occurring.